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Abstract

When Howard Gardner proposed his Multiple Intelligences (MI) theory in 1983 it was not with the direct intent of influencing views or perceptions of gifted and talented education. Instead, he sought to change the way we view everyone's intelligence. That does not, however, preclude MI theory from having applicability for gifted and talented students, as the gifted and talented are, essentially, the highly intelligent, however that is viewed.

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Mapping MI to the DMGT: A theoretical framework

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Introduction

When Howard Gardner proposed his Multiple Intelligences (MI) theory in 1983 it was not with the direct intent of influencing views or perceptions of gifted and talented education. Instead, he sought to change the way we view *everyone's* intelligence. That does not, however, preclude MI theory from having applicability for gifted and talented students, as the gifted and talented are, essentially, the highly intelligent, however that is viewed.

The terms 'gifted' and 'talented' are used in different contexts to indicate individuals who are performing, or have the potential to perform, at a *significantly* higher level than their peers in any specific field of human endeavour. Beyond the term 'giftedness' as a common starting point for gifted education, however, there is little international agreement on the application of the terms 'giftedness' and 'talent' (Gagné, 2009), making a universally accepted definition problematic, at best. The only real commonality is that there is an acknowledgement that certain individuals have a higher ability, or capacity, to perform at a significantly higher level than others. Whether gifted and/or talented, such individuals have differing needs from the mainstream at all levels (Fraser-Seeto, Howard, & Woodcock, 2013; Shaywitz, Holahan, & Freudenheim, 2001; Tomlinson, 2005) and can be characterised by affective and cognitive capacities that are beyond that of their same-aged peers (Fraser-Seeto, Howard, & Woodcock, 2013; Maker & Schiever, 2010; Plunkett & Kronborg, 2011; Shaywitz, Holahan, & Freudenheim, 2001; Tomlinson, 2005).

Rather than engaging in a semantic exercise to differentiate the two meanings, which are not universally agreed upon, 'gifted' is adopted here as a single descriptor, except when discussing François Gagné's Differentiated Model of Giftedness and Talent (DMGT)¹, which treats the two as separate. From a historical perspective, giftedness has often been intimately tied to intelligence through its capacity to demarcate higher-ability individuals from those of lower ability. Conceptions of intelligence thus provide a fundamental starting point for a discussion of

giftedness. Such an approach is tacitly supported by Baldwin and Vialle (1999a, 1999b) who, writing in the closing years of the twentieth century, noted that "we have moved to a position during the latter part of this century when the construct of giftedness has been expanded to encompass fields of endeavor beyond the scope of traditional views of intelligence" (1999b, p. xiv).

Links between Gardner's MI theory and giftedness have already been acknowledged in the literature (e.g., Gardner, 2000), but MI and the DMGT have been treated as two discrete aspects, with each having its own characteristics and applicability. In reality, there are significant commonalities between the two models. It is curious, then, that MI and the DMGT have not been mapped together, which this paper seeks to rectify. To do so, it is necessary to take a component approach, through addressing intelligence concepts, MI theory and Gagné's DMGT, followed by discussion of the MI-DMGT crossover and the proposal of a new Differentiated Model of Multiple Intelligences (DMMI).

Intelligence

Conceptions of intelligence have undergone many changes in the history of humanity, but perhaps none more so than during the twentieth century. For most of that century the Intelligence Quotient (IQ) was a standard measure of intelligence, but was not without its detractors (Bartholomew, 2004; Weiten, 2013). Much of this criticism centred around the nature-nurture debate, with racial implications (e.g., Aby, 1990; Herrnstein & Murray, 1996; Mensh & Mensh, 1991). If intelligence is a result of genetics, and genetics underlies racial classifications, then it follows that the underperformance of some races on IQ tests would indicate an intellectual inferiority in those races, while affirming the superiority of the dominant culture, the creators of the test (Kaplan & Saccuzzo, 2009; Weiten, 2013). Note the differences in conditioned terminology: the origin is a 'culture', even if that culture is dominated by a given race, while the subjects are allocated 'race', unless they belong to the dominant culture, which is itself an abstract

¹ Reference to the DMGT should be taken to refer to the DMGT 2.0, unless specified otherwise.

concept. Concepts of intelligence thus became racially divisive, even when there was a questionable basis (Beatty, 2013).

