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An Evaluation of Multiple Intelligence Theory on Architecture Students

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Abstract: ***The term intelligence defines the intellectual capacity of any human being. The point here is that if a person has high intelligent quotient (IQ) it does not mean he/she will excel in other fields as well. Every individual is different and has its own interest of area where that person applies his/her full knowledge and hard work. Therefore, the discussion starts with every person is different and has its own sets of interest.***

The design tasks are complex in nature which in today scenario requires every individual with a wide range of skills– such as spatial visualization and creation, problem solving skills, communication skills which involves both interpersonal and intrapersonal skills, verbal and non-verbal skills, and so on. Identifying and recognizing these multiple intelligences becomes essential and an important factor for architects and researchers to deal and nurture diversity in architecture field, empathize with the variety of cognitive strengths and weaknesses, and implementing divergent tools which will help to evaluate different design thinking skills.

The study deals with the comparative analysis of existing theories on Intelligence by numerous psychologists. This paper, furthermore explores and evaluates the multiple intelligence theory by psychologist Howard Gardner (1983) in his book "Frames of Mind" which states about the theory of intelligence and also types of intelligence at large. The use of this theory in architectural design studio could be relevant in the ways to think as a diverse set of intelligences and to understand individual differences among all.

The paper investigates about what type of intelligences are more in Architecture Students. A MIDAS test consists of 80 questions were carried out on 750 students of Architecture, 150 students from each year of B.Arch. program for examining the study. The hypothesis of this research is based on inspecting the existing multiple intelligence that Architectural students have spatial visualization intelligence more than other intelligence. The research concludes with a notion that intelligence in design or any other field cannot be restricted to only one set of variables but rather should be considered as a flexible framework that can be adopted for a desired learning outcome.

Keywords: Design ability, Intelligence, Multiple Intelligence, Architecture, Pedagogy, and Spatial Intelligence.

I. INTRODUCTION

The process of learning and teaching are associated with variety of terms and intelligence being one of them. Various researchers till now have been working to get the correct definition of the term intelligence and trying to identify the different components and factors associated with the term intelligence which further has a relation with learning and teaching outcomes. Traditionally, intelligence has been measured through numerous intelligence tests and scales.

It has never been facile to understand the nature of human intelligence and devising methods to assess it, and has been the focal problem in psychology since its inception. Hence, the definition of intelligence and measurement tools has been changing ever since with the aim of getting the right instrument to measure and test intelligence.

Different theorists provide summaries of varied approaches to understanding intelligence. The theory of multiple intelligences, considers learners' with diverse intelligence profiles, emphasizes the tasks that provide opportunities for learners' to work in a variety of ways and assessment of learners has to be 'intelligent fair', with emphasis on performance assessment. The assessment tools should not evaluate the learners through the lens of one or two valued intelligences which are mostly verbal linguistic and logic mathematical.

Whereas Design education in traditional design disciplines like architecture, visual communication, and interaction design has tended to value knowledge, thinking, and skills that focus on helping design students develop formal design abilities and understandings. (Davis, 2005). The work of integrating and uniting traditional and emerging design disciplines poses a challenge for design education programs who value form as the ultimate criteria of design success.

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Emerging design disciplines inflate the need for those who plan and teach their curricula to amalgamate theory, research, and the development of empirical skills and understanding. (Norman, 2010). Design knowledge, thinking, and skills are now being applied to address numerous complexes, multifaceted, systems-based problems that require a synthesis and analysis of understanding the traditional and emerging design practices. (Dennis, 2017)

Donald Schön's The Reflective Practitioner: How Professionals Think in Action and Nigel Cross's Designerly Ways of Knowing provide the most well-known scholarship in this area. Cross proposed the notion of a unique term as design intelligence that enables designers to remit and define ambiguous problems and solutions. As design expands its influence and attention beyond form, design education must also expand its scope and content of what designers need to learn and develop — augmenting abilities to create form with recognition for fostering development to the ways as how designers think? This expansion can be exemplified, and thus better be understood, by examining various design mindsets that span traditional design disciplines and courses. (Dennis, 2017).

