Designing for Children
- With focus on 'Play + Learn'

Adapting to a Digital Future
The Indian Context

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Abstract: The digitalization of the world around us has brought forth an unprecedented technological development. The physical and virtual worlds are gradually blurring. At this stage, we need to prepare our children for this rapid change. It has been found that creativity, critical thinking, emotional intelligence, judgement, people management will become the most important skills of the future. Our research delves into the aspect of play as an important methodology of preparing the children for the future with innovation and creativity as the foundation. It was found that though digital exposure at an early age is important but it doesn't need to be the dominating aspect of playing and learning. Rather it was found that for the right growth of a child's mental abilities, a centre point needs to be achieved between free play, structured play and direct instructions.

Key words: Play, learn, digital, future, children, design, free, structured

1. Introduction

With the advent of 4th Industrial revolution, we are seeing an unprecedented change in the digital field. The lines between the physical and digital spheres are blurring day by day and it is a priority that we recognize these changes and prepare our next generation of children for it. According to research 65-85% jobs of the future as close as year 2030 have not been created yet (Dell technologies, 2017). The world is highly digitalized and it has brought forth technologies such as additive technologies, IoT, AI, quantum computing, 5G telecommunication systems etc. At this juncture, we need to understand that the children should be brought up in a manner which caters to innovation and creativity to the highest levels. According to a white paper, creativity and critical thinking have risen in the charts of top skills required by the year 2020 which were otherwise very low in their importance in 2015 (TFO, 2017). Play as a behaviour is not just for fun but it is the most important methodology to achieve better physical growth and also learning about ones own environment. It is defined as self-motivated, free, flexible, enjoyable, with active

participation and engagement. The engagement is both physical and psychological (Shetty, et al., 2015).

To prepare our children for the paradigm shift that digitization is bringing in today's world, we must create learning scenarios. But to understand that we need to explore the ways through which a child prefers to learn. Golinkoff and Hirsh-Pasek (2016) (Toub, et al., 2015), have theorized the 6C's or crucial competencies- collaborate, communicate, critical thinking, content, creativity and confidence. To inculcate these 6 C's, we need to understand the process through which children prefer to learn. Play is one of the most primary nature of a child's growth. According to a research by Marc H. Bornstein, Chun-Shin Hahn, and Joan T. D. Suwalsky in 2013 (Bornstein, et al., 2013), children who are exploratory and active when they are 5 months old are more successful by the age of 14 in school. Thus, it is very clear that play acts as a highly important aspect of a child's learning. Thus, the question arises about the composition of play and if it should be highly inclined towards digitization. Also, it is important to understand the scenario for a developing country like India.

2. Education problem in India

Report by IECEI (Indian Early Childhood Education Impact) (ASER, 2015) has revealed certain interesting aspects of the condition of education in India. For this, they undertook a study of 14000 students between the age group of 4-8 in the states of Assam, Rajasthan and Telangana. They studied the readiness of the schools, learning outcomes of the students, quality of the preschool programmes etc. They found that 7 out of 10 students attend pre-school which was a big achievement. However, children do not necessarily go through a linear education system, as prescribed by the RTE (Right to Education) Act, 2009 and National ECCE (Early Childhood care & Education) Policy 2013. As a result, some 4-year-old children are already in primary schools and many 6-year-old children are in pre-primary. As a result, many children go through a curriculum which is inappropriate according to their developmental levels. They also found that a higher participation level at the pre-primary stage leads to improved participation levels at the primary schools. But due to inappropriate education levels, the readiness of the children at the age of 5 is very low, especially in the cognitive, pre-numeracy and pre-literacy abilities. Most of the students are exposed to inadequate materials, methodologies and activities which do not lead to their proper mental growth. It was observed that Anganwadi schools are multitasking in nature whereas most private preschools have incoherent teaching methodologies. Maximum focus is on formal modes of direct instructions in reading, writing and arithmetic.

Neither models of schools provide an education which is optimum according to their age group with low emphasis on activtiy, creativity & critical thinking.

