### **Research: "Formalized Curiosity" to Improve Life?**

Dr. Clara Cheng

One of our supportive parents asked me a question: "Is GT being changed from a secondary school into a research school?" This is an interesting question that other parents or stakeholders might have in mind. I would say, "GT is becoming a research school for education for the gifted and talented." Instead of answering one question, I think the question has four subsets.

# Q1: Why do we research the talented, if not exactly the gifted?

Yes, this is a short question which demands a long answer. Like all jobs, we need to provide different types of professional support for our own workplace. If GT is a school for the gifted and talented, there must be an array of students who are in great need of being better understood and supported with diverse methods of teaching and learning that can better bring out the hidden or latent potential. This is why and where we have cut in.

The level of formality and research elements all depend on the needs of the school and the types of students admitted. "Research" might be a very formal term for this kind of professional support for the students; research is just a means to investigate the problems or needs that will prevent the organisation from its long-term development or growth. Research might be termed as "formalized curiosity" that "is poking and prying with a purpose" (Hurston, 1942, p. 143). This kind of curiosity is meant for improvement, betterment, and even excellence.

Ultimately, we research in order to obtain some kind of solutions to the special needs of our students. It might be more appropriate to say that "Research is about facilitating situation improvement. It is about offering ways forward" (O'Leary, p. 3). Instead of having the right solutions or keys to a problem or situation, research is an attempt to obtain "some kind" of solution that enables "situation improvement."

I was energized and had my awakening when I came across the phrases above "some kind ... situation improvement." Without the motivator "situation improvement," teachers may not be motivated enough to do research for "some" ways to improve their classrooms or school situations.

#### Q2: Why do we need research knowledge?

To most people, research knowledge belongs to researchers in research centres or university labs. Seemingly true, but it isn't.

Teachers' workplaces are the classrooms and the school campuses and even outside the schools. Their data are the students who possess diversity and discrepancy, complexity and chemistry. Students need attention, guidance, and coaching. Students need soft and hard skills to be with. They are humans, not robots; most of them need to be tamed most of the time in most cases.

We thus need different types of research knowledge that can "facilitate problem-solving" (O'Leary, p. 4). As O'Leary puts it:

Well, unfortunately no—but research can be an instrumental part of problem resolution. Research can be a key tool in informed decision-making. It can be central in determining what we should be, what we can do, how we will do it and how well we have done it. Research may not be the answer to our problems, but it can supply some of the data necessary for us to begin to tackle challenges we all face.

#### Q3: So is GT now a research school?

The school will automatically become a research school when teachers and policy-makers endeavor to play their roles as a teacher-researcher inside and outside the classroom or school. The question is how many and how often. I would rather say, if there are a handful of teachers or administrators playing this researcher role, the culture of a research school will be established in due course. It is the becoming, not the being. Then, another key question might pop up.

Q4: Does an MI school need to be a research school?

The answer is as absolute as a YES or NO. Students with MI traits need a higher level of challenge or risk-taking and task complexity. They are also in quest of intellectual and emotional support from teachers, peers, and family (Li & Cheng, 2020 2021, & 2022). These students are also by no means "easy people" or autonomic high achievers (Callahan, 2017). Research is more a need than a fad to teachers, school-administrators, policy-makers, and even to the students.

GT, you are on the right track, and becoming a research school will create all the impacts and differences to your teaching and learning, your students and alumni, your teachers and school board, your school and your city. Your research will help nurture the future global leaders on the globe. It will prove to be a steady fix in the long run.

#### References

- Callahan, C. M., & Hertberg-Davis, H. L. (2018). Fundamentals of gifted education (2nd ed.). Routledge.
- O'Leary, Z. (2017). *The essential guide to doing your research project* (3rd ed.). Sage.
- Hurston, Z. N. (1942). Dust tracks on the road. https://www.joankoster.com/research-yoursubject-and-validate-your-writing/



#### **Beyond Collaboration**

# **Weighter Control Cont**

#### **Professor Howard Gardner**

I've written a great deal about "MI theory" including several books, as well as a personal memoir in which "MI theory" occupies the middle of that book (Part II of three parts). I'll try not to repeat

or paraphrase what I've already said and/ or written many times in many places.