Adult IQ scores are good indicators of such factors as social and employment status (Brant et al., 2013; Weiten, 2013), but whether an individual develops the capacity to satisfactorily complete an IQ test appears to have its basis in environment and experiences (including those related to the genetic-environmental correlation), through sensitive periods for cortical development (Brant et al., 2013). The activation of these sensitive periods may have socio-economic circumstances as an influence, leaving the question of whether the sensitive periods are caused *by* or are a cause *of* high intelligence. Shavinina (1997) noted the importance of sensitive periods to the development of high-level giftedness, referring to them as the “inner mechanism” (p. 250) driver of prodigy. Even when the right genetic, environmental and socio-economic circumstances align, it is questionable whether IQ testing is an accurate indicator of giftedness. Ziegler and Ziegler (2009) suggest that tests of giftedness, specifically intellectual, as could be applied to the academic domain, are flawed, in that the use of specific cut-off points contributes to the paradoxical attenuation effect, whereby some individuals who are identified as gifted are actually *not* while others who miss out *are*.

Dissatisfaction with IQ as a measure of an individual’s intelligence prompted theorists to consider alternative models (e.g., Guilford, 1967; Spearman, 1929; Thurstone, 1938). These models had two central tenets: 1) that intelligence could not be encapsulated by a single number; and 2) that the IQ tests only measured a narrow range of intellectual capacities. In the latter decades of the twentieth century two theorists in particular, Robert Sternberg and Howard Gardner, fundamentally altered conceptions of intelligence through a reassessment of what constitutes intelligence. While both Sternberg’s triarchic theory and Gardner’s Multiple Intelligences theory have altered the way we view intelligence, it is Gardner’s work that has had the most impact on the educational environment by resonating with educators (Cuban, 2004), with consequent influence on teaching practice – for example, Kornhaber, Fierros, and Veenema (2004), whom von Károlyi, Ramos-Ford, and Gardner (2003) view as having “misconstrued and misapplied MI theory” (p. 101) – and the stimulus for further research beyond what could have been conceived with a single intelligence concept (Corno, 2004).

Notions of a multiplicity of intelligences – that intelligence should not be narrowly defined – are egalitarian based. Each form of intelligence that is acknowledged brings a previously excluded group of humanity into the recognition of their peers. This forms a broader base of cultural value and, by extension, enhances societal attitudes toward the manifestations of those intelligences. This is not to say that people who displayed these ‘extra’ intelligences were not valued, rather that they were not viewed as ‘intelligent’.

Multiple intelligences

Howard Gardner’s MI theory has its grounding in the principle that each member of the human race possesses a bundle of intelligences, not merely a single IQ-focused intelligence, but that these intelligences are subject to a combination of nature and nurture. A synthesis of such things as opportunity, societal values and talent influence how, if or when these intelligences are manifested and to what extent. Gardner originally identified intelligence as “the ability to solve problems, or to create products, that are valued within one or more cultural settings” (Gardner, 1983, p. x), but this was later refined to the “biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture” (Gardner, 1999, pp. 33-34). The theory of Multiple Intelligences originally comprised seven intelligences – linguistic, logical-mathematical, spatial, musical, bodily-kinæsthetic, interpersonal and intrapersonal (Gardner, 1983; von Károlyi, Ramos-Ford, & Gardner, 2003) – all of which met a set of criteria Gardner had devised to qualify as an intelligence:

1. Potential isolation by brain damage.
2. The existence of idiot savants, prodigies and other exceptional individuals.
3. An identifiable core operation or set of operations.
4. A distinctive developmental history, along with a definable set of expert ‘end-state’ performances.
5. An evolutionary history and evolutionary plausibility.
6. Support from experimental psychological tasks.
7. Support from psychometric findings.
8. Susceptibility to encoding in a symbol system. (Gardner, 1983)

Two criteria were connected to each of four fields: biological sciences (1, 5), logical analysis (3, 8), developmental psychology (2, 4), and traditional psychology (6, 7) (Gardner, 1999). An

extra one and a half intelligences were later added (Gardner, 1999; von Károlyi, Ramos-Ford & Gardner, 2003) – naturalist and spiritual/existential (see Table 1), with the latter being a ‘half’ intelligence because it does not meet all of Gardner’s intelligence criteria.

