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Editorial Note

It is with great pleasure and enthusiasm that we welcome you to the Volume 2 Number 1 issue of the International Journal of Arts, Architecture and Design (JAARD). We as Editors are honored to be a part of this scholarly endeavor and to introduce you to the world of artistic exploration, architectural innovation, and creative design thinking.

JAARD aspires to be a hub of intellectual discourse and creative expression in the realm of arts, architecture, and design. We are committed to providing a platform where original research, critical analysis, and innovative practices can thrive. This journal is not only a repository of knowledge but also a dynamic space for dialogue and collaboration among scholars, practitioners, and enthusiasts in these fields.

Our editorial board comprises distinguished members who bring a wealth of experience and expertise to ensure the quality and rigor of the content published here. We encourage diverse perspectives and cross-disciplinary exchange, embracing a wide spectrum of topics from music to user experience design.

We invite you to explore the articles, essays, reviews, and commentaries presented in this volume. Your engagement and contributions will be vital in shaping the future of JAARD. We look forward to your scholarly pursuits and creative endeavors as we collectively explore the fascinating world of arts, architecture, and design.

Thank you for being a part of this exciting journey, and we eagerly anticipate the scholarly discoveries and innovations that will emerge through JAARD.

Editors

Cocoon Finger Puppets: Fostering Creativity and Innovative Teaching Through a Participatory Pedagogical Method

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ABSTRACT

Fostering creativity has been the main emphasis in 21st-century educational discourses, leading to engaging innovative teaching approaches and methods. More often, materials used in such activities are unsustainable and offer limited creative manoeuvring possibilities. Considering the size and scale of educational activity worldwide, it would become a significant concern. Puppetry proved efficient in improving communication, narrating concepts, and helping learning outcomes in education. Finger Puppets are relatively modern and easy to make among various puppetry forms, which offers scope for participatory pedagogy. In earlier attempts, silkworm cocoons have been used in handicrafts, value-added products, and limited teaching explorations. The sericulture industry extracts only ~18-23 % of silk filament wrapped around each cocoon, leaving the inner shell (~80%) unutilized, which unwraps an enormous opportunity to explore this unique natural material for its qualities and abundance. The article explores the potential of 'Silkworm Cocoons' as the primary material for creating finger puppets to aid the teaching process at the preschool stage. The insights gained in the study and feedback from educators motivated us to design various character options using a locally available cocoon breed, *Bombyxmori L.*, as a primary resource, envisioning a novel approach to pedagogy. That included identifying the gap, demonstrating the creative possibility of Cocoon Finger Puppets (CFP), and piloting a study to check feasibility at the foundational stage. The iterative design process exposed infinite possibilities that could aid effective pedagogy across educational stages, offering staggered complexity of making and performing. Hence, we propose CFP, a novel 'material-centric' 'make-and-learn' framework, as a 'participatory pedagogical method.' That is creative, appropriate, nature-friendly, and simple to implement in schools at various stages identified in NEP2020, supporting global Sustainable Development Goals.

Keywords - Creativity, Innovation, Make and Learn, Cocoon Finger Puppets, Handmade-Toys, Participatory Pedagogical Method, Education, SDGs,

1. Introduction

Despite being complex, 'Creativity' has gained much traction in educational discourses (Patton, 2023). In general, there seems to be a consensus on the characteristics of creativity and agreement on it being new with some value and that everybody can be creative to some extent (Runco and Jaeger, 2012). Many innovative teaching methods, including toys and activities, have been harnessed to foster creativity. Puppetry proved to be effective in this context ((Mehrotra et al. (2009), Dunst (2012) and (Bernier and O'Hare 2005)). But the traditional repertory of Puppetry still essentially serves religious propagation. The conventional practices no longer appeal to the new generation's audience and are the reason for their decline. Modern forms of entertainment like cinema, television, and web-based media infinitely streamed through various platforms have captured people's attention. Contemporary forms of entertainment serve commercial, cultural, and political communication and consumption. Such influences have altered the indigenous Puppetry forms, transforming them for

secular and educational purposes (Brandon, 2023). The article explores the potential of 'Silkworm Cocoons' (*Bombyxmori L.*) as the primary material for creating finger puppets and aiding the teaching process at the preschool stage (Ahlcrona, 2012), employing a participatory method (Hedges and Cullen, 2012).

Finger puppetry, a kinaesthetic activity, would be ideal for foundational and primary stages. Due to their ease and less effort, they are preferred handcrafts among parents, children, and educators; however, making and using puppets are sporadic in educational practices. We piloted a study to check the feasibility and demonstrated the other possibilities of creating simple and complex characters. It would be an inventive learning method supporting mediating interactions in elementary educational stages, offering authentic and experiential learning opportunities for educators and students to improve skills, imagination, and collaboration. The paper's second section, covering puppetry's historical and modern significance, leads to the third section, which deals with the participatory pedagogical method and learning theories. The fourth section describes the methodological process that advocates a 'material-centric' make-and-learn framework, which is creative, appropriate, nature-friendly, and simple to implement in the classroom setup. The fifth section, discussing the results, concludes with the proposition for a novel material-centric pedagogical approach and framework.

2. Historical Significance of Puppetry: A Literature Review

The visual and performing arts are expressions of distinct cultures and geographies they represent. Eclectic forms of arts and crafts can be traced throughout recorded human history. We know little about the origins of puppetry; we can only hypothesize about the milieu that motivated our ancestors to use puppetry. Common traits and strong parallels between traditional art forms and regional Puppetry are typical as they imbibe similar attributes worldwide. Unlike in Europe, it is still a living tradition in Asia (p.69) (Orr, 1974). For instance, over twenty such puppetry traditions can be traced in India. Noted are 'Hand Puppetry' (*Punch & Judy type*), String Puppetry (*Marionette*), Rod/Stick Puppetry, and Shadow Puppet Theatre (Foley and Pudumjee, 2013). Hand puppetry is believed to be the oldest form due to its simplicity and is found across Asia (Orr, 1974)—the 'Bunraku Puppet' of Japan roots glove-type puppets (Foley and Pudumjee, 1974). Puppetry amalgamates many artistic domains like painting, sculpture, movements, music, space, light, costume, and accessories. At its core, Puppetry is the art of transforming an inert object into life; the diverse puppet practices have been painstakingly documented (UNIMA) from various regions. Over the years, these were integrated into folklore worldwide. The earlier Puppetry practices were usually an open-air affair commonly practiced in India, Indonesia, and Japan; ordinary village folks believed it was 'auspicious' and effective in escaping droughts, bringing rain, and warding off evil spirits epidemics (p.98)(Iyer, 1960). As Bascom lists,

"[T]he four traditional functions of the Asian puppet theatre are (1) The magico-religious, (2) The educational, (3) The reaffirming of cultural and social institutions, (4) The reinforcing of traditional ethics and moral standards", (p.79) (Bascom, 1954).

Since time immemorial, Puppetry has been a crucial vehicle for religious propagation and entertainment. The inclinations of iconographical traditions in 'Hinduism' might have prompted celestial and demonic manifestations to develop a rich tradition of sculpture that has long been turned into puppets. Archeological evidence reveals several pre-historic (*c. 2500 BCE*) terracotta artifacts "*with moveable limbs (Mechanical Dolls); the toy cow with a moveable head was found at the Harappa*" (Basham, 1959), and recorded that

"The ritualistic use of human and animal figures predated the Vedic Aryan culture and continued on the subcontinent until idol worship became characteristic again of the later Hinduism (from about the 8th-century CE)" (p. 21) (Basham, 1959).

Discoveries in Egypt revealed that puppets were created more than 3,000 years ago. Foley & Pudumjee (Foley and Pudumjee, 1974) indicated that the Indian epic 'Mahabharata' is the oldest reference to puppetry, which can be traced in the oral stories of the 9th Century BCE that got into the written format in ca. 4th Century; Panini and Patanjali works have mention of Puppet conceptions. Richard Pischel (1849-1908), a German scholar, emphasized Indian Puppetry and contended that *"India was the origin of Western puppet traditions"* (Foley and Pudumjee, 1974). The traditional forms of Puppetry enacted stories from epics and Puranas, besides fables and local tales. The known stories and memories are reinforced through simple performances that recharge communities' spiritual and moral values. The figurines might have moved hearts and minds through the dancing shadows, gestures, and repeated patterns. The captivating audiovisual storytelling medium survived the test of time and is still relevant. Recent trends to keep up with changing audiences include references to popular media, women in newer roles, themes on corruption, awareness, Family planning, and ecological concerns (Khan et al. 2023), (Babu, 2020). Asher (2009) referred to *"Radical Puppets as a powerful tool to voice current social issues."*

Similarly, Chattopadhyay (Chattopadhyay, 2017) accepted Puppets's potential in mass communication in India. Puppetry breaks down all barriers and directly reaches people and society (Khan et al. 2023). Mehrotra et al. (2009) also ascertained the appropriateness of Puppetry in the multicultural Indian context due to its inclusive and collaborative nature. More recently, Aravind et al. (2015) attempted to rejuvenate this age-old technique and storytelling medium by automating sections of puppet theatre. They employed 'Robot Puppet' manipulators and custom-designing software to give the ancient practice a modern and technological life—an example of a novel approach to interactive Puppetry.

2.1. Puppets in Therapy

Health professionals and researchers have used puppets with children in therapeutic practices. These simple, inexpensive approaches have been effective since the 1950s (Howells and Townsend, 1954). Kurt & Seval (2021) highlighted that Finger puppet plays could effectively be a non-pharmacological aid to decrease postoperative pain in children. Puppet experiences were employed as a healing strategy to familiarize elementary school children with aspects of wellness (Synovitz, 1999), education (Aldiss, 2009), and research (Measelle et al., 1998). Reid et al. (2014) used Puppets as part of the educational framework of undergraduate nurse education programs 'Pup-Ed' (*KRS Simulation*).

2.2. Puppets in Education

Krögera and Nupponen's (2019) comprehensive literature review on *"Puppet as a pedagogical tool"* complements the aim of this endeavor. They found five potential applied uses of Puppetry in education; they are *"(1) generating communication, (2) supporting a positive classroom climate, (3) enhancing creativity, (4) fostering cooperation in and integration to a group, and (5) changing attitudes"* (ibid.). Similarly, Measelle et al. (1998) describe:

"[P]uppets pedagogical value may be highlighted when combined with children's ability to dramatize, freely express feelings and emotions, creativity, and self-knowledge... Children observed and remembered facts, imitated them, and added personal characteristics and experiences to what they observed".

Puppets act "as transitional objects linking children's inner and outer worlds" (Bernier and O'Hare 2005)). Furthermore, Riyani (2019) used finger puppetry utilizing storytelling techniques to teach vocabulary to the fifth grade and found a correlation between children's development of ideas and concepts and their initial formal schooling experiences. Romanski (2019) states, "*The complexity of form in puppetry allows for play, discovery, imagination, problem-solving, brainstorming, collaboration, and innovation.*" Brèdikytè (2000) introduced "the DDP (*Dialogical Drama with Puppets*) method" to promote child-teacher interaction. Puppets could also boost the confidence of the novice teacher by using them "as a type of cover" (Remer and Tzurriel, 2015). Marshall (2014) advocated for integration and framing art as a transdisciplinary paradigm to meet the current needs of education. Performing arts such as Puppetry has also been a productive method in informal education in India (Shah and Joshi, 1992). In earlier attempts, artistic shows were arranged for developmental programs (Littlepage, 2006). It helped the audience to be receptive to the new programs due to their metonymic (Tillis, 1992) and liminal properties (Delanty, 2009 and Turner, 1994).

2.3. Barehand Puppetry (Hand Shadows), Make-up hands, Finger Puppetry

Violette recollects hand shadow works of Mario Mariotti, like *Animals (1980)* and *Hu-mains (1982)*, and acknowledges Make-Up Hands' tremendous possibilities of Bare Hand Puppetry (Violette and March, 2009). The finger puppetry type is relatively modern and less explored than traditional forms. As the name suggests, the Puppet is animated using one or two fingers occupying the Puppet's interior (Finger puppet - Wikipedia); the Puppeteer's fingers constitute the prime form of manipulation (Violette and March, 2009). Finger puppets could also be created simply by placing the ball on the tip of the finger. Sergei Obraztsov similarly performed a number with two characters, and Frédéric O'Brady used a bare-hands puppet with a simple head attached to the index finger (Jarovtseva, UNIMA). Jean-Paul Hubert has performed puppet plays by simply reciting the text as a voice-over and illustrating his interpretations with simple finger puppet manipulations (Jarovtseva, UNIMA). Due to their ease and less effort process, these are favourite handiworks among parents, children, and educators of current times; such well-crafted or industrially manufactured finger puppets are also commercially available with educational kits and often come in a set of 5. They are designed to fit all fingers of one hand. However, imaginatively creating puppets for the given context is invaluable.

2.4. Silkworm Cocoons and Present Usage

The cocoon is formed in distinct shapes, textures, and colors depending on the racial features of the silkworm breed. 'Indian silks' are renowned for their artistic sophistication, designs, and distinctive colors (Vikaspedia). India is "the second-largest silk producer of raw silk and the world's largest consumer of pure silk." Since independence from the raw silk production level of 1,437 MTs during the first 'Five-Year Plan' period to 31,831 MTs till 2018, and planned to augment to 48,800 MTs by 2023-24 (Vikaspedia). The Sericulture industry is banking only ~18-23% of silk filament wrapped around each cocoon (Mascarenhas and Suvidha (D'Source)), leaving the inner shell (~80%) unutilized, which unwraps an enormous opportunity to explore this unique natural material for its qualities and abundance. The cocoons are perfect for handcrafting, and there have been many attempts to use this humble material in value-added products like flowers, bouquets, garlands, Jewelry, and various other accessories (Mascarenhas and Suvidha (D'Source)).

2.5. Cocoon and Finger puppetry

The cocoons are pierced at one end while extracting silk in the Sericulture process, creating a small opening. The oval shape and natural form of the Silkworm cocoon allow us to insert fingers into them, complementing the idea of 'Finger Puppetry.' The plain light surfaces are excellent for creating rich surface details by drawing. Prihatin et al. (2018) investigated learning outcomes in biology subjects using Brain-Based Learning, applying role-play through Finger Puppets made of cocoons. However, the activity did not extend its scope to the design development process. Also, the authors did not use them as the primary resource material or propose a comprehensive educational approach that can aid across age groups, subjects, and skills. We have attempted to create and demonstrate exciting characters and discover the possibilities of CFP in pedagogical practice. This paper complements the earlier attempts to use finger puppets in education (Riyani, 2019), (Romanski, 2019) and the use of the cocoon as material in an educational aid Prihatin et al. (2018) and proposes a prospect as a generalized participatory pedagogical method (PPM) for educators and learners alike.

3. Participatory Pedagogical Method and Participatory Learning Theories

Scholars have urged alternative and coherent theoretical frameworks for developmental psychology that underpins culture in learning, Burman (2001) cited in Hedges and Cullen (2012). Most scientific studies are devoid of sociocultural dimensions and historical contexts. A more recent understanding of the developmental stages informed by the research in natural contexts acknowledges the role of culture and social values, suggesting cultural psychology as an alternative (Vygotsky, 2012). Vygotsky's early seminal work (1934) explains children's learning of simple concepts without any formal or explicit instruction just by participating in the experiences, a critical concept in play, in puppet creation and usage. Further, it affirms Vygotsky's idea that learning should be authentic and relevant to the daily life of the child, its community, and its culture. In Vygotsky's view (Vygotsky, 1978), sociodramatic plays have been the primary sources of learning. The elements of the imaginative and symbolic nature of play assume the thinking, emotions, actions, and language of the roles they are enacting. Though Vygotsky is credited for being a proponent of the cultural dimension in child learning, he did not claim this (Cole and Gajdamaschko, 2007)

According to Wells (2008), teaching-learning is inseparable and occurs through co-creation in a joint activity with cultural artefacts. The Participation Plus model (Hedges and Cullen (2012)) of pedagogy also acknowledges that creative learning and knowledge building occur through active participation in complex cultural activities. The common feature of Participatory Learning Theories (Hedges and Cullen (2012)) that built upon this understanding imbibes observation, participation, Language, Dialogue, and learning construction. In this context, the Participatory Pedagogical Method (PPM) complements the PLTs in action mediated by the facilitators. Puppetry is a cultural practice, and creating puppet characters promotes learning as a dynamic pedagogy. That involves co-construction, dialogue, and belonging: incorporates knowledge, attitude and skills and comprises constructs such as 'dispositions,' 'funds of knowledge,' and 'working theories.' Hence, the proposed participatory pedagogical method, at least in the foundational and primary stages where the educators and students create the characters or enact them using the narratives rooted in the immediate context that are ontologically different from what is in practice. For example, students learn without a clear objective to apply their creation or complete the activity in isolation from the context it is created for.