Yet, at a time when I've already surpassed the years of life allotted to me in the Bible, and while I am still in reasonable cognitive and physical shape, it seems appropriate to set down a few thoughts.

#### The Good And The Bad

On the one hand, "MI theory" (and practices) have received far more attention than I could ever have anticipated.

Much done in the name of "MI" seems benevolent and perhaps helpful to various constituencies. I am especially touched—indeed thrilled—at the number of schools launched or featuring "MI ideas;" the number of educational organizations that describe and discuss multiple talents or intelligences; and the many people—not only educators but parents, children, relatives, scholars from different disciplines—who say that they have been inspired by "MI work" undertaken by my colleagues and me.

On the other hand, not all individuals and groups expressing views about "MI" seem to have read, absorbed, or reflected on the original ideas and the ways in which they were stated. Some of these applications and implications are fine or at least neutral, but others have been misguided and some injurious. I have spoken out when I could, but I quickly learned the following lesson: once an idea has become a "meme", one cannot attempt to control its fate. Recently, my colleague Annie Stachura has documented some of these misunderstandings or misapplications, soon to be published here.

#### A Middle Course

I am basically a scholar and a writer with a penchant for taking on new questions and puzzles. Left to my own devices, by the middle 1980s, I probably would



have simply closed the chapter called "MI"—just as I had finished projects from earlier years that probed structuralism, artistic development, and the breakdown of cognitive capacities under various conditions of brain

damage.

But because of the enormous interest generated, it would have been wrong simply to abandon "MI"—and so I have tried to respond when appropriate and to be helpful when possible—without letting "MI" dominate my "in" or my "out" box. Similarly, when I get correspondence (and 80% of my non-collegial inbox continues to be about "MI"), I try to respond helpfully; and when I get a worthwhile invitation, I typically pass it on to appropriate colleagues.

#### **Avoiding Monetization**

At least in theory, I could have trademarked or claimed copyright on tests and games based on "MI." As my children have occasionally quipped "Then we'd be very rich!" I was never tempted to do so and am glad that I never succumbed.

Had I done so, I would then have had to become a policeman and probably take legal actions against those who impinged on my "property." Instead, I have encouraged many individuals to use my ideas but cautioned them not to state or imply any endorsement from me of their particular approaches or products. And a few times, I have had to ask lawyers to send a "cease and desist" letter.

#### **On To The Actual Claims**

"MI theory" is based on research that is now a half century old. Suppose a younger version of myself were to embark today on the study of "the nature of human potential in the cognitive realm" – the charge given to those of us on the Van Leer Foundation "Study of Human Potential." I would have had to examine different sources of knowledge and synthesize them in appropriate ways.

One question that would immediately pop up is whether in the original work I had missed important intelligences. What of a cooking intelligence, a humor intelligence, a technological intelligence-just to mention three commonly proposed intelligences? During a sabbatical year in 1994-5 when I was able to conduct necessary research, I added naturalist intelligence to my list-raising the number of databased intelligences to eight. But life is short; and I did not have additional years to devote to any new candidate. And so, since 1995, I only have speculated about the possibility of an existential intelligence (the intelligence of big questions) and a pedagogical intelligence (the intelligence that allows us to teach individuals of different ages, knowledge bases, and motivations). While invoking these concepts, and allowing others to invoke them, I have also stressed that there is not the same carefully culled evidence for these that led to the positing of the initial seven, and then, eight intelligences.

