# Into a world of the "really not real": leveraging a child's make-belief abilities for design clues to build a cross-cultural collaborative environment on the Internet

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A

**Introduction:**

This paper is based on research that predicates itself on the use of computing as a representation of "action in which humans can participate"*(Laurel, 1991)*. Which is to say that the functionality of the computer moves into the background to allow for computer-mediated human-human interaction to occupy centerstage. According to Laurel, computer-based representation without a human participant is like "the sound of a tree falling in the proverbial uninhabited forest."
Additionally, our concerns to make the computer more companionable are in the specific context of the Internet and, therefore, of relatively recent origin *(WWW, 1993).*

This paper addresses two crucial sets of questions towards the build-up of the proposed collaborative environment:

(1) Do children like to collaborate in a computer-mediated environment, as well as collaborate cross-culturally? Is there a pedagogic and technological basis underlying such preference? and

*(2)* How do we build-in collaborativeness onto the Net? Can we tap into children's aptitude for make-belief to create such an environment?

The idea is to attempt this from the perspective of the designer - arguably "keepers of the larger picture" *(Saffo, 2001).* And leverage their ability to look at things from an outside-in perspective that adds dimensionality in a way that traditional engineers and computer-scientists don't because they are too close to the machine. Critical to this perspective is the desire to bring technology within the scope of the human being. And, for the specific purposes of this paper, a desire to articulate the relationship inherent between technology and our user-group focus, viz., children.

B

## Empirical and pedagogic assumptions underpinning children as a special interest group for the Net:

Inspiration for our specific interest in addressing the needs of children as a user group stemmed from two sources that enabled our progression towards the natural synergies between technology and children's learning:
(i) *An empirical basis* derived from an ongoing initiative going back to 1997 and named Project Solar Eclipse (http://www.colorsofindia.com), which was conducted as a series of 'events' (synchronous and asynchronous). The Project had displayed a distinct *joie de vivre* resembling a carnival-like environment as well as a large degree of conviviality *(Sen, Poovaiah and Pulley, Wales, 2002).* And all of this emerging from interactions between children from different countries played out via computer-mediated interactions combined with exchanges in the real world *(Sen and Poovaiah, Sydney, 1999).* The exchanges had made it evident that children adapted with ease to technology, in general, and certainly to the Net in particular *(Sen and Poovaiah, Bangkok, 2001)*. The Project also demonstrated, quite conclusively, the Net's own specific ability as a medium to bring players together to collaborate and create ideas and artefacts over shared and new knowledge domains *(Sen, Falmouth, 2000; Sen, Poovaiah and Pulley, 2003).*

(ii) There was also *a pedagogic basis* for wanting to focus on children. This was inspired after the Constructivists' school of thought that maintained that a certain kind of learning environment (detailed below) could actually create a sense of joy in children rather than create the pressures that the present learning systems seem to engender. In particular, there was Seymour Papert's vision from way back in the sixties *(Mindstorms, 1980)* about the efficacy of computer-mediated learning methods in fostering effective learning. The question was: *could we use these propositions as benchmarks/models for purposes of integrating learning systems into computer-mediated collaborative environments*?

At the heart of the pedagogic basis driving our assumptions for a collaborative environment was the proposition that children learnt best via *experiential learning* (often termed as *home-style/Piagetian learning* after its proponent Jean Piaget) by actively constructing new knowledge rather than by having information "poured" into their heads through *verbal learning/school-style*. In the latter instance, which is what unfortunately prevails, children are made entirely dependent on individuals (teachers) and systems (conventional schools) and which singularly decide what children should learn.

In Papert's words, the idea instead should be to "preserve the child's natural strengths as a learner" *(Schwartz, 1999)* through constructional means (which children are best adept at) rather than via instructional means (that is imposed upon them).