4. Methodology

The initial feasibility study was piloted to determine how children under age seven respond to the material-centric (Silkworm Cocoon) activity—the feasible method to understand children's participation in academic practice. With the class teacher's coordination at *'Novus: Early Learning*

Centre' in Bengaluru, Karnataka, twelve students aged between 3.5 and 6.5 were identified with parents' consent. However, two kids did not turn up on the day, and one child chose not to do anything, with 9 participants (Six girls and three boys) participating in the activity. Of the nine, two kids just played with the cocoons, inserting fingers without drawing any details (Fig 1) on them. The cocoons used in the study are (*Bombyx Mori/ Bivoltine*), a locally available type sourced from a local cocoon market. The pilot study was qualitative and conducted remotely through the Zoom VC platform. The activity spanned 45 minutes at the above-said venue. The outcomes were used in performance (Coordinated by the instructors), weaving all characters (Fig 2) in an impromptu narrative. The data was gathered primarily from observations and visual documentation as per the instructions given to the teachers. The kids' drawings and the CFP-making process were video-recorded and photographed for the observational study. The children's demographic information, anecdotal experiences, and suggestions from class teachers were collected.

4.1. Design and Procedure

The recordings were transcribed to elicit spontaneous reactions from the children. The participatory approach included simple prompts like "*Who is your favourite person?*" "*How does she look?*" or "*Can you draw her?*" are used to induce making. The conscious choice was not to have pre-decided parameters like in the study (Sparapani et al. 2013) or suggest any prescriptive steps. We tried to look through such a lens "to conceive a process without predetermination" and engage younger children freely (Bretherton et al., 1990). We employed the "mosaic of techniques combining the visual with the verbal means," as advocated by Clark et al. (2003). Moreover, while focusing on younger kids (3-7), we tried to engage them in the present continuous tense (Gallacher and Gallagher, 2008), which required an 'ontological shift' in that the authors offered reflections, debunking some implicit assumptions about the participatory approaches involving children and critically viewing the usefulness of 'participation' as a framework. Punch (2002) also suggested that children should be understood as "autonomous individuals" and encouraged to participate 'actively' rather than 'passively responding in an activity.'

Based on the observations, insights from the literature review, and teachers' observations, an exploratory design development process of CFP was carried out after the study to demonstrate the possibilities (Fig 10) of implementing a similar activity across the educational levels. We used the same type of cocoons in the DD process as the pilot study. Other stationery materials like water-based gum, poster color, markers, cutters, and scissors were utilized. The natural woollen thread and the silk floss scrapped from the surface of the cocoons are also used in making hair and other details (Fig 3). The cocoons are ideal for iterative processes and best suited for large-scale applications as the waste generated is minimal and nature-friendly. The process involved sourcing cocoons and other materials for creating puppets, identifying or creating suitable characters around the themes, visualizing and developing characters by simple line drawings, and crafting details on cocoons (Fig 4, 5, 6). The content for the puppet performance can be elicited from the existing children's literature. Alternatively, the instructor can also create them around the topic of teaching. The verbalized narrative could be enacted, animating with gesticulations of real-life characters with modulated voices. It could be an innovative learning method supporting and mediating interactions.

Few theme-based puppets were made to engage the kids in conversations (Fig 7, 8, 9). The Puppet could be formed using a single finger resembling the body, with a simple oval head stuck on the top or an accessory made of a cocoon. For example, a pointing finger is used for the body, and the adjacent thumb and middle finger become hands, leaving the rare two fingers to form folded legs. Alternatively, each finger could constitute a personality complementing the narrative between two

or more characters. Such a performance, where a single hand becomes an entire theatre, and the palm becomes the stage on which the concert appears. Multiple fingers can also be operated on each hand, letting the performer control many puppets simultaneously as a family of human figures, a crowd, a camp of animals, a zoo (Fig 10), or distinct characters used together in the choir or the story. The cocoons could also be employed as footwear where an inverted hand with a pointing finger and middle finger wearing the shoes and thumb and ring finger can act as right and left hands, respectively.

5. Results of the pilot study and discussion

The pilot study used locally sourced cocoons. Unlike the 'readymade' toys, the sheer experience of the exotic material was remarkable and well-received. Kids intuitively inserted fingers into cocoons and started waving them. Gallacher and Gallacher's (2008) study recorded that "*children [were] acting in unexpected ways: appropriating, resisting or manipulating our research techniques for their purposes.*" We had a similar experience; a few slightly older (5-7) kickstarted exploring the material.

In contrast, others observed their peers and started exploring. The youngsters could not draw on Cocoons; however, they started drawing on paper with simple prompts and happily wore cocoons and owned them satisfyingly. Children attempted to develop the characters of their choice using the available markers and showed them to their peers and teacher. The puppets' characters represented their teacher, mother, sister, and brother. In one case, on both hands, two different people and subjects like 'Santa Clause' and 'Christmas tree.' Identifying the characters, naming them, speaking to them, or on behalf of the character were spontaneous. We observed the children engrossed in the process of explorations. Puppets could moderate their thoughts and elicit a qualitatively distinct response from kids of different ages. Puppetry proved to be an effective tool to improve communication and narrate concepts, increasing students' enthusiasm and learning outcomes in education. The natural material-based CFP would be an ideal aid at foundational and primary levels of education. That offers a tangible, experiential opportunity for a fascinating teaching-learning process across age levels in varying complexity. Hence, the objective of the design explorations is to ascertain the potential of CFP as one of the educational possibilities where the participation of both the maker and teacher blends. However, we recommend a few categories of age-appropriate activities, keeping the complexity of making CFP while the pedagogic explorations are planned.

The activities meant at the age (of 3-5) could have simple drawing activities on paper and then on the fingertips. Later, the instructor could transfer these creations to the cocoon surface, helping the kid retain their ownership and see them animate. In our experience, the students in this age group are still very raw and imaginative; hence, the teacher could make and demonstrate the characters and use them as props, supplementing the existing children's literature. (The DD process undertaken is aimed at this age segment as a broader reference) The second category of children aged between 5 and 7 could be encouraged to make the characters of their choice autonomously or slightly older, 8–10 years on the existing stories with more details and embellishments. The hands-on activity helps them experience the material and making process. (E.g., Fig 4). The third segment of 10-13 could be encouraged to conceive a narrative and make the characters (E.g. Fig 10) perform individually or in groups for their fellow schoolmates. In addition to the above, young adults aged between 13 and 18 can design a mobile stage and perform among interschool and inter-regional platforms like "Kala-Utsav".

5.1. Limitations and Future Potentials

The DD exercise made us realize the infinite possibilities of utilizing Cocoons. Due to the pandemic, the pilot study was remotely conducted on a small sample of nine urban-centric children under seven. The pilot study revealed this method's vast strengths and few limitations. Its diverse applications in age-appropriate activities in education are the scope of future research. However, the proposed CFP being a material-centric pursuit, the accessibility of raw material might be limited at places where Sericulture is not in practice. Though the cocoons are available commercially through e-commerce services, the remotely located schools are disadvantaged. The inexperienced and untrained instructor could also impede the full potential of this method since these activities demand unique skills and motivation. According to the 8th AISES report (2009), about 13 lack (1.3 million) "recognized primary, upper-primary, secondary, and higher secondary schools" exist in the country. Puppetry also has enormous potential to integrate into teacher education. Most states of India boast high yields and consumption of silk varieties that can utilize cocoon shells creatively in their pedagogical practice. The creative and naturally appealing small puppets could be made and carried to any place and stored safely in a small container.

6. Conclusion

The kinesthetic nature of 'Cocoon Finger Puppetry' is an ideal educational aid, and the participatory approach to pedagogy is the most appropriate method at foundational and primary levels of education. Puppets being a 'toy' is both a strength and a weakness. At one end, it could connect diverse fields, such as art, culture, science, technology, communication, media, and ecology, and it might end up being only a fun activity without much thought on its usefulness. The simplicity of CFP allows the blending of fact and fiction, curiosity, and reflection. After extracting silk yarn, the Silkworm cocoon shells are unusable in the sericulture industry and could lead to an unmanageable byproduct ending up in landfills. However, this material is ideal for small, large-scale, and iterative pursuits and demonstrations, generating minimal waste and being nature-friendly. Making and using puppets are sporadic in practice, pedagogy, and publications. The puppets provide enjoyment and fun and stimulate curiosity and conversation. The excitement and the imagination that the making process offers are invaluable. The potential designs and possibilities of handmade toys and characters are demonstrated and documented for use and broader reference—the present paper aimed at the feasibility study in the pre-primary/foundational stage educational context. The second part is the design development process that we conducted, keeping the primary, secondary, and higher secondary stages requirements based on the educators' insights gathered in the discussions. With this background, acknowledging the limitations of the present work, we urge Policymakers, design researchers, and academics to nurture newer explorations in the creative educational ecosystem while preserving and promoting cultural and folk forms that have much to offer to education.

Ethical consideration: The Design Development process did not involve children/human subjects and conformed to the (Level-I) 'IEC- provisions. The pilot study qualified as Level-2 and was excused from IRB-IIT Bombay review, as the only risks of harm to participants posed are 'informational risks.' Hence, the parents were informed about the research aim, ensured the confidentiality of all data collected through the class teachers, and confirmed its future access after the academic scrutiny.

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Figures

Few outcomes of Pilot Study

23rd December 10.30am (45 mins)

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Fig 1. Few outcomes of the pilot study conducted @ Novus, Bengaluru, on 23rd Dec 2021



Fig 2. The class performances using some of the outputs from the children @ Novus



Fig 3. The material used in the Design Development process



Fig 4. The output of the Design Development process (Christmas theme) that appeared in the Pilot study



Fig 5. Characters with hair attached, The output of the Design Development process.



Fig 6. The output of the Design Development process (Birds and animals)



Fig 7. The output of the Design Development process focusing on Panchatantra tales (Rabbit and Tortoise)

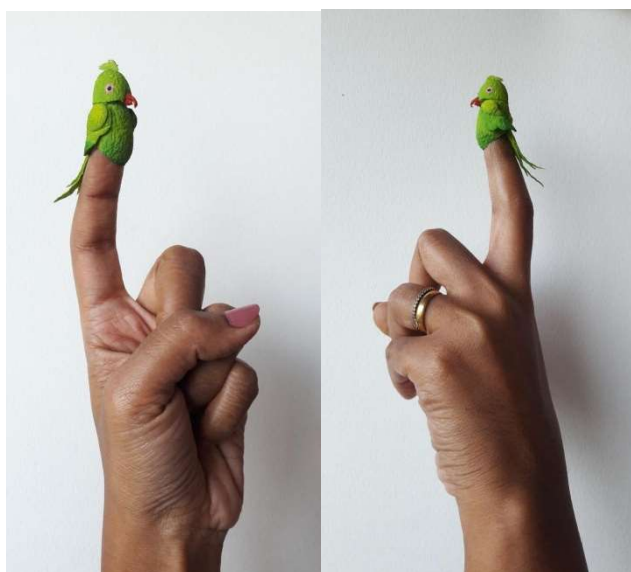


Fig 8 and Fig 9 The output of the Design Development Process (Parrot Story)

Design Development Process

► Category -1
(Characters)

Simple Explorations with
Marker on Cocoon



Children's Output (Pilot Study)



► Category -2
(Added Complexity)

Drawing and Colouring
on Cocoon shells,
Joining the cut pieces of
cocoon shells and using
substitute material to
represent the other details



► Category -3
(Multiple Layers of
Complexity)

Joining two or more
cocoon together



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Fig 10. The Summary of the Design Development Process and Output (1)



Fig 11. The Summary of the Design Development Process and Output (2)

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Designing for the Land of Affluence: The Postwar American Dream through Synthetic Fabrics

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ABSTRACT

After World War II, overproduction and overconsumption overshadowed the ascetic period 1940-1945, as new commodities such as houses, new technological house equipment, cars and other vehicles, travel, frozen food, fast food, but also plastics realized the dreams and expectations of middle class Americans, fulfilling their purchasing desires. Synthetic fabrics constituted a great part of this new socioeconomic and cultural phenomenon and symbolized the US's emergence from years of deprivation, austerity, depression and war. In the 1950s and 1960s the American market was flooded with man-made materials such as nylon, acrylic and polyester, the 'miracles of Du Pont's chemistry laboratories' which replaced traditional natural fibers such as silk, cotton and wool, suggesting a, new, colorful, modern clothing.

This article aims at exploring the effect of man-made fabrics mainly invented during the 1940s or before, on the social and cultural theater of the US as new technological achievements in the fields of fashion and home interior design. The article also aims to shed light on their historical background and unprecedented behavioral qualities which fascinated the postwar American consumer audience by altering their sense of taste and purchasing choices.

Keywords - Synthetic fibers, nylon, acrylic, polyester, man-made fabrics, postwar America, overconsumption

1. Introduction

The postwar period in the US was marked by a series of major political, social, cultural and economic changes that established a new status quo within which subsequent generations were nurtured. The start of this new season focuses on the cessation of war and the subsequent repatriation of thousands of fatigued American soldiers, who, as veterans, struggled to rebuild the life they left behind before departing for the front. These men, who demanded not only jobs, but much more, such as houses, cars and appliances, were the first substantial consumer targets of a new order of things based on the country's policy of intense mass production that marked the post-war decades (Sivulka 1999: 264). Bombarded by press, television and radio, but most of all by the advertising strategy of the Madison Avenue sales industry, American consumers followed the sweeping path of advertising, buying more and more products. The basic, but at the same time mandatory, need for American citizens was spotted in the housing market.

The tendency of Americans to flee from large urban centers to the suburbs or even the countryside, in an effort to have greater security and tranquility in family life, was sweeping and intense. As the social ferments became more intense, the need to find affordable housing, but also household goods began to become more and more imperative, which triggered important developments in the design and production

of architecture and objects (Tsoumas 2019: 18). This was supported by new technologies, as well as by the new materials invented during the war, which further helped free design from the remains of historicism and tradition after the interwar aesthetic movements, thus creating the conditions for aesthetically and functionally better mass-produced objects in more affordable prices (Goss 2004). Specifically, as it was the time for turning a nation of renters to a nation of owners, the construction of new, usually prefabricated, housing that began to be built at a rapid pace was the result of the imagination of most Americans in their effort to decentralize and, at the same time, develop new urban areas in the peripheral zone of the big cities (Friedman 1996: 131). Most of the house types were identical in that they had pitched roofs, spacious gardens, barbecues and high-tech home appliances, such as radios, televisions, washing machines and hoovers and constituted one of the strongest motivations of middle-class Americans for the first and most important step towards the mass consumption that was synonymous with the coveted American dream (Sivulka 1999: 266). These houses were contracted with the concept of myth, thus highlighting the sharp contrast of the optimistic reality of that time with the still fresh wounds of the Second World War and thus constituted a fertile ground for the cultivation of the myth concept through excessive consumerism (Tsoumas 2019: 19).

The car was another commodity that represented the post-war American dream as it fueled the consumers' tendency to buy only new, technologically and aesthetically advanced products (Genat 2003: 66). The early 1950s cars were designed to be symbols of social status, technological superiority, and breakneck speed, while reflecting the style and pace of the era. They were usually large in size to serve the whole family rather than individuals, in a sense supporting the recovery of the institutions of a happy family life (Tsoumas 2019: 20). Car industry soon became one of the largest in the country and contributed to the United States' becoming an international economic giant (Ikuta 2000: 18).

Plastics are one of the most important and, at the same time, most controversial phenomena in global industrial production, as well as in the economic, social and cultural theater of the twentieth century (Tsoumas 2007: 10). They were the anticipated result of global mechanization, but mainly of the West's need to find cheap and effective solutions to everyday practical problems (Tsoumas 2019:1). Though plastics had already been popular since the interwar times, in the second half of the 1940s many types of products made polymers such as nylon stockings, clothes, bags, accessories and polyethylene dumpsters, bottles, flower pots, bins and thousands more flooded the American market (Freinkel 2011). These were cheaper, lighter, more pliable and easier to replace than objects made from thermoset plastics. Many magazines of the time such as *House Beautiful* hosted several articles and inserts devoted to that extremely modern material, which became a new attitude to life (Alfred Sloan Foundation 2023). The American dream and the post war new lifestyle in general, were found to be wrapped in plastic, as almost everything could be produced in this material.