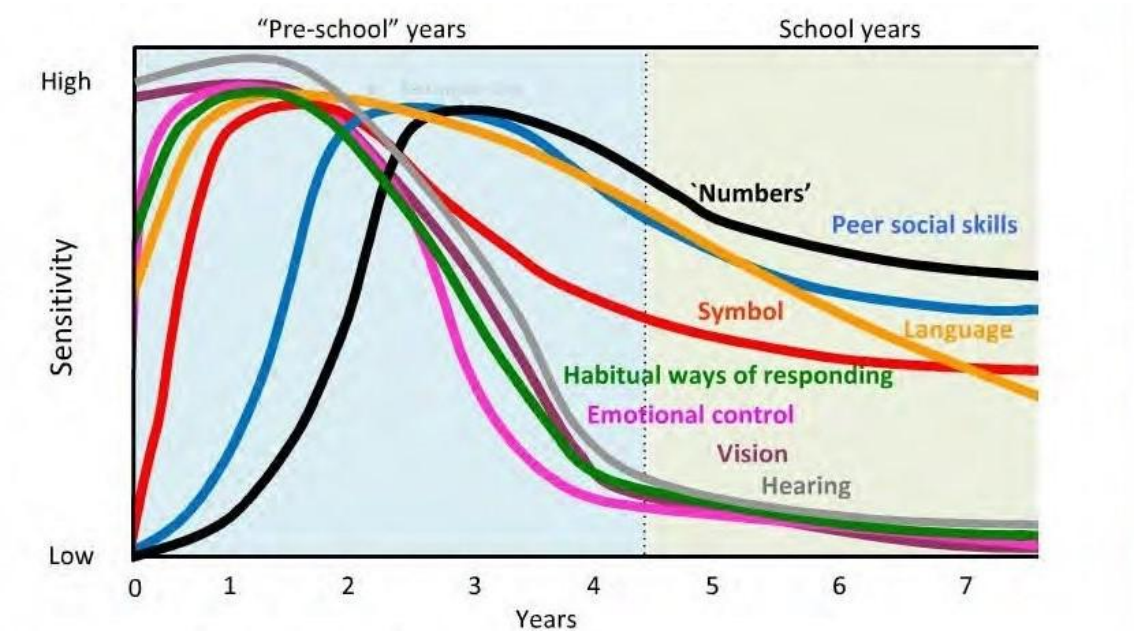


Figure1: Sensitive periods for Early Development (Hertzman, n.d.)

Figure1 shows the sensitivity period of brain development and we can see that the most sensitive period is up to the age of 5 and after that, it declines in the school years. Hence all the efforts to optimize a child's mental capabilities must be done before the age of 5. Thus we must identify the factors that stimulate the brain to its maximum capacity.

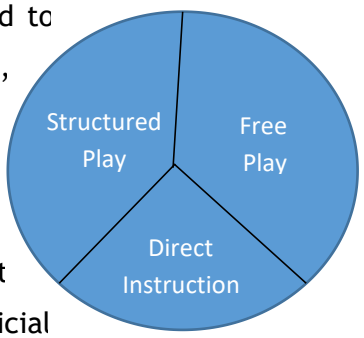
3. Structured Play vs Unstructured Play

A child normally goes through 5 stages of play- Exploratory, Relational, Self-pretend, simple pretend and sequence pretend play. In exploratory play or sensory-motor play, which is mostly based on discovering the objects/ toys around them through throwing, moving, shaking, etc. In the relational play, a child tries to relate objects to one another by hitting or stacking them. In the self-pretend play, the child usually starts imitating others like toy cups or guns represent the real ones. In the simple pretend play, the children start relating actions that they see around them such as feeding a toy animal or a doll. And finally when many simple pretends are done in a sequence such as making a child feed the doll and then making it sleep, then it is called a sequence pretend play. Such play usually starts from the age of 9 months till the age of 36 months (Shetty, et al., 2015).

