

# **Deciphering creativity: A potential transformation in art and design classrooms in Singapore.**

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## **Abstract**

### **Deciphering creativity: A potential transformation in art and design classrooms in Singapore.**

From an artistic phenomenon to humanistic ideology holding that creativity is a fundamental human attribute (Rogers, 1961), to creativity as a teachable skill (Runco, 1993), to creative personalities (Amabile, 1983; Craft, 2001; Cropley, 1992; Dellas & Gaier, 1970; Sternberg & Lubart, 1995), creativity is arguably a fluid concept that has manifested itself in a variety of ways. By casting creativity as a catalyst to communicate ideas for an intended message, the author wishes to demystify the concept of creativity into a catalyst for purposive communications. Critical to the communication process are considerations for the content of the message, recipients of the message, execution and delivery formats, and the context in which it serves: economic, political, cultural, environmental, and societal realms. Without considering them, there is no defined focus to effectively deliver the message. Whether creativity is a personal attribute, cognitive skill, motivational environment or social factors, the paper serves as a traversing guideline to facilitate creativity in undergraduate classrooms.

## **Introduction**

With the Singapore government's push to promote the art and design industries, there has been a growing interest in cultivating creativity in classrooms. The transition from a manufacturing into a knowledge-based economy has been one of the pivotal initiatives to keep the island state competitive. As a graphic communication lecturer in a major public university in Singapore, the author's approach is not to teach creativity as a subject but as a catalyst for communication, an intermediary between human experience and visual expressions.

Graphic communication is different from other forms of applied art because the field combines artistic creativity and commercial viability. A distinctive way of looking at and thinking about the field is that it is first and foremost, a form of communication. Although an individual can be creative in isolation but in the field of communication, a message, product, or service is intended for a specific audience. It has a purpose primarily because of the audience to which it is trying to influence. This places the field in economic, political, cultural, environmental, and societal realms. Cognitive flexibility, motivation, or an unusual and inspiring experience may occur all the time but the different realms become powerful determining factors in accepting or rejecting what kind of novelty gets produced.

Nonetheless, by understanding the underlying structures of creativity, this paper examines different literature reviews to provide ideas that allow for creativity to take place under varying complex conditions in classrooms.

## **What is creativity?**

For some, creativity is a big word, which packs a lot of punch with it. A dreamy word it may sound, it often fills students with trepidation. People expect miracles and originality. When we speak of creativity, we often imply the ability to conceive something new, original, or different. According to Brand (2001), creativity rarely involves totally new or original ideas; instead most creative work is an effective integration of existing information. This shows that artisans build their ideas on past accomplishments and creativity is rare, if not incremental.

Creativity can be an ability, knowledge, or a set of skills in solving problems and its effects are revolutionary as well as evolutionary, holistic as well as specialized. Cropley (1992) suggested that combinations of knowledge, accurate observation, good memory and logical thinking (usually regarded as aspects of intelligence), inventiveness, unusual associations, fantasy (usually seen as aspects of creativity), inner drive, capacity for being enthused or turned on and flexibility (motivational properties of an individual) as traits necessary for identifying creativity. Yet there is no one-rule standard that applies to all because every student is different and these differences can be caused by cognitive factors, personality, environmental, and social influences (Glover et al., 1989). The beauty of creation lies within the benchmark of these intervening factors which constantly pushes the boundary for challenging old ideas.

Nonetheless, as cultures evolve, it becomes increasingly difficult to master one or more domains of knowledge. If specialization is favored over generalized knowledge as Csikszentmihalyi (1996) argued, we need new and creative ways to confront our problems. Finding solutions requires more than just a good amount of attention and efforts. According to him, creativity is “an act, idea, or product that changes an existing

domain or that transforms an existing domain into a new one” (Csikszentmihalyi 1996, p. 28). He added that creativity is influenced by three components: i) domain, which consists of a set of symbolic rules and procedures with its internal logics which exposes the individual in order to be creative; ii) field, which includes all the individuals who act as monitors may validate or repudiate a new idea or product; and iii) the individual person who has a new idea or sees a new pattern. To him, one’s ability to create is the result of an interaction among person, product and environment.

