

An interactive conceptual multisensory model to elevate creativity of undergraduates: a review of literature.

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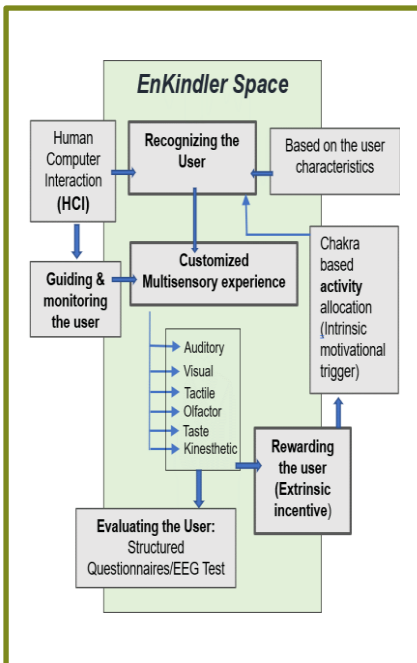
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ABSTRACT

There's a great interest in creativity and innovation in today's world and it is vital for the educators to create mechanisms that can aid students in instilling and boosting the skills that are essential in generating creative ideas in the process of design, ensuring originality, novelty, and authenticity. This research proposes a novel idea on enhancing creativity levels in the contexts of Architecture and design education; The 'enKindler' Space, a conceptual multisensory model which is interactive and entertaining. Incorporating the domain of Human Computer Interaction (HCI) the proposed space will recognize the user, determine, and activate a customized multisensory experience, monitor sensory stimuli activation, and enable students to be sensory aware, form cognitive interactions and develop new neural pathways that could aid in being highly creative, as an innovative and practical solution. It is recommended to assess the impacts of the proposed 'enKindler' space on elevating creativity focusing on its effectiveness, short term and long-term impacts with reference to diverse student samples to improve its feasibility, practicality, sustainability, and effectiveness as a model which could be applied in large scale in different creative academic disciplines to boost creativity and innovation.



1. Introduction

In Architecture and design schools, individuals with creative aptitude are chosen, trained, and shaped to become competent Architects and designers in the industry. In almost all the Architecture and design schools, the students are selected with a preliminary screening/apptitude test, which evaluates whether the candidate inherits relevant skills and potential to originate creative solutions for current design problems. As the world is directed towards an innovative realm, it is a vital task of design educators and institutions to generate mechanisms to instill skills such as creative problem-

solving, interaction, and skills of digital literacy, which are considered to be the essential enterprise skills of the 21st Century (Belski & Belski, 2018).

According to (Taylor & Gantz, 1969), there are several forms of creativity varying from lowest level to the highest; Expressive Spontaneity : the unrehearsed mode of creative expression free from prior formal training, Productive Skill: the stage when the spontaneous creative expression becomes inhibited through formal training, Inventive Ingenuity: the creatively that merge existing technical concepts with previously explored concepts in creating solutions, Innovative Flexibility: the level of out of the box thinking which explores unique methods, modifications and adaptation to generate a unique idea with an independent creative outcome, and Emergent Originality: the highest form of creativity which involves emerging abstract and un-applied by creating original concepts and theories. Based on the above categories it can be summed up that the goal of a design institution is to train the students to achieve innovative and emergent originality which supports the required skill set of the 21st century.

According to Taylor (1969), it is crucial to have flexibility in providing suitable material for students based on their creativity level in shaping creatives to achieve their supreme character. Further, he describes that if the individual lacks the transactional ability i.e., altering the external environment to correspond with the inner world of perception, this ability can be instituted with the environment and sensory stimulation.

According to research commentaries, to acquire the utmost creativity, individuals must develop a deeper connection and understanding of themselves, known as self-actualization (Runco et al., 1997). It is known to be the most contented, fulfilling state of mind of an individual, making him realize his full potential. As Maslow (1987) explains, "Self-Actualization is the intrinsic growth of what is already in the organism, or more accurately, of what the organism is". It is the pinnacle of needs an individual wants to achieve throughout their lifetime. Maslow (1987) claimed that it is required for a person to fulfil his deficiency needs to pursue cognitive needs, aesthetic needs and the ultimate self-actualization and self-transcendence. Accordingly, it could be argued that the failure to achieve self-actualization can be understood as a factor that limits a person from reaching his utmost creative character.

Maslow has enlisted reasons that hinders a person from achieving self-actualization. Namely, anxieties and fears, genetics, low socioeconomic status, poor education, poor attachment styles and social marginalization (Maslow, 1965). Similarly, in creative education, the obstacles that hinder a student from being creative are known to be perceptual, emotional, environmental, and intellectual barriers (Alencar, 2001). Therefore, when

both concepts are inspected, it can be claimed that there is a correlation between these two categories of barriers.

Among various practices, mindfulness and meditation have been recognized as critical practices to direct an individual to develop self-actualization (Shapiro & Jazaieri, 2015). Guided meditation with individual or group focus is the most used mechanism of practicing meditation. Further, with mobile technology interventions, a range of mobile apps have been developed to promote mindfulness on the go even in the cooperate sector (Bégin et al.2022).

On the other hand, focusing on Architecture and design schools, the time allocated for mindfulness-based practices is apparently negligible. Including such courses in the curriculum might seem compelling at a high-level view. However, there might be impracticalities when it comes to implementation. Because it can be tedious and challenging for some students (McKeering & Hwang, 2019).

Apart from monotonous meditation practices, ancient methods derived from yogic practices develop mindfulness with the involvement of sensory stimuli which will lead an individual step by step towards self-actualization (Saradananda, 2011). Thus, this seems appealing to a user rather than sticking to the spiritual way of focusing only on breath and mind.

Developing self-awareness in the classroom is challenging due to its impracticality and the nature of not motivating a beginner to practice. Therefore, rather than sticking to curriculum revision aspects, this study attempted to explore developing a mechanism to instill mindfulness and self-actualization practices with more feel of entertainment, interactivity, and extrinsic rewards. To acquire this goal, a literature review was conducted to derive a conceptual model describing the phenomenon of enhancing creativity.