II. NEED AND SCOPE OF THE STUDY

Over the past several years, it is believed that success of an individual depends upon the level of intelligence or intelligence quotient as reflected in an individual's academic achievement, examination passed, mark obtained etc. But now, research on social intelligence has revealed that it is the most important determinant of the extent of professional and personal success in life.

The appeal of multiple abilities was a sudden and a welcome substitute from IQ in educational faction. However, the use of MI theory in architectural design could be relevant in as much as it affords a way to think of architectural designing as a diverse set of intelligences and to acknowledge individual differences among designers.

It will also help to explore how these intelligences are being learnt and experienced in the studio environment. It could be beneficial as a diagnostic or career guidance tool for architectural education and practice.

Finally, it would provide a framework which could be used as design module in Architectural Design Studios.

III. RESEARCH QUESTIONS AND HYPOTHESIS

Using multiple intelligence theory as a mode for understanding intelligences, the following research questions are asked through this paper:

1) What intelligence(s) are important to architectural designing?

2) What type of intelligence(s) are more in Architecture Students?

Whereas, the hypothesis of the research is from the theory itself by Psychologist Howard Gardner who states that "Architectural students have spatial visualization intelligence more than other intelligence"

IV. RESEARCH METHODOLOGY

The quantitative research is done by carrying out MIDAS test on Architecture students using Design Intelligence-learning Outcomes questionnaires. The sample size of the study is 750 students, 150 students from each year of the B.Arch. Course.

V. LITERATURE REVIEW

From the analysis of the human intelligence from the earliest (general intelligence) and modern definition (multiple intelligences), there is a coherent picture of distinguishable ability factors.

These distinguishable ability factors can be arranged in three different levels of hierarchical order (Lohman, 1996) These are:

1) General intelligence ('g') which is at the top of the group; showcasing about its central ability to get involved in all cognitive test performances.

2) Fluid and crystallized intelligences from ('g') or generalized educational achievement. Reflects the ability in cognitive charge that imposes a figural spatial imagery demands.

3) Multiple intelligences, that moves away from defining intelligence as general and single intelligence, with single quantifiable measurement scale (IQ).

Currently, much of the modern research on intelligence, are now more concerned with the processes of intelligent thinking than with the organization of traits that define it (Lohman, 1996).

A study was conducted to showcases How the definition and understanding of intelligence has changed over time.

On the novel front, intelligence can be exhibited in multiple ways, can be expanded, a medium of problem-solving process, can be measured in different contexts or even real-life scenarios and can be understood as a human capacity which may vary from person to person.

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VI. THEORIES ON INTELLIGENCE

There are various theories on Intelligence and its types. These theories are divided into two parts such as Factor theories and Cognitive theories. The factor theories talks on particular element or a component as a factor whereas cognitive theories are related with the mental process or action of an individual.