In forming a model of creativity, Rothenberg (as cited in Couger, 1995) categorized creativity into three factors: (a) creative person, (b) creative process, and (c) creative products. Realizing that the person-process-product model is incomplete because it fails to address environmental factors and their effects on creativity, Mel Rhodes added the fourth component, *press*, which refers to the relationship between human beings and their environments. According to Couger (1995), *press* is a term derived from the field of education that “refers to the relationship between human beings and their environment” (p. 3). With the new component, the Four-Ps Model of Creativity is born: person, process, product and press.

Lindstrom (2006) suggested that creativity in students can be drawn out through the use of models. For her, creativity can be fostered through the integration of production with perception and reflection. This suggests the importance of having peer learning, critique, as well as ample access to resources. When such opportunities are available, students are able to observe, reflect, learn and when necessary, borrow so as to solve the problem at hand.

The emotional and intuitive appeal of a new idea, concept, or product can make it “creative” in a philosophic or artistic sense but in order for one to be considered creative, several traits are observed. According to studies conducted by Amabile (1983), Dellas and Gaier (1970), Motamedi (1982), Runco (1989), Treffinger, Isaksen, and Firestein (1983), Sternberg and Lubart (1995), creativity does seem to be related to certain personality characteristics. Creative people generally display the following personal characteristics: intelligent, capable of sustaining hard work, seek changes and adventure, impulsive, non-conformity, and sometimes undisciplined, although they are perfectly capable of highly disciplined behavior when they pursue a goal. Although these traits may show rebelliousness, arrogance, and self-centeredness, creative students may be considered difficult to handle in the classroom but they also readily accept new ideas, challenge rules and authorities on occasion, prefer loose and flexible planning, and may be withdrawn or talkative. If effort, persistence, and motivation are necessary for maintaining creativity as Cropley (1992) opined, then it makes sense to think of creativity as a form of mental exercise that is a direct result from a collection of extensive, diverse knowledge base rather from eccentric or serendipitous natures.

Several researchers concluded that creative products need to have a close relationship to reality (Bruner, 1962; Motamedi, 1982; Sappington & Farrar, 1982). An easy solution is to design something that is obvious or is easily available. After all, a direct solution means that it requires no guessing work. In evaluating a design, Oldach (1995) recommended striking a balance between realism and creativity. By being realistic, one can refrain from producing the most bizarre and inconceivable ideas and by being creative, the designer can push the envelope, take risk, and freshly competitive in

approach. By overemphasizing either aspect, the designer shall either lose sight of the main objective or risk an unacceptable innovation. Following this frame of thought, a creative innovation has to have an utilitarian purpose in order to function within an environment such as the market-driven framework that validates it. In the name of practicality, efficiency, and productivity in a market-driven context, creativity can best be thought of in terms of accomplishments and productions.

Communicating a design that embodies our total experience through design requires a creative imagination for it allows us to express ourselves by allowing thoughts and actions to occur in a more holistic manner. While exposure and experience allow us to relate to a design, a broader understanding of experience covers our apprehensions of feelings and emotions, beliefs, and attitudes. Our minds are affected by prejudice, etiquette, politics, judgments, and criticisms. An offensive or disturbing idea is not necessarily a bad idea since one of the many objectives of a design is to solicit a reaction from its audience. Approval implies that design ideas are determined by the judgments of others. This form of validation is highly dependent upon acceptance within an acceptable construct. This leads to creativity as an interaction due to the fact that much of the impact of the message depends on the content (what are the things combined to produce a message?); composition (what is the physical make-up and skill sets needed to give form to the message?); and context (what is the purpose?; and why is it done the way it is done?).

This is necessary because while a creative individual can flourish in different periods, being creative is more than a personal insight as it is also co-created by domains. When creativity is combined with knowledge, technical capacity, and experience,

designers and artists can stimulate and support free play, manipulation of objects, and ideas to produce tangible products that display ingenuity in creativity.

### **Creativity as a catalyst to communicate ideas**

The process of creating is complex with many factors influencing its success or failure. Creative ideas can emerge from the process of giving meaning and making interpretation. If creativity is designated as a catalyst for purposive communications, several questions must be posed. Who are the customers? For whom the design is for? What is the problem that it tries to address? When is it due? Is there a prior solution and if there is, how did it fail? How much is the budget? Such questions suggest that solution produced must be clearly understood, self-explanatory, unambiguous and precise in the search for the answers.