However, a research work by David Geary (Geary, 2007), that exploratory or discovery-based learning will only develop primary or biological skills. However, the biologically

secondary skills such as language or complex mathematics can only be taught through a structured system. Free or unstructured play have limitations in teaching secondary skills.

Hence we need to understand the process of play. Free play is fun, unstructured, flexible and voluntary without any specific goals (Weisberg, et al., 2013). A completely free play can only help a child learn certain basic characteristics and they should gradually be introduced to structured play. In this kind of play, the playing methodology is guided by the parents/ teachers so the children can develop their secondary skills. However, the structured play usually diverge into direct instruction based approach. In such a scenario there is a high chance of a child getting demotivated. According to a stud, students only retain 10% of their learning from the last 10 ins of any direct instruction based session (Rüütmann, et al., 2011). So to achieve optimum learning we need to achieve and maintain a centre point between direct instruction, free and structured play where the child stays motivated. For example, playing with blocks improves mathematics skills whereas playing with books improves literacy skills (Goble, 2014). However, teaching the children through books, passively, without any engagement on the part of the children leads to superficial learning.



ACTIVITY	ANGANWADI	PRIVATE SCHOOLS
Planned activities for all round development	Low	Low
Rhymes and Songs	High	Medium
Conversation	Medium	Low
Formal Teaching	High	High
Routine Activity	High	High
Unplanned Play	Low	Low
No Activity	High	Medium
OPPORTUNITY	**ANGANWADI**	**PRIVATE SCHOOLS**
Learn to share	Low	Low
Think and answer	Medium	Medium

Express curiosity and ask questions	Low	Low
Learn to wait for turn	Medium	High
Play/work with other children	Low	Low
Rote memory	High	High

Table 1: Comparison of Activities & Oppurtunies between Anganwadi and Private Schools at Pre-primary Levels (ASER, 2015)

The above table highlights various aspects of Anganwadi schools and private schools according to IECEI Policy 2015 (ASER, 2015). Here we can see a high emphasis on rote learning and low emphasis on unplanned activity as well as planned or structured play. E Thus, the 6C's or the crucial competencies are not taken care in the above example and will lead to lower learning levels of children.

4. Digital Play / Exposure for children- Important or Hindrance

With the world getting highly digitized and automated every day, it has turned impossible to keep children away from the new-age gadgets and tools. Hence it has now become imperative that we should accept the change and use these tools more intelligently for their learning. By blending the learning features with play, it becomes more attractive for a child and it improves their eagerness. Firstly, we should understand what are the different skills that need to be inculcated in a child. Only play and only learning in an isolated manner can achieve very limited goals respectively. Thus for a child to grow, it needs to develop two types of skills-Primary or evolutionary and secondary skills. Evolutionary skills such as numerosity and discovery-based learning. Secondary skills such as language, arithmetic, etc. need to be taught. Thus a child should be taught in a manner that both the skills are developed in the right manner.

National ECCE Policy (Anon., 2013) suggests the use of 'spiral curriculum' where complex curriculum should be taught more simply and the same concepts can be revisited at a later more mature age in a complex manner. This is what many digital applications intend to achieve while designing their curriculum where certain simple learning are taught in visual and animated formats which creates interest among children. It also stresses that learning through play and activity as natural methods. Similarly, another *study* (Sajana., 2018) *shows that cartoons* can act as a very effective medium to teach language to children. According to Jerome Bruner in his book 'Toward a Theory of Instruction', the children learn through *activities or enactive, images or iconic and symbols or language*. These

three interrelated modalities of learning form the basis on which most learning applications are designed. According to Hirsh-Pasek, digital applications provide children with the interface where cognitive skills are enhanced through interpreting words into images and symbolic understanding through virtual imagery of real life objects. For example, a mathematics app that is designed to teach quantity will present visual imagery of objects of a certain colour such as '6' red balls and verbally express it as well as numerically represent the number '6' so that children can relate the sound with the symbol or numerical. Similarly, children can use music apps to create their notes on touch screen interfaces (Hirsh-Pasek, et al., 2013). Thus these apps provide the opportunity to the children to engage with the actual solution formulation rather than through direct instructions. This active engagement leads to a deep learning experience rather than being superficial.