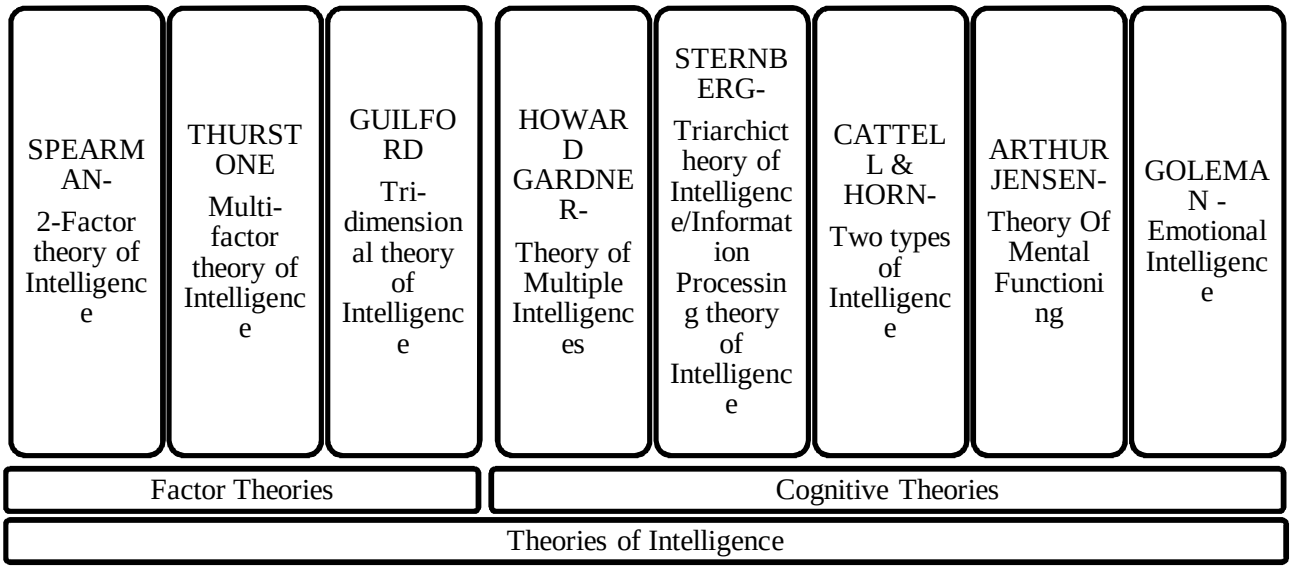


Figure 1 Theories on Intelligence.

VII. THEORY OF MULTIPLE INTELLIGENCE

The theory of multiple intelligences differentiates into definite 'modalities', rather than seeing as one controlled factor. Howard Gardner proposed this model in his book “Frames of Mind: The Theory of Multiple Intelligences” which talks about multiple intelligence a human can possess. According to the theory, intelligence fulfills different criteria: a potential factor for brain damage, a relevant place in evolution, for core operations, symbolic expression, development or progression, a part of experimental psychology and numerous findings.

Later on, he even suggested that existential and ethical intelligence may also be worthy of addition in his work of research.

Although the dissimilarity between various intelligence has been laid out in contingent, he refuses the point of marking pupils to a specific intelligence. He states that the theory should "empower learners", neither restrain them to one modality or style of learning. He states that, intelligence is "a psychological potential which gathers all the information and knowledge in a particular setting, which helps to solve problems or to create outcomes that are of great benefit in a particular culture."

In 1983, he posited that the theory of multiple intelligences is diverse and pluralistic. According to his work, it hypothesizes that every individual has at least eight different intelligences which responds to the ways of interacting with the world.

Table 2 showcases the eight multiple intelligences that a human possess. A person may be good at certain subject and may not be good in other.

Multiple Intelligence Theory By Howard Gardner				
No	Intelligence Type	Description	Activities	Personalities
1	Verbal/Linguistic	Sensitive to meaning and order of words and language	Hear, listen or speak, tongue twisters, oral or silent reading, documentation of work, creative writing, spelling words, journal writing, essays and poetry.	Poets and journalists
2	Logical-Analytical	Is able to handle sequence of reasoning and recognizing patterns,	Understanding abstract symbols/formulae, deciphering codes, numerical calculations	Mathematicians and Computer programmers.

		numbering, permutations & combinations and statistical order.	and problem solving	
3	Musical	Is sensitive to dynamics, pitch, melody, rhythm, harmony and tone.	Musical recitals, singing and musical compositions	Composers
4	Spatial	Can visualize, perceive, transform, create and modify spatial transformations and processing all information with ease.	Recreation of images, area conception and perceptions drawings, sculptures, various forms, color schemes.	Artists, painters and Architects.
5	Bodily-kinesthetic (movement with body)	Having control over motor actions and reactions.	Drama, role playing, sports and dancing	Dancers, gymnasts and rock-climbers.
6	Intrapersonal	Ability to recognize personal feelings and emotions	Silent contemplation, thinking skills and higher order of reasoning.	Writers and Thinkers
7	Interpersonal	Ability to recognize others emotions, feelings, beliefs and intentions and understand people and their relationships.	Group projects, counseling and feedback.	Counselors , human resource personnel and teachers
8	Naturalistic	A person who is able to make himself in association with the intricacies and complexities of nature	Archeology, paleontology and wildlife watching.	Botanists and Archeologists.