Synthetic products started soon replacing ordinary fabrics which showed a significant shortage after the end of the war mainly because many of them had been extensively used by the armed forces (Larsen 2017). The synthetic alternative solutions, such as nylon, polyester, acrylic and others, were nothing but the immediate result of the abundance in oil and gas and soon they were considered as miracle materials by seamstresses, fashion designers, interior designers, textile and ready-to-wear industries. Their exceptional properties as durable, waterproof, stain-resistant, light, easy to wash and cheap quickly linked them with the concepts of abundance, over- consumption, fashion and style trend, but also with the throw-

away society, like most plastic items (Tariq 2022). However, it should be stressed that in the 1950s synthetic fabrics were rapidly accepted and adopted by the postwar consumer audience who did not face them as the artificial substitutes of cotton, wool, silk or linen, but as unique, new, pioneer industrial products which would change their daily living (Kativa 2016). This paper examines the role of synthetic fabrics which emerged in masses in the postwar American market and reflected in their own way the new hyper-consumption model which mainly expressed the middle and lower classes, in the rapid building of the US postwar cultural identity.

2. Nylon as a form of postwar cultural revolution

The American company Du Pont was a pioneer in the invention of revolutionary chemical materials such as fibers, films and plastics, which is why it had already occupied one of the highest positions in the world ranking of new technology companies since the first decades of the twentieth century. The inter-war period and especially the 1930s proved to be particularly productive as it saw the further improvement of synthetic rubber, but also the invention of the revolutionary synthetic material nylon, by the two great researchers of the company Wallace Carothers and Julian Hill in their attempt to discover an artificial substitute for the very expensive silk (Handley 2000: 34). Although initially nylon fibers were used for the creation of everyday objects such as bristled toothbrushes, nylon as a form of fabric became widely known just before the Second World War, when it was the basic material for the creation of the first women's stockings, a pioneering invention of the company that was first presented in the World New York Fair in 1939 (Wolfe 2008: 16). Nevertheless, they did not appear in the world markets until 1940, which brought a striking change in the design of traditional women's stockings, which until then had been produced from Japanese, hard-to-find silk. About sixty-four million pairs were sold worldwide, while generally during wartime their use was quite limited as almost all nylon production was directed to the making of military items such as the parachute.

After the end of the war, and under the new socio-political, economic and cultural conditions, it became apparent that man-made fabrics had begun to claim a large part of the country's industrial production, as they had already proven that they could be used in many ways in clothes and accessories, but also in household, regarding the new way of life of Americans. Their flexible qualities, variety of colors, easy care and affordability in relation to the swift increase of consumerism, intense industrialization, and the fast pace of everyday life, contributed to their wide acceptance and use. Pre-war nylon stockings represented only the beginning of a cultural and economic phenomenon that would soon revolutionize the world of fashion. Durable yet cobwebbed they returned to the market in 1945 and immediately became as popular as before. But it was not too long before the nylon pantyhose appeared and soon began to displace the long-known nylon stockings which would embrace women's legs only up to a certain degree (Wilson 1975: 19). On the contrary pantyhose was easier to use as it did not need any garters to be held up by: women were then given an unimaginable sense of freedom and comfortability as their bodies were covered from the toe to the waist, and they could enjoy the presents of new technology with less restrictions in daily life (Krier 1988: 19). At the same time pantyhose functioned as the secret emancipation object of the oppressed American women and it gradually also displaced other types of tights and socks along with the devalued position of women, especially those of the periphery.

Since the late 1940s consumer public's appetite for new clothing options after years of economic depression and war, started becoming enormous, following the general trend of the American market.

Store windows from the States of the East Coast to California and the cities of the American South were filled with fancy casual nylon clothing, as well as home goods, thus shaping the new fashion that would sweep the whole world in the years to come. On the other hand, classic Sears retail catalogs featured nylon and rayon clothing, underwear, and accessories on their fashion pages, drastically shaping thus female consumers' purchasing choices.

On the whole, 1950s experienced an unprecedented increase in nylon clothing production and consumption which spanned from feminine dresses, longer or shorter skirts, blouses, shirts, scarves, hats, sportswear, but also light and enchanting lingerie, such as nightgowns, panties, slips, brassieres and corsets. Nylon sleepwear was particularly delicate, silk-like soft, whereas many times it was combined with cotton, as was the case of the lace which decorated night garments, or with other synthetic material such as rayon.



Fig.1 Du Pont's nylon stockings were also popular after the end of the war, but soon were replaced by pantyhose. Source: Guido Deussing (2017).

American women seemed to have just rediscovered their lost femininity, self-confidence and self-esteem and enjoyed purchasing colorful, stamped, patterned or simple, light and economical clothing and footwear which were associated with their purchasing power and social autonomy. At the same time, nylon household goods such as curtains, tablecloths, pillow cases, bed sheets, carpets, towels etc., helped

housewives rearrange their houses in the up-to-date technological, practical and smart manner, which reflected the advanced sociocultural spirit of the postwar US.

As Kativa claims (2016) nylon, unlike semi-synthetic rayon, which was the result of chemical processing of plant fibers such as cotton, was thoroughly artificial, and this possibly why it was so revolutionary in its use. Nylon ignored the traditional ways of washing and ironing and brought about a new trend in wash-and-wear products for the convenience of women, especially those of younger generations who followed a modern lifestyle with less housework and more carefreeness. It was not accidental that between 1950 and 1959 washing-machine sales in the US soared. Overall, nylon was a wonder material which changed the cultural and the social profile of postwar American consumer audience, but had an important drawback: it was highly inflammable and primarily for that reason was superseded by polyester, in time.

3. Acrylic fibers: the Orlon fabric flexibility

Acrylic fibers, another great DuPont achievement, created in 1941, began to be produced soon after the end of the war; however, their mass production in the form of commodities began in the early 1950s. These fibers were light weight, warm and soft, usually textured, and formed the basis of a type of fabric, trademarked as Orlon. This new product was more like natural materials, could be washed and worn easily, as it was wrinkle resistant, but also had hypoallergenic properties, which the use of nylon could not guarantee (Stauffer 2004: 112). As it looked and felt like processed wool, but was much cheaper to produce (Cohen and Johnson 2010: 54) acrylic began to gradually displace wool's production, initially in knitted garments such as dresses, blouses, sweaters, scarves and caps, and later on blankets and bedding, in general. But it should be noted that although there were several similarities between wool and acrylic, there were also several differences. According to Kadolph, Langford, Hallen and Saddler (1993: 39), acrylic fibers could crease when they went through the dry spinning process, and, unlike wool fibers, they had more bulk and could be warmer without being too heavy. Due to their technological superiority, their ability to be produced in a huge variety of items, designs and colors, their ability not to need dry cleaning, to be washed without shrinking and to dry very quickly, but also because of their affordable price Orlon products very quickly flooded the American market and became extremely popular. Throughout the 1950s, but also the 1960s, the advantages of acrylic fibers were immediate and obvious, which is why Orlon products seemed to conquer, in addition to the American markets, those of Europe and Asia. This happened mainly because acrylic fibers were also industrialized in Germany and Japan being thus accessible to everyone. It was the time when the world consumer audience, as well as the industrialists, expected the permanent replacement of natural fibers by artificial ones, which would bring about a great revolution in world textile production. However, by time consumers began to express their concerns about the flammability of acrylic, a major disadvantage of synthetic fibers in general, which made them gradually switch to the choice of wool products, as wool is much more flame resistant.

Nevertheless, Du Pont's remarkable technological achievements alone were not enough to make Orlon a success. According to Blaszczyk (2006: 490), the company had to find ways to position Orlon as a key material for modern, fresh ideas in the field of fashion design. Du Pont had to know or even guess the taste and desires of the consumer public and accordingly had to create the corresponding design proposals.

Thus, Orlon soon became a new form of fashion, especially in knitwear, giving a new lease of life to the design of mass produced clothing. It was then that American consumers turned to the knitted, elegant and feminine dresses in great colors and designs, such as the casual or evening sleeveless dresses, the dresses with ribbed knit skirts and plastic flowers around the neckline, the V-neck, short or long sleeved, ribbed knit textured dresses etc. Particularly popular were the 2-piece 1950s sweater dresses which included a roll neck sweater top with cuffed, three-quarter-length sleeves. Knitted cardigans and sweaters for women, but also men's V-neck vests, sweaters, jumpers, pullovers in striking motifs and colors, were also much in demand.



Fig.2. Orlon family clothing as advertised in Good Housekeeping Magazine, 1955. Source: Good Housekeeping Magazine.

Except clothing, Orlon was also popular in home and outdoor use products which were much advertised by the company. Through the pages of the Du Pont's special booklet entitled this is Du Pont (1953: 29), its new technological achievements in this type of products is described with pride and confidence:

“...Strong sunlight will damage most fibers- but not ‘Orlon’ acrylic fiber, the latest synthetic yarn to come from Du Pont laboratories. This remarkable fiber which took eight years of intensive research to develop, has a lasting resistance to sunlight, mildew, high temperatures and even sulfuric acid. Experts say that it is the best fiber yet found for outdoor use...In developing the uses of ‘Orlon’ Du Pont will work with hundreds of smaller business- a ‘partnership’ which will bring Americans not only new and better products, but more jobs, more business activity and another contribution to better living.”

The rapid increase in the demand for residential housing, mainly in the suburbs of large cities, but also in many smaller cities of the American periphery in conjunction with the phenomenon of the recovery of family life, the large increase in births (baby boom phenomenon) and the strengthening of the middle class were important elements of the post-war culture and contributed to the development of the garden, but mainly of the suburban courtyard.



Fig. 3 Print advertisement presenting Orlon fabric's high qualities in the classic American backyard and sportswear. Source: Du Pont booklet This is Du Pont, 1953.

Very quickly the courtyard space at the back of the 1950s house became the physical and emotional extension of the domestic space itself, as it was associated with the concepts of carefreeness, tranquility, peace, and entertainment. In many cases in the backyard there was a private small or larger private pool, lots of potted plants, but also a lawn with small trees or bushes and a designated area for cooking, barbecuing and other such activities. It was the place where owners could accommodate their friends, colleagues and neighbors, especially during the summer time, and enjoy themselves.

The furniture of the back yard, such as chairs, armchairs, tables, sun umbrellas and shades were usually of metal or plastic frame and were upholstered with unique Orlon fabrics in modern designs and colors. Once again we can see how acrylic fabrics became associated with the culture of the post-war American dream, contributing significantly to the shaping of the garden and outdoor design of the American home (Holik 2017).

4. The qualities of polyester

Another of Du Pont's technological achievements that had a catalytic effect on the hyper-consumption lifestyle, but also on the shaping of taste and the broader US post-war culture, was the invention of

polyester, another type of fabric made of petroleum- based chemicals. In fact, polyester fibers first appeared in the company's laboratories in the early 1930s, and as in the case of nylon, they were invented by Wallace Carothers who had the brilliant idea to experiment with mixing different types of alcohols with carbonic acids. After several processes, Carothers, in collaboration with Julian Hill, decided to publish the results of their research in an article in the Journal of the American Chemical Society claiming that they had the ability to turn polyesters into a fiber with properties superior to those of natural fibers, such as silk or cotton (American Chemical Society 1995: 1). Although it had very promising prospects as a raw material for mass-produced fabrics in the mid-1930s, polyester was overshadowed by the unprecedented success of nylon and remained in obscurity until 1939 when it was discovered by John Winfield and James Dickson chemists who, with the help of the British scientists, W. K. Birtwhistle and C. G. Ritchie worked on its improvement. Two years later they succeeded in producing the most perfected polyester fiber named Terylene, the rights of which they sold to Du Pont in 1946.

Soon, polyester would have to prove its high qualities on which the new American trade and market would rely on. For example, its durability and strength as a fabric enabled it to cope with the daily activities of consumers, especially those who needed movement or strenuous exercise such as athletes, so many types of sportswear and athletic uniforms were made out of it. When it was first marketed it was rather expensive, but soon became a more efficient and affordable material and thus it could be the first choice for economical manufacturing options. It did not wrinkle nor fade and could often be blended with other, most of the times natural fibers such as cotton, in order to create more versatile products. However, except its advantages, polyester had also several drawbacks, as it was a material prone to static, and thus could not absorb moisture, and it did retain heat. Consequently, it was unsuitable for the manufacture of products such as towels or bedding needed to soak up moisture or products needed to facilitate airflow (Vanoer, 2019). Polyester could also be skin irritating for people allergic in synthetic materials and could cause nose and throat irritation during melt processing.

However, it was not until the 1950s that polyester began to become popular, as did the aforementioned synthetic materials, following the post-war fashion of technology, speed, comfortable and happy living, but also the concepts of the cheap and the ephemeral, which the overproduced, much promising synthetic products bore. The pleasure of overconsumption and the myth of advertising triggered the massive production of polyester commodities, mainly clothing, but also textiles which were used to manufacture home furnishings and carpets, ropes, nets and sailcloth. But, polyester's high qualities would not have been explored and experienced by American consumers if its marketing strategy was weak and feeble. Advertising had to be intense and convincing for polyester's technological superiority and its unprecedented advantages. This was a rather feasible goal if we take into account the overall postwar period image which reflected people's almost desperate need for consumption (Handley 2000: 54).



Fig.4 Print advertisement demonstrating the polyester’s flexibility in menswear, 1958. Source: [www.vintage- adventures.com](http://www.vintage-adventures.com)

Thus, consumers would soon discover many interesting qualities in this new technology material and to which it owed its exceptional popularity. House appliances, cars, travels, even music apparels were quickly affordable for the middle classes, and that was a great opportunity for industrialized clothing to become the next most popular commodity as it represented then a rather new, more ‘democratic’ way of mass production. In the 1950s and in the 1960s polyester for men’s sweaters, vests, jackets, ties, shirts and suits, but also women’s clothing was broadly known under the trade name Dacron. Being in a variety of shapes, colors and pleating, these items gradually became the symbols of a new, laid-back, unwary era. As polyester was associated with plastics success soon signified the new modernist aesthetic and became the icon of novelty, especially in men’s ready-to-wear fashion (O’Connor 2011: 79).

5. Conclusion

As the postwar period in the US was proved to be a time of abundance and affluence based on technological change and overconsumption, Americans embraced newly invented products and they gradually turned away from whatever they thought as traditional and typical as they wanted to be liberated from commodities associated with the war period of deprivation. Marketing strategies, and especially advertising made new technology fabrics, along with plastics, a great opportunity for a carefree casual living, with no anxiety and worries. Nylon, acrylic and polyester clothing, but also house interior fabrics soon gained a big part in this new sociocultural vision of leisure, as they enhanced the idea that comfortable, affordable, easy to use and wear clothes can inaugurate a new, brighter era in consumption and in the standard of living. Manmade fabrics seemed to have acquired particularly important meanings

which changed the way American consumers perceived fashion in everyday life, and constituted both personal and household icons of a new type of modernity and innovation.

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Gamification of Primary Education

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ABSTRACT

Young minds learn and explore through play. In an increasingly digitised world, 'play' has shifted its base to digital and virtual worlds, even for the youngest minds with basic cognitive skills. The relevance of sustainable education practices for early learners becomes paramount, especially in the wake of recent pandemic of COVID -19 which catapulted the education system into the digital domain.

The paper elucidates the core problem of adapting traditional education systems to the digital era. Evolving definitions of sustainable education, learning, retention, educator and learner are fructified and shifting dynamics between them, through primary data from providers of gadgets or technology and secondary research on changes in child psychology due to prolonged exposure to digital and virtual worlds. The research takes into account the disparities prevalent in different regions of India and shares insights into the challenges and opportunities unique to this demographic with a specific focus on the rural-urban divide. The research delves into the significance and effectiveness of gamification in e-learning to bridge these gaps and enhance learning outcomes, offering a fresh perspective on sustainable education practices. However, cautions against the plausible negative impacts on child psychology from excessive screen time and gamification-induced addiction are discussed.

Sustainable education can harness the power of gamification to engage and inspire young learners and there is a great scope for growth in this dynamic field while remaining vigilant of the negative repercussions. Ultimately, the paper provides a valuable framework for educators and policymakers navigating the ever-evolving landscape of digital education.

Keywords - Alternate Pedagogy, Child Psychology, Gamification, Technology, Early Learner.

1. Introduction

In an era marked by rapid technological advancements and unprecedented global challenges, education undergoes profound transformation. The COVID-19 pandemic, a global crisis, catalysed a shift in education perception and delivery. Traditional learning paradigms were disrupted overnight, making digital education the new norm (for and The United Nations Educational, Scientific and Cultural Organization (UNESCO), 2022).