#### A New Non-Human Intelligence And New Resources

When *Frames of Mind* was written, scientists had certainly studied neuroscience and genetics. And I drew on these disciplines. But in the early 1980s, only writers of science fiction could have anticipated how much we now know about the human genome, and as well as our knowledge of the development of, and the connections within, the human nervous system. And to this, one must now add new, non-human form of intelligence—notably artificial intelligence (AI) which makes possible things like the Large Language Learning Systems (such as ChatGPT). Needless to say, any offspring of *Frames of Mind* would have to deal with these and other new arrivals on the scientific, technological, and epistemological landscapes.



Would new concepts and new data change the basic arguments introduced in *Frames of Mind*?

In one way, of course they would. Any work of synthesis— (and I now understand synthesizing far better than I did in 1980)—needs to take into account the current state of knowledge, as well as possible new information and news sources. The literary offspring of *Frames of Mind* would be very different in 2025. But it is quite possible that the basic argument—that there exists a small number of relatively independent human intellectual capacities—might still remain.

#### The New Frontier: Synthesizing

When, some years ago, I began to write my memoir, I thought I would be focusing on "MI"—after all, that's what I am known for, that's the principal reason why my memoir might be of interest.

But the more I reflected on my own life, and my own mind, the more I realized that "MI" is not an adequate description of how my own mind works. In fact, I am a fairly conventional scholar—with a reasonable amount of linguistic and logical mathematical intelligence. My own scholarly approach draws as well as on musical and naturalist intelligences, but those are bonuses, not core, to the enterprise.

If my mind—and my approach—to scholarship is distinctive, it's because I like to examine lots of disparate information from diverse sources and put all of this information together in ways that make sense to me, and, with any luck, to others.

And so, now and for the foreseeable future, I (and if I am fortunate, a few other colleagues) will be trying to understand that frame of mind—The Synthesizing Mind—which may well actually in itself entail several of the originally posited frames of mind.

#### CLOSING THOUGHT

I am extremely grateful to all my collaborators, colleagues, and friends who have supported me over the past decades, as I have sought to preserve what may be of value in the "MI world;" to correct errors of fact and ill-advised judgments and recommendations; and to move on to other projects, each with their own promises and their own enigmas.

I'd like to thank Ellen Winner and Shinri Furuzawa for their comments on an earlier draft.

# How Talent Is Made, Not Born: ECT in a Nutshell

#### **Professor David Yun Dai**

Evolving Complexity Theory (ECT) of talent development was initially developed for practical purposes of guiding gifted and talented education as an alternative to "Gifted Child Paradigm" (Dai, 2011, 2017; Dai & Chen, 2013, 2014). It is more of a developmental systems theory rather than component or trait theory (Dai, 2019, 2020a, 2020b, 2021). As I have argued for many years, a more contextual, dynamic, developmental view of talent is a better alternative to a decontextualized, static trait view, simply because the "evolving complexity" involved in TD cannot be reduced to simple traits, or even genetics, albeit their distal contributions.

#### Long Argument of Evolving Complexity Theory (ECT)

Think of an octopus with its multiple "arms" (tentacles) reaching out to interact with its environment. Human senses and sensibilities might work just like those arms of an octopus (it is not trivial to mention that about two thirds of an octopus's neurons are located in the nerve cords of its arms!), with many aims (presumably serving different functions), each functioning as a distinct way of building its effectivity in response to certain affordances, to use the terminology of ecological psychology (Gibson, 1977). Those proverbial human tentacles constantly scan the surroundings to catch something of significance, sometimes visually pleasurable, other times intellectually exciting, still other times functionally useful (see Figure 1). ECT specifies five basic forms of human engagement, representation, cognitive modeling, resulting in some level of effectivity vis-à-vis their corresponding affordances: a) psychomotor, b) technical, c) social, d) expressive, and e) intellectual, all of which were manifested when "human modernity" was solidly established roughly fifty thousand years ago.