Table 1 Multiple Intelligence Theory (Source: Newton D'Souza, 2007)

As per the theory, Architects are said to have more spatial intelligence. This is defined as the function to define and perceive any visual or spatial knowledge, transforming and modifying, creation of visual images even without a novel physical stimulus. Central abilities of this intelligence include the capacity to construct images in different aspects of spaces and ability to draw and ample use of visual perspectives in ways no one can think of.

VIII. ASSESSMENT TOOL – MIDAS

A need has arisen to identify different course of action or process that can be used to assess these intelligences. The role of assessment in context with learners' performances in digital learning tasks or setting is essential. The development of some standardized, definitive assessment tools is a reason behind the development of this theory (Klein, 1997).

A test named as Multiple Intelligences Developmental Assessment Scales (MIDAS) was developed by Shearer. MIDAS is a divulging tool to measure intellectual character in a person. It is instead a controlled plan for describing a person's intellectual and creative skills in the real-world scenarios. After completion, the learner is assisted to validate or affirming the information by means of analysis, reflection, feedback, response, and discussion. The resulting profile' then serves as a focus for curriculum development in different hierarchy, approaches and planning.

IX. EXISTING STUDY

In developing a measurable scale and quantifying the design skills, the Multiple Intelligence Development Assessment Scale (MIDAS) developed by Shearer (1996) to operationalize and evaluate MI theory (D'souza, 2007). MIDAS is intended to give a reasonable evaluation of the person's intellectual nature in each of the eight skill sets proposed by Gardner.

