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Practice of Curiosity: An Intellectual Curiosity-based Industrial Design Pedagogy

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ABSTRACT

Design education is frequently criticized by leaders in the creative industry for failing short of what is promised and expected. As the impact of designers enormously gained by the advancement of technology and connectivity to the world, the education of industrial design seems hemmed in the silo that aims exclusively at the job market. Moreover, changes were rarely made in response to socio-economical and technical changes since it was established. This thesis seeks to delineate the circumstances of Industrial Design education from both historical and disciplinary aspects and suggests a theory in the learning of Industrial Design in response to above mentioned challenges.
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1 PROBLEM STATEMENT

Industrial Design Education lacks innovation regarding how the curriculum reflects today’s intellectual life. The curriculum is outdated with few updates since it was established. Instead of dealing with an interdisciplinary subject, the education process, is industrialized toward a single type of occupation.

“If design is to live up to its promise it must create new, enduring curricula for design education that merges science and technology, art and business, and indeed, all the knowledge of the university“ (Norman, 2014).

Don Norman says that the current status falls short of the promise given by design. Specifically, the method educating industrial design is obsolete, because future designers take more initiative, more empowered by applicable tools and are more knowledgeable with the help of enormously gained connectivity to the world. Vocational oriented educational model is hemmed in by the idea of supplying competent candidates to the industry. In which case, designers’ motivation is driven, tools are restricted, vision is tunneled. The academia of design depreciates, for education being passive and industrialized.

The vocation-oriented model of educating industrial designers at the University of Cincinnati is also devaluing because the job market changed. Industrial Design graduates are facing more diversified career options than their predecessors as a result of emerging Solution Economy, the maker movement, and multiple socio-economic trends, in which businesses are not defined only by established industry, but also unsatisfied needs. Moreover, the emergence of start-ups elevate expectations of versatility in a single creative person due to their limitation of
employment size. As a result, the curriculum of Industrial Design falls short in addressing such trending diversification.

The other factor that saturates educational value of current curriculum is the surge of appropriate tools that revolutionized the creative process of industrial design. Those tools include design theories that changed the objective of industrial design from arbitrary style making into human centric tool creating; Technologies that enriched mediums of interactive communication between human being and object. Surprisingly, the vocation-oriented educational model seems to be immune to the changes in terms of response.

The goal of learning industrial design as well changes when the Millennial generation takes over the classroom. As the demographic report shows, Millennial take different approaches than prior generations. They are more active, passionate and goal-oriented. Most importantly, they are inclined to take education as a stepping stone on their way to self-achievement. As a result, teachers are less authorized judging student the mastery of industrial design, students give voice to the criteria as well. Not only receive education, but they also actively participate in planning their education. Philippa Lion summarized this changes in designer education as moving from a firm belief in the authority of the teacher knowledge and their ability to ‘transfer’ or ‘transmit’ this knowledge to a learner towards a sense of the vital role the learners have in creating meaning and understanding and in being aware of how to learn.

The industrial design program is considered valuable and innovative because of its graduates are contributing significantly to the economy, which happens not only in the realm of product development but also in other fields. To propose a new educational model, the essence of

\[\text{\footnote{1} Referral data can be found on HR2 Econ Report: Industrial Design Services (NAICS 541420)}\]
current industrial design education, which catalyzes the synthesis of new knowledge as well as fostering creativity, should be centric. Moreover, philosophy of industrial design education should be identified, developed and stay relevant with flow of history.

This thesis seeks to discuss essences of industrial design learning, through which a dynamic learning model can be suggested in response to an empowering solution economy, emerging technologies and new expectations in learning industrial design.

Chapter 2 look through educational methods applied to industrial design education through history, and benchmarks educational models by the extent of sophistication. This study described the learning models of industrial design using the language spoken in the modern science of pedagogy. It also points out the depersonalization of existing design education paradigms.

Chapter 3 proposes an educational model grounded upon constructivism and capitalizing personal curiosity, which is heavily supplemented by the idea of new Bauhaus suggested by Christopher Frayling and Emotional Design theory from Don Norman.

In the proposed theory, Intellectual Curiosity in the case of academic industrial design learning is acknowledged as the causation of personal development. Explained using the revised metaphor of the Heart, Head and Heart (Frayling, 2011), Intellectual Curiosity is the impetus initiated by the Heart that directs the growth of the Hand and Head, which respectively represents the knowledge and professional skills of industrial design at a broader definition.

The curiosity initiative also suggests practical missions and goals about learning industrial design to avoid the anarchy of objectives caused by the comprehensively demanded knowledge. Wherein, the three levels of design (visceral, behavioral, emotional), from Emotional Design by Don Norman are utilized to measure extents and goals of design influence.
“...Design...At the highest level, they are a reflection of the idea that the knowledge built up by science can, through technology, give man control over his surrounding and the power to shape more fully his own destiny.” (Baynes, 1967)

The proposed theory suggests a learning philosophy supported by this statement. In which, industrial design education is described as excellence in transferring intellectual curiosity into authentic impact to reality as oppose to merely satiating commercial needs; The goal of industrial design education is thus set to empower student with design ability to pursue personal interests that are meaningful to humanity.