This formed the very kernel of the Constructivist school of learning and education led in the early 20th century by John Dewey (interaction, reflection and experience as key to education) and Maria Montessori ("children teach themselves") Followed from the mid 20th century onwards by Jean Piaget (founder of the Constructivist Theory of Intellectual Development and genetic epistemology and who said "children have real understanding of that which they invent themselves, and each time that we try to teach them something too quickly, we keep them from reinventing themselves") and Seymour Pappert (founder of MIT's Artificial Intelligence and Media Labs, student of Piaget's and the one to have defined the theory of Constructionism).

Closer home in India (between early 1880's to 1980's) progressive thoughts in experiential learning came from founders of educational setups, viz., Aurobindo, an educationist-philosopher ("information cannot be the foundation of intelligence"), Rabindranath Tagore, Nobel laureate poet and educationist ("by devoting our sole attention to giving children information, we accentuate a break between the intellectual, physical and the spiritual life") and J.Krishnamurti, an educationist-philosopher (cultivation of a global outlook, a spirit of inquiry and concern for man and environment).

# C

## Children as special interest group for the Net: children's relationship with technology - a story foretold:

Between our empirical and pedagogic propositions and literature, what clinched the **children-technology relationship** for us were two sets of correlations:
(i) firstly, the observation that the above Constructionist proposition of learning exactly complements Papert's assertion about technology, viz., that, the true power of the computer as an educational medium lies in "its ability to facilitate and extend children's awesome natural ability and drive to construct, hypothesize, explore, experiment, evaluate, draw conclusions - in short to learn - all by themselves" *(Schwartz on Papert,1999).* In other words, technology is endowed with certain ***constructionist attributes*** of its own and ones which incidentally and significantly match with children's natural learning ability through constructing knowledge. It is an assertion that has since been empirically proven and used as basis for constructing storytelling and other computing tools for children (*Ryokai and Cassell, 1999 and others)*.
(ii) the second correlation between children and technology taps into the notion of ***imaginary worlds*** related to both children and

computers:
(a) on the part of children - the possibility of leveraging their innate ability to transport themselves to 'make-belief' worlds;
(b) on the part of the computer - the benefit of the knowledge that designing human-computer experience is about creating imaginary worlds that have a special relationship to reality. This notion itself taking a leaf out of a very early assertion that computers are representation machines that can emulate any known medium. In fact, "the protean nature of the computer is such that it can act like a machine or a language to be shaped and exploited. It is the first metamedium, and as such it has degrees of freedom for representation and expression never before encountered and as yet barely exploited" *(Kay, 1982).*
Human-computer experiences are, in effect, represented by imaginary worlds inside the computer and now the Web. And which tend to hold out their very own and special relationships with reality. In effect, it is all about converting reality into representation via "make-belief".

It is this 'make-belief' ability incipient in children as well as in the computer (and now the Web) that contains the germ of our experimentation. As a critical basis to our attempt at constructing for children, a collaborative environment on the Net with cross-cultural features, we rely on asking the question: *Could we combine to advantage two conditions already in existence: (a) children's propensity to travel to fantasy worlds and (b) the computer's innate ability to represent reality in imaginary worlds as also the Web's ability to make these fantasies reside within its domain*?

# D

**Modules proposed for the intended collaborative environment based on synchronous and asynchronous modes - deriving design clues from a make-belief world as basis for Project New Century's first initiative:**

Pioneering attempts at constructing a collaborative tool for children have been in the form of computational construction kits, which are tools that support children's design and construction of their own projects within specified domains. These were paradigmatically, by far, ahead of the computer game which didn't allow the child to build his own ideas into it (*Resnick, 1994., Umaschi and Cassell, 1997., Ryokai and Cassell, 1999., Simsarian, 1999., Stanton et al, 2001, among others).*

The proposed collaborative tool, the first of the initiatives under Project New Century (following Project Solar Eclipse), goes a step further than this in enabling children to not only design and construct their own projects within a given domain. But to construct and create *with each other*, around themes mutually designated for the purpose, and as opposed to constructing and creating unilaterally with a computational kit.