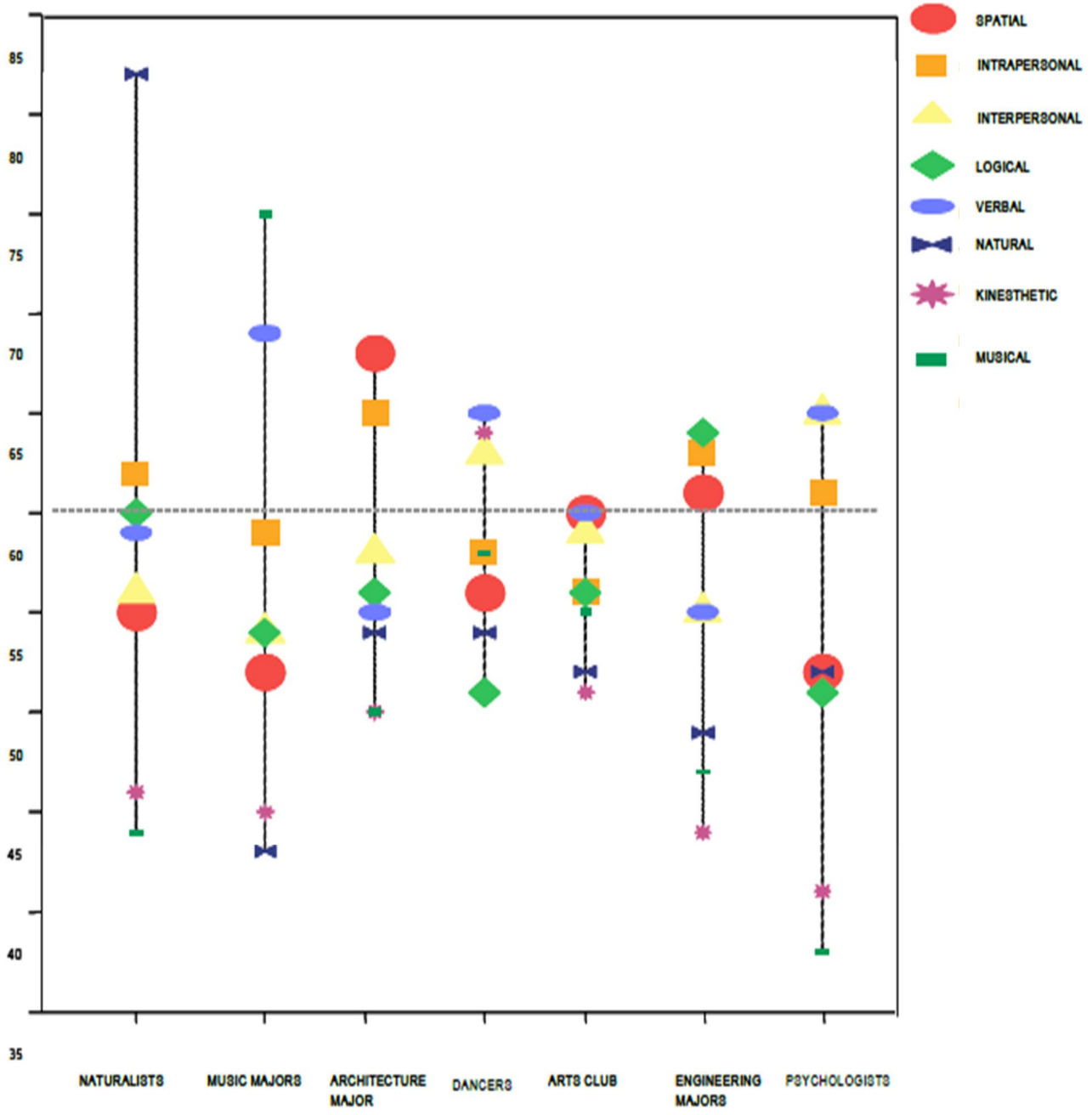


Figure 2 Multiple Intelligences consistent with well---defined ability groups. (Source : Shearer, 1996; D'souza, 2007)

The Graph after the drop-line showcases mean percentage score distribution for MIDAS across different groups. Starting from left to right, Naturalists (n=17), Music Majors (n = 40), Architecture Majors (n=36), Dancers (n=17), Arts Club (n = 79), Engineering Majors (n = 93) and psychologists (n=30). Architecture majors' students were placed at the center of these groups i.e., in a reasonable range, neither had too high nor too low scores.

This means that architecture students were upright at numerous intelligences at an obstetrical level. Indicating that the characteristics and nature of architecture field are interdisciplinary and multifaceted domain.

The conclusion of this study was that compared to other disciplines, designers used all skills in some threshold capacity although they excelled in specific disciplinary skills (such as spatial for architecture design).

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X. MIDAS TEST CONDUCTED ON ARCHITECTURE STUDENTS

A Midas test was conducted among 750 students of Bachelor of Architecture. 150 students from each year i.e. from 1st to 5th year. The test consisted of 80 questions of Multiple Intelligences Test - based on Howard Gardner's MI Model.

Testing of Hypothesis 1 Architectural students have spatial visualization intelligence more than other intelligence.