While there have been criticisms of Gardner’s concept of MI, criticism of the eight criteria has been minimal. Most criticisms of MI theory are essentially semantic, relating to consideration that Gardner’s ‘intelligences’ are instead traits, cognitive styles, skills or abilities (Armstrong, 2009; Morgan, 1996). Gardner’s definitions of intelligence both centre on the concept of ‘value’. By positioning intelligence as something

of value within a social/cultural context, the emphasis is moved from a testable, psychometric-controlled scale to a more-subjective measure.

Each individual, regardless of context and/or culture, possesses all of the intelligences to varying degrees (Gardner, 1983, 1999). As a result, the profiles of intelligence will vary from person to person. A dancer, for example, would be stronger in bodily-kinæsthetic intelligence than a surveyor, whose strength would be in spatial intelligence. Gardner’s end-states are essentially indicative of which intelligence an individual is strongest in, but all can be developed and improved.

Table 1: Gardner’s 8.5 MI, with indicators and end-states

<i>Intelligence</i>	<i>Core characteristics</i>	<i>Child characteristics</i>	<i>End-states</i>
Linguistic	Language sensitivity, whether spoken, written or symbolic (sign, body, etc.); functional discernment	Lots of questions; good vocabulary and language skills; word play	author comedian barrister
Logical-mathematical	Recognition and exploration of patterns and relationships; utilising logical procedures and/or reasoning	Enjoy puzzles; number play; ‘how does it work?’; classify and analyse	scientist detective accountant
Spatial	Three-dimensional visualisation of objects and/or materials; orientation, of self or position	Eye for detail; dismantle and build; conceptual; doodles	surveyor sculptor photographer
Musical	Musical capacity or appreciation; discern sound patterns	Attuned to patterns of sound; demonstrated through movement and discrimination	composer musician critic
Bodily-kinæsthetic	Control of fine and/or gross motor skills	Good hand-eye coordination and balance; gestures; interprets body language	athlete dancer calligrapher
Intrapersonal	Understanding of self; strengths/weaknesses, desires, capacities, etc.; guides behaviour	Self-awareness; self-confidence; definite opinions; self-reflective	philosopher artist poet
Interpersonal	Sensitivity to the contexts, emotions, motivations, etc. of others; appropriate response	Empathy; relates well to others; mediator	counsellor teacher politician
Naturalist	Recognition of features in the natural world, both sentient and non-sentient; distinctions and categorisation	Interest in natural things; empathy beyond humanity; classifies	botanist farmer veterinarian
Spiritual/existential	Ability to see and respond to deeper relationships	Daydreamer; deep questions; contemplative	philosopher humanitarian altruist

(adapted from Gardner & Hatch, 1989; Vialle & Perry, 2002)

In theory, given ideal conditions, any individual can develop high performance in all of the intelligences. How, and if, particular intelligences develop is influenced by four factors: pluralisation, contextualisation, distribution and learning environment.

Pluralisation

Intelligence is plural, such that there are societal, context-dependent valued capacities that go beyond what is measured in an IQ test. Which intelligence is 'valued', and thus likely to be expressed, will vary both between and within societies and cultures. The intelligences proposed by Gardner were not meant to be definitive, in the sense of being the only possible intelligences. In particular, Gardner has also suggested the possibility of pedagogical intelligence – "the ability to teach others" (Gardner, 2011, p. 8; see also Rubin, 1989).