The focus thereby shifts to *shared domains,* preferably cross-cultural ones, given that the computer can now actually "connect up" the user with different countries through the Net. The proposed environment would, therefore, make the proposed collaborative tool an enabler for children to "meet" with each other, exchange ideas and then build and construct on the basis of these shared ideas across time (fixed or open modes).

In other words, the users (viz., children) will not just communicate with a computational system. They will use a computational system to communicate with each other to create (collaboratively), in the process constructing and further building into these communications.

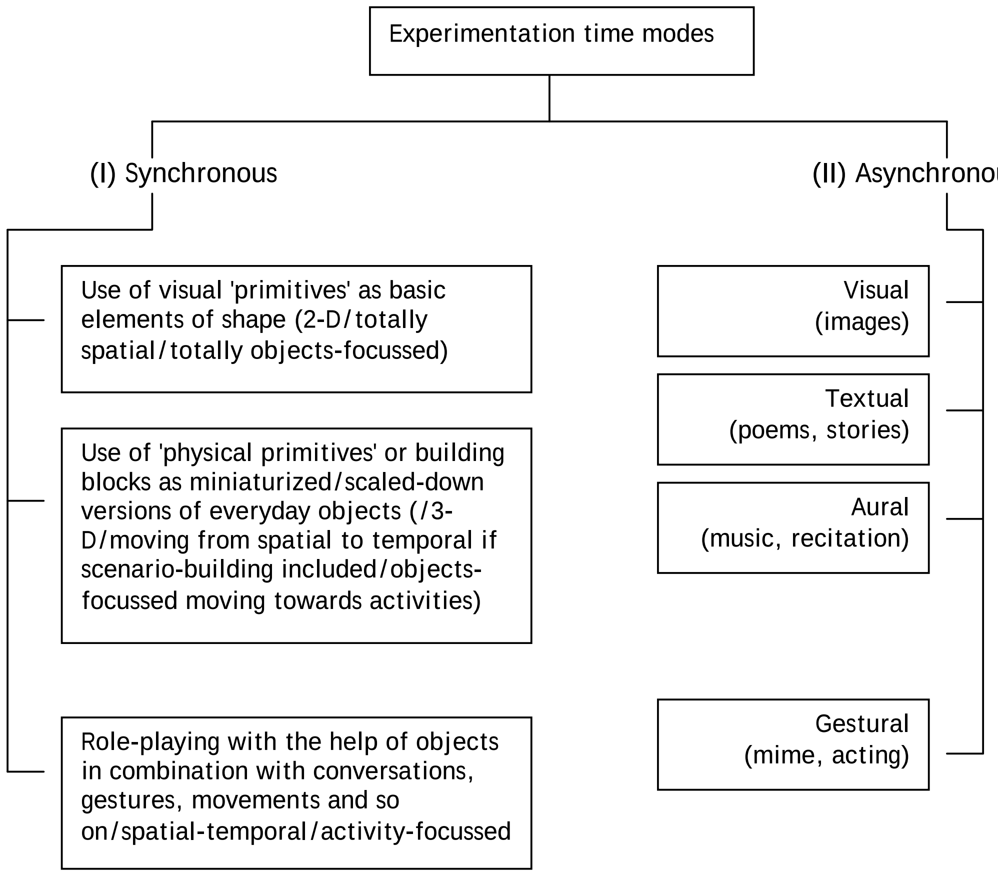
**(1) Groundwork for experimentation:** Our desire to build a collaborative environment for children obviously tapped into the confidence gained from Project Solar Eclipse that confirmed for us the efficacy of collaboration between children across different cultures, as well as the efficacy of the networking technologies in delivering the same. Equally, in recognizing the difficulties of sustaining an organizational enterprise such as Project (Solar Eclipse) as an everyday-use instrument of collaboration to be employed by children. Attempting a stand-alone environment on the Net was the next obvious step.