A personal focus approach would also benefit the economy through reconstructing social economy from bottom up as oppose to trickle down MBA strategy model that is proven clumsy, slow-reactive and consumptive. Furthermore, curiosity centric approach results in changing design schools from job preps to lifestyle laboratories, where future fashion is curated from the naïve talents. In the such vision, design academy, freed from the constraint bond up by industry and disciplines, can truly take the lead in the movement of humanizing technology.
2 PROBLEM HISTORY

Design Education in general refers to the teaching of theory and application on products, services and environments. It naturally directs focus to the tertiary education that specializes in the nurturing of future design professionals without further discourse about definition of the subject matter, which in turn segregates academic disciplines with exertive efforts and excludes new ideologies besides counter-current requirements demand from the industry.

Education is defined as the knowledge and development resulting from an educational process (Merriam-Webster dictionary), normally in schools. The notion indicates its two faces: First, as gaining knowledge of both formal and informal content; Second, as the development of an individual, which inevitably leads to the unsettled philosophical argument about the purpose of education. Regardless of what purpose to be carried in this process, the second face of education endorses the shift of thinking modality of an individual. In the case of Design Education, there should be "a designerly ways of knowing" that are at the core of the design area of education.

The history of Design education itself is loosely defined because the word Design is defined radically different in different cases. Design education, as spoken at the beginning of this chapter, refers to the training of design practitioner for industrial purposes whose history can date back to the apprenticeship in medieval guilds. As design strides as the innovation toolkit in both business and scientific world, design as epistemology, also known as Mode 2 or theory of design, is barely taught yet practiced extensively at cutting-edge researches. Even though the profession as Designer (Architect, graphic, industrial) yields demands of its education, the higher education of individual should not be bound to merely the building of vocational competence.
The notion that distinction between workmanship and design lies on the verbalizability of design and tacit nature of workmanship (Pye, 1995) is partly true because the action of designing, using this criterion, is as well tacit.

Three archetypes are suggested based on the workmanship of risk each pedagogies bear. They are Vocational Conditioning, Studio Learning and Design Epistemology manifested by Interdisciplinary Learning.

2.1 VOCATIONAL CONDITIONING

The History of educating industrial designer has a much shorter history as oppose to those long established professions that were trained through apprenticeship. Nonetheless, the goal of educating an industrial designer differs not much than other occupational educations in the light of pedagogy, motivation, and organization at tertiary level, yet some design scholars emphasized that industrial designers (as well as architect, engineer, artist, and so forth) exploit more creativity whilst others do not.

Letting alone the overstatement on the significance of nurturing of creativity in Art and Design education, providing needs of industry was central to the goal of education in both design & non-design professions. As the goal being claimed to be vocational, a prerequisite of both practices is to fit in an existing role in an established system handed down by tradition. A tradition that educates novice through imposing interaction between actual working context and the learner. In which case, like Nigel Cross stressed, products and processes were predictable.(Cross, 2006)
2.1.1 Learning in Apprenticeship

Apprenticeship per Merriam-Webster dictionary’s definition means one who is learning by practical experience under skilled workers a trade, art, or calling. It emphasizes the on-the-work experiences that can hardly be replaced by another form of learning. The craftsman-designers, as oppose to the craftsman who has no hands in design, as a primitive figure of modern industrial designers, were trained mainly through such means.

At that time, when graphic design was calligraphy and lettering, fashion design was embroidery and weaving, furniture design was woodcarving, merely all professions of this sort were taught through apprenticeship that was strictly hierarchized by the guild system. The concept in such education refers to the training of a profession whose goal is to gain a qualification.

**Learning through copying:** Imitatio (Demonstrate and imitate) is the legitimate method, through which apprentice observation and emulation the particular skill from masters. Knowledge in this case, different from formal knowledge, was acquired through specialized training and exercise, which is a complete engagement of vocational environment. Going through this kind of training (learning), some of the craftsmen appear to have been almost as mechanical as the semi-automated when practicing (Frayling, 2011).

**Workshop as the environment:** Apprenticeship was the most preliminary form of skill education that prevailed guilds, mason’s lodges and even early form of art academies. Those systems, strictly regulated with the master builder-master of other crafts-apprentice–assistant hierarchy, impeded aesthetic innovation from happening due to the restriction of free movement and expression of individuality and meeting the need of commonsensical aesthetic. Workshop in this sense is the place of regulated manufacturing, wherein technique repetitively performs but not in pursuit of intellectual purposes.
2.1.2 Specialist education

Vocational Education inherited the mode of practical education from the guild’s apprenticeship system. The objective of such education shifted from “training” to “educating”, which due to the substantial development of public education in humanity, science, and technology, in some countries with design as well.