Contextualisation

An individual's intelligence is more evident when in a familiar context, allowing expression of that intelligence through valuing within the immediate setting. This also contributes to simultaneously reducing extraneous cognitive demands through the interaction of cognitive function and context-specific memory: "an interaction between, on the one hand, certain proclivities and potentials and, on the other, the opportunities and constraints that characterize a particular cultural setting" (Gardner, 1983, cited in Johnson, 2002, p. 141). How, and which, intelligence is utilised is thus a contributor to the context rather than being solely dependent upon it.

Distribution

Whereas the focus of contextualisation is the individual, the focus here is on relationships to entities in the environment. Distribution goes beyond the wider cultural context and its associated values, structures and conformities to enhanced performance through the use of preferred tools, whether concrete (e.g., pen, computer), assistive (e.g., files, notebooks), or human (e.g., collegial networks, ego-centric networks; Palchykov, Kaski & Kertész, 2014).

Learning environment

An educational environment, both concrete and cognitive, recognises and caters for the varied skill sets of the students, through provision, practice and assessment (Gardner, 2006). The learning environment, however, extends beyond the direct education context. It also takes into account wider governmental structures and support, particularly in relation to investment, as well as the role of family in both preparing children for school and the support needed to get the most out of the children's education.

Gagné's Differentiated Model of Giftedness and Talent (DMGT)

Gagné considers giftedness to be comprised of significantly higher-than-average *natural* aptitudes in at least one domain, sufficient for an individual to be placed in the top 10% of their age peers in that domain. In contrast, talent applies to significantly higher-than-average *intentionally developed* competencies in a field of human activity, which would place the individual in the top 10% of their age peers in that field. Gifts, in themselves, are not innate (Gagné, 2008), in the sense that they will not automatically be apparent without suitable conditions. Talent is the expression of giftedness that has been developed (Gagné, 2003). Giftedness, thus, precedes talent, but may not necessarily be developed into talent. To illustrate how giftedness becomes talent, Gagné developed versions of the DMGT in 1985, 2005 and 2008, with the latter being the DMGT 2.0 (Gagné, 2013; see Figure.1).

The DMGT is structured in five separate components, discussed below, all of which are subject to the influence of 'chance'. Chance, in its role as "*qualifier of any causal influence*" (Gagné, 2009, p. 70), takes into account factors that the individual is not in control of (Gagné, 2008, 2013) but which, nonetheless, influence how the DMGT plays out through "accidents of birth and background" (Gagné, 2008, p. 5). This is fundamentally based in the 'nature or nurture' argument, the actuality of which is expressed through, genes, environment (including experience) and the genetic-environmental correlation. The five DMGT components have as their base, gifts (G), talents (T) and developmental process (D) of talents, which are subject to the catalytic influences of intrapersonal (I) and environmental (E):

1. Gifts (G) – Domains evident through observation of the learning process, speed and ease of acquisition of task-based skills. Two clusters of sub-components: mental – intellectual (GI), creative (GC), social (GS), perceptual (GP); or physical – muscular (GM), motor control (GR).
2. Talents (T) – Fields of occupational applicability of developed gifts, evident through generally accepted measures of performance in a wide range of roles: employment occupations – academic (TC), technical (TT), science and technology (TI), arts (TA), social service (TP), administration/sales (TM), business operations (TB); other occupations – games (TG), sports and athletics (TS).