It was attempted to achieve the following objectives,

- Understanding what creativity is and the ways of enhancing the creativity of individuals.
- Understanding the best mechanism to elevate student's creativity with the sense of interactivity and entertainment.
- Investigating the ways of adapting the above-identified mechanisms to foster creativity among Architecture and Design students.

This paper will bring into limelight the findings of the theoretical explanations of creativity and creativity enhancing methods by primarily focusing on

mindfulness and self-actualization. The line of thinking leads to determining the concept of using multisensory stimuli which was supported by the concept of Chakra (Saradananda, 2011). This approach gives insights to achieve self-actualization through mindfulness as an approach for creativity boosting with a feel of entertainment and interactivity in this proposed intervention. Finally, the above theoretical paradigms are amalgamated together with human computer interaction to formulate a conceptual multisensory experience model called "The enKindler Space".

2. Review of Literature

2.1.Creativity: Theories and Definitions

Creativity is an extensive subject area that spans almost all domains. Creativity appears as an interdisciplinary singularity as it applies to the phenomenon of synthesizing knowledge (Rhodes, 1961) which unveils an original and appropriate outcome. The outcome can either be a tangible physical object (a product) such as a physical product, a scientific manuscript, a piece of art or otherwise an intangible result (an idea), a musical improvisation, a scientific theory, a concept etc. Considering definitions of creativity, a diverse range of explanations can be found. In the most common understanding, creative ideas should be novel and original, should be of high-quality and should be related to the task at hand, which is summed up as a novel, good and appropriate (useful) idea (Kaufman & Sternberg, 2007). Alencar (2001) argues that creativity requires originality (also called novelty, newness, or uniqueness) and effectiveness (also called utility, usefulness, appropriateness, value, or meaningfulness). Concerning the perception of creativity of the world, researchers have recognized a significant difference between Eastern and Western ways of thinking about the individual's role in the process and the goal of creativity (Runco & Albert, 2010).

2.1.1. The creativity in Easterner's and westerner's eyes: parallels and contradictions

The learnings on creativity in the Eastern world have been fostered based on Eastern Philosophies such as Buddhism, Hinduism, Taoism, and Confucianism. The idea of creativity is perceived as a discovery or impression by the Easterners. However, contradictory views on creativity even within the East Asian and South Asian perspectives can be observed. A study conducted in East Asia claims that the eastern cultures being characterized with a collectivist norm that people should maintain social harmony catering to collective interests over individual interests, identifies creativity as devising solutions to uphold this concept. On the contrary, South Asian views predominantly focus on seeing creativity as a holistic approach which leads towards a state of personal fulfilment, a connection to the elemental realm, or the expression of an inner essence or ultimate reality (Kapur et al., 1997; Sen

& Sharma, 2011). Hence, eminent originality is the ultimate outcome of one's creative exercise. Creation has been viewed as a top form of self-extension in Indian wisdom.

Western culture usually refers to the United States, Western Europe, Canada, Australia, and New Zealand, which are nurtured by the ideas of Christianity, Judaism, and rationality (Weiner, 2012) that value the individual's goals and interests over the group's collective interests and goals (Xie & Paik, 2019). Accordingly, creativity promotes originality for westerners (Morris & Leung, 2010). Even though the concept of creativity is believed to arise in the renaissance (Taylor & Gantz, 1969) in the West, the roots of creativity lies back in the earliest stages of human evolution. Creativity has been recognized as an artisan doing God's work on earth. It has been appreciated as a divine power during Aristotle's era (Runco & Albert, 2010). The pre-Christian understandings of creativity evolved with the idea of genius and accord with the inceptions of individualism and humanism (Montuori, 2017; Taylor & Gantz, 1969). There had been two additional features of genius in Roman perception: to see it as a male capacity and passed on by birth (Runco & Albert, 2010). Later during the renaissance and beyond, creativity is recognized as a practice that involves multiple processes and perceptions which recognize the needs and respond adaptively to provide new approaches or products that are unique and purposeful to the problem (Montuori, 2017; Taylor & Gantz, 1969). When observed, westerners seem more biased towards a process-centered and product-centered view of creativity, as the westerners' minds are more attentive to the objectivity of the consciousness, the actions, and accomplishments (Raina, 2004). Thus, it can be stated that the product or process-focused approach to creativity is the conception of the contemporary understanding of creativity in the West.

2.1.2. The 4 P's of creativity

The aspects of the facets of creativity are known as the four P's of Creativity (Kaufman & Sternberg, 2010), namely, they are person, process, product and press (Rhodes, 1961). When elaborated, the person stands for the individual who is involved in the creative exercise. The behavior, defense mechanisms, habits, intellect, personality, physique, self-concept, temperament, traits, and value systems are the aspects of what makes the facet of a person (Rhodes, 1961). The creative process is the activity of bringing an original and useful new idea, solutions for problems or a product by passing through several stages of preparation, incubation, illumination and verification (Wallas, 1926), both conscious and subconscious (Koestler, 1967). The theories that focus on the creative process seek to reveal the characteristics of the mental mechanisms that occur when an individual is involved in a creative exercise

or creative thinking (Kaufman & Sternberg, 2010). A Product is the output or the result of the creative process which can either be tangible or intangible. The product can be used in making judgements or viewing creativity as it provides quantitative objectivity (Kaufman & Sternberg, 2010). The exertion of pressure from an individual's internal and external environments can be recognized as the press. Excessive press on a creative person can result in a lack of creativity in the output or the product (Rhodes, 1961). Therefore, it can be said that the creative blocks may be a side effect of excessive press on an individual performing a creative activity.

2.1.3. The levels of Creativity by Taylor (1969) and the 4C's of creativity by Kaufman & Beghetto (2009)

According to Taylor (1969), creativity can be categorized into several forms, as highlighted below.

Expressive spontaneity: The unrehearsed mode of creative expression free from prior formal training.

Productive skill: The stage when the spontaneous creative expression becomes inhibited through formal training.

Inventive ingenuity: The creativity that merges existing technical concepts with previously explored ideas in creating solutions.