The idea of creating an environment on the Net was akin to creating a parallel world of representation. In this case, it would have to be a world for children, and one that would be inhabited by activities arising out of their own particular mind-sets. Hence, what we needed to build into the representational world were a set of 'social proxies' that would mimic/recreate/relive the ways in which children built and constructed objects and activities in real life.
We needed to set up a framework of parameters based on factors that were germane to children's learning process as well as instrumental in their ability to collaborate with one another across thoughts and activities. The questions that naturally arose were: *what were the traditional, time-worn ways, in which children were likely to collaborate with each other in the real world? could we employ them in experimental setups in the real world? and then translate them/simulate them on to the Net?*

**(2) The actual experimental setup:** We designed two sets of experiments for the purpose of observing children in interaction with each other in real environment. The age group chosen was 8-10 years which is the Period of Concrete Operations' (7-11 years) after Piaget's classification of the development stages of children according to cognitive structures. Which, during this period, is logical and hence capable of concrete problem-solving combined with ability to perform multiple classification tasks, but depends upon concrete referents The intention was to pick up clues about distinctive attributes driving these interactions. Which, in turn, could work as 'social proxies' for integration into the Net.

The experiments followed across two time modes time modes (diagram):

**Diagram depicting ways in which children are likely to collaborate with each other**




Experimentation in the above modes are in progress. Although early findings are already available with us, for reasons of space we will report outcome of experimentation as also the modes of translating some of the emerging clues into social proxies during actual presentation of this paper (ICSID, September, 2003).

**(I)** In the **synchronous mode** we moved across the entire spectrum of abstraction from completely object-focussed, two-dimensional interactions to the highest level of abstraction in the domain of activity-focussed, spatial-temporal interactions. The intention was to observe if (given the respective medium/aids), children were able to collaborate with each other towards constructing a given task

**(1.1) Use of visual 'primitives' as basic elements of shape (2-D/totally spatial/totally objects-focussed)** and represented by materials such as broken glass bangles, sticks, pebbles, marbles, seeds, ice-cream sticks, big and small match sticks, sand grains, etc. *([Although haptic, the 'primitives' go to construct objects in the visual domain/2-D and hence they may be considered as being visual primitives]*

Inspired after Maria Montessori's turn-of-the-century observations (in 1906) through her 'Casa Bambini' ("Children's House") experimentation, the following insights seemed compelling: that children effortlessly absorbed knowledge from their surroundings, that they were endowed with an untiring interest in manipulating materials and thirdly, that children did these manipulations and creations "naturally" by themselves unassisted by adults. This allowed us to venture forth on testing a two-fold ability scale seemingly inherent in children, viz.,
(1.1.a) their ability to manipulate with materials (as well as their love for such material - as compared to adults who would consider them messy and useless), and
(1.1.b) children's ability to visualize beyond the obvious condition of the given materials. And figure out shapes and pictures (as basic visual elements/visual 'primitives') from these otherwise incoherent materials. E.g., they were able to see the tail of an animal in the curved section of a broken glass bangle. And further, construct a coherent picture or story. E.g., a large dinosaur quickly emerges from these given materials (on the floor of experimental activity). Or objects such as a house, a tree, etc., depicted on a smaller scale.

**(1.2) Use of 'physical primitives' or building blocks as miniaturized/scaled-down versions of everyday objects (/3-**

**D/moving from spatial to temporal if scenario-building included/objects-focussed moving towards activities)** and represented by objects such as trees, arches, brick walls, pillars, roofs of houses, water bodies such as ponds, wells and rivulets, doors/doorways, vehicles, cooking utensils etc.
This category of interaction was intended to tap into their innate ability to reconstruct/build, with the aid of scaled-down objects, environments familiar to them. Examples of constructions were a zoo, a village, a forest and so on. There was also distinct inability to give shape to environments unfamiliar to them.

While it is this very ability to construct the familiar that Lego sets tap into. Our intention would be to leverage the opposite, viz., the factor of the unknown, in order to make collaboration with physical primitives challenging and exciting for the child.
Such as the Indian child attempting to build the Sphinx from Egypt or possibly the American child the Taj Mahal - situations rife with potentials for cross-cultural collaborations, or children collaborating over new knowledge domains of the other's and complementing each other's information gap with situational knowledge.