As oppose to the generalist approach and another liberal approach (will be discussed in the following chapter) in tertiary design education, specialist education carried the practical objectives of apprenticeship, which is preparing readiness of the learner for industry.

An earlier form of this education, at a bigger picture was first initiated by British Government aiming at: First, improving the standard of manufactured goods for export would be stimulated, employment would grow, and the standard of living would be raised; Second, to improve the quality of life both private and public by design. Although design as decorative art was elusive in content even just for the decorative purpose, the training of aesthetic creation through approach of fine arts is deliberately limited to certain spectrum in the light of its practical goal, regardless of valid account. As Swift described this form of approach during period of the Birmingham Government School of Design, the curriculum included copying examples, studying various designs in different materials and lecture on the ‘practical application of Design to particular manufacturers’ whilst Drawing from life was not taught in the belief that it raised students’ aspirations beyond design to fine art, which was literally prohibited in the early schools. This distinction between Art and Design as a profession to educate could be traced back to the Renaissance period, when hand making began to see as separate from ‘art’, and the latter became more associated with intellectual skills.(Lyon, 2012)
The controversy about generalist versus specialist in industrial design education in the United States cumulated at the golden time when the editors of new Industrial Design magazine called out the educators to consider which philosophical approach was most appropriate: a rational approach favoring technical proficiency over imagination, or a “blue-sky” approach stressing creativity. The substances of this discussion remain unsolved while the common cause was found as the educational minimums. In that case, curriculums were developed according to the interests of each school, yet as James Shipley suggested that “most professionals are aware that historically American education has been vocationally oriented.”

The academic setting of design education through vocational oriented, the prerequisite elements such as Foundation year, Liberal Arts, Humanities and other administrative entities that make a degree program collegiate more or less distance educational models from being purely vocational as in apprenticeship. Professional Academies in design is the extremist practical model that provides occupational training.

Pensole Academy, a footwear design school, based in Portland is one of those. It was founded by D’Wayne Edwards an industry veteran who started in the industry without any formal training and culminated his career at leading the design of Air Jordan sneakers. Instead of following the collegiate curriculum, he educates his student using a complete industry-centric approach. “I teach the way you would learn if you were at a company,” said Edwards in an interview (Brettman, 2014) The school is widely considered a success as it became the rather successful model of education in helping students land design jobs.
2.1.3 Cooperative education

Cooperative Education (co-op) was developed at the University of Cincinnati (UC) in 1906 by Herman Schneider, a young, dynamic dean. Co-op is today defined as an educational methodology in which periods of classroom instruction alternate with periods of paid discipline-related work experience (Cates and Cedercreutz 2008). Co-op students typically participate in a school-work rotation that may span over as many as five academic years throughout their undergraduate education. (Cedercreutz & Cates, 2010)

The practice of co-op education in the undergraduate industrial design program at the University of Cincinnati turned out magnificent and considered as a major contributor to the superb recognition of the program nationwide (Top 5 according to Design Intelligence). Wherein, students in this program required and assisted to going to practice at discipline related occupation every other academic year. Program emeritus Tony Kawanari occasionally recalled that leaps of core professional competence happen every time students come back to the school, and majority gained a comprehensive understanding of the profession during co-op, which as a result made student industry ready long before their graduation. Additionally, some student impressed and built up strong connections with their employers who ended up hiring them for full-time career.

2.2 STUDIO LEARNING

Studio discussed in the phrase studio learning did not refer to a specific place for the study of an art per Merriam Webster dictionary’s definition. Instead, it denotes the collective of
teaching/learning approaches included in an archetypical industrial design studio in a school of design.

The education model of Art Academy founded near 1561 or 1563 by Vasari, also celebrated as “the father of modern art history”. Wherein, “theoretical auxiliary subjects, such as geometry, perspective and anatomy were to be taught in regular academic courses” to supplement the workshop apprenticeship (Wick, 2000).

The art academy came to form when the practice and teaching separated from the medieval unity. The art academy established for this particular purpose of adopting teaching from the workshop. The academies, different than the one whose mission was to transmit a comprehensive intellectual education to prepare the youth for service to the (ideal) state, had abandoned the ambition for more general training and education in response to pressures from professional specialization (Wick, 2000).

Influenced by romanticism thinking following French revolution, the appreciation of the academies drops among artist as “every genuine feeling, every worthwhile thought… was suppressed” by the concept of vocational school. In fact, “no self-respecting artist wants to be called an academic” according to the German impressionist Max Liebermann (Wick, 2000). These anti-academia thinking eventually led to the reform of art schools, which culminated in the establishment of Bauhaus.