The COVID-19 pandemic's impact on education is undeniable. School closures and lockdowns forced institutions to pivot to digital platforms and e-learning, changing education for young and adult learners. Early learners, in particular, are increasingly engaged in digital play and learning (Pattnaik and Jalongo, 2022).

The importance of sustainable education practices is evident in this digital age (Gray et al., 2011). These practices encompass more than environmental concerns; they address cultural, social, and systemic

dimensions (Sterling, 2001). Harnessing digital tools to educate the future generation necessitates exploring how these tools align with sustainable education principles.

Pedagogy is evolving into multifaceted dimensions, adapting traditional education for the digital era. New definitions of sustainable education, learning, retention, educator, and learner emerge within this digital transformation (Veresov and Veraksa, 2022). Analyzing the changing dynamics between educators and learners in the digital realm and examining potential impacts on child psychology due to prolonged digital exposure shifts understanding and education practices.

2. Review of Literature

Secondary research has been collated to form a comprehensive understanding of education goals, child psychology, and the impact of digital environments, along with studies on gamified learning. Pre- and post-COVID statistical data from various sources underscores the effects on educational disparities across diverse socio-economic demographics of children.

2.1. Sustainable Education

Table 1. Literature review - Sustainable Education.

Name	Authors	Research Methodology	Findings
Efficacy of Social Networking Sites for Sustainable Education in the Era of COVID-19: A Systematic Review	Cavus, N.et al. (2021)	Systematic Review	This review highlights SNS as a valuable platform for remote learning, fostering communication and resource sharing among students and educators. It emphasises digital tools' significance for sustainable education, particularly during the pandemic.
Homework: APA educational psychology handbook, Vol. 3. Application to learning and teaching	Cooper, H.et al. (2012)	Literature Review	The literature review explores homework's multifaceted role in education, offering a comprehensive overview of its effects on holistic learning.

Teacher development with mobiles: Comparative critical factors	Royle, K et al. (2014)	Critical Analysis	The paper explores factors impacting teacher development via mobile technology, emphasising the need to address unique challenges and opportunities in evolving pedagogical landscapes.
Sustainable Education: Re-visiting learning and change	Sterling, S. (2001)	Theoretical Framework	Sterling's work lays the theoretical foundation for sustainable education, focusing on ecological, social, and pedagogical sustainability. It stresses adaptability, inclusivity, and lifelong learning in a rapidly evolving digital landscape.
Trends in Educational Research about e-Learning: A Systematic Literature Review (2009–2018)	Valverde-Berrocso, J.et al. (2020)	Systematic Literature Review	This systematic literature review summarises the trends in e-learning research from 2009 to 2018. It highlights significant areas of research growth and change, providing valuable insights into the evolution of e-learning practices.
The relationship between homework time and achievement is not universal: evidence from multilevel analyses in 40 countries	Dettmers, S.et al. (2009)	Multilevel Analyses	This study highlights the complex, country-dependent relationship between homework time and achievement, influenced by socio-economic background and school track. Excessive homework can negatively impact other aspects of learning.

The collective insights from the literature on sustainable education underscore its dynamic nature and the diverse factors influencing its effectiveness, emphasising the pivotal role of digital tools, particularly Social Networking Sites (SNS) and e-learning platforms, in fostering sustainable education. We reviewed the evolving pedagogical landscape and the unique challenges and opportunities posed by mobile technology for teacher development. Sterling's theoretical framework lays the groundwork, emphasising the importance of adaptability, inclusivity, and lifelong learning in sustainable education, emphasising the need for adaptive approaches, leveraging digital tools, and considering socio-cultural contexts for effective educational practices.

2.2. Gamification

Table 2. Literature review - Gamification

Name	Authors	Research Methodology	Findings
The school as a playground: HCI in the full-scale living lab	Cajander, Å. et al. (2018)	Living Lab Study	The study explores schools as HCI research living labs, showcasing the potential of innovative educational environments, including apps and games.
Cybertext redux: using digital game-based learning to teach L2 vocabulary, reading, and culture	Neville, D.O et al. (2020)	Experimental research with digital game-based learning interventions	The study shows that digital game-based learning effectively improves L2 vocabulary, reading, and cultural understanding, enhancing language learning.
Digital games and digital play in early childhood: a cultural-historical approach	Veresov, N., Veraksa, N. (2022)	Qualitative research, cultural-historical analysis	This paper offers a cultural-historical view of digital games in early childhood, emphasising play's importance in learning. It advocates for diverse, inclusive game environments for young learners.
Is Gamification a Magic Tool?: Illusion, Remedy, and Future Opportunities in Enhancing Learning Outcomes during and beyond the COVID-19	Oe, H., Takemoto, T., and Ridwan, M. (2020)	Qualitative research, cultural analysis	This journal article explores gamification's potential to enhance learning outcomes during and beyond the COVID-19 pandemic, providing insights into its opportunities and challenges in education during crises.
Don't make the player, make the game: exploring the potential of gamification in IS education	Kenny, G.et al. (2017)	Qualitative research, literature review, case studies	The paper explores gamification's potential in IS education, highlighting its importance in engaging and motivating learners. It emphasises making learning enjoyable by game-like approaches.

The literature on gamification collectively illuminates its multifaceted impact on education. Gamification proves to be a powerful tool in engaging and motivating learners, as highlighted by Kenny et al. Through qualitative research, literature reviews, and case studies, the literature emphasises the importance of designing educational experiences that are inherently enjoyable and game-like. Oe et al.'s exploration of gamification during the COVID-19 pandemic provides valuable insights into its potential as a remedy for enhancing learning outcomes in crisis situations. Additionally, the studies by Cajander et al. and Neville et al. showcase the effectiveness of digital game-based learning interventions, not only in improving language skills but also in creating innovative educational environments within living labs. Veresov and Veraksa bring a cultural-historical perspective, advocating for diverse and inclusive game environments, particularly in early childhood education. The collective findings underscore gamification's potential as a transformative force in education, enhancing engagement, motivation, and the overall learning experience.

2.3. Other Technologies

Table 3. Literature review - Other Technologies.

Name	Authors	Research Methodology	Findings
Teacher development with mobiles: Comparative critical factors	Royle, K et al. (2014)	Systematic literature review	This systematic review delves into augmented reality in education, offering a comprehensive overview of existing literature. It highlights its potential benefits in enhancing learning but also addresses challenges and areas needing further research.
Advantages and challenges associated with augmented reality for education: A systematic review of the literature	Akçayır, M., & Akçayır, G. (2017)	Experimental research with digital game-based learning interventions	This systematic review comprehensively explores the pros and cons of using augmented reality in education. It highlights potential benefits in enhancing learning but also addresses challenges and areas for further research.
Cyber-physical systems: AI and COVID-19	Ramesh Poonia (2022)	Qualitative research, literature review, case studies	This book offers insights into the interplay between cyber-physical systems, artificial intelligence, and the COVID-19 pandemic, relevant to technology's role in education during the pandemic.

The literature on other technologies, including augmented reality and cyber-physical systems, provides valuable insights into their potential in education. The systematic reviews by Royle et al. and Akçayır and Akçayır highlight the advantages and challenges associated with augmented reality, emphasising its potential to enhance learning experiences. They also acknowledge the need for further research to address existing challenges. Additionally, Ramesh Poonia's work on cyber-physical systems and AI during the COVID-19 pandemic offers a broader perspective on the interplay between technology and education, particularly in the context of the global health crisis. The qualitative research and case studies contribute to understanding the dynamic role of technology in shaping educational practices. Collectively, these sources underscore the evolving landscape of educational technology, emphasising both opportunities and challenges that warrant exploration and consideration in the broader discourse on technology in education.

2.4. COVID and its Effects

Table 4. Literature review - COVID and its effects.

Name	Authors	Research Methodology	Findings
The impact of COVID-19 on early childhood education and care: International perspectives, challenges, and responses	Pattnaik, J., and Jalongo, M.R. (2022)	Qualitative primary research	This publication offers an in-depth analysis of the COVID-19 pandemic's impact on education, providing a broad overview of its challenges and transformations, particularly in relation to technology's role during and beyond the pandemic.
From Learning Recovery to Education Transformation	OECD, UNESCO, UNICEF, and Bank, W. (2022)	Qualitative primary research	This publication highlights the shift from learning recovery to education transformation, involving multiple organisations. It offers a comprehensive overview of the post-COVID-19 educational landscape.
Children's Eating Habits, Physical Activity, Sleep, and Media Usage before and during COVID-19 Pandemic in Poland	Łuszczki, E. Et al. (2021)	Survey and analysis	This study examines children's eating habits, physical activity, sleep, and media usage in Poland before and during the COVID-19 pandemic. It offers data and insights into how the pandemic has impacted children's lives, including technology use.

The Impact of the COVID-19 Pandemic on Education	for, A. and UNESCO (2022)	Qualitative research, literature review, case studies	This book offers insights into the interplay between cyber-physical systems, artificial intelligence, and the COVID-19 pandemic, relevant for understanding technology's role in pandemic education.
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The literature on COVID-19 and its effects on education provides a multifaceted understanding of the challenges and transformations within the educational landscape. Pattnaik and Jalongo's qualitative research delves into the international perspectives, challenges, and responses to the pandemic's impact on early childhood education and care, emphasising the role of technology in this context. The Organisation for Economic Co-operation and Development (OECD), UNESCO, United Nations Children's Fund (UNICEF), and World Bank collaboration offers a comprehensive qualitative exploration, shifting from learning recovery to broader education transformation post-COVID-19. This highlights the need for systemic changes in education. Łuszczki et al.'s survey and analysis on children's habits in Poland shed light on the pandemic's broader impact on children's lives, including changes in media usage. Additionally, the collective insights from various sources, such as UNESCO's book, provide a comprehensive overview of the broader effects of the pandemic on education, offering valuable perspectives for understanding the role of technology in shaping educational responses during and beyond the crisis.

2.5. Psychology

Table 5. Literature review -Psychology.

Name	Authors	Research Methodology	Findings
Processes and pathways in development via digital media: Examples from word learning	Kucker, (2021)	Experimental	This study explores digital media's role in early word learning for infants and suggests its significant role in facilitating early childhood word learning.
The Role of Play in Human Development	A.D. Pellegrini, (2009)	Literature Review and Observational	Pellegrini emphasises play's vital role in human development, contributing to various aspects of child development and psychology.

Television and video game exposure and the development of attention problems	E.L. Swing et al. (2010)	Observational & Longitudinal	This study explores the link between television, video games, and the development of attention problems in children, showing a connection.
Associations between screen time and lower psychological well-being among children and adolescents: Evidence from a population - based study	J.M. Twenge & W.K. Campbell, (2018)	Population Based Study	This research examines associations between screen time and lower psychological well-being in youth, providing evidence of a relationship between the two.

The literature on psychology reveals valuable insights into the impact of digital media on early childhood development, emphasising the significant role of digital media, particularly in word learning for infants. Pellegrini's work underscores the importance of play in human development, contributing to diverse aspects of child development and psychology. Swing et al.'s observational and longitudinal study explores the association between television, video game exposure, and the development of attention problems in children, shedding light on potential connections. Twenge and Campbell's population-based study further contributes by revealing associations between screen time and lower psychological well-being in children and adolescents. These collective findings emphasise the need for a nuanced understanding of the psychological effects of various media exposures on young individuals, providing valuable insights for crafting a comprehensive discussion on the psychological aspects of technology use in education.

3. Methodology

In this study, a mixed-method research approach was employed to gain comprehensive insights into the research topic. The research methodology encompassed both primary and secondary data collection methods to provide a well-rounded perspective.

This section outlines the primary and secondary data collection strategies utilised in the study. First, a qualitative observational study was conducted in public spaces and educational centres, focusing on toddlers' activities and their responses to technology. This observational study sought to provide firsthand insights into the behaviours and interactions of toddlers in various settings and their engagement with technology. This in-depth interview aimed to gather expert insights and firsthand information from a key figure in the field of educational technology and STEM learning. Mr. Gandhi's

perspective was sought to understand the vision and practices of Stemious, as well as its implications for addressing the research objectives. In addition to primary data collection, the study included a comprehensive secondary research component.

A literature review was conducted, encompassing various types of literature relevant to the study's focus. These sources were critically reviewed to provide a theoretical foundation for the study. Sources like online repositories, educational platforms, and relevant websites were also explored.

This mixed-method approach allowed for a holistic examination of the research topic, offering a multi-faceted perspective on the effects of educational technology in the context of COVID-19 and broader educational practices.

4. Findings and Discussions

The research collates all aspects of the primary and secondary data analysis to form a comprehensive path of pedagogy in the digital era for the new generations of early learners. This begins with the reassessment of basic blocks of learning within the parameters of the current scenario and re-establish relationships between them.

4.1. Re-definitions of core principles discussed in paper

For the purpose of this research paper, the following terms will be used as per renewed understanding of the concepts, as explained below:

- A. **Learner:** An active, curious individual engaged in acquiring knowledge, skills, and competencies, often through digital means, shaping their educational journey (Royle, Stager, Traxler, 2014).
- B. **Educator:** Includes traditional teachers, facilitators, and mentors guiding and inspiring learners in digital settings, promoting critical thinking, problem-solving, and a passion for continuous learning (Royle, Stager, Traxler, 2014).
- C. **Sustainable Education:** Beyond ecological sustainability, it encompasses "cultural, social, and pedagogical sustainability," endorsing adaptability, inclusivity, and lifelong learning in the evolving digital landscape (Sterling, 2001).
- D. **Learning:** Encompasses diverse knowledge acquisition modes, from classrooms to self-directed digital exploration. Learners actively engage, fostering creativity and essential skills (Pellegrini, 2009).
- E. **Assessment:** Adopts a multi-faceted approach, including formative and summative assessments, peer evaluations, and self-assessments. It provides constructive feedback, guides individual progress, and measures comprehensive understanding (Sterling, 2001).
- F. **Gamification:** Encompasses a spectrum of engagement strategies, like game-based mechanics, simulations, interactive challenges, and incentives. Designed to enhance the learning experience, stimulate curiosity, and foster a sense of accomplishment in digital education (OECD et al., 2022).

4.2. Trends in Education Systems in the Digital Era

In the digital age, where technology dominates, there is a need for a balanced pedagogical approach that incorporates digital tools while remaining rooted in sustainable education practices.

4.2.1. Trends in Educational Research about e-Learning

The field of educational research has been significantly influenced by the rapid proliferation of e-learning. The nature of education is evolving, emphasising the shift towards online and digital platforms. There is an increasing prevalence of Massive Open Online Courses (MOOCs), which have democratised education by providing accessible, online courses to learners worldwide.

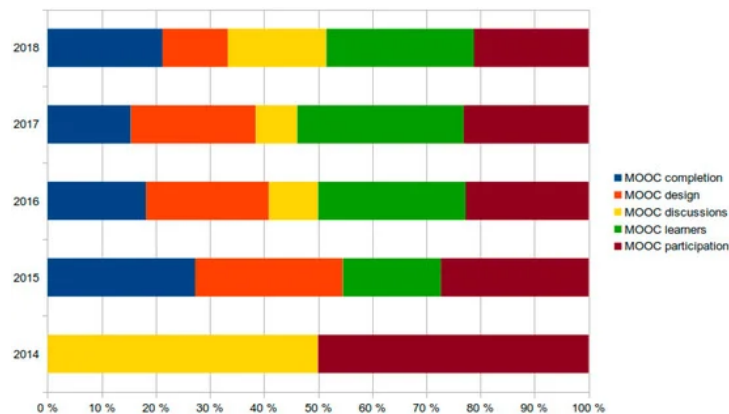


Fig. 1. Evolution of the nodes of massive online open courses in the period of 2009–2018, Valverde-Berrocoso et al. (2020)

Additionally, the integration of Artificial Intelligence (AI) and Machine Learning (ML) into e-learning platforms has opened new horizons for personalised and adaptive learning experiences (Poonia, 2022). These trends underscore the need for educators and policymakers to harness digital tools effectively.