**(1.3) Role-playing with the help of objects in combination with conversations, gestures, movements and so on/spatial-temporal/activity-focussed:**
This was meant to tap into children's innate ability to imagine real-life situations and build narratives/scenarios into them through mimetics/imitativeness

Examples of activity on the ground were playing out house-house, running a restaurant, enacting teacher-student situation at school, playing at hospitality through roles of host-guest, playing at air-travel through characters such as the pilot, the passengers, etc.,

**(II)** In the **asynchronous mode** we examined collaborative practice across sequential time purely to test out children's ability to create narrative structures collaboratively, but in terms of building on each other's ideas across sequential time. With the difference here that ideas would have to be generated and developed individually (not collectively in a group) and then passed on to the collaborating partners as inputs for a larger common, collaborative task. The closest to an analogy for this mode of communication could be the 'Chinese whisper' *(footnote 5).* The ensuing narratives were expected to be articulated in the sensory domains of the visual (images), textual/verbal (stories, poems, haikus, songs), aural/auditory (sounds, music, eloqution, recitation, etc.,) and if possible, in future, through gestures and actions (as in theatre, mime, acting).
This is a form of collaboration that requires less group coordination and a lesser frenetic pace than synchronous group activity. And could work additionally well with children who are a bit reticent and introverted by nature. Or amongst children with slightly challenged social skills as a result of physical handicaps such as cerebral palsy, dyslexia, hearing/speech impairment and so on.

E

**In conclusion:**

"As digital technology begins to give children greater autonomy in exploring larger worlds" it will necessarily underscore a concomitant shift in power relationship away from the 'teacher' to the 'taught' (with parents and teachers having less control over what children will learn). Equally, as children begin to see these gateways they will demand better and they will demand more.
Our own attempt at devising a technology-driven learning environment that harnesses the innate qualities of children to construct, invent and learn in their every day lives remains a tribute to the learning-theory seers long before our time. It is also a tribute to the children-technology relationship foretold by half a century. And a small step in the direction of the anticipated power vacuum in the wake of a potential paradigm-shift from treating children as empty vessels to be filled with knowledge (content-based learning) to children being considered as active builders of knowledge (process and skill-based learning).

Our modest attempt to build a collaborative environment into the Net for children has been overarchingly driven by a design understanding which reflects the Constructionist reality that children don't think like grown ups. What children have in place of the adults' world of intellectual constructs are their own primitive laws for comprehending life, such as: "things disappear when they are out of sight", "big things float and small things sink", "going faster can take more time (which had intrigued Einstein since his own theories of relativity ran so contrary to common sense)" *(Papert on Piaget, 1999a).*

While liberally referencing the thoughts of early Constructivists, we are also sorely aware of certain anachronisms. That, when John Dewey had espoused democracy in education-systems he had not foreseen the power of the new media technologies because they simply did not exist even at the time of his death (1952). And yet, a hundred years after Dewey it would seem, almost by serendipity today, that technology alone will make it incumbent upon the established school-style/verbal-learning system to give way to what was always evidently more conducive for the development of children's minds: viz., home-style/experiential learning.

However, technology by itself is like the proverbial Trojan horse. Seymour Papert, the great advocate of technology for children, raises this analogy to place technology-for- learning in true perspective. He says it wasn't the horse that was effective, it was the soldiers inside the horse. And maintains that "technology will be effective in changing education only if you put an army inside it".

This is the army made up of a changed profile of children and parents in future - a politically potent force. Without the proverbial army, technology could be just what the vendor sells to a school - a computer as a mechanical device, devoid of human participant. Or like the pencil in a classroom full of pre-school children, with the hope
that it will somehow make the children learn how to write. And, at the end, all of this amounting to nothing but the mere token presence of technology with the further hope that it will somehow revolutionize education *(Papert, 1999b).*

*References (in order of appearance in paper) as well as for more details on the paper: refer to* http://www.colorsofindia.com

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