The breakthrough in the studio of the culture of Bauhaus is the unity between art and craft (later technology) in the creative process during studio. Which happened under the directorship of Moholy-Nagy, who was recognized having an entirely different conception of craftsman - who does not create on his hands, but control and oversee the handicrafts production process. His rejection on prioritizing between form and function, extensive exercises with modern technologies,
reflected in the furniture and metal workshop, eventually paved the Bauhaus’ way to Industrial Art (Westphal, 1991). Which grounded the industrial design education of the future.

Anita Cross suggested that educational principles of Bauhaus may as well developed from, or influenced by the work of educational innovators such as Froebel, Montessori, and Dewey (Cross, 2006). Therefore, the subject as experiential learning in design studio can be explained with an knowledge base of constructivism and experimental learning.

This chapter will discuss faces of modern design studio learning experience in archetypical design school based on a secondary review of literature, which is heavily grounded on the research works of Philippa Lyon’s Design Education: Learning teaching and researching through design. The four elements of the University design studio learning are suggested as learning through copying, learning through shared space, and learning through project-based study.

2.2.1 Learning through demonstration

Demonstration in modern design studio differs little from Imitatio process of apprenticeship. Throughout years, the educational progress of design studio was validated by the level of sophistication that doesn’t directly reflect delivery of taught content. However, in the case of a craft apprenticeship, the result can be measured by tangible product.

Sennett explained the concept of demonstration in a design studio in a study that compares cooking instruction styles. One was call “dead denotation”, which composed using literal and mechanistic descriptions, also known as ‘commanding’ verbs that have no life and little educational value. The second was written in a learner-centered viewpoint on the task, which he described as “sympathetic illustration” providing a framework for the information being conveyed then provided guidance from the perspective of a novice. In the third one, a detailed context or
story is provided with a description of how locals talked it, which he described as ‘Scene narrative’, a poetic approach that lacks precise instruction. The last one is described using ‘Instruction through metaphors’ approach. The language style even though in written form represents possible means that a design studio instructor could apply regarding delivering practical skills.

The author also pointed that design education at tertiary level tends to incorporate a ‘constructivist’ model of learning. Demonstration, as the major teaching method in this model, seeks to convert and deliver knowledge in the form of experience. the learner, in response, plays a bigger, more active, and participative role. Pedagogical theorist, Laurillard argued that role of the teacher is a’ mediator’ between academic knowledge and the learner.(Lyon, 2012)

In summary, the demonstration learning in design studio intended to familiarize the student with the progressive pattern of approaching explicit product while ensuring no strict outcome from a student. Instead, in an apprenticeship the learning through demonstration implies more about the looking, making and replicating, nature of hands-on emulation. Meanwhile, learner’s active involvement and interactions with the demonstration is also central in fostering student’s confidence to work with the process and shown technique due to the constructivist nature of this sort of learning.

2.2.2 Learning through studio

The design studio is both a process and a place. As a place, it is where most the design work goes on, and students work alongside each other with varied levels of intervention from tutors and external critics in events such as tutorials and design reviews. (Sara, 2006)
2.2.3 Leaning through doing

Studio learning is a major educational model of Industrial Design program at the University of Cincinnati. After the study of basic academic liberal arts and science, a topic studio featured every academic semester, mainstreams the development of curriculum supplied with technical studios and other electives.

Apprenticeship learning was monotonous in every aspect in the light of workmanship of certain, whereas workmanship of risk was considered ingenious or artistic that was barely encouraged in the learner.

Learning through demonstration delivered the isolated experience for the development of skills in the learner. Learning through doing in the studio should inter-connect fragmented skills, which is normally regarded as fundamentals. It also facilitates the authentic creation incorporating compound applications of fundamentals.

Learning through doling in industrial design studio speaks about learning goals that integrate multiple demonstrated technologies. In which circumstance, the design was discussed at process level as well as the systematic level where aesthetic thinking alone won’t suffice achieving the completion of the desired artifact.

As a contrast to the project-based learning depicted in the following chapter, learning through doing in an educational design studio emulates the tradition of creation. However, project-based learning set to alternate tradition at an inter-discipline perspective.
2.3 PROJECT BASED LEARNING

In the 1950s, the heroic roles industrial designers played in reviving the post-war economy attracted mass media attention that aroused the interest from outside the fields of Art and Design about the notion that intuition, imagination, and talent could be rationalized measured and dispensed to the uncreative. John Arnold of MIT was one of the those who sought the potential of such application and started practicing with the introduction of “creative engineering” to his engineering students. In which courses, problems in product design were assigned to the class, and its results were to judge by a guest jury basing on presentation, originality, the level of engineering that was used to solve the problem. (Pulos, 1988)