The first task is to realize that creativity involves shifting our perspective which requires us to depart from facts, find new ways in making unusual connections, and to challenge the status quo. Sometimes, by stepping outside of the box, we can then begin to envision solutions. It allows our thoughts to roam freely without any constraints imposed by ritualistic, conventional or other traditionally known impositions. Some aspects of social problems involving human behavior are likely to go beyond the rules and require human judgment. For example, when we speak of the “artistic preference” we tacitly admit that this refers to a subjective commodity, very much in the beholder’s eye. Style preference is highly a matter of subjective choice—what one finds aesthetical pleasing and effective may be deemed tasteless and ineffective but what is important in communicating a visual idea is that it expresses the designer’s ideas or the sender’s



message. Sometimes the best ideas will emerge from one's mind making unexpected connections.

Innate abilities and randomness aside, creativity also involves a thorough knowledge of one's field; a talent which involves combinations of sensory, motor, and intellectual capacities, expenditure of great effort in reaching the end product and finally the element of opportunity (Cropley, 1992). The emphasis on end results is prevalent in Singapore especially in her educational system where only final results matter, for example, the PSLE, "O" and "A" levels. In her research, Mello (2002) discovered that another important factor in producing the end product is to develop the intangible portion of a product such as those that involve partnerships and relationships, in addition to the core product itself. Due to these nuances, it is important for educators to identify traits that are associated with creativity such as willingness to take risks, innovativeness, boldness, flexibility as well as valuing different behavioral and personal traits in students. It is not an easy task because universally educators prefer their students who are "courteous and considerate of others, punctual, energetic and industrious, popular with their peers, well rounded, receptive to other people's ideas, and obedient" (Cropley, 1992, p. 19).

For creativity to flourish there must be encouragement and stimulation of imaginative and unconventional environment. This is particularly true in problem-solving activities where one explores uninhibited ideas and concepts, exercises capability to reconsider and explore ideas in direct contradiction to accepted facts. According to Sawahata (1999), creative designers respond to new stimulus, introduce the elements of surprise, and solve specific problem to reach targeted goals. They enthusiastically grow

and gain energy as the process moves them forward. Sternberg (1998) presented a similar model. They agree that traits such as the ability to adapt to special circumstances, recognize opportunities, find order in chaos, bridge broad categories, cope with new information, recognize possibilities and cross boundaries are traits of a creative person.

On the educational forefront, identifying and facilitating creativity lies in the hands of parents, administrators and educators. Our school curriculum is still practicing what Cropley (1992) defined as “closed content” (p. 20). What students learn are specified by other people as programs, lesson plans, exercises, projects, and the like that are written in advance. It seems that excessive dependence on external sources of evaluation and excessive conformity to conventions may be deemed anti-creative. In Chan’s interviews with educators and key industry creative professionals in Singapore, he learned that the educational system in Singapore has produced individuals who are linear in thinking. The industry itself has to take some blames as clients are not receptive to “unconventional” ideas (Chan, 2006, p. 68). In overcoming linear thinking, Lindstrom (2006) suggested that teachers provide ample opportunity for research, experimentation and revision and assignments should extend over a significant period of time so that students can investigate and reflect. It is important to show appreciation and approval when a student is adventurous and willing to take risks, even if the outcome is not always the intended one.

Dineen, Samuel & Livesey (2005) placed theories to the test in art and design classroom environments where they highlighted the importance of task, content and outcomes, instead of the project itself. Winner (1989) echoed the same sentiment by emphasizing that besides the end product, it is the process of performing and executing

that matters. She further elaborated that “the process of thinking, problem solving, or problem finding should be emphasized in schools.

### **Skills as a creativity catalyst**

Designers, painters, sculptors, poets, writers, musicians, and other artisan in the creative field would argue that creativity involves skills or abilities (Brand, 2001). They see it as a medium for enhancing the environment, communication and self-expression, or as a way of understanding and coping with unknown areas. If one’s ability to express is governed by factorial and contextualized concerns, then the key to creating a truly, focused and appropriate idea is not singularly dependent on creativity alone. Innovative and effective work may result from controlling every step of the creative process because every internal and external domain can determine the outcome of the solution.