engagement, representation, modeling is probably social and co-

operative in nature, enabled by empathy and sympathetic understanding, significantly enhanced by the invention of language (spoken and written). Psychomotor engagement, modeling, and effectivity, probably the most ancient, can be seen in hunting and handcrafts as well as most modern sports, and can even be traced to brain anatomy (e.g., cerebellum for motor control). Technical engagement, modeling, and effectivity can be observed in tool making and innovated procedures in ancient and modern times. Apparently some symbolic representation and manipulation (e.g., some means-ends causal schemas) is involved even in chimps' insight as to how to reach a dangling banana with a wooden box in Kohler's experiment. Human effectivity in artistic expressiveness can be witnessed in cave paintings, ancient ritualistic dances, and many other instances. Fundamentals of expressiveness never change despite increasingly sophisticated forms and styles of expression. Lastly, intellectual engagement, modeling, and effectivity can be observed in early human history as myths and religions and in modern ages as natural science and disciplinary understandings of human nature and the human past. What drives intellectual engagement is a desire for deep understanding of the world, physical, social, artificial, as well as human.

Whenever we discuss talent, we should be aware of the distinction between more "natural" bio-ecological talent discussed above, and significantly nurtured talent, which takes much "enculturation." According to ECT, the complexity of talent is determined by how many forms of effectivity are involved in developing excellence in a cultural domain. A talent can be considered "simple" in the sense it only involves the execution of simple performance components. Writing a play for theater is more complex than writing a poem simply because poetry only involves crafting expressive languages and images, whereas writing a play goes beyond expressiveness to involve the construction of a web of fictional characters and relationships that logically and temporally unfold over time. Being a lawyer involves exercising social, expressive, technical, and intellectual forms of effectivity, whereas being a golfer mainly involve psychomotor and technical maneuvers.

This complexity of talent and talent development have implications for developmental timing. For example, poets appear at much younger ages than playwrights, because developmentally more components need to develop and get self-organized for creative productivity (Simonton, 1999). Regardless of complexity, all culturally created talent as we know is not innate (i.e., genetically preprogrammed) but a new machine made of old parts, that is the five ancient forms of bio-ecological effectivity that can traced all the way to our ancestry or even our neural and physical anatomy. All new inventions of talent domains, F-1 car race, video game competition, E-business, or all works of Elon Musk involve various forms of human activity in the service of crafting a more powerful way to deal with new challenges and stretch human limits to a

#### Main Drivers of Talent Development

Everything we do creates a subjective sensation that informs us of the significance of this encounter in terms of valence (i.e., positive or negative affect) and meaning (significant relationships with an object, person, or activity), which is retained in memory as such. This indicates an organismic principle: human beings function as a whole when dealing with their environments; thus, the five forms of effectivity are not modular in terms of impenetrable to central control (cf. multiple intelligences; Gardner, 1983). Here we are getting close to the heart of the matter: individuals are increasingly capable of self-direction and their behaviors become more purposive. Consequently, individual development follows a trajectory of being increasingly integrative (effectivities and personal goals more coordinated and coupled) and purposive (from playful engagement to serious work). In the meantime, the process of individual development is mediated by cultural selection through its value system, and cultural enhancement through resources and tools it provides to ensure chances of success. This indicates a cultural principle. Culture serves as a gatekeeper as well as an enabler (Dai, 2020a). The two principles (organismic and cultural) lead to two central concepts regarding the underlying regulatory forces that propel talent development: characteristic and maximal adaptation indicated in Figure 2.



#### ( social-cultural mediation) Maximal Adaptation Figure 2. A multi-layered, onion-like evolving system of TD featuring CA and MA

Characteristic adaptation (CA). As shown in Figure 2, CA indicates a developing person's tendency to seek an environment that enhances one's chance of surviving and thriving. To use a colloquial term, a variety of nichepicking behaviors reflect CA (the kind of books one is eager to read, the kind of persons one emulates, the kind of activities one is passionate about). Niche-picking behaviors may be initially spontaneous and sporadic but getting more purposive and systematic by which all five forms of effectivity are harnessed, developed, and integrated to achieve personal goals. For TD, CA is mainly indicated in three ways: (a) the ease of learning in specific contexts, and distinct representations of the world, (b) some affective-conative characteristics manifested in situ, such as selective affinity with a particular class of activities, and (c) some favorable social conditions such as opportunity structure that facilitate self-exploration, and

comparative advantages demonstrated among peer groups. The consequence of CA is the exploration and expansion of one's contextually bound Personal Action Space (skill set, personal projects, life themes, aspirations, etc.).