John Arnold’s approach to creativity resembled Moholy-Nagy’s approach to Art by means that do not subscribe to clearly defined methods or disciplines when it comes to stimulating creativity. In 1956, John’s summer program at MIT invited champions of unique areas for lecturing. Among which Charles H. Clark of the Ethyl Corporation demonstrated the popular method of “brainstorming”, which was invented by Alex F. Osborn of the advertising agency of Batten, Barton, Durstine and Osborn. Furthermore, Arnold brought in other lectures including psychologist, psychoanalysts, and other human behaviors scholars for stimulating his class. He believed in that creative process consisted of more than simply having an idea. He saw research and planning as equally important. Also, he was said to feel that, although industrial designers had a certain special talent that equipped them to apply art to industry, engineers were the real designers in the industry. (Pulos, 1988)

This pedagogical experiment sparkled future advancements in three aspects. An exploration of the creative process, later recognized as Design Thinking. A problem-centric pedagogy featuring the creative process at a rather sophisticated and practical level, which was
recognized as project-based learning. Moreover, a broadened definition of industrial design that reveals the inter-discipline nature of the subject, even though he gave the credit to the engineering discipline.

2.3.1 Design Thinking: the creative process

‘Creative engineering’ and ‘creative process/ mentioned above is now more widely recognized as Design thinking. Which is a formal method for practical, creative resolution of problems and creation of solutions, with the intent of an improved future result. In this regard, it is a form of solution-based, or solution-focused thinking – starting with a goal (a better future situation). Design thinking identifies and investigates with known and ambiguous aspects of the current situation to discover hidden parameters and open alternative paths that may lead to the goal. Because design thinking is iterative, intermediate, "solutions" are also potential starting points of alternative paths, including redefining of the initial problem. (Wikimedia Foundation, Inc., 2016)

Although the design is always influenced by individual preferences, the design thinking method shares a common set of traits, mainly: creativity, ambidextrous thinking(Faste, 1994), teamwork, user-centeredness (empathy), curiosity and optimism. (Wikimedia Foundation, Inc., 2016).

2.3.2 Project-based learning: An interdisciplinary approach

Project-based learning as an educational concept mainly contrasts traditional, teacher-led classroom activities in light of its emphasis on student’s individual artifact construction to
represent what is being learned. In which account, product design studio mentioned in an earlier chapter was regarded as one type, whereas the concept project based learning referred in this chapter points to the kind of project or ill-defined problems that enforces adopting solution-focused cognitive strategies and employing abductive or appositional thinking and non-verbal modeling per Nigel Cross’s definition. (Cross, 2006)

Studio Learning and Vocational Conditioning, which emphasize the replication of experiences or methods that engage unchange applications are monotonous. Interdisciplinary project based learning, as in John Arnold’s practice, weights equally importance on both analysis and synthesis of various artefactual mediums that are to be exploited by the learners. In another word, nothing but a methodology was provided.

Also, teacher’s role as a facilitator working with students to frame worthwhile questions, structuring meaningful tasks, coaching both knowledge development and social skills, and carefully assessing what students have learned from the experience was strongly demanded by project-based education (Wikimedia Foundation, Inc., 2016).

2.4 CONCLUSION

2.4.1 Escalation of complexity regarding artifacts

The three types of learning benchmarked above share common value to some extent while differing in some other aspects. All of them should not solitarily hold account for educating an individual because education takes places with or without guidance, and sometimes is autodidactic.
The formative effect of education should not be judged merely by one’s formal education, yet the design of pedagogy sure has unneglectable influence over the learner.

All of them encourage hands-on practices that facilitate interaction between learner and learning subjects. Because skills, thinking models and construction of artifact are kinds of tacit knowledge cannot be articulated clearly through verbal.

Utilization of one model does not argue against the application of another. Sometimes it works better having one collaborate with the other in the case of designer education, which solely depends on the expectation of educational purposes.

Vocational conditioning bests at maturating competence. Vocation candidates are less flexible when it terms with the developing of a profession, which can be explained using workmanship of certain.

Studio learning features more educational value than vocational education in the light of discourse on the nature of the subject that provides the learner with deeper insight, also known as the aesthetic view of things, which facilitate a change of perspective. It also helps to defamiliarize predominant beliefs, assumptions, or practices which open up new lines of thought and discussion. (Styhre & Eriksson, 2008)

Project based learning in the design studio is a process of both inquiry-based learning and abductive reasoning that establishes practical theory accounting for the phenomena related to the ill-defined problem. In another words, the process itself is a development of knowledge based on learner’s experience through the course. It is also regarded as accommodation and assimilation in constructivist learning theory.
2.4.2 Debasing of vocational education

Long before there is a profession called an industrial designer, designer’s functions such as devising and creating utilities were carried out by the means of old crafts methods. In which case, craftsman frequently knew the people who would eventually use what he made and, if he did not, he at least had a clear conception of their lives and tastes. He also had complete control over the production of what he ‘designed’ and often made it entirely with his own hands. The profession was needed when the industries were highly specialized and automated to the point where the craft methods were sufficiently broken up, and the necessity for somebody to carry on the creative and formative aspect of the craftsman’s work rose. (Baynes, 1967)

Most industrial designers transferred from proximate disciplines like art and crafts before a specialized education for the industrial designer was established. It seemed not all art & design training made a smooth transition. As (Doren, 1940) mentioned in his book Industrial Design: A Practical Guide that people educated with a generalist approach turned out having a better transition to the role of an industrial designer than those who received a rather specialist training because the nature of industrial design seemed multifaceted.