According to Lawson and Ming Loke (1997), designers typically develop an understanding of both the problem and the solution together. In the earliest stages of design, a designer must address several fundamental questions. These questions arise whether the design is for buildings, clothing, toys, furniture, annual reports, or bridges. Graphic communicators establish a balance of presenting visual and technical information by using various media and technical know-how to develop visual ideas. A designer is able to create many objects, interior spaces, exterior structures and visual messages by arranging and manipulating the component in elements, characteristics, and interactions.

According to Bowers (1999), categorically, all visual form is comprised of three basic components: elements, characteristics, and interactions (see figure 1). The elements

are comprised of dots, lines, planes and volumes with differing characteristics of size, shape, texture and color. Elements and characteristics influence each other as they interact in position, direction, and space. If elements in design can be understood as visual ingredients where dots, lines, planes, volumes, with different characteristics in size, shape, texture, and color, interacting in different positions, directions, and space, “content” is basically what and how things are put together (See figure 1).

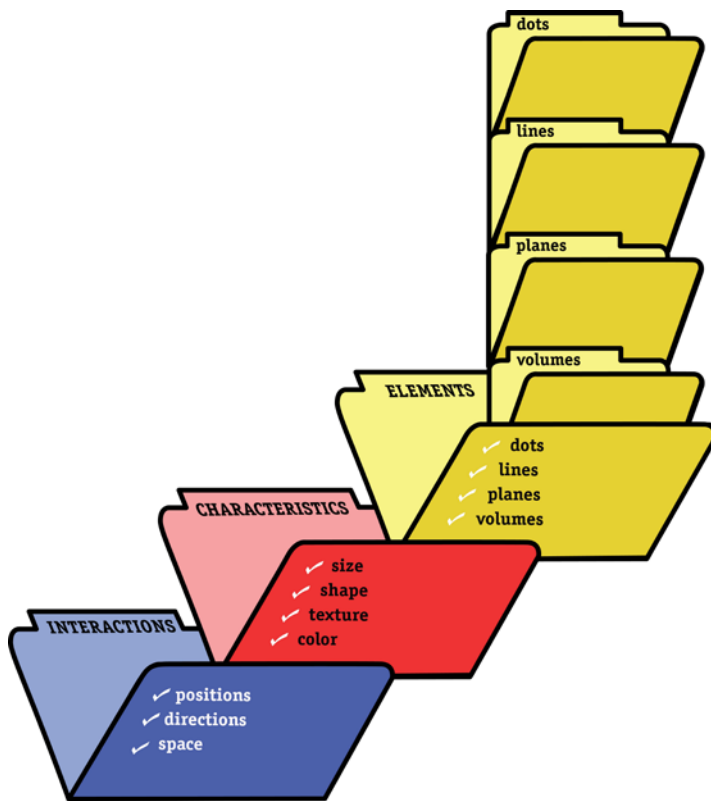


Figure 1. Bower's model for visual form.



Figure 2. In a 4" x 6" postcard assignment, this student shows that shapes repetitively positioned can create various patterns. The illusion of depth, dimension, movement and direction are suggested by varying the size and location of the shape.

As our society becomes more visual-oriented, imagery has become a powerful communication tool. However, the relationship between images and written words still exists. Mark Oldach (1995) agrees when he writes “the words within a creative communications solution are perfectly married to the image... In some cases the words lead the creative solution. In other cases, the images lead the message. Sometimes words and images are equal partners.” (Oldach, 1995, p. 63). Words are used to verbalize our experience and the visual portion compliments the verbal message. In television and motion pictures, verbal and visual images are used in various sight, sound and motion-based platforms to gain our attention. In the absence of pictures, words are used to conjure up images. Images generated by verbal suggestions seem to carry with

them more cross-sensory details than visual messages. This is evident in the aural medium of radio that strongly relies on the power of visual suggestions, where advertisers build commercials around interesting sound effects and voice-overs.

### **Metaphor as creativity catalyst**

Our mind is a dynamic muscle that is capable of incorporating new experiences. According to Simons (2001), we learn and communicate ideas by using metaphors, analogies, and similes. Through different media, we have sensorially interacted with different forms that represent “literal,” “abstract,” and “symbolic” concepts (Bowers, 1999, p. 34). In presenting an object or idea in a literal way without ornamentation and exaggeration, the audience can understand the form in a simplistic manner. In an abstract representation, where “deliberate simplification [and] often with exaggeration” are utilized, difficult concepts or ideas can be depicted (Ibid, p. 34). A symbolic representation calls for the usage of symbols in translating complex technical information and highly abstract concepts. Lawson and Ming Loke (1997) argued that the way the human mind understands concepts is through physical interactions and experiences with the external world accumulated over time. Brand (2001) added that creativity needs an audience to appreciate and validate its usefulness. Ideas that are far too ahead of their time are often ignored or even criticized. To overcome this, Brand (2001) suggested using metaphors and analogies during the creative process to facilitate in integrating abstract ideas into understandable and existing knowledge structures.