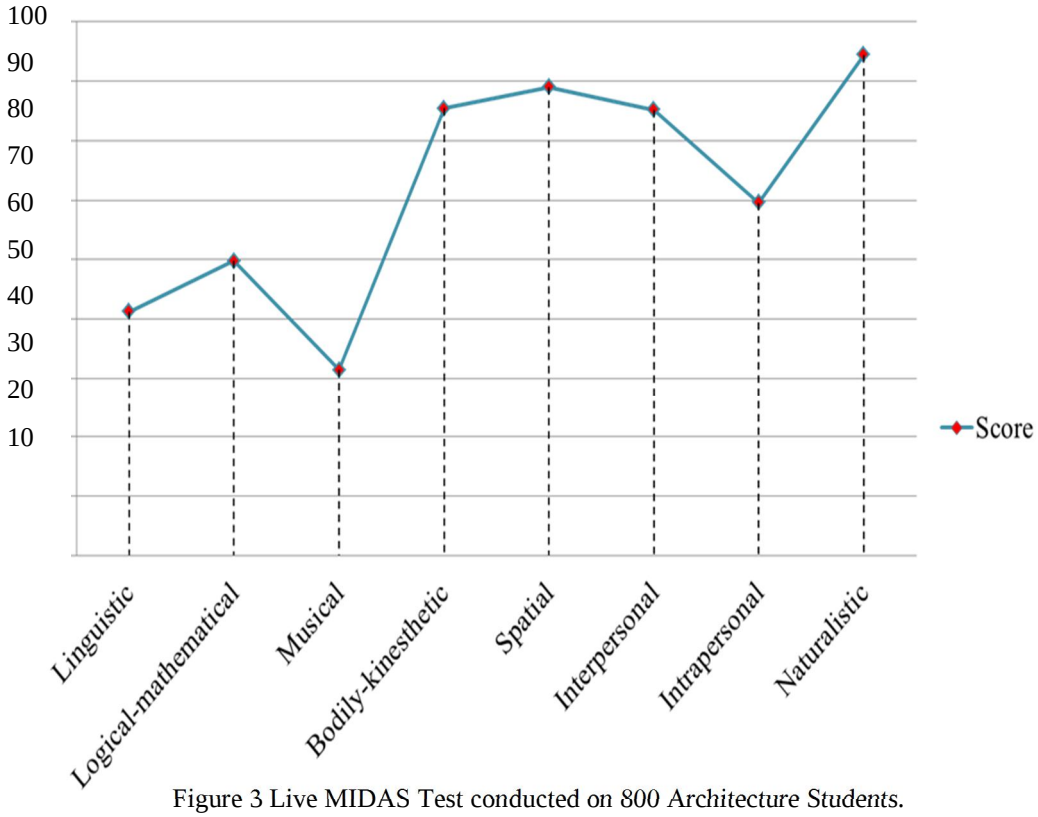


Figure 3 Live MIDAS Test conducted on 800 Architecture Students.

The fig. 3 clearly showcases that the test conducted on architecture students, are more naturalistic intelligence than having spatial intelligence. Furthermore, as an architect you need to be nature smart as well while designing. The context of surroundings and for which environment we are designing, what resources are available and what materials we are using. This entire mentioned factor plays an important role in architect's life.

The analysis also states that spatial visualization is of significance importance too scoring second rank among students.

The results from above study could be also seen from one perspective that all the intelligence are in narrow difference from each other. This indicates that Architecture is an interdisciplinary field where it requires knowledge from diverse corners.

XI. ANALYSIS AND INTERPRETATIONS

The hypothesis 1 which states that Architectural Students have more spatial intelligence proved wrong. The results and findings after conducting the MIDAS test showcases us that naturalistic intelligence is more in Architectural Students. Naturalistic Intelligence deals particular that involves how sensitive an individual is to nature and the world. As an Architect you need to be little conscious towards design and environment. The world in which we live in, current scenarios we face, a care should be reflected towards the world, for which we are responsible for.

Results also prove that spatial intelligence is not that far away from naturalistic intelligence. The second most important intelligence among students was spatial only. They own the capability to visualize and perceive the world precisely; interpretating their surroundings based upon their experiences, perceptions, and then recreates the aspects of their relationship.

The ability of design is omnipresent amongst all people, but these abilities are supplementary to others. The nature of design, nature conscious design is not a new phenomenon. We as human beings have a backdrop history of design potential, and abilities as evidenced which can be seen in the artifacts of previous civilizations and in the continuing heritage of vernacular design and indigenous art and craftwork.

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XII. CONCLUSIONS

The idea of Multiple Intelligence in association with Architecture students gives us an insight towards collective package of intelligence in students. The quantitative research aids a platform for a more complex term as Design Intelligence, that can be used to facilitate as design mindsets and research can be expanded in that notion.