Maximal Adaptation (MA). Maximal adaptation implies dedicated effort and devoted strivings. The very notion of deliberate practice (Ericsson, 2006) suggests MA or maximal grip (Dai & Renzulli, 2008). As indicated in Figure 2, while CA is characterizing an individual trajectory of harnessing one's strengths and directions for effectivity, MA highlights the force of social-cultural mediation that cultivates and strengthens one's talent in the service of the common good (i.e., what is deemed as enhancing social vitality and cultural identity). Specific to talent development, MA is manifested in a variety of ways institutions (guilds, academies, universities, incubators, social networks) are established, and tools and technologies (symbol systems, equipment, training regiments) are invented, and resources (museums and libraries, field trips, science labs, makerspace) are developed to sharpen the mind and develop expertise in many valued areas of human activity. Without these social-cultural provisions, even "highly talented" individuals cannot go very far. Thus, MA is the only way of perfecting one's trade and surpassing oneself.

According to ECT, the transition from CA to MA involves several psychosocial conditions and milestone

achievements that facilitate deep commitment to long-term development; they include a) increasingly challenging task demands (cognitive, sometimes social, such as high professional standards); b) strong identity as to what the person wants to be, suggested in Figure 2; and c) institutional recognitions (recognition of achievements, admissions to graduate schools, etc.). To explain this developmental process, ECT specifies three critical transitions from childhood to adulthood.

#### Critical Transitions in Reaching High-Level Excellence

Figure 2 suggests that personal agency takes several forms, mediated by social-cultural forces. The three critical transitions indicate the emergence of new forms of personal agency and momentum for TD.

- 1. Transition from spontaneous play to CA in terms of active seeking developmental opportunities and environments for achieving personal aspirations.
- 2. Transition from CA to MA in terms of more dedicated efforts and strivings toward a high standard of excellence.
- 3. Transition from mastery and high-level technical proficiency to the carving out of a personal niche for major contributions to a field of human endeavor.

Likely, the first transition occurs during adolescence, the

second during young adulthood, and the third during midadulthood. Developmental timing of these transitions will vary from domain to domain, from individual to individual. What is more important is the kind of environmental affordances, opportunities, and support that support each of these transitions. To facilitate the first transition, ECT emphasizes timely exposure to enriched environments (Renzulli & Reis, 1997), typically in preschool and early school years for playful engagement of self-initiated or adult-structured activities that involve various combinations of the five domains of effectivity stipulated by ECT (see Figure 1). To facilitate the second transition, ECT stipulates the timely offerings of serious learning activities (e.g., project-based learning, makerspace) that engender deep experience and task commitment (Barron, 2006; Dai et al., 2015). As for the third transition, ECT postulates timely opportunities for cutting-edge work and mentorship that facilitate intrinsic meaning-driven personal enterprises (Dai & Li, 2020, 2023) rather than merely trying to get ahead (i.e., being competitive).

For school-age children and adolescents, we can think of the first two transitions as more relevant. Then, as educators and parents, the following talent milestone events or achievements can be used to track one's talent development:

- Early playful activities and interests (e.g., readings, playing gadgets) in formative years
- Early achievement (e.g., performing, carrying out projects, presenting a report)
- Recognized talent (in any of the five forms of effectivity) in childhood and adolescence
- Recognized achievement by parents and teachers in middle or high school
- High aspirations revealed as teenagers
- Distinct strengths in arts, sports, and academics in and outside of school
- Recognized talent in professional or leisure endeavors (game playing, cooking, etc.)