Metaphors are helpful in communicating the most basic concept to complex technical systems. We can draw pictures, create analogies, construct metaphors, or tell

stories and then share them. They help our brains in making connections with new and unfamiliar information with concepts, patterns, or ideas that we already recognize. Deep and abstract concepts which cannot be understood through physical interactions and experiences are made clear through the use of one or more metaphors (See figure 3).



Figure 3: In this assignment, without relying on words to create meaning, the student rendered the silhouette of a man's bust and placed the image of a construction worker to metaphorically depict the spring-cleaning of one's cluttered mind.

### **Intuition as creativity catalyst**

In today's market-driven realities, abstract concepts need to be describable and translatable into something tangible. Creativity in design requires a process and this

process involves discussions and interactions in various forms, visuals, verbal, nonverbal, concrete or even intuition-based. Naturally, one will be productive if his other knowledge is relevant in the subject matter but since a proposed design may not always stimulate perception and imagination to an equal degree, the challenge becomes making designs that appeal to the senses and to the imagination of viewers or readers. Hence, intuition can be used to turn a conceptual thought or an idea into a tangible piece of creative communication. Defining intuition as a process is difficult but in our subconscious, unconscious, or preconscious levels, we are preoccupied with causal relationship between understanding and analysis (Papanek, 1984). This is because as human beings, we are constantly looking for ways to understand ourselves and the environment which we live in.

Students could be driven by fad and techniques, but “design is the conscious and intuitive effort to impose meaningful order” wrote Papanek (1984, p. 4). Being conscious requires one to be intellectual, cerebral, research-oriented and analytical while the intuitive part is the sensing and feeling part that we all have. Working on a subconscious level, intuition plays a big part in the development of an idea into a finished product. A designer should not be afraid to follow intuition since it is composed of our experience and knowledge.

### **Clarity as creativity catalyst**

Creativity, in its imaginative and expressive forms, cannot be found in the style or techniques employed. Rather, it is found in the combinations of how effectively the problem is solved and the objectives are achieved. Although Oldach (1995) stressed that



passion will drive one to search for the perfect solution to a problem, graphic communication is a form of applied art that is highly influenced by internal and external factors. Inner drives are important because if we mindlessly treat every design project as another task and commodity, we relegate our minds to the perfunctory and sedentary job of a factory worker whose creativity is never an issue on an assembly line. However, there is no objective criterion to measure the results other than the fact that it has to meet the requirements to be produced. Therefore, creative vantage point develops from a clear comprehension of what needs to be communicated. The clearer the message, the more effective the results would be.

While it is possible to explore many options as we visualize, focusing on the objective is important to give the campaign a sense of direction. By focusing on crafting of the message, graphic communication becomes a vehicle for communication in which aesthetical considerations are secondary and personal expressions are last, if any, to be considered. Without considering them, there is no defined focus to effectively deliver the message.

When making a conscious design decision, the purpose or why it is done the way it is done must be answered. Ambiguity and expansiveness in design possibilities can be made clear if we follow a path that provides insights into the function and purpose of a campaign. Such parameters are not limiting, but liberating because the students are aware of what is expected. Within this limitation, they are encouraged to expand with some set parameters that consciously guide their every decision. Because graphic communication is a blend of functions and objectives, the contextual considerations become a decisive factor in determining the outcome of a design. The client that

commissioned the work is a component of the context for which the designer happened to be participating. Design ability, business acumen, ethics, the ability to communicate effectively and deliverance were tested.

### **Exploration as creativity catalyst**

Formation of ideas generally manifest in our minds. When designing, there is always more than one solution to a problem and exploration is the key. This is because exploring alternatives often lead to more ways of generating ideas and solutions. One way of encouraging creativity is to assert that every idea is a possible solution, no matter how silly or impossible they may seem especially during the process of ideation. This is also when creativity comes into play when visual representations that support and enhance the design are employed. A simple exercise for spurring creativity, according to Simons (2001) is to reject the first three things that first came to our mind. That is not to say that first few ideas are bad but he encourages us to push our selves to take the extra step in coming up with ideas that may even surprise ourselves.