Both Design and Intelligence is a complex field to understand and to amalgamating both together gives us more complex field to work on called Design Intelligence. Incorporating ethos, intelligences, and skills in design education processes, the convolution of practices can be simultaneously surveyed and explored.

Architects and designers apply their knowledge, thinking, and skills in different arrays that may help them to establish themselves as key participants in boosting individuals or communities at large. Researches in the field of design are applying approaches and systems in inter- and trans-disciplinary band to reveal insightful knowledge and solutions for various concerns and catering issues. The future advancement of design field will depend on practitioners and as well researchers developing an array and disposition to equip them for future and then work on forth.

XIII. RECOMMENDATIONS

The formation of a framework specific to design pedagogy should be considered. Researches into Multiple Intelligences has recognized wide array of intelligences with some overlays between them. The further development of a framework that could be handed-down to apply in design learning scenarios. Conducting literature study on various theories on Intelligence (table 1), comparison on common characteristics has been done. Intelligences then have been grouped under 5 banners which are Practical, Analytical, Creative, Social and Naturalistic. (PACS-N Model) The Architectural Design program should be made in accordance and emphasizing on these aspects.

1) Practical intelligence exhibits not just an ability to meet all time limits and further adapt to work in different work cultures and relates to the design potential as well as functional aspects. Given that design is a very time consuming and deadline-oriented endeavor in both practice as well as in research, these are important order to develop in individuals.

2) Analytical intelligence enables to think individual in critical mind frame and creating and further assessing design and learning outcomes. Critical thinking includes the notion and capability to work iteratively, assessing each design processes to determine the desired goals, aims, objectives and then makes appropriate decisions.

3) Creative intelligence in terms of design research is a generative process that requires identifying and defining a policy matter to be addressed; sometimes catering an issue and solving it by ingenious ways. The ability to discover hidden connections between the factors or conditions that affect a given circumstances, and then synthesize new solutions and outcomes that stock from these connections is a source for innovation and invention that creative intelligence makes possible.

4) Social intelligence deals with people in the field who are routinely involved in a wide span of social diversity and interactions. The ability to effectively and meaningfully engage with other teams who will formulate and operate research areas which requires deliberate collaboration and social involvement.

5) Naturalistic intelligence pays attention to detail when observing human behavior and environment enhances product testing/research; ability to sort guides composite information design decisions and nature conscious design solutions.

The PACS-N Model for design and development should provide a flexible framework for guiding and assessing both teaching and learning processes.

XIV. AVENUES FOR FUTURE RESEARCH

With every design interface, intended or unintended consequences cannot be fully preceded until whatever has been designed or visualize is made and then implemented to see the results and consequences to the problem.

The research further opens up new areas of exploration in terms of Design Intelligence and Design Research. A proposed framework can be put together under the banner of Design Intelligence in Architectural Design Studios for enhanced teaching and learning processes. The framework should include a module which deals with pedagogical and didactic approach, content methodology, role of instructor, teaching & learning strategies and proposed outcomes.

The wide range of distinct teaching and learning activities in several courses has expanded significantly in today's structure of academics. By starting with the inception, identification of the problem and then qualification of intelligences as pilot for human resource and development, the quintessence of teaching and learning activities being developed are less likely to follow the existing project parameters. There should be significant increase in the number of collaborative projects and participatory design model at various levels.