The curriculum of training has been substantially complicated through the years. Some university in the US followed the generalist strategy that originated from the “Ulm Model,” while some built its own concept of industrial design education on the minimums and on the particular school’s idea as to what the industrial design graduate’s capabilities should be. (Pulos, 1988) As it was specified, those schools philosophically closer to the immediate market for graduates tended to train students to meet the day-by-day needs of that market; others schools tended to see themselves as educating their students for a loftier position, often one once removed from the immediate needs of the employment market. (Pulos, 1988)
Few innovations happened through these years besides the introduction of new design philosophies, ideologies and software applications addressed by courses.

It seems that the current industrial design curriculums could be categorized into two types: One focus the design of curriculum on the role of industrial designer, meaning educate to be an industrial designer; The other emphasizes on definition and acquisition of industrial design knowledge. Both of which depersonalized the learners regarding their respective aspiration that bounds closely to their life experiences under the assertion that learning of industrial design dedicated merely to either the established industry or the body of design knowledge itself.
3 PRACTICE OF CURIOSITY IN THE LEARNING OF INDUSTRIAL DESIGN

The curiosity initiative strives to establish a pedagogic strategy that bridges the subject matters of industrial design learning with the personal aspiration that is, social, environmentally conscious. The strategy utilizes an inquiry centric learning style initiated by intellectual curiosity while imposing deep-diving experience through a project-based learning curriculum, which is designed to facilitate interaction between the learner and design thinking with the incremental sophistication of a project setting.

Instead of aiming at the education or training of industrial design, the curiosity initiative endeavors to enable a learner, prospect designers, to respond to constantly changing social, economic and technological needs. in the persue of design translation of authentic opinion regarding welfare at mass acceptance.
The curiosity initiative is a bi-rail scheme consists of a philosophy which directs the growth of design, and a practical pedagogy regarding how the philosophy terms with the nurturing of an industrial designer.

3.1 PHILOSOPHY OF DESIGN ENABLING

![Influence circle of design](image)

**Influence circle of design**
Philosophy of design empowerment through practice of curiosity

Figure 2 Influence circle of design
3.1.1 Design influence

Dino Karabeg convinced that design is a cultural paradigm, alternative to the tradition which is no longer functional, also a principle according to which most other things in a culture can be recreated. (Karabeg, n.d.) His convention suggests the alternating nature of design activity resembling the intended definition of Design Impact in this proposal.

“...Design...At the highest level, is a reflection of the idea that the knowledge built up by science can, through technology, give man control over his surrounding and the power to shape more fully his own destiny.” (Baynes, 1967)

Design influence is therefore defined as the potential alternation to tradition an individual can make through the activity of design, which normally features the fabrication utilizing multiple types of artifacts. As Figure 1 shows, the potential is composited by the synergy of the heart, the head and the hand\(^2\) of a designer. It is acknowledged as the indication of one’s design ability in the curiosity initiative.

As it is indicated in Figure 1, the expansion of perimeter, which represents emboldening of design influence, happens when the three faculties self-empowered. Moreover, none of these faculty grows alone as they being bonded by the inter-connected mechanism of formal and tacit knowledge. Moreover, as the arrow on perimeter indicates, a designer’s ability to make design influence gains only through iterations that involves all three faculties.

\(^2\) See chapter 3.1.2
3.1.2 The heart, the head, and the hand

Christoph Frayling accredited John Ruskin’s statement, which advocated the education of a young artist should always be a matter of the head and heart and hand going together, the origin of the head, hand and heart idea in the education of artist in his book *on the craftsmanship*. Frayling then reiterated the notion from Bauhaus that: “… *Thoroughly perfect art is that which proceeds from the heart, which involves all the noble emotions, associates these with head, yet as inferior to the heart; and the hand, yet as inferior to the heart and head; and thus brings out the whole man.*” Moreover, he envisioned the new Bauhaus to be an ‘association’ of the head, the heart and the hand, which can create the sort of knowledge modern society and the modern economy so desperately need and what’s more so desperately want. It is the role of the new Bauhaus to be a crucible for that sort of knowledge, and to reflect on its implications. In summary, a convergence between the head, the heart, and the hand. (Frayling, 2011)

The hand, head, and heart regarded in this thesis are inspired from the above statement yet further defined regarding their function within the curiosity initiative.

The head: Logic. As the source of intelligence yet the storage of formal knowledge. An index connecting across disciplines by a solution centric approach. The logic machine analyses facts to particles which passes to the hand with maximum artefactual resources.