In the digital era, traditional definitions of education, learning, retention, educator, and learner have evolved significantly. Sterling's work on sustainable education (2001) has contributed to reshaping our perception of education, emphasising the importance of holistic and environmentally conscious approaches to learning (Sterling, 2001). Furthermore, the digital landscape has blurred the lines between educators and learners, with students often adopting roles as both consumers and creators of knowledge. The research conducted by Royle, Stager, and Traxler (2014) emphasised factors related to teacher development in mobile learning environments. Their findings highlighted the evolving pedagogical landscape and the need for educators to adapt to digital platforms (Royle, Stager, Traxler, 2014). Additionally, Spires, Oliver, and Corn (2011) delved into the new learning ecology of one-to-one computing environments, underscoring the transformative impact of technology on the relationship between educators and learners (Spires, Oliver, Corn, 2011).

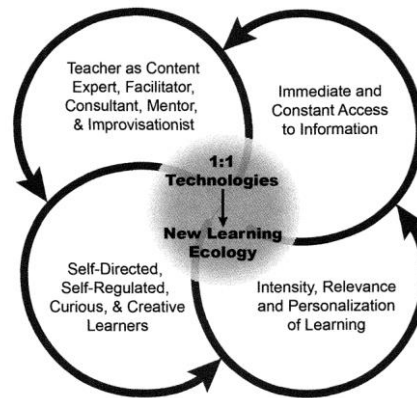


Fig. 2. The four conditions of the new learning ecology in one-to-one settings. (Spires, Oliver, Corn, 2011).

4.2.2. Impact of Tech-exposure on Child Psychology

The COVID-19 pandemic significantly increased children's screen time, raising concerns about its impact on child psychology, particularly attention spans. Extended screen time during the pandemic affects their ability to concentrate on learning, potentially impacting cognitive development. Parents worry about academic (73%), social (82%), and daily living (33%) skills if distance learning continues (Pattnaik and Jalongo, 2022).

Digital games' impact on cognitive skills varies based on content and exposure duration. There's a need for tools to quantifiably measure digital play effects on children. Widespread digital communication tools adoption necessitates adjustments in children's social interactions, impacting their social and emotional development (Núñez-Canal, de Obesso, Pérez-Rivero, 2022).

A case study on children's media usage before and during COVID-19 revealed significant variations in time spent on Internet/TV. Screen time and gaming activity notably increased.

Variable		\bar{x}	SD	NAA(%)	<30 min (%)	30 min–2 h (%)	≈2–3 h(%)	≈3–6 h(%)	>6 h (%)	p	
Time of watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day [h]	pre Weekdays	2.12	1.00	11.7	0.0	61.1	20.5	5.3	1.3	0.0319	
	peri Weekdays	2.34	1.12	4.4	14.0	44.0	23.4	9.0	5.1		
	pre Weekend	2.81	1.04	4.3	0.0	34.4	37.6	18.9	4.8	0.0276	
	peri Weekend	2.70	1.10	2.3	8.0	35.9	31.5	16.2	6.1		
Time of playing games (on your computer/game console/smartphone/iPad etc.) per day [h]	pre Weekdays	1.29	1.08	27.7	30.1	31.5	7.2	2.7	0.8	<0.0001	
	peri Weekdays	1.64	1.23	20.3	27.8	29.5	14.7	5.9	1.9		
	pre Weekend	1.94	1.23	13.3	21.3	37.6	16.0	9.1	2.7	0.0599	
	peri Weekend	2.11	1.29	11.4	20.4	34.2	18.6	11.1	4.4		
Variable		\bar{x}	SD	I Don't Have Access (%)	<5Times a Day (%)	6–10 Times aDay (%)	11–20 Timesa Day (%)	21–50 Timesa Day (%)	51–100 Timesa Day (%)	>100 TimesPer Day (%)	p
Using a smartphone on a regular day	pre	3.14	1.65	18.4	22.1	22.1	14.7	13.1	6.1	3.5	0.0016
	peri	2.81	1.58	23.6	26.8	20.0	13.3	9.5	4.4	2.5	

NAA—not at all, \bar{x} —arithmetic mean, SD—standard deviation, p — p value, indicate significant values ($p < 0.05$). Bold values denote statistical significance at the $p < 0.05$ level.

Fig. 3. The media usage characteristics in the groups pre- and peri COVID-19. (Łuszczki et al., 2021)

In response to these changes, an opportunity arises to harness evolving child psychology positively. Tailoring learning experiences to accommodate shifting attention spans and cognitive abilities can be a powerful tool for personalised learning (Kucker, 2021).

Promoting digital literacy and critical thinking skills becomes essential as children engage more with digital media. Collaboration between educators and parents can integrate these skills into the curriculum, empowering children to navigate the digital world safely (Núñez-Canal, de Obesso, Pérez-Rivero, 2022).

Balanced screen time is critical to mitigate potential negative effects. Guidelines from educators and parents should ensure that digital exposure complements traditional learning and plays for a healthy balance (Pattnaik and Jalongo, 2022). Additionally, leveraging digital games and play-based learning enhances engagement and cognitive development, making education enjoyable and effective.

4.3. Gamification in E-Learning

This section discusses the potential for gamification in e-learning to enhance learning outcomes and offers a fresh perspective on the interplay between technology and sustainable education practices.

4.3.1. Understanding Gamification's Potential

Education faces challenges like low retention, motivation, and engagement. Gamification enhances learning outcomes, with 53% of variation in gamification self-efficacy promoting student-led gamification initiatives (Kenny, Lyons, Lynn, 2017).

Interview with Gaurang Gandhi, CEO of Stemious, reveals using research-backed pedagogical principles, like active/experiential learning and digital technology, enhances engagement and understanding. The relationship between play, homework, and learning is complex and context-dependent. Play fosters exploration, skill development (Pellegrini, 2009), while homework reinforces classroom learning and independent study skills (Cooper et al., 2006). Balancing these aspects, especially in primary school, is crucial. Poorly designed homework can cause stress and disengagement, undermining play-based learning benefits (Dettmers, Trautwein, Lüdtke, 2009).

Gamification encourages curiosity and a growth mindset, fostering students' resilience in the face of challenges and failures (Mr. Gandhi). As technology shapes education, digital resources and games bridge the gap between play and homework, offering interactive, engaging learning experiences (Shelton et al., 2016).

Educators and parents should adopt a balanced approach, leveraging play and homework's educational potential while considering learners' individual needs and developmental stages.

4.3.2. Industry leaders

Education faces challenges like low retention, motivation, and engagement. Gamification enhances learning outcomes, with 53% of variation in gamification self-efficacy promoting student-led gamification initiatives (Kenny, Lyons, Lynn, 2017).

Vernier, a standout leader in gamification and e-learning, provides science tools and educational solutions. Their Graphical Analysis app transforms science experiments into immersive experiences. Students use Vernier sensors for real-time data collection and analysis, turning science learning into an exciting adventure.

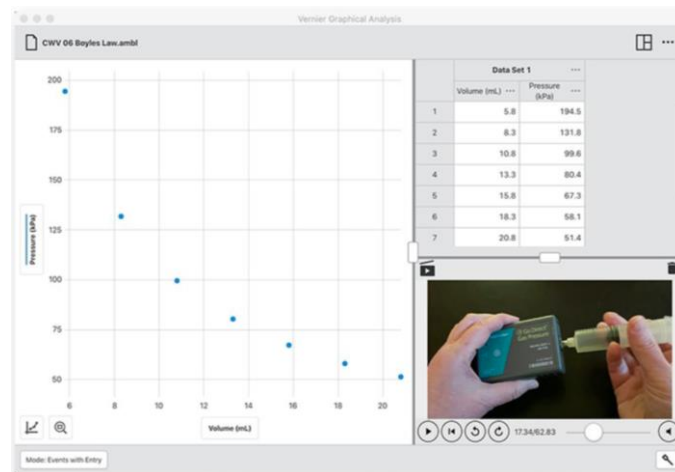


Fig 4. Vernier Graphical Analysis® tool, being used with their gas pressure sensor

Stemious partnered with Vernier, incorporating gamification elements like game-based challenges, interactive simulations, rewards, and leaderboards. Collaborations with brands like Snap Circuits Jr. 100 and Vernier Graphical Analysis® combine physical and digital learning spaces for an immersive learning experience. Users tackle real-world STEM problems, engage in virtual experiments, and collaborate with peers on STEM projects within Stemious.

Minecraft Education Edition, building on its immersive sandbox gameplay, ventures into education. It offers a digital learning ecosystem where students explore and build in educational worlds. By integrating gamification elements, it combines entertainment and education, making learning dynamic and interactive.



Fig 5. Coding with Minecraft: Education Edition

4.4 Funding and Support for Digital Learning

Securing digital education funding is vital, with options like public-private partnerships, grants, and crowdfunding. Public-private partnerships, exemplified in the World Bank's "Public-Private Partnerships for Education" report (World Bank, 2021), involve government and private sector collaboration. Grant programs, like those from the Bill & Melinda Gates Foundation (Bill & Melinda Gates Foundation, n.d.), support educational technology. Crowdfunding on platforms like Kickstarter and DonorsChoose engages a broader community (Kickstarter, n.d.; DonorsChoose, n.d.).

- a) **Identifying Potential Stakeholders and Interested Parties:** Identifying and engaging key stakeholders is crucial. These include government agencies, educational institutions, technology companies, and nonprofits. Government agencies shape policy and funding. Educational institutions partner with tech companies, while nonprofits like UNESCO and Education International promote global education quality (OECD et al., 2022). Collaborative efforts among these stakeholders are essential.
- b) **Role of Public and Private Sectors in Supporting Sustainable Digital Education:** Both public and private sectors have pivotal roles in sustaining digital education. The public sector creates an enabling environment with policies and investments, exemplified in India's Digital India campaign (Government of India, 2015). The private sector contributes through innovative educational technologies and partnerships, such as Google for Education and Microsoft Education (Google for Education, n.d.; Microsoft Education, n.d.). Balancing these contributions ensures equitable access and quality in digital education.

These considerations on funding, stakeholders, and the roles of the public and private sectors shed light on the multifaceted nature of sustainable digital education initiatives and highlight the need for collaboration and strategic planning.

4.5 Cautionary Notes on Negative Impacts

While digital education and gamification offer benefits, it's crucial to consider potential negative impacts on child psychology. Excessive screen time may lead to sedentary behaviour and health issues like

childhood obesity (Biddle et al., 2019). Educators and policymakers should integrate breaks, physical activity, and healthy lifestyle education into digital learning programs.

Excessive screen time and gamification can trigger addiction-like behaviours, affecting children's mental health. Research shows it can lead to sleep disturbances, reduced social interaction, and increased anxiety (Twenge & Campbell, 2018). Implementing screen time guidelines and raising awareness among parents and educators is essential.

Psychological research offers insights into technology's impact on children's development. Prolonged screen exposure may reduce a child's focus (Swing et al., 2010). Research on play therapy in digitised contexts can illuminate technology's effects on children's play and cognitive development (Veresov & Veraksa, 2022). Integrating these findings into digital education strategies balances the benefits and potential drawbacks of technology-based learning.

By addressing these concerns and drawing on psychological research, educators and policymakers can prioritise children's well-being and cognitive development in digital education programs while leveraging gamification and technology's advantages.

4.6 Addressing Disparities and Stereotypes

While digital education and gamification offer benefits, it's crucial to consider potential negative impacts on child psychology. Excessive screen time may lead to sedentary behaviour and health issues like childhood obesity (Biddle et al., 2019). Educators and policymakers should integrate breaks, physical activity, and healthy lifestyle education into digital learning programs.

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4.7 Insights into Gamification as a Model

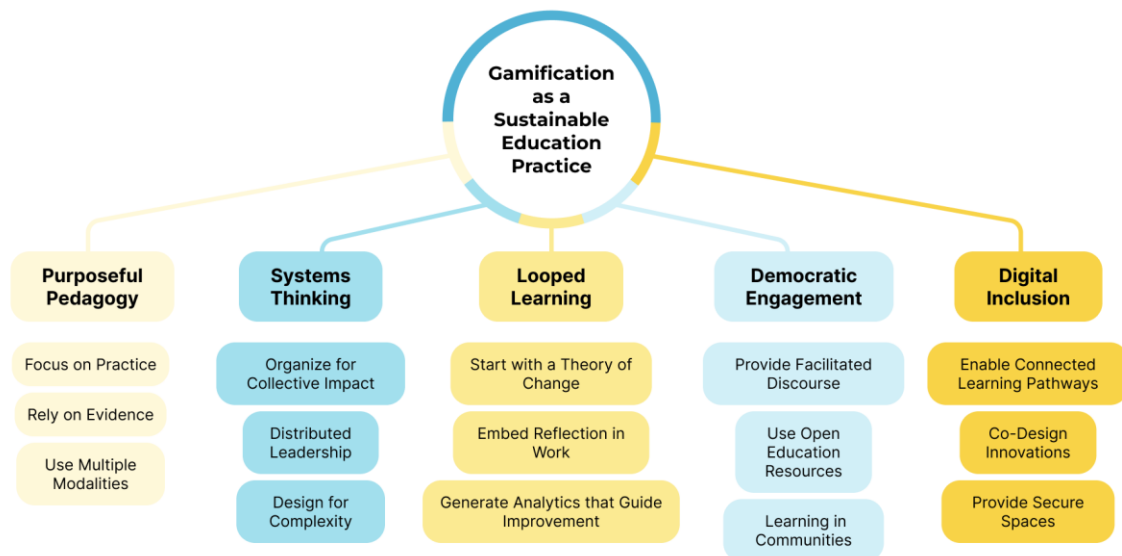


Fig. 6. Gamification as a Sustainable Education Practice

In our exploration of sustainable education practices for primary education, we draw inspiration from key principles in pedagogy, systems thinking, looped learning, democratic engagement, and digital inclusion. Our approach is rooted in purposeful pedagogy, emphasising a student-centred methodology where hands-on problem-solving is central to the learning process. Evidence-informed pedagogy guides our teaching practices, ensuring they are backed by reliable research and applicable across diverse contexts.

Co-creating content is fundamental in utilising digital resources to foster community building, critical inquiry, and the development of digital literacies. By embracing multiple modalities, one can leverage varied forms of communication – text, images, motion, and audio – to enhance the learning experience.

By applying systems thinking, we can organise for collective impact, encouraging collaboration across disciplines to solve complex problems. Distributed leadership structures, such as communities of practice, promote innovative solutions and the sharing of valuable insights. Designing for complexity allows one to dynamically adapt instructional elements to suit the unique contexts, abilities, and preferences of learners and educators.

Looped learning is integral to starting with a theory of change and embedding reflection into work. Analytics generated throughout the process guide continuous improvement, ensuring our practices are responsive and effective.

In fostering democratic engagement, we facilitate meaningful discourse through purposeful online discussions and leverage open education resources to enhance accessibility and adaptability. Structured learning communities, inspired by communities of practice and communities of inquiry, play a crucial role in developing teaching presence, social presence, and cognitive presence.

By embracing digital inclusion, we can aim to enable connected learning pathways, co-design innovations, and provide secure spaces that adhere to established standards for privacy and security. We

must seek to weave these sustainable gamification practices into the fabric of education, creating a holistic and adaptable framework for primary education. By aligning gamification with these principles, we envision a powerful and sustainable educational practice that caters to the evolving needs of primary learners.

5. Conclusion

In conclusion, this paper has delved into the transformative power of gamification in e-learning, exploring how it enhances sustainable education practices for the digital generation. In a post-COVID scenario marked by changes in attention spans, shifts in authority, and increased digital dependency, the need to adapt traditional education systems to the digital era has become paramount. The research has underscored the evolving definitions of sustainable education, learning, retention, educator, and learner, highlighting the changing dynamics between educators and learners in the digital context.

Throughout this paper, we've emphasised the potential of gamification to significantly enhance learning outcomes, particularly in the primary school context. The interplay between technology and sustainable education practices has been explored, shedding light on the implications of dynamic e-learning experiences in primary education. We've also highlighted the scope for further growth and innovation in this segment, especially by harnessing co-creation and peer learning methodologies.

While recognizing the promise of gamification, we've also issued cautionary notes regarding negative impacts on child psychology, such as excessive screen time and gamification-induced addiction. Drawing insights from psychological research, including studies on attention span and play therapy in digitised contexts, we've stressed the importance of a balanced approach that considers both the benefits and potential drawbacks of technology-based learning.

In this rapidly evolving landscape of digital education, this paper provides a comprehensive framework for educators and policymakers. It encourages the incorporation of sustainable education practices to engage and inspire young learners while safeguarding their overall well-being. As we continue to explore the possibilities of gamification, we must remain vigilant, prioritise children's holistic development, and ensure that technology serves as a valuable tool in shaping the future of education.