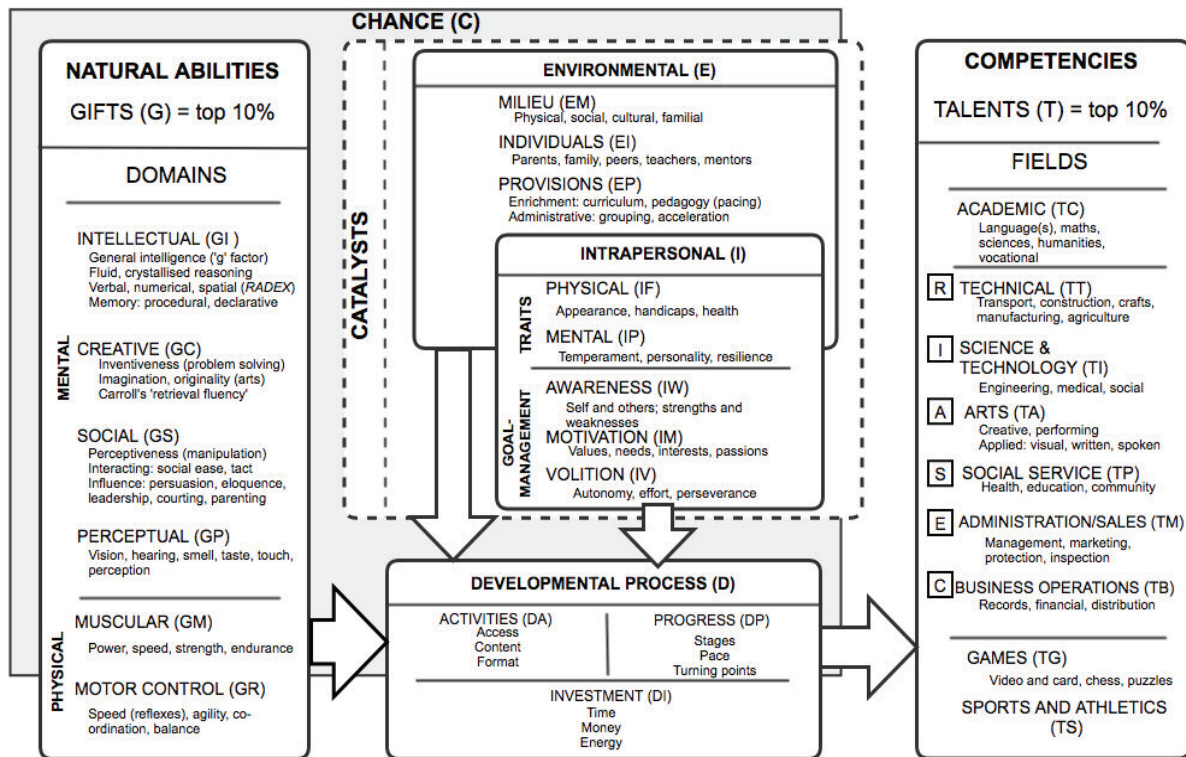


Figure 1: The Differentiated Model of Giftedness and Talent (DMGT; Gagné, 2008)

- Developmental processes (D) – “the systematic pursuit by talentees, over a significant period of time, of a structured program of activities leading to a specific excellence goal” (Gagné, 2008, p. 2), which is an intentional, rather than accidental or incidental, process. Three sub-components: activities (DA), progress (DP), investment (DI).
- Intrapersonal catalysts (I) – Two clusters: stable traits – physical (IF), mental (IP); and goal-management processes – awareness (IW), motivation (IM), volition (IV). There is a significant metacognitive factor inherent in (I), through examination and re-examination of values, needs and progress.
- Environmental catalysts (E) – Three sub-components: milieu (EM), individuals (EI), provisions (EP). Filtered through (I) and thus dependent upon which stimuli are chosen for expression through (I).

All aspects of the developmental process (D) and catalysts (I and E) have an influence on the development of gifts into talent. Although Gagné acknowledges a likely, descending, order of influence – G, I, D, E – he also notes that “talent emergence results from a complex choreography between the four causal

components, a choreography that is unique to each individual” (Gagné, 2008, p. 6).

Into the basement

Natural abilities are not innate (Gagné, 2009, 2013), rather, they are a result of progressive development, with a biological influence. The biological bases (anatomical, physiological, genotypic) of Gagné’s Developmental Model for Natural Abilities (DMNA) act as ‘basements’ to the DMGT – the biological counterpart to the DMGT’s behavioural focus (Gagné, 2013) – in part precursors but also directors of the talent development process evident in the DMGT. The addition of the basements to the DMGT in Gagné’s Expanded Model of Talent Development (EMTD) (Gagné, 2013) does not negate the validity of the DMGT, rather, it serves to inform the biological influences of both individual and external factors. These, in turn, are contributors to the DMGT as it stands, that is, impacting expression of the causal factors without calling into question their applicability. What the EMTD does do is lead to questioning of the role of both genetics and environment in career ‘choice’ (expressed through talents) and whether it really is such, rather than being a culmination of circumstances that began before conception, in a “choreography unique to each individual” (Gagné, 2013, p. 16).