The hand: Spontaneity. The materializing process and discourse of an idea. Expressional skills, as speaking, writing, drawing, making that any artist might profess at. Practical inquiry to the head. The bearer of tacit knowledge

The Heart: Compassion. Proximity to the engagement, immersion, and obligation of one’s surroundings. The obligation to take initiative with modesty sensitivity to phenomena and dedication to responsibly bring out the most wanted.
3.1.3 Curiosity: driver, enabler, and motivator

Inquiry-based learning starts by posting questions based on individual’s curiosity about immediately needed information as a reflection to experiencing the event. The concept of curiosity in this scenario describes one's desire and commitment to figuring out the unknown subject. As the process being self-initiated, purely based on the personal and social experience of authentic sense making.

Curiosity in the proposed theory relates to the impetus generated by the heart in response to the scenario, mission or goal spontaneously imposed by the initiator him/herself. The impetuses, then, stimulate learner by demanding overwhelming capability under facilitation from mentors. Which as a result causes the empowering of both the hand and head.

3.2 PEDAGOGY AND STRUCTURE

Design education owes much to the experience of studio learning and project-based learning, which takes a constructionism pedagogic style, while lacking a surgical strategy that fosters the growth of design intelligence that organizes, and reconstructs the designer scheme.

3.2.1 Overall approach

Jean Piaget believed that knowledge is acquired as the result of a life-long constructive process in which we try to organize, structure. Moreover,
restructure our experiences in light of existing schemes of thought, and thereby gradually modify and expand these schemes. (Bodner, 1986)

Figure 3 Building of industrial design influence

In above diagram (see Figure 2), Design Intelligence specialized in Industrial Design is acknowledged as the ability to manipulate Design Artifacts in resolving ill-defined problems, normally a practical one, for the massive population through the form of product, system, service and experience. (Design, 2015)

3.2.2 Principles of project design in industrial design curriculum

Logic has interests in abstract forms. Science investigates extant forms.

Design initiates novel forms. (March, 1976)
The following definitions are introduced to support articulation of the industrial design project design strategy illustrated in Figure 3. Each form represents the centric focus in exercise by means of artifacts creating.

**Aesthetic Novel Form** is created by composition of visual elements. In the case of Industrial Design, it mainly refers to the physical form materialized by technology. It is the physical vehicle that bears functionality. Exercise in such composition should mainly focus the emotive impact to visceral reflection.

**Abstract Functional Novel Form** is formulated by converging knowledge acquired by any means. It articulates the functionality whilst not fully constrained by feasibility. It normally exists in the form of information such as insight, objective, brief, plan, scheme, theory, strategy or even just a thought.

**Cognitive Novel Form** concerns culture, message and especially self-image as it interacts with one’s cognition. It challenges a complex of one’s experience, knowledge, sense and thought when the form is strange. Sense of appropriateness is the ultimate justification of such forms. To create such form, comprehensive circumstances has to be concerned, which exceed the totality of Aesthetic Novel Form and Functional Novel Form.

### 3.3 TERMINOLOGIES AND PROCESS OF DEFINING

#### 3.3.1 Faces of emotional design

Art & Design professions share prominence on creating sensory or reflective experience of the human. Also, thanks to the prevailing of Bauhaus model, Art and Design programs respectively...
exploit mediums that are historically proven to be sensible to a human being. From the audience perspective, any artifact created by these means has to be responded with processing systems of human faculty, which is the visceral system, behavioral system, and reflective system (Norman, 2004).

<table>
<thead>
<tr>
<th>Visceral</th>
<th>Behavioral</th>
<th>Reflective</th>
</tr>
</thead>
</table>

Figure 4 Three system of emotional design (Norman, 2004)

**The Visceral Level** is pre-consciousness, pre-thought. This is where appearance matters and first impressions are formed. Visceral Design is about the initial impact of a product, about its appearance, touch, and feel.

**The Behavioral Level** is about use, about experience with a product. But experience itself has many facets: function, performance, and usability.

**The Reflective Level** is where consciousness and the highest levels of feeling, emotions, and cognition reside. It is only here that the full impact of both thought and emotions are experienced. At the lower visceral and behavioral levels, there is only affect, but without interpretation or consciousness. Interpretation, understanding, and reasoning come from the reflective level.
3.3.1.1 Redefining design elements

"Our goal is the training of a designer so familiar with the principles of abstraction that he automatically thinks of a visual problem regarding organized relationships and feels free to study other aspects of the problem or to confer with specialists in related fields."

"...educate artists and designers by sensitizing their eyes and developing their powers of visual discrimination"...


Stimulus arouses by an artifact provoke the emotion at different level respectively. Various composited artifacts result in different emotions, which consist all three levels at different extents. The pattern of response between elements and reflective level are proposed as follow.