#### Nested Layers of Human Agency Unfolding Over Time: Evolving Complexity Explained and Enacted

As shown in Figure 2, as children and adolescents engage the world extensively, aptitudes and dispositions toward the five forms of engagement will manifest themselves, and eventually show distinct self-organization through differentiation and integration, which is CA for excellence. With further development, the issue of the self and future will come to the forefront of one's consciousness, in terms of what kind of person one wants to be, and what is worth dedicated work and striving, leading to a more purposive talent pathway. Thus, the multi-layers of talent development truly resemble that of an onion (see Figure 2), with many layers of agency developing over time in forming a distinct trajectory and pathway. Represented in a more dynamic way, ECT also proposes a push-sustain process that helps sustain the TD momentum (see Figure 3).



Stages: Foundational ----> Transitional ----> Crystallizing ----> Advanced Figure 3. A schematic illustration of a pushsustain dynamic in talent development.

Figure 3 can be viewed as a relational developmental system wherein the person as an endogenous agent reciprocates with its environment in terms of information and energy in an adaptive way. The milestone events and transition points indicated in this figure serve as important landmarks that guide educational and intervention strategies. In this sense, the educational and cultural provisions are part an integral part of the TD process, in terms of how our decisions and provisions help shape the trajectories and courses of TD for children and adolescents under our charge. My hope is that this introduction to ECT can provoke new ideas not only about how we explain TD, but also how we improve our educational practices.

#### References

- Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development*, 49(4), 193–224.
- Dai, D. Y. (2011). Hopeless anarchy or saving pluralism? Reflections on our field in response to A m b r o s e, VanTassel-Baska, Coleman, and Cross. *Journal for the Education of the Gifted, 34,* 705-730.
- Dai, D. Y. (2017). Envisioning a new foundation for gifted education: Evolving Complexity Theory (ECT) of talent development. *Gifted Child Quarterly*, 61, 172-182.





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# **Creating an MI Legend in Asia**

G.T. College is the first college to nurture and develop gifted & talented students as the goal. It was founded in 1996 by the Gifted Education Council, a charitable organisation for gifted education in Hong Kong. The College, renowned for its innovative approach to education and nurturing multiple intelligences, has undergone its remarkable transformation from an ordinary school into a school for the exceptiona-MI Signature School in Hong Kong: G.T. College Ily talented students. This esteemed institution has crafted a legend that celebrates the diverse strengths and abilities of its students who are encouraged to discover and develop their unique talents through differentiated curriculum, various specialized programs, and projects on- and off-campus.

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#### **Educational Perspectives**

# Experimental Mathematics: A Way to Enhance Math Project Skills for Students

In Thailand, not only the gifted students but also primary, middle or high school students are mostly mandated to do at least one mathematical project. However, the students as well as their teachers usually struggle with posing a good question for the project or do not know how or where to start with (even when they have a question posed). Thus, they may end up with the survey project using the mode or highest frequency to draw a conclusion on the popularity or the project that uses the commercial program to draw graphs of some functions and make them as a pattern on cloth or product. Most of the education personnel are also not happy when they see the project that has no presented product. Even though these survey projects or the project that makes some products may be useful in several aspects, but we think that they may not be counted as mathematical projects since they did not really teach the students in the mathematical process. Everybody may be familiar with the scientific method which consists of observing, hypothesis, experiment, analyzing data and making a conclusion. We would like to propose our idea about the mathematical method which consists of observing or experimenting, collecting and analyzing data, making conjectures and proving or disproving the conjectures. This idea was developed almost 20 years ago by Laorpaksin. He constructed the first set of mathematical classroom activities based on the discrete geometry. The activities consist of foundation on reasoning and proof,

especially, induction, and deduction reasonings which are the key concept of the experimental mathematics. The rest are universal measuring, lattice points, and Pick's theorem, wrapping and packing and equipartition of the object. Let us give an example from this set of classroom activities. First, we introduce square lattice points.