Acknowledgment

We extend our gratitude to NIFT for providing us with the invaluable opportunity to conduct research and present this paper. We would also like to express our appreciation to our dedicated colleagues at NIFT for their unwavering support and assistance throughout this research endeavour. Furthermore, special thanks are due to Mr. Gaurang Gandhi for generously contributing his time and insights through interviews, enriching the quality and depth of our work. We acknowledge the collective effort and commitment of all those who have made this research possible.

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UX Audit: A Comprehensive Review of Methodologies and Best Practices for Evaluating User Experiences

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ABSTRACT

User experience (UX) is crucial to modern-day digital products and services. A UX audit evaluates the UX of an application, website, or digital product by analyzing user data, conducting heuristic evaluations, and identifying areas for improvement. This review paper aims to outline UX audits, including their benefits, key components, and steps involved in the process. The research also discusses the importance of using empirical data in UX audits and how to measure the success of a UX audit. Additionally, the paper highlights UX auditors' challenges and provides recommendations for overcoming them.

Keywords - UX audit, User experience, Digital products, Heuristic evaluations, Empirical data.

1. Introduction

Defining User Experience (UX) in a way that is widely accepted is a problem that is well known, but it continues to be challenging to solve. The definition provided by ISO 9241-201, UX is defined as "A person's perceptions and responses that arise out of use and anticipated utilization of a product, system, or service." The article notes that UX "includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours, and achievements that occur prior, during, and after use." The user's internal and physical state as a result of prior experiences, attitudes, skills, and personality, as well as the context of use, all impact user experience (UX). Other aspects that impact UX include the brand image, functionality, performance of the system, interactive behaviour, and assistive abilities of the interactive system.

UX is a user's overall experience when using a product or service, including their emotions, attitudes, and behaviours (Norman D. A., 2013). The success of a product or service is directly impacted by the user experience (UX), which has grown in importance as an element of product development. A positive UX increases user satisfaction and loyalty, while a harmful UX can result in frustration and disengagement.

A UX audit is a method of evaluating the effectiveness of a product or service's effectiveness in meeting its users' needs. The following are some general steps in conducting a UX audit explained by (Kujala & Kaasinen, 2018); (Lazar, Feng, & Hochheiser, 2017):

1. **Define the scope and goals of the audit:** Identify the product or service to be audited, the specific aspects of the user experience to be evaluated, and the desired outcomes of the audit.
2. **Gather user data:** Collect user feedback and behaviour data through surveys, interviews, analytics tools, and other user research methods. This information will provide insights into user needs and pain points.
3. **Evaluate usability:** Evaluate the product or service for usability issues, such as confusing navigation, unclear instructions, and error-prone processes. Use established usability heuristics and guidelines to identify potential problems.
4. **Assess visual design:** Assess the graphic design of the product or service, including typography, colour, layout, and overall aesthetic. Ensure the design is consistent, visually appealing, and supports user goals.
5. **Evaluate content:** Evaluate the content of the product or service, including text, images, and multimedia elements. Ensure that the content is relevant, engaging, and supports user goals.
6. **Analyse accessibility:** Analyse the product or service for accessibility issues, such as lack of alternative image text, insufficient color contrast, and poor keyboard accessibility.
7. **Document findings:** Document the findings of the UX audit in a clear and concise report, including specific issues identified, recommendations for improvement, and the rationale for each submission.
8. **Prioritize recommendations:** Recommendations based on their impact on the user experience and the resources required for implementation.
9. **Create an action plan:** an action plan to implement the recommendations, including timelines, responsibilities, and resources required.
10. **Monitor progress:** Monitor progress and measure the impact of the UX audit by conducting follow-up research, tracking user feedback, and assessing key performance indicators.

UX audit can be a complex and time-consuming process, but the right tools will reinforce the manual job your team or a third-party consultant does. some of the popular UX audit tools as per below (eleken, 2023):

- Google Analytics
- Mixpanel
- Kissmetrics
- HotJar
- Crazy Egg
- UXCam
- UserTesting

However, choosing the tool that will best serve your project and accomplish the correct interpretation of findings is crucial.

2. Objectives

The objectives of this review paper are:

- I. To understand the user experience (UX) audit process.
- II. To discuss the importance of using empirical data in UX audits and how to measure the success of a UX audit.

3. Research Methodology

To write this review paper, secondary sources of data were carefully examined as part of this work's research process. To develop comprehension and a conceptual grasp of the subject, research papers and articles from reputable journals, marketing books, trend forecasting publications, and online resources on related themes were all assessed.

4. Literature Review

As per research published by (Hassenzahl, 2008) good user experience results from interacting with a product or service (hedonic quality) in a way that satisfies human requirements for autonomy, competence, stimulation (self-oriented), relatedness, and popularity (others-oriented). UX is primarily influenced by two types of product qualities: pragmatic and hedonic attributes. The phrase "pragmatic quality" refers to a product's perceived ability to help users accomplish "do-goals," hence it also refers to the utility and usability of the product for possible actions that are not directly related to the user.

Hedonic quality is the capacity of the product to support the user in reaching personal goals (i.e., being distinctive and competent). It is defined as the product's perceived ability to support the attainment of "be-goals".

Affordance and synesthesia are two categories for product attributes according to the notion of the signification of artefacts (Floch, 2000). In reality, objects are valued not merely for their embodied purposes but also for the significance they take on for those who use them, the moral and ethical messages they convey, and the aesthetic pleasure they provide. The term "affordance" refers to particular product characteristics that specify how to use the product and reveal the range for whom it is intended (McGrenere & Ho, 2000). When the product is successful, and satisfactory for the context of use, affordability qualities are attained. Thus, they are evaluated using usability testing techniques (Van Vugt, Hoorn, Konijn, & de Bie Dimitriadou, 2006). On the other hand, synesthesia is concerned with hedonic qualities that might arouse feelings of affection (Norman D. , 2004). If both aspects have an impact on how excellent an interaction is, then the product experience should be viewed as a holistic process. Proper assessment techniques must concentrate on both the objective and subjective aspects of interaction. Both the cognitive and emotional response must be examined. Traditional investigative techniques typically evaluate them individually (Kalviainen, 2002).

According to the ISO 9241-11 standard, usability is "the degree to which specified users may use a product to achieve specified goals with efficiency, effectiveness, and fulfilment in a specified context of use."

A theoretical framework presented by (Prajapati & Kumar, 2019) for conducting a UX audit typically involves several stages, which may vary depending on the specific approach used. Here is an example of a theoretical framework for conducting a UX audit:

- **Planning and Preparation:** This stage involves defining the objectives, scope, and methodology of the UX audit, as well as identifying the target audience and stakeholders.
- **Data Collection:** This stage involves collecting data on the user experience of the product or service being audited. This may include qualitative and quantitative data, such as user feedback, behavior data, and usability testing results.
- **Analysis:** This stage involves analyzing the data collected to identify critical issues and areas of improvement in the user experience. This may involve various analysis techniques, such as heuristic evaluation, task analysis, and cognitive walkthroughs.

- **Recommendations:** This stage involves making recommendations based on the analysis conducted in the previous stage. These recommendations may include design changes, usability improvements, and other user experience suggestions.
- **Implementation and Monitoring:** This stage involves implementing the recommendations made in the previous stage and monitoring the effectiveness of these changes over time.

A UX audit is a thorough assessment of a website, mobile application, or product to identify usability issues and suggest improvements to enhance user experience. Some benefits of conducting a UX audit include the following:

- **Identifying usability issues:** A UX audit can help identify areas where users may struggle with a product or service, such as confusing navigation or poor visual design (Nielsen J. , 1994).
- **Enhancing user satisfaction:** A UX audit can identify areas where users may experience frustration or dissatisfaction, such as slow load times or difficult-to-use features. By addressing these issues, companies can increase user satisfaction and loyalty (Hassenzahl & Tractinsky, 2006).
- **Improving conversion rates:** A UX audit can help identify areas where users may abandon a product or service, such as a complicated checkout process or unclear call-to-actions. Companies can improve conversion rates and increase revenue by making improvements based on the audit findings (Nielsen J. , 1994).
- **Gaining a competitive advantage:** Companies can earn a competitive advantage in the marketplace by conducting a UX audit and making improvements to enhance user experience. A better user experience can increase customer loyalty, positive word-of-mouth, and overall business outcomes. Overall, a UX audit can provide valuable insights into a product or service's usability and user experience, leading to improvements that can benefit both users and businesses (Hassenzahl & Tractinsky, 2006).

A company should consider conducting a UX audit when they notice a decrease in user engagement, high bounce rates, low conversion rates, or increased customer complaints. Conducting a UX audit can help identify pain points and areas of improvement within the user experience, leading to increased user satisfaction and overall business success (Li & Li, 2021).

- A cognitive walkthrough is a method used in UX audits to evaluate the usability of a software product or system by analysing how well it supports users in achieving their goals. The process involves identifying potential issues in the design by examining the system from a user's

perspective and evaluating how easy it is to use. The steps involved in a cognitive walkthrough typically include task analysis, goal identification, scenario development, and evaluation of the user's cognitive load (Smith & Johnson, 2019).

- Heuristic analysis is a method used in UX audits to evaluate the usability of a software product or system by examining it against a set of predefined usability principles or heuristics. The process involves identifying potential issues in the design by examining the system from a user's perspective and evaluating how well it supports users in achieving their goals (Nielsen J. , 1994).
- Competitor analysis is a method used in UX audit to evaluate the strengths and weaknesses of a software product or system by comparing it to similar products or systems in the market. The process involves identifying competitors, assessing their products, and identifying opportunities for improvement (Liu, Li, & Ren, 2021).
- Data analysis is used in UX audits to evaluate a software product or system's usability by analysing user behaviour and feedback data. The process involves collecting and analysing data from various sources, such as user surveys, usability tests, and website analytics (Fernández-Medina, Martín-González, & Medina-Medina, 2019).

The importance of using empirical data in UX audits cannot be overstated. Empirical data refers to data that is collected through systematic observation or experimentation. This data type can provide valuable insights into user behavior and preferences, informing the design of more user-friendly products. Empirical data is essential for effective UX auditing. The study found that the most successful UX audits incorporated empirical data, including user feedback, usability testing, and analytics (Nielsen Norman Group, 2020). Using empirical data can help UX auditors to:

1. **Identify usability issues:** Empirical data can help auditors to identify usability issues that are not immediately obvious. For example, user testing can reveal problems with navigation or information hierarchy problems that may need to be added to an initial interface review.
2. **Prioritize design changes:** Empirical data can also help auditors to prioritize design changes. By analyzing user feedback and behavior, auditors can identify the most critical issues that must be addressed and focus their efforts accordingly.
3. **Validate design decisions:** Empirical data can be used to validate design decisions. For example, A/B testing to compare the effectiveness of two different design options and determine which one is more effective (IBM, 2017).

A template for conducting a mobile app or website UX audit discussed and presented by (Chapman, 2018); (Hassenzahl & Tractinsky, 2006); (Nielsen J. , 1994); (Preece, Rogers, & Sharp, 2015); (Rubin & Chisnell, 2008) and ISO 9241-11:2018 is articulated as per given below :

Introduction:

- Briefly introduce the app or website and its purpose.
- Identify the target audience.

Navigation:

- Evaluate the ease of navigation throughout the app or website.
- Identify any confusing or unclear navigation paths.
- Determine if the navigation aligns with the app's or website's purpose and target audience.

Content:

- Evaluate the quality and relevance of the app's or website's content.
- Determine if the content aligns with the app's or website's purpose and target audience.
- Assess the readability of the content.
- Evaluate the use of headings, subheadings, and bullet points.

Layout and Design:

- Evaluate the overall visual appeal of the app or website.
- Assess the readability and legibility of text, font size, and colour.
- Evaluate the use of icons, images, and graphics.
- Determine if the design elements align with the app's purpose and target audience.

Functionality:

- Test all the features and functions of the app or website.
- Identify any errors or glitches that occur.
- Evaluate the response time of the app's or website's features and operations.
- Determine if the features and functions align with the app's or website's purpose and target audience.

User Input:

- Evaluate the ease of inputting data.
- Determine if the input fields are clear and concise.

- Test the error messages and feedback provided when incorrect input is entered.

Performance:

- Evaluate the app's or website's speed and performance.
- Test the app's or website's responsiveness to user interactions.
- Determine if the app's performance meets user expectations.

Accessibility:

- Evaluate the app's or website's accessibility features.
- Determine if the app or website is usable by individuals with disabilities.
- Test the app's or website's compatibility with assistive technology.

Security:

- Evaluate the app's or website's security measures.
- Determine if the app or website stores user data securely.
- Identify any potential security vulnerabilities.

Conclusion:

- Summarize the findings of the audit.
- Provide recommendations for improvements.
- Determine if the app's or website's UX aligns with the purpose and target audience.

The Graphical User Interface (GUI), which allows consumers to interact with electronic devices through visual icons rather than text-based interfaces, is crucial to UX/UI design. Maintaining the distinctive "look and feel" of these components—which include GUIs, icons, and visual cues—becomes essential to keeping your product stand out from the competition. Protecting key UX/UI design elements makes sure that users will recognize and find them appealing, and it sets your product apart from rivals. Patents on designs are "issued for a new, original, and ornamental design embodied in or applied to an article of manufacture." Remarkably, interactive UI/UX design features are also protected by design patents. For instance, the "page turning" function in Apple eBooks is covered by U.S. Design Patent No. D670,713 (Vijh, 2021). In India, design laws as well as copyright laws can provide protection for Graphic User Interfaces (GUIs). The Hon'ble Bombay High Court ruled in the matter of Maraekat Infotech Ltd. v. Naylesh V. Kothari that copyright protects the "structure, sequence, and organization" of computer programmes, suggesting that the UI/UX related to the program would also be protected (GPF, 2023).

5. Discussion and Suggestions

UX auditors may encounter a variety of difficulties while performing user experience audits, including:

- **Subjectivity:** UX auditing involves evaluating and assessing the user experience of digital products, which can be subjective. UX auditors may need help to remain objective in their assessments, especially if they have a personal bias or preference (UserZoom , 2018).
- **Limited access to users:** To conduct UX audits, auditors need access to users who can provide feedback on their experience with a product. However, accessing users can be challenging, especially if the product is in development or has a limited user base (Munteanu, Hara, Inkpen, & Carpendale, 2010).
- **Limited resources:** UX auditors may need more resources, including time, budget, and tools. This can make it challenging to conduct thorough audits and provide comprehensive recommendations (UserTesting, 2019).
- **Keeping up with technology:** UX auditors must stay up-to-date with the latest tools and trends as technology evolves rapidly. However, keeping up with technology can be challenging, especially if resources and time are limited (UserTesting, 2019).
- **Communication:** UX auditors must effectively communicate their findings and recommendations to stakeholders, including designers, developers, and product owners. However, sharing technical information in a way that is accessible and actionable for non-technical stakeholders can be challenging (UX Collective, 2019).

To overcome these challenges, UX auditors may need to develop strategies to remain objective in their assessments, find creative ways to access users, make the most of limited resources, stay informed about the latest technology trends, and develop strong communication skills. They may also benefit from collaborating with other UX professionals and seeking ongoing training and education opportunities.

Improving the UX of a product or service based on a UX audit involves identifying and addressing issues impacting the user experience. Essential points to improve the UX of a product or service based on a UX audit explained by (Huang M. , 2020) & (Li & Guo, 2020):

- **Prioritize issues:** Review the findings of the UX audit and prioritize the topics based on their severity and impact on the user experience.

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- **Develop solutions:** Work with a team of designers and developers to develop solutions to address the identified issues. Brainstorm ideas and use best practices in UX design to create effective solutions.
 - **Implement changes:** Implement the changes to the product or service, ensuring they are thoroughly tested and validated before being released to users.
 - **Re-evaluate:** Conduct further usability testing to validate that the changes have improved the user experience. Use user feedback to identify any remaining issues and continue refining the product or service.
 - **Monitor performance:** Continuously monitor the product or service's performance and make adjustments as needed to ensure that it continues to meet users' needs.

The recommendations to help UX auditors to conduct more effective assessments and improve the user experience of products and services (Huang, Zhou, & Ma, 2019).

- **Ease focus on the user:** When conducting a UX audit, keeping the user at the centre of your evaluation is essential. Try to understand the user's needs, goals, and expectations, and evaluate the product or service from their perspective.
- **Use multiple evaluation methods:** To get a comprehensive understanding of the user experience, it's essential to use various evaluation methods, such as surveys, usability testing, heuristic evaluations, and analytics.
- **Develop clear and actionable recommendations:** After identifying issues with the user experience, it's crucial to develop clear and actionable recommendations for addressing those issues. Make sure your submissions are specific and focused on improving the user experience.
- **Collaborate with designers and developers:** To ensure that your recommendations are effectively implemented, working closely with designers and developers throughout the process is essential. Collaborate with them to develop solutions that address the identified issues and improve the user experience.
- **Continuously evaluate and iterate:** UX is an ongoing process, so it's essential to constantly assess and repeat the product or service to ensure that it continues to meet users' needs.