Innovative flexibility: The level of out of the box thinking which explores unique methods, modifications, and adaptation to generate a unique idea with an independent creative outcome.

Emergent originality: The highest form of creativity involves emerging abstract and un-applied by creating original concepts and theories.

Similarly, Kaufman & Beghetto (2009) present a model called Four Cs of creativity which includes mini-C, Little-C, Pro-C and Big-C creativity. They perceive it as representing the developmental path of an individual's creativity throughout their lives, yet not in a fixed way. They suggest that in the journey to becoming an eminent creator, a person should pass through these phases of creativity.

Design and Architecture students are apprentices to becoming creative professionals. In design and architecture schools' individuals with creative aptitude are chosen, trained, and shaped to become competent designers in the industry. The students are selected with a preliminary screening/aptitude test, which evaluates whether the candidate inherits relevant skills and potential to originate creative impactful solutions for current problems. As the world is directed towards an innovative realm, it is a vital task of design educators and institutions to generate mechanisms to instill skills such as

creative problem-solving skills, interaction skills, and skills of digital literacy, which are considered to be the essential enterprise skills of the 21st Century (Belski & Belski, 2018).

2.1.4. Convergent and Divergent Thinking

Creativity is an understood multifaceted phenomenon, yet within this complex nature, it is believed that the dual process of convergent and divergent thinking plays a vital role in bringing creative ideas to light. In the structure of intellect model, Guilford (1956) explained the distinction between convergent and divergent thinking (Kaufman & Sternberg, 2010). Divergent thinking is the process of generating multiple and alternative ideas by making associations from different sources (Abdullah et al. 2016) based on initial problems or reference points (Lubart, 2016). Thus, divergent thinking is said to be contributing to the aspect of originality in creativity. On the other hand, convergent thinking is the opposite of divergent thinking which focuses on polishing up one right idea (Lubart, 2016) as the solution for the focused question and stresses on the correctness and accuracy (Cropley & Cropley, 2009). The basis of acquiring this mode of thinking needs pre-awareness and understanding of the context. It is seen as a mode of recalling from memory and applying conventional and logical search, decision-making strategies and recognition (Cropley & Cropley, 2009).

2.1.5. The Aha! Moment and the concept of letting go.

A sudden spark of creative ideas is known as the Aha! moment or the eureka moment which is defined as the creative insight (Kounios & Beeman, 2009). Sternberg & Davidson (1995) explain the Aha moment in simpler words as the insight that provides a new interpretation that could direct a solution to a problem. It is recognized as a cognitive phenomenon, a special retrieval mechanism, combination, and cognitive encoding process (Tik et al., 2018). Neuroscientists have identified that the insight was associated with a sudden burst of high-frequencies (40-Hz gamma Band) (Kounios & Beeman, 2009). It is identified that this state appears when the individuals let go of what they have been clinging to in the thought process. This phenomenon might sound as difficult, but creativity arises when it is done. Accordingly, it can be understood that creativity does not prosper under pressure.

According to legends, the great Greek mathematician Archimedes discovered the principle of fluid displacement when he stepped into a bathtub and saw the outpouring water from the tub, which is known to be the original "Eureka!" moment. Furthermore, historical manuscripts describes that the organic chemist Friedrich August Kekulé also had a similar experience of a eureka moment. The following day, after he had dreamt about snakes biting their own tails, he depicts the chemical structure of benzene as ring-shaped (Kraft, 2005). Thus, it has been noted that the moment of creative spark comes to most people when their minds are out of focus or when engaged in an unrelated activity. The reason why is that the brain starts to continue processing a problem once the necessary raw data has been fed in. Some

psychologists address this as mental fermentation or incubation (Kraft, 2005). In summary, the associative connections between ideas and imagination that already exist in mind become weaker. They are transformed by new information in the moments where there is relaxation and distance that change the mind's perspective on the problem without an individual being aware of it. In this very time where there is adrift in perspective, the brain generates alternative insights. It generates new pathways for novel, undisrupted, fresh, and more creative approaches to find a solution.

2.1.6. Diffusive mode of thinking/ Diffused thinking

The respite seems to allow the brain to clear thought barriers away by itself. At some point, newly combined associations break into consciousness leading to sudden, intuitive enlightenment. The little insights and breakthroughs experienced by all individuals encourage us to believe that bigger eureka moments are possible for anyone.

Human brains bestow moments of illumination almost as a matter of course if there has been adequate preparation and incubation. Since the neural processes that occur during creativity remain hidden from consciousness, individuals cannot actively influence or accelerate them. It, therefore, behoves even the most creative people to practice one discipline above all; patience (Kraft, 2005). Kounios & Beeman (2009) have pointed out that learning and developing methods to reach insight is an important aspect for the upliftment of innovation.

Therefore, it can be argued that training to enable an individual to reach insight will facilitate developing innovative ideas. The concept of 'Pratibha' in Indian views resonates with the idea of insight. Furthermore, this appears at a state where letting go rather than holding on to what individuals judged rationally resembles a state of self-actualization and creativity.

2.2.Barriers of creativity

The things that hinder a person's ability to perform in the creative process fully are often addressed as creative barriers or creative blocks. According to literature, diverse classifications of creative blocks are present, namely, conceptual block (perceptual block), emotional block, cultural and environmental block and the intellectual and expressive block (Adams, 1974). In other terms, creativity barriers are identified as learning and habit, rules and traditions, perceptual barriers, cultural barriers, and emotional barriers (Davis, 1999). Another classification of creative blocks are habitual, perceptual, cultural and emotional blocks (Mukhopadhyaya, 2003). To eliminate the diversity of explanation, based on the above theories, the following categorization was done.