In exploring ideas with sketches which involve the act of composing with a combination of text and images, composition in and of itself refers to an arrangement of components, parts, or elements to reach a solution. In applying Bowers' model to composing (Bowers, 1992, p. 33), it is a three-way causal effect between i) visual elements [dots, lines, planes, and volumes]; ii) characteristics [size, shape, texture, and color]; and iii) interactions [positions, directions, space] (See figure 1). They are interdependent to provide a deterministic understanding for effective communicational strategies. However, the measure of one's ability to present his/her idea relies on a

continual process of assessment, refinement, elimination, selection, and production. (See figure 4). Every interdependent step provides a deterministic understanding where visual skillfulness and technical proficiency are combined for effective communicational strategies.



Figure 4: There is always more than one solution to a problem and exploration is the key. In sketching, students quickly capture their thoughts in pure and raw forms. Because it can be perceived in different ways, sketching can be reinterpreted and this creates many opportunities for explorations.

### **The environment as creativity catalyst**

Dineen, Samuel & Livesey (2005) highlighted the need for a “supportive, student-centered environment” for creativity to be developed. Within a semester, it is always a challenge to make the most out of our design-related modules as projects are lined up one after the other. As a result, students do not get the luxury of time to experiment with ideas. Chan agrees and reports that students do not have sufficient time to develop their

craft as well as discovering their creativity. Moreover, the emphasis has always been on craft skills, execution and not enough of ideas. He also suggested that development of ideas should come first while one waits to attain skills necessary because technical skills are rapidly changing. This is true especially when universities are not capable of providing all students with practical skills they need for the rest of their lives because which vocationally relevant skills needed for the future may not be known at present. However, Winner (1989) argued that technique and creativity should not be viewed as a dichotomy. To illustrate her point, she asked her students to invent solutions to a perspective exercise by drawing two figures, one near and the other far away. In this way, technical skills and creativity are developed at the same time.

This is in contrast to the situation in Singapore where “students are spoon fed the correct answers” (Chan, 2006). Without a favorable and advantageous circumstance, it is difficult to be creatively productive. Creating such an environment is by no means easy. Students being students are too preoccupied in trying to score high grades and some are too quick to resort to tried-and-true methods. They are not willing to take the extra steps to take the risk. Even if they are willing but are not adept in visualizing their ideas, the fear of making mistakes is palpable in the classroom, especially for those who find it hard to cope with minimal instructions given. Guidelines may be necessary but not instructions, as I find the latter counterproductive in a creative environment.

In order to assist this, learning activities must be supported in an environment free of outcome-based thinking. I strive to place less emphasis on results, give more time and encouragement towards the creative process, focus on the process of conceptualization, and provide models of creative works for students to emulate. By not putting the end

first, students can freely reflect and explore in a playful environment of ideas (See figure 5 & 6). The importance of risk-taking is emphasized and students are rewarded for making discoveries through mistakes in projects that explore creative, conceptual elements as well as principles of the design process.



Figure 5: The element of play and risk taking are apparent in this student's assignment where she suggested unlikely events by using beloved icons of Singapore such as the Merlion statue.



Figure 6: In this rendering, the student playfully suggested a tornado which brought down an A380 Singapore Airline plane at the renowned Changi Airport in Singapore.

### **Realism as creativity catalyst**

In the discipline of graphic communication, solutions to design problems involve collective efforts and interactions in many areas but the practice and process of design is oriented to reality within client acceptance which explains why the field corresponds to market demand. In this collaborative effort, a graphic communicator is not just a producer of a body of works and ideas but also one that expresses their place in the marketplace.

Each problem requires a unique solution and every solution requires an original approach in dealing with a multitude of factors that may work for or against it. This in itself requires ingenuity. The possibilities are endless with the notion of creativity but for every functional path a student takes, the solution posed has to be accepted not just by the student, it must also be approved and realistically producible. After all, from the

designer's point of view, every internal and external factor can determine the outcome of the solution and from the clients' standpoint the solution has to be perceived in actuality as it cannot be guessed at. This means that artistic and effective problem-solving involves real risk-taking and not hypothetical risk-taking.