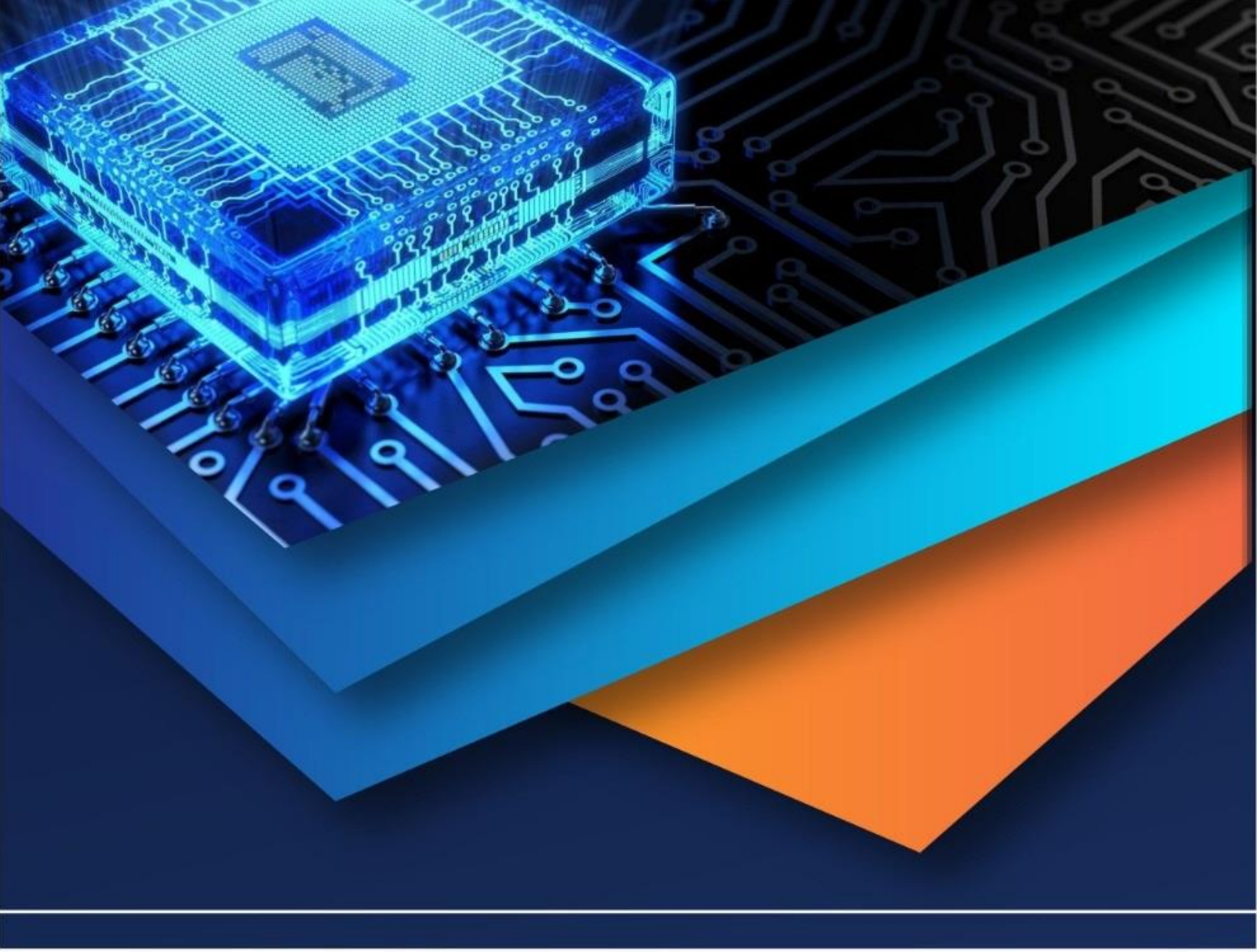
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Activities or functions where learners are expected to be part of the whole design process, which may result an addition to the development of critical and creative thinking and even statistical and analytical skills of every individual. By integrating different mindsets, intelligences, and skills, learning in design pedagogy activities, the complexity and entanglement of emerging practices or research can be concurrently done. Designers are now applying their knowledge, thinking, and skills in ways that establish them as key involvement in motivating individuals. The collaborative and participatory model ensures overall societal development and boosting communities. The future success of design in these areas will rely heavily on practitioners and researchers who will develop a wide range of intelligences to equip them for the work to the fore.

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