Table 1: Barriers of creativity

Name of the barrier		The effect of the barrier	Reasons for occurrence
Perceptual Block		Encountering restrictions in understanding the problem clearly	Difficulties in defining the problem. Stereotype perception. Facing Information overload. Inability to utilize all sensory information. Making assumptions. Missing associations
Emotional Block		It limits the freedom of the person to explore and will intrude on their personality.	Fear of failure. Being afraid of chaos Inability to incubate due to inability of giving time. judging ideas rather than generating. Being too absent or too involved in the task. Comparing themselves with others. Struggle with reality and fantasy.
Environmental Block	External Env. Block	Developing a negative attitude towards work.	Uncomfortable working environment.
	Internal Env. Block		Struggles with Intelligence and Intuition. Difficulty in convergent and divergent thinking.
	Social and Cultural Env. Block		Lack of support and trust by others. Unnecessary influence by others. Taboos like fantasy is only for crazy people, playfulness is only for children, tradition is to be maintained.
Intellectual and Expressive blocks		Encountering difficulties in expressing, perusing and in being strategic.	The inability of choosing the right language to think and to express. Not being flexible with the strategy. Lack of required information. Bad communication skills. Lack of confidence.

2.3.The relationship of creative process 4Ps, barriers to creativity, levels of creativity.

Creative blocks limit an individual in generating creative ideas; over the course, academics and practitioners have developed ways of coping with these creative blocks based on their types and impact. When considered, it could be understood that the barriers to creativity occur both inwardly and outwardly of a person who is involved in a creative act. The excessive amount of exertion of creative barriers may block the creative process and diminish the level of creativity of the output. Similarly, it can be argued that if moderate amounts of limitations are not enforced on a person, the quality of the creative product would be less. Therefore, a moderate press should be there in a person to achieve the best creativity of their exercise.

Based on this ground, it can be proclaimed that to enhance the creativity of a person, the creative barriers or the press should be controlled at a moderate level rather than letting them act excessively, hindering an individual's creative ability. Thus, enabling students to know strategies that will enable them to breakthrough creative blocks would be an ideal approach in enhancing creativity. It is said that higher levels of creativity require self-actualization abilities. When thought of this approach, it could be argued that the inward barriers of creativity such as perceptual, emotional, and intellectual blocks would be experienced less as the individual is aware of his abilities and inabilities. Further, at this stage of understanding, the individual would be much aware of his surroundings, may recognize the external barriers as barriers and may not act negatively on the difficulties but acknowledge them in a neutral manner. Thus, in the highest level of creative self, one must be capable of breaking through creative barriers rather than eliminating them fully but living along with them. It could be further argued that a person can reach the insight or the Aha! moment at this stage as he has let go of the unnecessary attachments and is totally free from attachments of the worldly phenomenon.

2.4 Maslow's view on self-actualization and creativity

In his explanation of human needs, Maslow (1987) claimed that it is a hierarchy that ascends from basic biological needs, which are known as deficiency needs to more complex psychological motivations. These higher levels of needs occur when the basic needs are fulfilled, therefore according to self-actualization; the highest purpose is attained only when the basic needs are fulfilled (Maslow, 1987).

As Maslow (1987) defines, "self-actualization means experiencing fully, vividly, selflessly, with full concentration and total absorption". He explains that it is a continuous process of human existence while denoting that self-actualizing people learn through intrinsic learning. Intrinsic learning stands for the process by which the individual realizes everything that they are capable of becoming (Maslow, 1965).

It can be understood that the Eastern conception of creativity and Maslow's view on self-actualization lies in a common ground. Further, this concept tallies with the levels of creativity by Taylor (1969) and the four C's of creativity by Kaufman and Beghetto (2009). On the other hand, Bloom (1956) explains that emergence in creativity is a high-level cognitive capability. When scrutinizing the above theories, a directly proportional relationship between the creativity level and self-actualization is evident. Further, an inversely proportional relationship between creative barriers and levels of creativity can be seen.

2.5 Enhancing creativity.

De Bono (2007) states that "without creativity, there's only repetition and routine". Thus, creative acts break the monotony and bring in the improvement and new directions to the task in hand. Therefore, nurturing creativity in contemporary design education is an essential need, and educators should be able to shape students by identifying, developing and utilizing their creative talent, which will unveil the individual capabilities of generating novel, original, authentic, useful and more human-centered ideas (Torrance, 1977).

The concept of creativity as an inborn talent is outdated in today's context. As Runco (2003) states, every individual child is creative, and it's not a gifted trait nor a highly intelligent characteristic. Even though there had been conflicting views on the ability to enhance creativity, in the domain of education, it is agreed that creativity could be trained and fostered (Lin, 2011). Studies by (Torrance, 1977) claimed that creativity could be developed with proper practice and stimulation, and it is the duty of individuals to identify, develop and utilize creative talent. Further, he pointed out that the utilization of cognitive aspects associated with emotional functioning paves the way to create a ground and motivation to successfully implement practices that foster creativity.

2.5.1 Classification of creativity-enhancing programs based on current studies.

According to the classification of existing creative training programs by McPherson (1964), several clusters are identified, namely; developing sensitivity to the problem, training for cognitive development, problem-solving, training which provides knowledge on factors that hinder or block creativity and those facilities and training which prepare individuals to accept and support their innovative ideas. Apart from this classification, as cited in (Leopoldino et al., 2016), Schlicksupp (1989) has classified creative training into two categories: associative and provocative. Further, as explained in a study by Couger et al (1993), creative training can be classified as analytical or intuitive.

2.5.2 Enhancing creativity through self-actualization - a path to emergent originality of a creative self.

As discussed earlier, emergent originality (Taylor & Gantz, 1969), presumed as the Big C creativity (Kaufman & Beghetto, 2009), articulates the highest form of creativity that gives inception to abstract authentic concepts and theories. Accordingly, it can be considered as a form of a higher-order cognitive skill. Self-actualization could be presumed as the key to open oneself

to be apt at being a highly eminent creative personality. As Maslow (1987) describes, when a person actualizes himself, he will get involved in a cause outside themselves without a single exception. And these individuals are on a mission of working towards a purpose that is precious to them. Thus, these individuals do not have the contrast of work and happiness within their everyday lives as they work towards something that their fate has called, and it is something that they love and work at. Therefore, a self-actualized person is aware of the surroundings, and they are less prone to the emotional and perceptual blocks. Further, they are aware of their intellectual skills; thus, they will be good at recognizing their limitations and will be more prepared when getting involved in creative acts. Even when it comes to environmental blocks, these individuals will have a clear vision and understanding of the reasons behind these issues and will not be carried away through instincts and temptations. Hence, it can be argued that a self-actualized person will be able to cope with the creative blocks in a sustainable way. Similarly, a self-actualized person will have a clear thought process, which will lead them to think in both convergent and divergent approaches to generate solutions without forcing their predominant thought sequence. Thus, they are able in coming up with intuitive solutions for the problems they are dealing with. Moreover, it is suggestive that a self-actualized person can be authentic and original; thus, they will bring innovative ideas to the stage.