IPR-Intellectual Property Rights:

In the realm of UI/UX (User Interface/User Experience) design, intellectual property rights (IPR) are essential for safeguarding innovative ideas, designs, and creative works. Here are several main justifications for the significance of IPR in the UI/UX design process:

Safeguarding unique designs, promoting creativity, establishing ownership, stopping unfair competition, safeguarding brands, drawing in investment and customers, Possibilities for Licensing, Legal Action for Infringement, Preserving Design Integrity, and Worldwide Protection

To sum up, the protection, respect, and expansion of the design profession as well as the larger creative industry depend on the incorporation of Intellectual Property Rights into the UI/UX design process. It establishes a framework that promotes innovation, creativity, and fair competition in the quickly developing industry of design.

6. Limitations

Due to time restrictions, only a limited number of literature sources could be examined in order to fully comprehend the user experience audit. Furthermore, the research still needs to include empirical work.

7. Conclusion

To make sure a product or website is user-friendly, effective, and efficient, a UX audit must be carried out. This thorough review's techniques and best practises offer a strong framework for assessing the user experience and pinpointing opportunities for development.

UX is crucial since it has a direct impact on user retention, satisfaction, and conversion rates. You may learn valuable information about how consumers engage with your product, spot pain points and areas of confusion, and implement improvements that improve the user experience as a whole by conducting a complete UX audit. Utilising both quantitative and qualitative methodologies to obtain information and insights is crucial when conducting a UX audit. The right approach and tools can improve the usability and accessibility of your product and create a more engaging and enjoyable experience for users.

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Sustainable Renewal in Urban Areas: Looking Beyond the Jawaharlal Nehru National Urban Renewal Mission

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ABSTRACT

Urbanisation is a continuous process of growth by which the cities accommodate the shifting populations. A city must continually address concerns related to housing, employment and the balance of demand and supply of basic infrastructure services. The act of planning for urban growth and transformation is termed Urban Renewal. While urban renewal started after World War 2 in Europe, it was not until the 1980s that issues of sustainability were addressed through urban renewal. Sustainable urban renewal enables a balance of physical, social, economic, and ecological improvements in cities. This paper presents case studies of some exemplary urban renewal projects implemented around the world focussing on physical, social, cultural, economic or ecological development of an area. It traces the evolution of the concept of urban renewal in the Indian context with a focus on the biggest scheme launched by the Indian government under the aegis of JNNURM. It further analyses the performance of JNNURM on the sustainability platform. The paper concludes by proposing that the learnings from JNNURM should be used to devise the next phase of urban renewal programs in India and that all future schemes should be based on sustainable urban regeneration principles. It also proposes that effective implementation of any UR scheme requires the strengthening and empowering of the urban local bodies as well as contextualising the issues while engaging the community in the process of planning and implementation.

Keywords - Urban Renewal, Sustainable Renewal, Sustainable Regeneration

1. Introduction

The term "Urban Renewal" originates from Europe and Britain, primarily emerging as a response to the need for the redevelopment of urban centres in the post-World War II era, focusing notably on economic infrastructure. Over time, the concept has evolved into a global intervention, driven by the escalating forces of urbanisation and rapid transformation worldwide, propelled by factors such as population growth, migration, globalisation, and poverty.

The correlation between urban sprawl and neighbourhood degradation is evident and impactful. When economically secure individuals and investments migrate to new areas, leaving behind marginalised and impoverished communities, neighbourhoods often experience blight. This shift results in a decline in property values and a challenging environment for attracting new investments. The core objective of urban renewal is to ameliorate these ailing aspects within a city. Urban renewal encompasses a diverse range of activities aimed at revitalising established areas that have succumbed to blight and disinvestment Courey (2019).

The areas in need of renewal exhibit signs of neglect, ranging from aged and dilapidated buildings to poorly maintained streets and utilities. In some instances, these areas may even lack essential infrastructure altogether. Urban centres, serving as multifunctional nodes, play a pivotal role by integrating commercial, retail, cultural, and residential components. Beyond being key drivers of regional economic growth, these centres significantly contribute to national GDP and serve as crucial revenue sources for local governments.

The imperative to renew declining urban areas stems from the fundamental goal of improving living conditions, ensuring longevity, and adapting to the evolving needs of the populace. The motives for renewal are diverse, encompassing the facilitation of urban growth, reconstruction from decay, demolition, and destruction, restructuring or relocation for densification or relief, and, in certain cases, the revival or revitalization of areas for the preservation of public memory.

In summary it can be said that urban renewal has transcended its historical origins and has now become a global imperative, addressing the complex interplay of urbanisation, migration, and socioeconomic dynamics. By revitalising declining urban areas, we can not only enhance living standards but also foster sustainable growth and resilience in the face of evolving societal needs

2. Urban renewal and urban regeneration

Urban renewal (UR) and urban regeneration (UG) have very similar meanings and both involve work of a relatively large scale: urban renewal is defined as the process of slum clearance and physical redevelopment that takes account of other elements such as heritage preservation (Couch, Sykes, & Börstinghaus, Thirty years of urban regeneration in Britain, Germany and France, 2011). It aims at improving the physical, social-economic, and ecological aspects of urban areas through various actions including redevelopment, rehabilitation, and heritage preservation. Urban regeneration, on the other hand, is a comprehensive integration of vision and action aimed at resolving the multi-faceted problems of deprived urban areas to improve their economic, physical, social, and environmental conditions (Ercan, 2011)..

2.1. International Urban renewal projects

Urban renewal projects around the world have been undertaken with a physical, cultural, social or environmental focus. Some representative cases are discussed below:

2.1.1. Physical renewal

Physical renewal includes developing city identity and preservation of heritage in certain cases. A good example of physical renewal is that of the Toronto Distillery District project (TDD) (Fig 1, Fig 2 & Fig 3) taken up in 2003. The project transformed a collection of Victorian-era industrial buildings into a thriving pedestrian-friendly district.



Fig 1. Layout of Toronto Distillery District project (TDD)

Source: <https://torontosavvy.me/2018/04/08/the-distillery-district-40-heritage-bldgs-3-theatres-galleries-shops-bistros-within-13-acres/>



Fig 2. Exterior View of Toronto Distillery District project (TDD)

Source: <https://torontosavvy.files.wordpress.com/2011/03/distillery1.jpg?w=585&h=652>



Fig 3. Interior View of Toronto Distillery District project (TDD)

Source: <https://torontosavvy.files.wordpress.com/2016/07/youngctr1.jpg>

New York High Line Project (Fig 4 & 5) started in 2004 was born out of the need to repurpose an abandoned and deteriorating elevated railway track. Originally built in the 1930s, the railway fell into disuse and faced demolition threats. The project aimed to address the lack of green spaces in the surrounding neighbourhood, enhance the quality of life for residents, attract tourism, and contribute to the revitalization of the area.

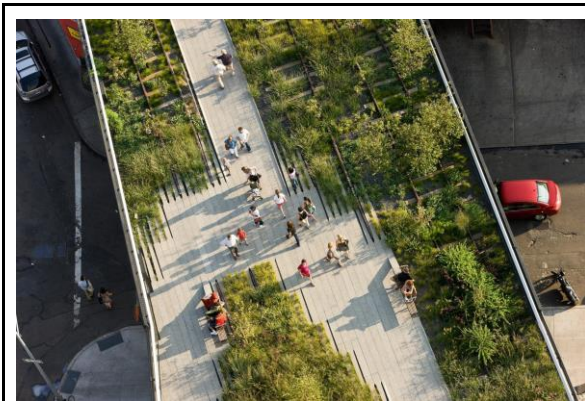


Fig 4. Exterior View of New York High Line Project
Source: <https://dsrny.com/project/the-high-line>



Fig 5. Exterior View of New York High Line Project
Source: https://en.wikipedia.org/wiki/High_Line

Vienna Urban Renewal Project (Fig 6 & 7) of 2011 was an ambitious initiative that focused on revitalising urban areas in the city. It aimed to create sustainable, liveable, and inclusive neighbourhoods. The project emphasised pedestrian-friendly streets, green spaces, and efficient public transportation.



Fig 6. Exterior View of Vienna Urban Renewal Project
Source: https://www.isocarp.net/data/case_studies/2042.pdf



Fig 7. Exterior View of Vienna Urban Renewal Project
Source: https://www.isocarp.net/data/case_studies/2042.pdf

2.1.2. Social renewal

Social renewal includes demographic changes, social housing, public spaces, and cultural facilities. Several cities have undertaken projects focussed on social renewal. Progressive socio-cultural urban renewal of the City of Genoa (North Italian region of Liguria) was focused on attaining better management of the city as a system of health, education, and jobs. It enhanced socio-cultural interaction through the creation of more museums, theatres, sports areas, and universities. The Waterfront di Levante is a project that aims to transform what was previously the back of a port into a new urban front

on the sea. The development is planned to become a new landmark on the seafront of Genoa, Italy, by bringing new urban and port functions, both public and private, to an underutilised area. By controlling the built-to-open area ratio, it also seeks to enhance the connection between the city and the sea. The project introduces functions such as the new Urban Park, a new dock, residences, offices, student housing, retail facilities, apart-hotels, and a new sports hall.

Urban renewal of Glasgow (Fig 8) central area was geared to bid for designating Glasgow as 1990 European City of Culture (Tanguy, Breton, P., & Amor, 2020). It focussed on visual improvements by removal of slums and upgradation of sub-standard tenements (Alpopi, 2013).



Fig 8. Exterior View of Glasgow city

Source: <https://www.bbc.co.uk/news/uk-scotland-scotland-business-37213627>

2.1.3. Economic:

Financial renewal focusses on inflow, increase in tax revenue, job opportunities and boom in real estate. Urban renewal of Porto-Novo in Benin (Sub Saharan Africa) proposed increase in public lighting, properly serviced roads, and cafes to boost the economy. It aimed at providing adequate infrastructure to internationally promote festivals and events for economic activities during day as well as night (Reguissé, 2012). Urban renewal of Dundee's Victorian industrial base and port facilities was to boost the confidence of financial institutions. The renewal process worked on decongestion of the centre and improvement of the peripheral estates. It introduced ways of diversifying and developing new economic environment (Anđelić & Mihić, 2016).

2.1.4. Environmental:

Environmental renewal focusses on reduction of pollution, adding more green spaces, soil restoration and waste management. Toronto Distillery District renewed abandoned brownfields that were turning into potential pollutants. Porto- Novo project aimed at reducing pollution, better waste management and promoting healthy living conditions (Jenkins, Kennedy, & Mukhopadhyay, 2014).

3. Urban renewal in India

India continued to follow the 'master planning approach' (5-year plan) initiated by the British the Town and Country Planning Act of 1947 (Ahluwalia, 2014). The first 2 five-year plans from 1951 to 1961 looked at the housing needs starting from the rehabilitation of the refugees and later fulfilling the housing deficit in many areas. The awareness of overcrowded cities and a missing housing policy was the first step toward the idea of an evolution in the field of urban policies in India. In May 1952, the Ministry of Works, Housing, and Supply came into existence. Later it was renamed as the Ministry of Works and Housing and a separate Ministry of Supply was created. Recognizing the importance of urban issues, the government named it as the Ministry of Urban Development (MoUD) in 1985. In 1992 (8th five-year plan) the focus shifted to the mega city schemes for development of metro cities like Mumbai, Kolkata, Bangalore, Hyderabad, and Chennai. To accelerate the process of development, the 74th Amendment was made to the constitution that helped prepare municipalities to use institutional funds. The 9th five-year plan closely looked into the skewed urban processes, uneven urbanisation, and economic growth. The 10th five-year plan then launched India's biggest mission, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) on the 3rd of December 2005. The aim was to redefine urban governance through a focus on the immediate demand.

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched on the 3rd of December 2005 by the Ministry of Urban Development (MoUD) as a coherent urbanisation policy/strategy to implement urban renewal projects in 65 cities in a mission mode (Brundtland, 1987). JNNURM was a ministerial program "to encourage reforms and fast track planned development of identified cities [with a focus on] efficiency in urban infrastructure and service delivery mechanism, community participation and accountability of ULBs/parastatal agencies toward citizens" (Government of India (Rao, 2017)).

JNNURM is a partnership program of Central, State, and Local governments that builds on some common understanding and agreed program of shared investments on core infrastructure and governance improvement policy. The Mission estimated that over a seven-year period (2005-06 to 2011-12), concerned cities would need a total investment of Rs. 1,20,536 crores as investments in basic infrastructure and services. On an annual basis, this meant an average investment of Rs. 17,219 crores (MoUD).

JNNURM aimed to encourage the state governments to make provisions for land to meet the acute shortage of affordable housing and to work through a partnership (Public-Private Partnership) model envisaged in the National Urban Housing and Habitat Policy (NUHHP) 2007. The four schemes under JNNURM were the Urban Infrastructure & Governance (UIG), Basic Services to the Urban Poor (BSUP), Urban Infrastructure Development Scheme for small and Medium Towns (UIDSSMT) and

Integrated Housing and Slum Development Programme (IHSDP). JNNURM reforms can be broadly categorised into 3 major streams, namely Financial Management Reforms, E-Governance Reforms and Poverty Related Reforms. Frameworks are most often established at the local level by Urban Local Body (ULB), and are nested into State and Central economic frameworks. The ULB and State have to make parallel financial contributions along with the Central Government in the ratio of State: ULB: Central Govt.= 10: 10: 80, (Rao PV 2017). The mission was due to end in Dec. 2012 but was extended for two years, up to March 2014 to facilitate the completion of ongoing projects and reforms and allow for sanction of new projects. The results at the end of the seven-year mission were mixed mostly because it came out that states were not able to work within the committed deadlines. (Sadoway, Gopakumar, Baidur, & Badami, 2018). Experts believe that though JNNURM was able to push the urban renewal process effectively, it fell short of reaching its full potential. The process of urban transformation in India is complicated by local factors including the high growth of population, legislation and informal settlements, private sector investment decisions, political, social, and economic transition, inter-governmental relationships, government capacity, and financial constraints.

4. Urban renewal and sustainability

Sustainable development is a term that was first introduced in the 1980s in the Report of the World Commission on Environment and Development (WCED), and it is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Weeks, 2010) (WCED, 1987). The commonly accepted concept of a sustainable city refers to attaining a balance between the 3 pillars of sustainable development namely People, Planet and Profit (Elkington, 1997). The 3P approach, also known as the “triple bottom line” (UN2002) underlined the importance of interactions between the different actors and institutions to carry out development and added the fourth pillar for Project and Process (Van Dorst & Duijvestein, 2004). Objectives Related to the 4 pillars and the criteria to be addressed are discussed below (Rey. E, M, & S, 2022).

Objectives related to Environment Pillar

- Optimal use of resources (Land, energy, water, and biodiversity)
- Impact Management (Carbon neutrality, pollutants, waste, and noise)

Objectives related to Sociocultural Pillar

- Quality of life (wellbeing indoor, wellbeing outdoor and proximity)
- Socio-cultural links (mixed use, flexibility, and heritage)

Objectives related to Economic Pillar

- Economic efficiency (Construction costs, operational costs, and external costs)
- Endogenous economy (Local economy and employment)

Objectives related to Governance Pillar

- Project specificities (Context, uniqueness, and temporality)
- Decision making process (Interdisciplinarity and monitoring)

5. Sustainability analysis of JNNURM

The strength of Sustainable Urban Regeneration (SUR) is that it helps build an urban environment where the quality of urban life and urban economic structure go hand in hand. SUR looks closely at the social structure while suggesting intervention in the physical, economic, political, and social structure. The criterion of the 4 reforms (Courey, 2019) can be used as a template to analyse JNNURM.

5.1. Criterion of Physical Reforms:

- Green Design (Optimal use of resources, waste management, Wellbeing of inhabitants, etc.)
- Access to public facilities / Open Space
- Provision for meeting, Special Needs
- Improvements in Existing Building Forms (Rehabilitation of Repairable properties)
- Efficient, Safe Environment for pedestrian & public transport user (Mobility, Walkability, safety of women, accessibility).