The MI/DMGT crossover

Utilising an approach that combines the principles of Gardner's MI with Gagné's DMGT appears dichotomous, but the two theories have significant commonalities. The underlying categorisations are different, but both are concerned with the means to turn a potential into an actuality, with MI mapping quite comfortably onto the DMGT (see Figure 2).

Gagné's gifts (G), underdeveloped natural abilities, align with Gardner's intelligences, as both are concerned with a potential capacity to perform (Gagné, 2009; Gardner, 2006). There is an apparent conflict here between Gagné's concept of giftedness in a *single* domain and Gardner's *multiple* forms of intelligence, all of which are present in every individual. Gardner acknowledges, however, that while an individual will have all intelligences there will inevitably be one in which the individual is strongest, which can be expressed through a greater aptitude in that intelligence and a preference for working within that intelligence domain (Gardner, 1983, 1999, 2006; Gardner & Hatch, 1989). This is in line with Gagné (2009), who does not preclude an individual having abilities in other domains – in effect, giftedness is the potential for expression of the dominant intelligence.

At first glance, the DMGT catalysts (E - Environmental; I - Intrapersonal) would appear to be problematic for linking to MI theory. These

need to be viewed within the framework of the MI factors of Contextualisation and Distribution, with the latter being dependent upon the former (Gardner, 2006). Environmental (E) ties directly to Contextualisation, through the context-specific characteristics of Milieu (EM), Individuals (EI) and Provisions (EP), all of which provide both impetus and background for the expression of intelligence/giftedness. Distribution is less clear cut, when linked to Intrapersonal (I). However, when viewed as a reciprocant of Environmental/Contextualisation, a developed theatre appears for the assessment of what is 'valued', with the expression of the enhanced performance in an area being dependent upon the value assigned to it through the sub-components of Contextualisation.

The same argument extends into the use of preferred tools, both practical and mental (rather than physical and mental traits in the DMGT), of expression of giftedness/intelligence, which are also subject to the value assigned to both tools and expression in Contextualisation. This is the only part of the talent/intelligence development process where a change in the sub-categories is necessary, where Gagné's Physical (IF) trait becomes the Practical tool. Both complement the Mental (IP) sub-category, but with a different focus. The individual's physical expression in the DMGT has effectively been superseded by the biological basements. What is left has primary relevance to how the individual