Kaufman (2018) states that, self-actualized individuals denote characteristics such as self-acceptance, positive relations, environmental awareness, personal growth and autonomy. They have a clear understanding on both the purpose and satisfaction of their lives. Further they are associated with self-transcendent experiences. Moreover, his study portrayed a statistically significant results which depicted the correlation of self-actualization and creativity.

Based on these insights, the current investigation suggests that promoting self-actualization will be a sustainable approach to solve issues related to students in terms of creativity and creative problem solving.

2.5.3 Instilling Self-actualization in individuals - Parallel theories

The notion of self-actualization as the basic drive/motive to realize and actualize one's full potential as best as possible was pioneered by Goldstein, (1934). It was further elaborated by Maslow (1987) as the highest level of psychological development of an individual where his/her full potential is achieved after fulfilling all the basic bodily and ego needs.

Aligned with the same line of thinking, Maslow (1961) described man's tendency to actualize himself, to become his potentialities, to express and activate all the capacities of the organism which he used as the therapeutic force behind person-centered psychotherapy. Humanistic psychology is based on the existential assumptions that humans have free will and are motivated towards achieving self-actualization.

On the other hand, being resonant with above, the idea of existentialism which was originated as a philosophy was later adopted in psychology and psychiatry. Frankl (1963) being a noted figure in existential theory, identified the core of existential therapy as the search for meaning or purpose of life. Echoing with this idea Bugental (1992), distinguished the central concern of existential therapy as to assist the individuals in identifying and achieving their life's existential goals and living authentically. As clarified by (Malchiodi, 2003), an existential approach emphasizes liberating the individual from fears and anxieties and helping the person to live life to the fullest.

Alternatively, a range of meditation techniques are being adopted worldwide to achieve self-actualization, namely, Buddhist meditation techniques (Vipassana), Yoga meditation types (Trataka), Om mantra meditation ...etc. Transcendental meditation is a specific form of meditation accompanied by a silent mantra, developed by the Indian sage Maharishi Mahesh Yogi (Dalton, 1993) and is attested as one such yoga technique to promote self-actualization (Alexander et al., 1991). Chakra meditation or chakra balancing is found as another method which can assist individuals towards seeing within and perceive the deepest self (Jain & Yadav, 2016). Out of the aforementioned techniques the current investigation will seek in to the potential of chakra as a means to enhance creativity through self-actualization.

2.5.4 The Concept of Chakra



Figure:1

– The seven chakras

Source: Wilber (1981)

Chakra, discus or the wheel of energy, a system discussed in ancient Vedic scriptures, accounts for how the human body and the universe are interconnected. Chakra denotes the center of power energy which serve as collection and transmission centers for both subtle, and metaphysical energy and concrete, or biophysical, energy (Jain & Yadav, 2016). They are focal points of energy within the auric and physical body of every human being (Saradananda, 2011) vibrating at specific frequencies. There are seven chakras located along the spine of a person representing the energetic juncture between the human consciousness and the physical matter. It is said that working with chakras enable an individual towards self-discovery, to know themselves better and to deal with day today activities in inner peace and finding innovative ways.

The seven chakras are responsible and acts at different stages of human activities. As clarified by Wilber (1981), "the Great Chain according to kundalini represents the seven major chakras (stages/levels) as they appear in the human compound individual. The two curved lines represent, approximately, sympathetic, and parasympathetic currents in the body and, in the brain's, left and right hemispheric functions. The locations of the chakra centers

themselves are not merely symbolic, but real. The first (i.e., anal) chakra represents matter (as in faecal matter), the second, sex (genitals), the third, gut reactions (emotions, power, vitality), the fourth, love and belongingness (heart), the fifth, discursive intellect (voice box), the sixth, higher mental-psychic powers (neocortex), the seventh, at and beyond the brain itself, transcendence. There is precisely nothing "occult" or mysterious about their locations" (Wilber, 1981).

2.5.5 Basic techniques of Chakras

Each chakra energy is found to affiliate with an aspect of consciousness. Further, each chakra energy is found to harmonically interact with a specific element; colour, sound, a lotus with differing number of petals and associate with the physical, emotional, mental and spiritual aspects of being human (Jain & Yadav, 2016) . For each chakra there are different sets of techniques and materials that are used to perform above staged activities.

Accordingly, balancing of Chakra are done through an array of methods such as colour therapy, visualizations, sound therapy, aromatherapy, reflexology, crystals/ gemstones and physical exercises (yoga asana) (Diemer, 2000).

2.5.6 Blockages to chakras

When a chakra is disharmonious or out of tune from its characteristic oscillating frequency, chakra gets blocked. These blockages occur due to the resistance created within limiting the subtle energy flow (Saradananda, 2011). Hindering the corresponding energy to flow smoothly, these blocks may span across, physical conditions, distorted energetic patterns, inaccurate beliefs that one hold, emotional imbalances, and spiritual misconceptions. In order to have a smooth energy flow inside oneself, these blockages should be eliminated by bringing the chakras back in tune. In doing so, several techniques are said to be incorporated namely, asanas, pranayama, pure and healthy diet and fasting. As highlighted in literature asanas, mouna (silence) and pranayama are incorporated to remove energetic blockages while, pranayama, fasting, music and devotional practices are used for mental/emotional blockages. Practicing karma yoga and meditation on letting go are used in removing intellectual blocks and the selfless service and maintaining a journal are said to help with karmic blockages (Saradananda, 2011). Off balanced chakra are said to be associated with creative blocks. Each Chakra takes care of its own function and it's up to the specific individual to connect the causes of his/her creative blocks with reference to the functioning of the corresponding chakra.