Under JNNURM, the revision of building bye-laws, mandating rainwater harvesting in all buildings, has been successfully implemented in 57 cities, and the remaining cities are in the final stages of completing this reform. This crucial step aligns with broader objectives focused on cultivating a sustainable urban environment, with a key emphasis on the efficient utilization of resources (Sharma, 2013). While water needs are being addressed, unconventional energy sources like the sun and the wind have not been explored in the scheme.

JNNURM focuses on economic reforms for ease in the collection of property taxes. However, it overlooks the results of the collective reforms that lead to the increase in the exchange value of the property that ultimately leads to gentrification. The control in the hands of real estate agencies increases which may not be in favour of the community (Cabernet, 2004).

Bangalore city launched an online property transaction platform in 2003 called Kaveri. It covers aspects related to Registration and valuation of properties, scanning and archival of documents, Reports, Vendor management systems, Utilities, Websites, Societies, Firms and Marriage Registration and Data Transmission (Choguill, 2008).

The urban form that is shaped for capital satisfaction generally avoids justice to the social needs of the people (Couch C. &, 2000). JNNURM must find a middle path and all reforms must balance the two.

5.2. Criterion of Political Reforms

Under JNNURM, Municipal Acts were amended by ULBs to incorporate most of the reforms. E-governance improved the system of governance. Many cities have been able to implement this.

However, smaller ULBs do not have enough resources and capacity to implement this reform (Couch, Fraser, & Percy, Urban regeneration in Europe, 2008).

5.3. Criterion of Social Reforms

The initiative to allocate 20-25% of developed land in all housing projects for the Economically Weaker Section (EWS) and Low-Income Group (LIG) was implemented to enhance the availability of cost-effective land for housing those with limited financial means, ensuring access to essential services. Municipal bodies were tasked with the responsibility of augmenting the provision of land and economical housing options for individuals in need (Korkmaz, 2016).

Social reforms provide opportunities for inhabitants to become citizens who participate actively in the production of space. JNNURM looks at the participation of urban local bodies whose formulation may or may not be based on the common goals of the community. This may lead to factions and thwarting of the reforms.

An analysis of the JNNURM scheme shows that though significant progress has been made in developing the framework for reform-linked investment in urban infrastructure through JNNURM, yet, the program did not achieve all the expectations. This can be attributed to the following reasons.

5.4. Lack of Participation of the Urban Local Bodies (ULB)

Under JNNURM, the ULBs were entrusted with the responsibility of implementing the renewal programs as envisioned by the 74th Amendment of the Constitution. However, most ULBs in India face a resource constraint to carry out their functions. They are yet to develop themselves as autonomous urban agencies to dovetail urbanisation with economic development.

5.5. Lack of contextual focus

Effective urban renewal requires an approach that links small scale renewal to large scale social change. It is required for all the stakeholders to be in consensus and no one should feel left out of the decision-making process. The challenge is to determine how to coordinate and collaborate among divergent groups to homogenise the community voice. In conclusion it is important to note that community development can happen only after community organising. Thus, urban renewal process must regulate urban reforms at the neighbourhood scale i.e., bottom-up approach rather than the top-down approach of JNNURM that had put forth India's urban agenda as the basis of urban renewal.

6. Conclusion

It may hence be concluded that there is a need to have large mission scale projects like JNNURM to bring about UR in India. The learnings from this mission should be used to devise the next phase of urban renewal programs in India and that all future schemes should have sustainability as a major pillar in planning. It also proposes that effective implementation of any UR scheme requires the strengthening and empowering of the urban local bodies as well as contextualising the issues while engaging the community in the process of planning and implementation.

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A Framework of Semiotics Theory to Understand the Signs and Their Meaning in Society

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ABSTRACT

The main objective of the study of semiotic theory provides a framework for understanding how humans use signs to make sense of their environment. Semiotic theory holds that signs do not convey meaning that is inherent in the object being represented. Semiotics is a method of studying communication that focuses on all types of communication rather than just spoken or written language. Semiotics, also known as Sign, is any object that can communicate meaning to a sign interpreter. The meaning could be intentional or accidental. The sign may also convey feelings that are reflected on the mind by any of these senses, such as visual, tactile, auditory, imaginary, and others. Signs and sign processes, symbolism, metaphor, indication, designation, and communication are all relevant subjects to explore as well as investigate the systems of nonverbal communication. The logical dimension of visuals as semiotics will be the focus of this paper.

Keywords - Semiotics, Signs, Symbols, Communications, Semiotics meaning in society.

1. Introduction

The term "semiotics" comes from the Greek word "semeiotikos," which means "the movement of interpreting signs." Language is defined as anything that has the ability to convey meaning. It is possible to use words, drawings, photographs, symbols, logos, gestures, linguistic and non-linguistic communication methods, and even street signs. Its framework and language provide the knowledge needed to perceive and comprehend in new ways. Furthermore, it adds value to human life through visuals, which society accepts in order to communicate more easily in everyday life.

Semiotics, the study of signs, symbols, and the ways in which they convey meaning, is essential for forming and comprehending human civilization. Language, visual images, and gestures- all of which are utilized in diverse situations to communicate ideas, beliefs, and values, can all be analyzed and interpreted using the semiotics framework. We can comprehend how symbols and signs take on meaning and affect how we see the outside world through the study of semiotics. This information can be used to comprehend how communications are created and received in fields like marketing, media studies, and cultural study. Semiotics aids us in comprehending the intricate communication process and how they influence our social and cultural experiences.

Semiotics can help determine which signs/messages to use, which to avoid, and whether proposed options are likely to have the desired impact. Semiotics is on the rise. In the past, gathering data, most of it

quantitative, occupied a large portion of the insight process. Semiotics allows us to understand the link between image and society in a new way, using language and framework. It is also a method for exposing photos, studying mass media, literary texts, and systematically analyzing a variety of other aspects of popular culture. In order to interpret a sign's meaning, we usually need to know what's going on around it as well as the sign itself. Semiotics is an important tool for ensuring that intended meanings (of a piece of communication or a new product, for example) are unambiguously understood by the person on the receiving end. This is crucial because semiotic systems can shape social relations and society itself. The principle that modes of communication offer historically specific and socially and culturally shared options for communicating is central to social semiotic theory.

This paper will focus on the concept of signs and symbols, as well as their roles in society as an assisting tool and communication tool through the use of signs within codes. According to Umberto Eco, an Italian novelist and semiotician, every cultural phenomenon should study semiotics as communication that interprets its meaning. Semiotic theory is important in society because the structure and operation of sign and symbol systems make them very user friendly to handle and communicate effectively. Communication, according to semiotician Wendy Leeds-Hurwitz (1993), is a human centered activity in which symbols or signals play an important role. Similarly, Umberto Eco asserted that semiotic signification and communication are always inextricably linked. To be applied with the assumption that any cultural manifestation can be understood as communication, the semiotic approach must be very clear. As the brief has explained to some extent, it is not enough to justify semiotics, but there are a few valuable studies such as signs and sign processes, symbolism, and so on.

2. Analysis & Meaning of Semiotics

Semiotics is the study of cultural signs and symbols in general, and semiotic analysis is a deeper look into the unconscious cultural patterns that shape consumer behaviour and response to textual messages, thematic content, and still or video imagery. Semiotics (also known as semiotic studies) is the systematic study of sign processes and meaning formation. Semiosis is defined as any activity, conduct, or process involving signs, where a sign is defined as anything that communicates something, usually referred to as a meaning, to the sign's interpreter.

Semiotic analysis has three steps:

- Analyse verbal signs (what you see and hear).
- Analyse visual signs (what you see).
- Analyse the symbolic message (interpretation of what you see).

Semiotics is the study of how meaning is created and communicated. Its origins can be traced back to academic research into how signs and symbols (both visual and linguistic) create meaning. These theories are significant because they reveal how signs convey ideas, attitudes, and beliefs to us. Semiology explains how images are used to represent and relay information to the audience in the context of television, film, newspapers, and other forms of media.

Understanding these principles and theories is so important because the way signs are presented communicates ideas, expressions, and attitudes, and we believe it and carry it forward. When it comes to images, which are always used to convey information to the audience through the context of

newspaper, television, film, and many other forms of media, semiology plays an important role in society as communication. The weightage of meaning carried by signs and symbols is always determined by the culture's background. Every culture has its own style, celebration, and presentation to express the specific ideology and social structures that define it. There are many states with various cultures, and the signs and symbols help us identify them so easily and these are not inherent but it is automatically culturally learned to express. Above said every culture has its own set of signs and symbols with different perceptions and experiences. In the society the most important elements are signs and symbols which is used as language. It has got some poetry which narrate a story to make us understand to proceed for the communication. There are elements, which speaks many things without any texts.

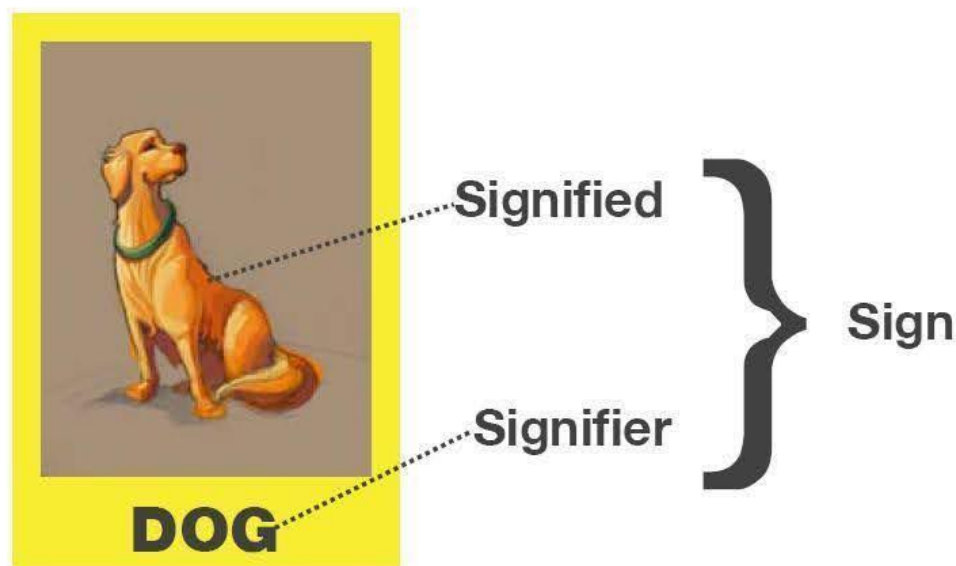


Fig 1. Sign= Signified, Signifier (1: Image Source from Internet)

The image above depicts three different types of signs and symbols; for example, a question may arise in the mind to be analysed. It may provide a clear answer due to the "painted form of DOG" image, which is referred to as "Signified," and it has a physical form with an expression. "The three letter DOG" only causes us to visualise the image known as "Signifier." When viewed as a whole, the image is understood as "Sign," and this paper discusses it in detail. According to Ferdinand de Saussure, who was a world-

famous Swiss linguist, semiotician and philosopher. He explains in his theory the language is a system of sign which has the importance of grasping the distinctiveness.

Each sign is made up of two parts: The Signifier, which represents the concept, form, or image as described above, and the Signified, which represents the concept, form, or image as described above..

2.1. Importance of Sign and Symbols in media

Since ideas and meanings were communicated through symbols and signs during the Greek and Roman eras, semiotics have a lengthy history. However, the field of scientific study of signs and symbols did not begin to develop until the late 19th century.

The term "semiotics" was created in the late 1800s by mathematician and philosopher Charles Sanders Peirce to describe his theory of signs and the interpretation of meaning. The Swiss philosopher Ferdinand de Saussure established the concepts of the signifier and the signified at the start of the 20th century, providing the foundation for contemporary semiotics.

Eugene Tononi, a philosopher and linguist from Romania, created it as a science of signification in the middle of the 20th century. In the 1960s and 1970s, when academics started incorporating semiotic theories into a range of disciplines like literature, film, advertising, and cultural studies, semiotics became a well-known topic of study.

Over the last few decades, scholars have investigated new applications and perspectives for semiotics, such as postmodern semiotics, cultural semiotics, and visual semiotics. Today, it is a booming, international discipline where experts from several fields study how symbols and signs affect how we view the outside world and express meaning.

Because it provides a framework for analysing the signs, symbols, and messages present in visual forms of communication, semiotics is used extensively in art and design. It is always used in both design and art to discover more about the significance behind aesthetic elements. Artists and designers can better convey meaning by using diverse visual aspects by understanding the cultural and symbolic significance of such elements through the use of semiotics.

The semiotics provides artists and designers with the skills they need to create and transmit stories and messages using visual forms. Design as visual narrative and conveyed as visual language. In the development of visual languages like graphic design and typography, it is used to produce sign and symbol systems that clearly and efficiently express meaning.

Semiotics is used to analyse and assess how diverse cultural identities and groups are portrayed in art and design in the study of visual culture. Semiotics, which is commonly used in branding and advertising, aids in the analysis needed to generate distinctive logos and visual identities.

Signs and symbols are graphical representations that always convey meaning based on their use. The difference between a sign and a symbol is that a sign is conveyed as its own language. The symbols appear beneath it to present the meaning. The sign is primarily used to communicate as a language based

on its requirements. Since its inception, the sign has been required to be followed. Signs are typically informative, regulatory, or warning in nature. A sign should be followed as is, for example, while driving on a high road, signs are placed to alert drivers that the road will be divided after a few metres. Once seen by the driver, it is the clearly understood for further action.



Fig 2 *Sign: Divided Road (2: Image Source from Internet)*

A symbol is a visual image that represents an understandable concept and a recognizable object; it can also narrate the story to make it clearer to understand. It could be as straightforward as a letter. Flags, for example, are symbols of the nation without text.

There are three types of forms that have symbolic value: comparative, ideological, and isomorphic. Comparative symbols are referred to as "superior," such as prestigious office addresses, famous paintings, and so on. Ideological symbols, such as state symbols, convey messages about sets of beliefs and the need to work together to do the right thing. Isomorphic symbols always speak about professional value, which includes knowing each other, greeting each other, and so on.

The symbols enable the human brain to think and create meaning using sensory input, as well as decode the symbols via connotation and denotation.



Fig 3 *Symbol: Children Crossing (3: Image Source from Internet)*

In general, applying semiotics to art and design offers a critical and analytical framework for comprehending how visual forms of communication convey meaning and affect our experience of the outside world.

3. The significance of tropes in semiotics

Tropes are essential to semiotics understanding design and communication. The study of signs, symbols, and the construction and transmission of meaning is known as semiotics. For the sake of this research, tropes are simply ways that meaning is expressed through words, images, or other symbolic forms. The power of tropes to express complicated concepts or elicit certain feelings through well-known and established symbols makes them important in the fields of semiotics and communication design. Tropes frequently rely on contextual or cultural knowledge that unites them and facilitates effective communication.

The usage of tropes in communication design can assist designers in producing textual or graphic pieces that appeal to readers right away. Designers can transmit messages, evoke feelings, or direct understanding by drawing on pre-existing associations and meanings through the use of recognizable tropes. Using the "rising sun" motif, for instance, in a logo can use its well-established cultural meaning to suggest a fresh start or hope.

It's important to understand the audience, their cultural background, and the context in which the design will be interpreted in order to employ tropes in communication design effectively. Through using these mutual comprehensions, designers can produce more significant and influential messaging. But the trick is to employ tropes sparingly enough to avoid turning them into clichés while still preserving originality and innovation in the design.

The descriptions about themes, motifs, or conventions that are frequently employed in literature, movies, artwork, and other storytelling mediums are known as tropes. They could be recognizable patterns, strategies, or components that artists or viewers can comprehend and apply in a certain setting. Character types, plot devices, narrative approaches, and even particular words or idioms that have become well-known due to their frequent usage in storytelling can all be considered tropes. They can be used as building blocks for stories and to express concepts, arouse feelings, or set expectations within a specific genre or story.

4. Conclusion

The goal of selecting and defining these intriguing Semiotic concepts is to create effective communication because they carry different meanings and convey powerful messages. The Semiotics theory provides a framework for understanding how signs and symbols function with meaning all over the world. As stated above, semiotics has been used in various areas of communication such as: it helps to improve branding by communicating the required meaning and it influences consumer decision-making. Another important

function of semiotics is that it tells the story and demonstrates the image's aesthetic beauty. Choosing and employing signs and symbols not only aids comprehension but also communication in various industries.

As a result, this paper contributes to a better understanding of how users interact with sign systems from a semiotic standpoint. The semiotic method of examples about the function in society is presented here. This paper is expected to serve as a foundation for further research and study in this field.

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