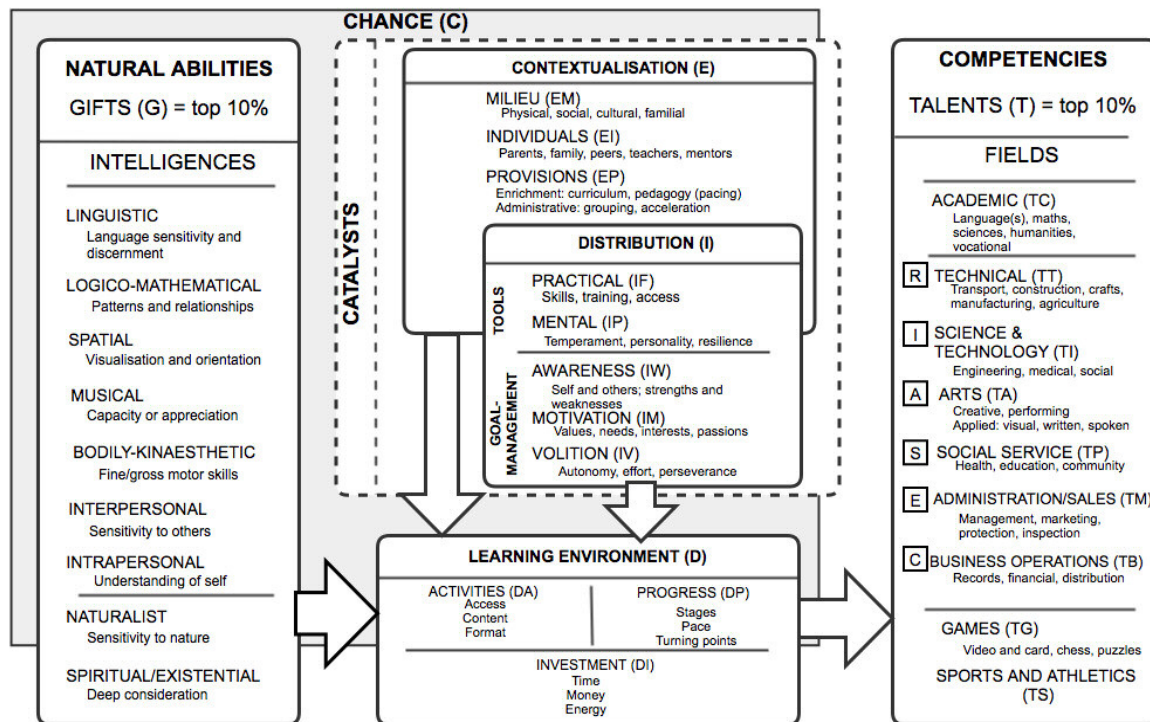


Figure 2: Modified DMGT (Gagné, 2008), with MI adjustment (DMMI; Walton, forthcoming)

is perceived by others, rather than what the individual can do, and how that impacts Mental (IP). Instead of physical attributes, in the DMMI the role of Practical is focused on the physical means to achieve higher understanding.

Developmental process (D) can be equated to the factor of Learning environment (Gardner, 2006), where the individual teacher and the prevailing education system as a whole contribute to providing the medium for learning and expression (Gardner & Hatch, 1989). In this instance, only the name changes, as all of the sub-components (DA - Activities; DP - Progress; DI - Investment) are intact, applying to both Developmental process and Learning environment. The teacher is in charge of the micro-environment for the student, providing learning experiences and direction in line with the macro-environment dictated by the relevant government educational body. The effectiveness and applicability of this process will be influenced by both Contextualisation/ Environmental (E) and Distribution/Intrapersonal (I).

Talents (T), or MI end-states, are the developed expression of a gift in specific domains. These talents would be the application of highly developed intelligences in Gardner's MI within an occupational field. For example, someone with an outstanding ability within the interpersonal intelligence would be eminently suitable for employment in Social service (TP), or some aspects of Administration/sales (TM). There is no need to amend this component of the DMGT to match it with MI, as both link directly to the expression of gifts/intelligences through occupational categories.

For both MI and DMGT, Chance (C) is a constant factor that underpins everything, particularly in relation to whether an individual has the opportunity to be aware of, and develop, their particular gift(s)/intelligence(s). These linkages preserve Gagné's suggested, descending, order of influence – G, I, D, E – through correlating gifts with intelligences (G), which can be expressed through enhanced performance that is grounded in intrapersonal characteristics (I), while being nurtured during the learning process (D) and situated within the value-laden context (E). Gardner's MI are latent intelligences, which may potentially be gifts, in that while all individuals have all of the intelligences it is only those intelligences an individual possesses which have higher potential that can be gifts. The expression and application of talents (T) is thus an end-state in itself for both MI and DMGT.

Conclusion

The DMMI provides an opportunity to validate the DMGT, as a model for gifted and talented development. That the DMGT's underlying principles can be applied to an unrelated theory is a good indicator of both validity and versatility, of the common grounds evident in development. This is not to suggest that either MI theory in itself or the DMMI can be used as an identifier of gifted students, just as the DMGT can not, nor that because everyone has all of the intelligences that everyone can be gifted, which Gardner specifically argued against (Gardner, 1997). MI, DMGT and DMMI are not diagnostic tools. They are prisms that allow light to be shed on aspects of commonality in development, while maintaining the integrity of each. In the process of recognising what is common lies the opportunity to develop a greater understanding of how theories overlap – that what is perceived by one person to be specific to their field actually transcends that field and can inform both understanding and application in another.

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