2.5.7 The Chakra Model as a multisensory approach to enhance creativity through self-actualization.

Many scholars have seen a parallelism between Maslow's Hierarchy of needs as in western psychology and the functions associated with Chakras as described in eastern psychology in achieving a person's full potential (Chanda & Chanda, 2019; Dossey et al., 2015; Seaward, 2006). Accordingly, the chakras associated with reaching self-actualization are basically the Vishuddha

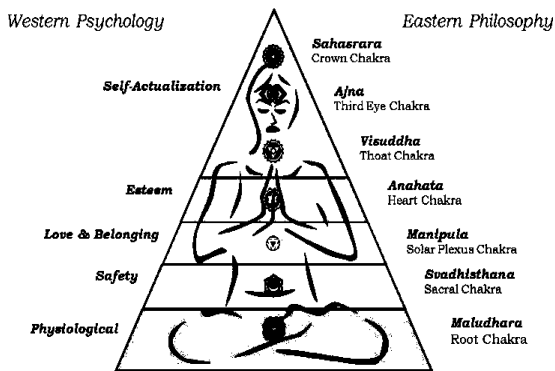


Figure: 2 – The seven chakras
Source: Chanda and Chanda (2019)

chakra, Ajna chakra and Sahasrara Chakra. As elaborated in literature the fifth chakra (the Vishuddha chakra/ throat chakra) is responsible for development of personal expression, creativity, purpose of life and will power (Seaward, 2006).

Working on Vishuddha chakra develops creative ability and enhances self-expression, compassionate listening and deep conversation (Redmond, 2012; Saradananda, 2011).

Located just above the notch

at the top of the sternum, the throat chakra is said to associate with a lotus of 16 petals, mauve, silver, or greenish blue in colour, oval shape and thyroid and parathyroid glands. It is the energy center related to expression and communication, inspiration, and detachment.

"Ajna" is the sixth chakra, located in the space between the eyebrows which is also identified as the third eye chakra, brow chakra, the eye of wisdom, inner eye chakra or the commanding chakra (Jain & Yadav, 2016). Opening up the third-eye chakra is found to enable many psychic abilities. This gives way to a path for the individuals to see within and perceive the deepest selves. Ajna chakra is harmonically corresponding with colour indigo/violet, lotus of 2 petals, 'Om' sound, Pituitary and Pineal gland. According to Jain and Yadev (2016) Ajna chakra works more harmoniously than any other Chakra and accompanies a sharpened sensitivity, an advanced level of consciousness, and intellectual skills. A person with an opened up third eye can reach the philosophical truths in depth while possessing a well-developed capacity for visualization and intuitive comprehension enhancing creativity levels. This process helps an individual to achieve a direct inner awareness of reality to (Jain & Yadav, 2016) leading to self-actualization.

On the other hand, Anja chakra is found to associate with Pineal gland which releases melatonin to the blood circulatory system (Jain & Yadav, 2016) which regulates the sleep-wake cycle (Hranush & Arakelyan, 2021). There is growing evidence which indicates that sleep can aid creativity. R.E.M. sleep has found to help the brain to connect unrelated ideas, which in turn aids creative problem-solving. Accordingly, R.E.M. sleep is explained as the stimulant for late night innovation; the latter half of the sleep phase in which rapid side-to-side movement of the eyes occurs. This portion of the sleep cycle is associated with an altered brain state linked to creativity (Hranush & Arakelyan, 2021). As clarified by Seaward (2006), the seventh Chakra called crown or Sahasrara chakra is associated with the matters of the soul and the spiritual quest having the potential to access the highest level of

consciousness. Located at the crown of the head this chakra is corresponding with 'Aum' sound (mantra), violet/white colour and a mudra of a lotus with thousand petals.

2.6 Multisensory Interactions in Human Computer Interaction

Being one of the vastly discussed topics in the modern world, Human Computer Interaction (HCI) has become a rapidly evolving multidisciplinary field of study. Before the 70's computers were just tools used to conduct scientific calculations and research related work. However, with the introduction of personal computers in 1970's, general audience was provided with the opportunity to interact with computers often. Therefore, the tasks handled by computers became diverse. With the introduction of the microprocessor technology, a vast development took place in the field of computer science and related technologies; as a result, technology became tangible to everyone. Thus, the users became one of the most critical parts of a computer system apart from the technology and mechanism.

As stated by Marasek et al.(2017), the domain of HCI has traditionally dealt with optimizing user interfaces and new interaction styles. The rapid growth of the field of telecommunication has made a considerable number of people accessing wireless networks and handling devices like smartphones. Consequently, on-line services and mobile applications have become essential parts of everyday life. This advancement of the technology has exposed avenues in HCI not to restrict humans to become mere software users but also to act an important stakeholder in I.T. Projects (Marasek et al., 2017). HCI traditionally had a narrower focus, being "concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them" (Preece & Rogers, 2002).

As emphasized by Sears and Jacko (2009) emerging topics in HCI are; sensor-based interactions, tangible interfaces, augmented cognition, cognition under stress, ubiquitous and wearable computing, privacy and security...etc. In addition to that, multisensory interaction is one of the novel attention drawing topics in the HCI domain. Surpassing the limits of Audio, Video and Haptic/tactile interactions, multisensory interaction seeks modes of extending the interactions to olfactory, taste as well as somatic interactions.

The bloom of immersive media and interactions have created a great opportunity for multisensory interactions to emerge as a new domain of interests within the community. It has created opportunities for explorers to look beyond traditional products, technology, services and to come up with innovative solutions to overcome the barriers in implementing sensory experiences to the users. Even if the knowledge on sensory systems and devices has grown rapidly over the past few decades, the researchers still don't fully understand individuals' multisensory experiences in HCI. In order to create richer experiences for human-technology interactions, a proper comprehension on the ways in which human senses process information and

relate to one another should be acquired (Obrist et al., 2017).