According to Chan (2006), in order to promote creativity, educational institutions should employ professionals from the industry who can lead by examples instead of plain teaching of theories. Differing vocational fulfillment and a broader range of personal development can prepare students to enter a real-world with a much wider range of jobs that offer challenge, income, and social status.

The methodical and exhaustive process in design is limited to available materials and resources within an organizational structure. The process is subject to change during the course of the design direction with many ongoing internal and external factors, some controllable to a certain degree and some not. Knowing these drawbacks from the start allows the students to have a higher percentage of control in the creative process. This can be achieved by defining the objectives realistically at the outset. From a well-developed objective, a list of visual categories can be developed that translates abstract ideas into tangible results that mean something to an audience. Several categories such as mandatory format, techniques, production parameters, issues affecting the audience, usage and longevity, budget and schedule are design frameworks that form the paradigm for explaining how things work and problems are solved. By considering these problems ahead of time, they also become the solutions for designers during this early stage of the design process.

## **Problem solving as creativity catalyst**

We exercise creative thinking not only to communicate, but to solve problems. Problem-solving is also definable as a heuristic which is a speculative formulation serving as a guide in the investigation or solution of a problem where one considers a wide range of alternatives with methodical processes to reach the desired and effective end result.

The credit goes to Graham Wallas and John Dewey for the conception of thinking as a problem solving activity. The connection between artistic creation and problem solving can be traced back to 1926 when Graham Wallas identified four steps in the process of problem-solving: (a) preparation, (b) incubation, (c) inspiration, and (d) verification (Couger, 1995). As such, *problem solving* is defined as the ability to analyze, identify, interpret, connect, and apply a set of visually pleasing, technologically adept, socially responsive, and intellectually effective solutions through concepts and skills to solve project-based assignments.

Hanna; et al. (2001) and Sawahata (1999) defined creativity as problem-solving using effective methods, informed by an understanding of social, cultural, historical, and technical aspects of communication to achieve a desired goal. This suggests that if ideas are better structured, central, and accessible, creative innovations are likely to happen. Although creativity itself is difficult to be structured, the procedures that facilitate creativity in the design process such as brainstorming, thumbnail sketches, research, and refinements can be managed. The basic problem-solving methodology involves speculative formulation of reasoning, techniques, tools, and adequate information to resolve issues and select the ultimate solution that leads to an explicit goal. The process



of achieving an effective solution requires an understanding of the problem and evaluation of the technical accuracy of process and materials.

By fusing personal experience and cognitive knowledge, students can transmit new discoveries into design. Efficient, methodical, precise, and organizational capacities allow us to organize information and vary functions that contribute to the whole and to collective functions in the design process. Cropley (1992) suggested that besides intellectual skills in solving problems, creative thinking requires diligent hard work, motivation, courage, a sense of recognition, and other similar factors. Often times, the solution is found only through the process of solving a problem because we have not been exposed to it yet. This reinforces the concept of discovery. Perhaps the most remarkable feature of problem solving was that problem solvers had to formulate the problem as well as propose a solution to it.

## **Conclusion**

As a catalyst for discovery with developmental and productivity tools, creativity can add values for communicating meanings in design. Arguably, creativity is a matter of viewing a problem in varying perspectives. The solutions can be random or systematic, a confluence of different ideas or a combination of the two, depending on the circumstances and scope surrounding a project. Educational systems can contribute to student development by recognizing and encouraging many ways of thinking. Fostering creativity is more likely, in the event of a classroom setting to emphasize differences as opposed to homogeneity. It is promising to think of it in terms of fulfillment of a student's aspirations and values, rather than a standardized pattern of management.

In conclusion, there are a handful ways to promote creativity in a classroom. While each option has its respective strengths and weaknesses, they may work better if a combination of the options is put into practice at the same time. The suggestions may work with varying success in Singapore and educators need to conduct more research and experimentation to find out which method is more applicable given the different contents and contexts they serve.

Whether we think of creativity as novelty, innovation, progressiveness, conceptual and technical expression, or problem-solving, creativity as whole is probably the single most important factor in determining excellence. Creativity is part of who we are and it determines what we can become, when to act, where we can go and how we can function. Through design, creativity leads to the discovery in deciphering the meaning of communication through explorations and discovery.

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