Then, we let them explore these lattice-polygons by considering a number of points on the boundary (B), inside the polygon (I), its area (A) and their relation. If the students still cannot see their relation or not so sure about the relation obtained, then they can use the lattice points provided below to get more information. At this point, they have already trained how to gather information, observe and had a chance to do the experiment so that they can use inductive reasoning to make a conjecture. As soon as they have

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their conjectures, we will let them use the deductive reasoning to prove their conjectures. However, we

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#### Dr. Jinnadit Laorpaksin & Dr. Ratinan Boonklurb

will do it step by step. We start from the rectangle, right-triangle and triangle in general format. If they

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are gifted students with mathematical minds, we can let them try to prove the Pick's theorem for the general lattice-polygon. Of course, some of them may come up with a new idea to get their own research topics of



interest. For example, they can consider the triangular lattice instead or they can consider the Pick's theorem on higher dimension. We believe that the process which the students have gone through should lead and help them attack the "new" problems. Recently, Laorpaksin also developed a new set of classroom activities. This new set consists of "chub" (the sound of scissors make one cut), Platonic solid, tiling by L-trominoes, chameleon changing color, leaping frog and walking forward-backward. Let us illustrate one example, "chub." We let the students use the scissors to make a single cut so that the polygon on the paper is cut out. The following are some polygons that we let them try. Some of them may be



a bit difficult as compared to the others. However, as they try several cuts, they will observe the process and technique until they can make their own conjectures. Then, we let them use the deductive reasoning to prove their conjectures in the easy case first, namely triangle. This proof leads them to the center of



the triangle. Definitely, if they have mathematical ability, they may try to prove a general case for polygons



and may explore themselves with these sophisticated figures.



(These three sophisticated figures are due to the research conducted by Professor Erik Demaine from MIT).

We did try these two sets of classroom activities with several groups of students and the feedback was great. We hope that if students (in Thailand) have a chance to explore themselves

References

Jin Akiyama and Mari-Jo P. Ruiz: A day adventure in math wonderland, World Scientific, New Jersey, 2008 Erik Demaine, The fold-and-cut problem, http://erikdemaine.org/foldcut/ (July 12, 2023)





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Ratina Door

#### Ms. Daisy Yung

# The Art of Teaching Arts in an MI School (Part 2)

The application of art education in cultivating students' multiple intelligence development:

**Creation of Traditional Chinese Art Culture and technology** teaching

#### Introduction

Visual arts teachers have shifted from traditional teaching methods to the new teaching mode in order to adapt to the learning styles of the new generation. This includes using electronic equipment, videos, live demonstrations, online communication platforms, and the like.

G.T. (Ellen Yeung) College allows students to understand and appreciate artistic creation from different perspectives through the combination and application of art and technology.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) proposed the "Four Pillars of Education" in 1996, which are:

- 1. Learning to know 學會求知: Students should learn how to use different methods and learning tools to acquire knowledge.
- 2. Learning to do 學會做事: Students need to have recognized skills including some comprehensive skills.

3. Learning to live together 學會共處:

Students should learn how to cooperate with others, and learn to respect diversity and different values, thereby increasing mutual understanding, empathy, and strengthen social harmony.

through the mathematical activities that we encourage them to do experimenting, making conjectures by inductive reasoning, and trying to prove the conjectures using deductive reasoning, then they should be able to enhance their mathematical ability, they can make their own "interesting" research questions and

Disclaimer: This is only our idea for developing the skills of

the students on the process of doing a mathematical project as well as the ability to pose the questions of the project.

can mimic the process of solving their own problems.

educational research results provided.

4. Learning to be 學會做人:

Students should have the right and responsibility to sustain their own development while continuously developing their creativity, critical thinking, autonomy to continue their sense of responsibility for social transformation.

Let me share with you how the "Four Pillars of Education" are being observed in the form of digital art in Classes 4 to 6 and let us reinterpret traditional Chinese art and culture together.

#### Theme 4: Ink Colors

Colors are powerful and can evoke emotions. We use the MTR stations as an example to let students guess the meaning behind the different colors used in different stations.