2.7 Multisensory interactions through HCI to 'kindle' creativity.

Several models have been developed and tested around the world based on the multisensory interaction enabled through HCI to enhance creativity around the world.

The 'Slow Floor' (Feltham et al., 2013) is an interactive pressure-sensitive and a sound generating surface which aims to increase the creative agency through walking. The results of this study have revealed that the linking of pressure data to auditory display has stimulated a unique creative agency in the body. The authors have predicted that the value of this system provides a potential opportunity for individuals to learn more of their embodied selves. In another study done to stimulate creative ability, the researchers have looked at the impact of walking under exposure to a shining blue light on the improvement of convergent and divergent thinking in users (Abdullah et al., 2016). As established in literature, blue light is found to improve several cognitive processes, namely, attention, working memory and sleep and known to influence creative abilities. The investigators imply that the blue light resulted in a 24.3% increase in convergent thinking ability, while walking improved divergent thinking by 18% based on their study with 21 subjects over 2 weeks period (Abdullah et al., 2016).

Multisensory environments are also known as "sensory rooms" or "Snoezelen", the original terms coined by Hulsege and Verheul (1987). MEDATE (Pares et al., 2005) is an interactive therapeutic environment designed to generate real time stimuli in visual, aural and vibrotactile modes for low functioning children (age 6–12) in the autistic spectrum (P.A.S.), with no verbal communication. The children were found to enjoy MEDATE and be creative within this environment. On the other hand, intuitive art (Unorthodox, 2018) is an environment that created to stimulates the senses of users via incorporating a 270-degree projection of two distinct films using various visuals and specifically selected music. As said by the designers, each of the two environments are designed to evoke different moods and emotions. The intention was to tap into the user's creativity and allow the users to express themselves freely. This experience has found to help the user to make the connection between intuitive thinking and the creative process.

Magika (Gelsomini et al., 2018) is an interactive Multisensory Environment that enables new forms of playful interventions for children with Special Education Needs (S.E.N.) which integrates digital worlds projected on the wall and the floor with a gamut of "smart" physical objects (toys, ambient lights, materials, and various connected appliances). These devices intend to enable tactile, auditory, visual, and olfactory stimuli. The room is connected with an interface for educators that enables them to control the level of stimuli and their progression, define and share a countless number of game-based learning activities and customize such activities to the evolving needs of each child.

Interactive Multisensory Environments : iMSEs (Garzotto et al., 2020) are room-sized interactive installations equipped with digitally enriched physical materials and ambient embedded devices which can sense the users' presence, gestures, movements, manipulation, and react by providing gentle stimulation (e.g., light, sound, projections, blowing bubbles, tactile feel, aromas) to different senses. Research on iMSEs focuses on providing inclusive game-based activities for mix groups of children including ones with disabilities (e.g., autism) to relax, socialize, communicate, and play focusing on developing memory skills, sensory integration capability, logical skills and autonomy. Atalaia et al (2019) attempted to design a user-adaptative 'cognitive room' allowing multisensory experience to enhance design education. This was created incorporating appropriate images, sounds, colours and a multi-user tool for vital signals assessment, to suit to an individual's educational needs, including emotional status, in order to enhance creativity. Apart from the studies which focus on enhancing creativity with the means of training and cognitive approaches, in the 70's, Taylor (1970) has explored the concept of Simultaneous Sensory Stimulation (S.S.S.) which has been proven to be effective in uplifting the openness, originality and creativity of an individual. It is an experimental procedure of exposing subjects to sensory stimuli for a period of 15 mins, where application of light, haptic (vibrational) stimuli and temperature stimuli along with taste stimuli as means of sensory stimulation. This method has been adopted in several studies executed during the same era. However, it was observed that this method has been overlooked afterwards as there are no traces of using S.S.S. in contemporary studies of enhancing creativity. The reasons for resulting negligence of this study are not fully understood.

3.The proposed conceptual model - 'enkindler space

As recognized through the preliminary investigations, it was found that developing mindfulness and self-awareness in the classroom to be challenging due to its impracticality and the nature of not motivating a beginner to start practicing. Accordingly, it was attempted to ideate a mechanism to instill mindfulness and self-actualization practices with the feel of entertainment, interactivity and engendering extrinsic rewards based on the concept of Chakra and related techniques. Thus, enhancing extrinsic motivation was supposed to trigger intrinsic motivation of the individuals. Incorporating this line of thinking, a space to 'en-kindle' or spark creativity was proposed which is termed as 'enKindler' space' in this paper. The below diagram denotes the proposed interactivity of the 'enKindler space system' at a high-level view.

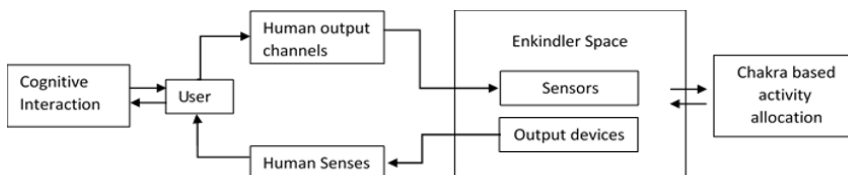


Figure:3 – The High-level view of the functionality of the system

The Chakra based activities were determined through a comprehensive understanding of the sensory stimuli-based methods in Chakra based practices. Based on existing literature, techniques associated with enhancing 'Throat' and 'Ajna' chakra with the use of sensors were incorporated to create a Multisensory stimulus based human computer interactive system as elaborated below.