<table>
<thead>
<tr>
<th>Aesthetic</th>
<th>Technology</th>
<th>Utility</th>
<th>Empathy</th>
<th>Information</th>
<th>Emotion</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visceral</td>
<td>Behavioral</td>
<td>Reflective</td>
<td></td>
<td></td>
<td></td>
<td>Dimensional</td>
</tr>
</tbody>
</table>

*Figure 5 Design elements and its responding systems*

For instances, Architect seems to attack the visceral level more often. Industrial Design influences its user at behavioral level as well as visceral level because the utility artifact is rather emphasized; Communication Design talks to reflective level frequently due to the needs of being interpreted and understood; Entertainment Design has the most necessity to communicate at a reflective level as Story Telling being centric to its product.

By comparing mediums and tools exploited by different creative professions, following design elements are identified. Application of design elements is listed in Figure 3.

Form, Technology, Utility, Empathy, Information, Emotion, Time Communication
Figure 6 Design elements utilized by creative professions

Aesthetics: Known as the philosophy of art and beauty, includes material artifacts that compose the experiential and materiality of the object.

Most creative professions excel in the manipulation of aesthetic elements besides the fact that utilized artifacts are not necessarily the same from one to another. Industrial Designers play with actual aesthetic materialized by modern manufacturing technology, which resembles the artifacts that architecture and fashion interact with regarding the technological and physical constraint. Communication designers, no matter print or interaction, exploit graphic aesthetic artifacts, in which instance the visual studies make sense and the medium are usually virtual; Conceptual Artists work on similar virtual medium to communication designers (graphics artist) while their expression is relatively realism.
**Technology**: the elements that decide the possibility of form giving, serving as the means to form creation.

Aesthetic is the medium that affords functionality of an artifact. Then Technology is the decisive factor of its affordance. Even though it is arguable that which comes first, either technology created in the need of medium or invention enables the application of mediums, Technology, together with objective, normally confines a creative profession as a discipline.

In the domain of Industrial Design, Architect, Fashion, technology refers to the industrial technology as in industrial revolution. Communication design, entertainment design are more likely to be considered as the product of information revolution.

**Utility**: The extent to which an artifact pushes the physical limitation of a human being or eases the nuisance of the desired task.

Industrial Design and Mechanical design deal with this aspect more often than any other profession in physical form as an inheritance of tool-making. Communication Design concerns this factor as vision is not universally perform on every user.

Universal Design is an important term in the definition of utility as a design element in a modern setting. The transition happened from tools created to enable to artifacts designed to leverage human productivity to the pursuit of equity in human ability.

**Empathy**: A Creative process that identifies latent user needs. Normally, incorporates empathetic thinking that helps finding unarticulated needs.

Different than the ability to be empathetic, empathy, as a design element, refers to the performance of which artifacts is proven to be compassionate and plausibly novel regarding the
perception of the ultimate user. It can also be regarded as designer’s sensibility to mental model\(^3\). It is the main element differs a design activity from artistic expression.

**Information:** The content/message being conveyed through the form of the artifact, which requires processing of personal remembrance and consciousness.

In Industrial Design, the utilitarian information includes signifier and messaging combines both logical and expressive meaning (Mothersill & Mothersill, 2014). Fashion design concerns more about the visual messaging of appearance; Communication design help user accessing architected content information; Animation and entertainment excel in the story telling with form, which falls in the category of narrative information.

**Emotion:** The resonance that an artifact evokes from personal experience, which results in recurring positive reminiscence, perspective changing, and character building.

**Time:** The elements that decide the occurrence of artifact and the fourth dimension that defines the physical ceiling of an artifact.

Industrial Design in regard to Time works on occasion. In this instance, multi-function to an Industrial Design artifact means applicability on multiple occasions. Mode and scenario are frequently introduced to explain the application of such elements. Time in Architect happen as the artifact have to deal with the shift of time and its following environmental changes, which consequently impact in the form of artifact in many aspects. Another sample of introducing

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\(^3\) Representation that a person has in his/her mind about the object he is interacting with.
continuous time element into the composition is the Transition from Graphic Design to Motion Design.

Professions differ by particular needs in its trade form, while designers discriminate by the elements frequently deployed in the creation of objects. As the goal of education being personalized and self-clarified, or called problem-oriented, design education should provide the best exercise for one to better manipulate design elements. The most critical ability, in this case, is the capability to navigate and converge design elements.
4 CONCLUSIONS

Perception of design has come through all the way from being a specialized stylist to a generalizable method of obtaining knowledge. The profession as a designer also shifts from focusing on creating products that people want to buy to truly understanding what people need. More and more people believe that design is more than a profession while design education in higher education yet discovers a new goal than prepare students for the industries. It is the time to question whether the objective of the design institutes to provide human resources following the prescription issued by the employer, or to educate people with the rationale of creation. So that they can question the assumption of modern lifestyle and change it in response to a constantly changing social, economic, and technologic trends.


Books.