Diamond Hill MTR Station is mainly black with white dots, linking the name of the station

# Education Psyched-Up RMI Highlights

When *Frames of Mind* was written, scientists had certainly studied neuroscience and genetics. And I drew on these disciplines. But in the early 1980s, only writers of science fiction could have anticipated how much we now know about the human genome, and as well as our knowledge of the development of, and the connections within, the human nervous system. And to this, one must now add new, non-human form of intelligence—notably artificial intelligence (AI) which makes possible things like the Large Language Learning Systems (such as ChatGPT).

-Professor Howard Gardner, p. 11

Achievement(s) and learning may not be the same issue, but they definitely are not contradictory or exclusive. Indeed, there should be long-term friendship rather than rivalry between them. For better grades or quicker rewards, we might opt for the former than the latter. For more confidence and satisfaction, there are no better ways to achieve them than via the process of learning with motivation as an intrinsic force (Cornby & Chamber, "Intrinsic Motivation and Process of Learning," 2015).

-Professor Rex Li, p. 4

Evidence shows us that the main goal of supporting the talented or gifted individuals is to yield larger benefits for the wellbeing of the globe . . . .

Let there be more opportunities for this small group of students who should not be discriminated against because of their intelligence levels or domains or gift areas. Society should give fair treatment to both the "weak" or the "strong" whose domains are diverse and even relatively subjective in significance, value, and time.

-Dr. Clara Cheng, p. 23

We encourage them to do experimenting, making conjectures by inductive reasoning, and trying to prove the conjectures using deductive reasoning, then they should be able to enhance their mathematical ability, they can make their own "interesting" research questions and can mimic the process of solving their own problems . . . .

-Dr. Jinnadit Laorpaksin & Dr. Ratinan Boonklurb, p. 31

優才書院的確做到「喜悅卓越」的目標。浩賢從來沒 有參加校外的補習班,在公開試亦能考獲理想的成 績,順利入讀他心儀的大學科目。我們慶幸能為浩賢 選擇優才書院,讓他能在良師益友薰陶下茁壯成長。 —Parents of Chung Ho Yin, p. 39 Everything we do creates a subjective sensation that informs us of the significance of this encounter in terms of valence and meaning, which is retained in memory as such. This indicates an organismic principle: human beings function as a whole when dealing with their environments; thus, the five forms of effectivity are not modular in terms of impenetrable to central control Here we are getting close to the heart of the matter: individuals are increasingly capable of self-direction and their behaviors become more purposive. Consequently, individual development follows a trajectory of being increasingly integrative and purposive.

-Professor David Yun Dai, p. 13

There has been little mention of special schools for gifted and/or talented students in Hong Kong except for G.T. College, Hong Kong's first college for the gifted. Some notable researchers in gifted education in Hong Kong have described the college briefly with regard to its admission policy but have not discussed its programmes. The present article aims to provide a more extended introduction about how G.T. College successfully nurtures its gifted and/ or talented students to become future leaders in Hong Kong. —Dr. Raymond Tam, p. 16

The role of buddies seems to play a vitally decisive role in the two cases from two gifted-talented schools in Asia.

"Understanding others and the world around them" as cited from Kelly (2019) is indeed the sanest and most obvious reason for the students in the postpandemic era. The ability to use collective values as courtesy or kindness is reflected in the reports above and this ability will be sharpened through experiential learning. It is not hard to believe that existential personality and intelligence will be nurtured in due course and at various levels for different individuals. —Mr. Leo Tsui, p. 28

I feel truly blessed for all the help I received throughout my years at GT that assisted me to achieve where I am now in my career, both as a student and a sportsman. It also inspired me to lend a hand whenever I could to my younger teammates in the Hong Kong Team . . . .

These are all valuable lessons for me to become a better person and conducive to my career as a future healthcare professional. Overall, my life at GT has shaped me into what I am now in different aspects and I am with gratitude that my talents were discovered and appreciated.

-Mr. Chung Ho Yin Alumnus, p. 38