Table 2: Types of sensory stimuli and sensory interaction associated with Throat and Ajna Chakras.		
Sensory mode	Stimulus	Sensory Interaction
Auditory	<u>Sound therapy</u> Throat chakra - Music compositions based on the keynote G – Frequency 284 Hz / sounds of birds	Listening to music, Humming, singing along
	Ajna chakra - Music composed based on the keynote A – Frequency 426.7 Hz /sounds of bells and chimes	
Visual	Throat - Blue color light (Abdullah et al., 2016) with the Low-intensity blue-enriched white light (750 lux)	Exposing to light (Light therapy)
	Ajna – Indigo Colour light	
Tactile	Throat - being outdoors, talking a walk on a sunny day	Feel of airy quality (ether; space, sky)
	Ajna – Sitting in stillness in nature basking in the sunlight	Feel element of light
Somatic	Throat Yoga poses – Neck Stretch Lion's Breath (<i>Simhasana Pranayama</i>) Supported Shoulder stand (<i>Salamba Sarvangasana</i>) Supported Fish Pose (<i>Salamba Matsyasana</i>)	Involvement in Yoga exercises with guided instructions
	Ajna Yoga poses - Balasana - "sleeping child" pose Bee Breath - (<i>Bhramari Pranayama</i>) Supported Shoulder stand (<i>Salamba Sarvangasana</i>) Supported Fish Pose (<i>Salamba Matsyasana</i>)	
Environmental temperature	Ambient temperature 230 Celsius	Comfortable level of temperature which is kept at a constant
Olfactory	<u>Aroma therapy</u> Throat chakra; Lavender, Rosemary, Lime, Sage, Cedarwood	Smelling the ambient aroma
	Ajna chakra: Jasmin, Lavender, Rosemary, Basil, Geranium	
Taste	Throat chakra: Currants, Blueberry, Blue grapes, Black berries	Ambient Taste of corresponding food
	Ajna chakra: Grapes, Raisins, Black berries, Egg-plant, Purple cabbage	

3.1 The design of the “enKindler Space”

Scrutinizing the array of sensory based practices mentioned above, the auditory, visual, tactile, somatic, olfactory and taste sensory stimulations were incorporated to balance the Throat and Ajna chakras to enhance creativity of the individuals. Apart from that, to enhance comfortability inside the space, the best practices of incorporating the factors, namely ambient temperature, intensity of sound and light was considered based on research evidence.

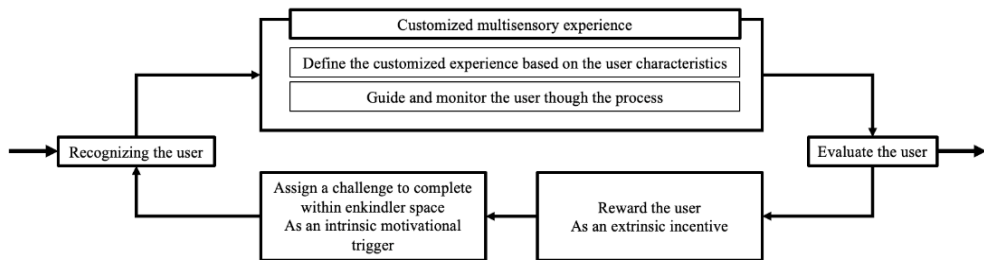


Figure:4 – The mechanism of the enKindler Space

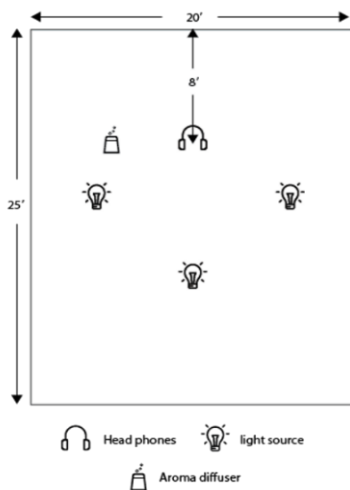


Figure: 5 – Proposed set up of the enKindler Space for testing purposes.

Furthermore, attention was given to determine the best dimension for the space to be executed considering the users with claustrophobia. The sensors within the proposed enKindler space could determine the user's characteristics based on the sensory inputs fed into the system. Once the user is identified, the allocation of chakra-based activities will be performed through the system. While the relevant instructions are given to the users via audio feedback, the sensory stimuli will be emitted using output devices. The sensory information received through human senses will be processed within the user forming a cognitive interaction which will activate a new neural pathway within the user in his first interaction with the system. This in turn will take the users brain state to 'theta' and 'Gamma' levels which are associated with

emergent creativity (Stevens & Zabelina, 2019). The constant exposure to this system at given intervals is predicted to be effective in creating a permanent neural pathway that could enable the users to access their utmost creative self without effort. As far as the mechanism of the system is considered, there will be six main stages; recognize the user, determine, activate, and monitor sensory stimuli activation, evaluating the user and rewarding (Eyal, 2014) to get the user hooked into the system.

Figure 5 illustrates the proposed set up for testing the enKindler space. This setup was designed based on the literature review outcomes, particularly

focusing on performing the test within controlled laboratory conditions. The physical set up of the enKindler Space will be a studio which is soundproof where blackout conditions could be brought in easily. The temperature is to be maintained at 23⁰ C while the room's acoustics will be designed to minimize the echo. The impact of enKindler Space on creativity of the participants is proposed to be assessed via structured interviews and testing the brain waves incorporating a Brainwave detection equipment; an E.E.G. focused exploration based on the learnings of the study by Stevens and Zabelina (2019).

5. Conclusions and recommendations

This paper provides an insightful systematic review of literature leading to a proposed interactive and entertaining multisensory conceptual model; "enKindler Space" to be adopted in Architecture and design education contexts to enhance creativity levels of undergraduates and instill sufficient skills for them to become equipped with emergent originality traits. As this novel conceptual model was derived through a desk study, it is expected to obtain in-depth experiential understanding of how this model will work in enhancing creativity levels of undergraduates by a customized manipulation of sensory stimuli via HCI. It is recommended to conduct a series of future investigations to further refine this model and to test its effectiveness as well as short term and long-term impacts with reference to diverse student samples in different disciplines to improve its feasibility, practicality and sustainability as a model which could be applied in large scale in design educational contexts to boost creativity and innovation. It is also suggested to further develop the model alleviating probable adverse impacts of certain stimuli or potential sensory overload, ensuring safety and well-being of participants. Considering different student populations in diverse academic disciplines and academic levels in future experiments could help to generalize the findings and make the intervention more widely applicable.

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