However, digital exposure comes with its challenges. A recent research says that digital exposure to children (Chang, et al., 2018) has risen exponentially with TV and smart-phones taking bulk of the time. In-fact toddlers spend almost half an hour every day with these devices. Though there is a lack of empirical data suggesting the effects on the children, however, a recent study shows that (California, 2018) children with higher frequency of use of digital media lead to a higher symptoms of ADHD (Attention deficit/ hyperactivity disorder). Moreover, thousands of apps are available online and parents or regular pre-primary teachers can't evaluate the nutrient value, appropriateness or impact on the children of such tools. As a tool, digital media is highly effective. But due to the high amount of digital exposure of unverified content on digital platforms, it is impossible to monitor it in the present context. Again for a country like India with economic classes varying to such extremities, and with high levels of the digital divide between them (Srivastava, et al., 2019), the challenges to impart impactful technological exposure increases. Irrespective of that, the digital media exposure in the form of phones, TV and cheaper internet services have made in routes into the life of all the classes of people. But the devices have not proven themselves as good tools to learn. However, these tools have been promoted by parents as a toy so that children do not disturb them rather using them as learning tools. Without any proper evaluating strategy or awareness, these devices tend to provide low nutrient value for a child's mental growth w.r.t to their age. According to a study by NCBI, 73% of Indian children have access to smart-phones. But addiction to smart-phones is as high as around 39-45% (Davey, et al., 2014). The other challenge that India faces is at the implementation and in-coherency in play and learn methodologies at kindergarten levels. We have to understand how to keep a parity between various types of schools starting from Anganwadis, private and international schools considering the

affordability & availability of these appropriate learning tools that stimulate creativity. However, as a society, it is imperative to prepare our new generations for the future which is going through a drastic and visible change.

5. Conclusion

Parity needs to be achieved between different types of schools whether they are Anganwadis or private schools in terms of the learnings that the students achieve. Undoubtedly, digital mediums are an added advantage in the learning of children. But they are not the only way to achieve parity. In fact for a developing country like India, it is difficult to provide digital interfaces to every child especially in Anganwadi or government schools. Though the Government through schemes like Digital India and e-Basta (Singh, et al., 2016) is planning a lot of initiatives to train the teachers in the digital modes. Some findings by the Joint Research Centre (JRC) of the European Commission that digital exposure of children is important but children also enjoy other forms of engagement. They also identified numerous other issues like social isolation, limited learning, unwanted exposure to harmful content etc. It suggests that digital mediums should be a support to the various other forms of interests like sports, games etc that improve physical and critical thinking (Chaudron, 2015). Thus, rather than emphasizing digital mode of learning as the only way forward, we should put more effort into achieving the 6 C's through various structured and unstructured play. It will give children a creative outlook, which will automatically prepare them for the future. The rapid pace of digitalization is such that it is very difficult to predict the kind of technology the children of today will experience in the coming decades. So instead of putting the effort on familiarizing them with present day technologies alone, emphasis should be on learning outcomes and not the tools.

1) With the discussion and research, we can come to a conclusion that the tools should be designed in a manner that the biologically primary skills development should gradually develop into biologically secondary skills.

2) The idea of discovering the surrounding by a toddler should convert into inquisitiveness. Hence the tools should have an inbuilt element of discovery and limited amount of direct instruction.

3) The tools should be designed in a manner that it encourages the child to make their toys or find their solutions

4) Discipline should give way to freedom to choose by learning to make the right choice through mistakes without the fear of punishments especially in pre-primary and primary levels.

5) The policies and recommendations according to various acts such RTE should be implemented

6) The learning of the children should be standardized across the country

7) Play, free and structured, should be appropriately made a part of the curriculum

8) Digital apps should be evaluated and proper evaluation criteria should be developed before prescribing it to the children

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