Identification and Education of Students with Gifts and Talents Based on the Fuzzy Conception of Giftedness

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Abstract: The purpose of this article is to review the Fuzzy Conception of Giftedness (FCG) and discuss its implications for the identification and education of gifted students. According to the Fuzzy Conception of Giftedness, the manifestation of giftedness results from the interplay between personal dispositions and stimulus conditions; thus, giftedness exists in the interaction between a person and the environment (e.g., stimulus conditions). While a person is disposed to carry out actions, the environment is potent to allow these actions. In line with this proposition, the identification and education of gifted students should be built on interactions. Interactive models are useful to identify and educate students who have overachievement potential. The FCG proposes three components to define giftedness that could be used in identifying and educating gifted students: intellective and non-intellective dispositions, stimulus conditions, and interaction.

Keywords: giftedness; talent development; disposition; interaction; stimulus condition; education; identification

1. Identification and Education of Students with Gifts and Talents Based on the Fuzzy Conception of Giftedness

Giftedness is a sort of ability. Abilities are dispositions implying possibilities. Thus, giftedness is a possibility. Abilities are dispositions to succeed under certain conditions [1]. Likewise, giftedness is a possible manifestation of dispositional properties to succeed under certain conditions. This simple definition offers three implications related to the three hypothetical components of the giftedness concept. First, giftedness requires non-intellectual dispositions to start actions. For example, a person must first intend or attempt to solve a problem. Second, giftedness includes some sort of intellectual disposition to carry out actions. For example, a person uses working memory to process information to solve problems. Third, gifted behavior is performed under certain conditions. For example, there should be a problem providing sufficient challenge and stimulus for the person to intend to solve the problem and maintain engagement in solving the problem. According to the Fuzzy Conception of Giftedness (FCG), giftedness is a network of dispositions, a higher-order disposition, evolving upon interacting with stimulus conditions at the micro level and the environment at the macro level [2]. This definition implies three hypothetical components necessary for developing and manifesting giftedness: dispositions, stimulus conditions (environment), and interactions. In this article, I first present a refinement of the components of the FCG (more details are available in [2] and then propose implications for identifying and educating gifted students. I briefly answer two questions in each section: How should we assess giftedness? How should we nurture giftedness?

2. Dispositions

All the dispositions are ascribed properties of the person and modifiable upon interactions. They are composed of intellective (e.g., reasoning) and non-intellective dispositions (e.g., motivation). As postulated by John Locke [3], the dispositional properties of giftedness are secondary properties, such as color, not primary, like size. For example, a
man’s height is a primary property, while his hair color is not, as the color is invisible in the dark even though the height does not change. The color changes under certain conditions. Likewise, the concept of giftedness changes from context to context and thus should not be considered a person’s property. Instead, our reactions to certain human behaviors create giftedness. We ascribe such behaviors as gifted under certain conditions. A person may be considered gifted by some people but not by others. Ascriptions are fuzzy constructs and thus dispositions, as they are social judgments. Four propositions related to the specification of dispositions essential for talent development and their implications for identification and education are discussed next.

**Giftedness is a higher-order disposition.** Manifesting dispositions of giftedness is a possibility only. A possibility is a potential emergence of a disposition. The disposition itself is the possible emergence of a lower-order disposition [4]. Thus, a higher-order disposition is an ability to attain another (new) ability [5]. As the term is applied in giftedness research, giftedness can be considered an ability to develop further personal dispositions, such as motivation, consciousness, and creativity, leading to excellence and the manifestation of excellence.

**Implication for identification:** The traditional identification of giftedness often assesses the degree of skills already attained by students. In addition, assessing giftedness should include the ability to develop new skills and the degree of attainment of new skills. Dynamic assessments may be used to assess giftedness as a proximal development of higher-order dispositions.

**Implication for education:** Educational adaptations should include practices on developing new skills necessary for developing higher-order dispositions. For example, meta-cognitive skills can be a precursor to further dispositional development.

**Dispositions are causally related to their manifestations** [6]. The giftedness concept may be explicated by its properties manifesting under some conditions. A particular disposition is causally related to the emergence of giftedness if this disposition is a member of every sufficient condition. Various terms are used to designate a set of personal dispositions in gifted education, such as precocious, intelligent, able, talented, academically advanced, gifted, etc. Nevertheless, such dispositions do not explicitly refer to stimulus conditions where they display their manifest properties. Personal dispositions are canonical dispositions that manifest when they are exposed to corresponding stimulus conditions [7]: “A” would show “C” if it were to be situated in “B” at “t”. When applied to the giftedness concept, a person is said to possess giftedness only if she exhibits dispositional properties relevant to giftedness (e.g., acquiring new skills or creating novelty) when interacting with corresponding stimulus conditions. From this perspective, no “hidden gift” should exist in a stimulus condition sufficient for mobilizing efficient interactions between stimuli and personal dispositions.

**Implication for identification:** Assessment of giftedness should be conducted using stimulus conditions relevant to manifest properties of dispositions of giftedness. For example, performance-based assessments in a domain can stimulate dispositions of domain-specific giftedness. On the contrary, general intelligence tests may not be sufficient to identify gifted students for talent development programs.

**Implication for education:** Educational adaptations should provide a learning environment that stimulates manifest dispositional properties of giftedness. An irrelevant environment to a particular talent type may not stimulate dispositions relevant to this talent.

**Dispositions have the potency to be stimulated by diverse stimulus conditions** [8]. Multi-track dispositions characterize giftedness. A disposition of giftedness could be activated by multiple stimulus conditions. Multi-track dispositions are characterized by responding to more than one pair of stimulus conditions [8]. For instance, a child’s interest in reading can be stimulated by her parents’ night readings, a television program, picture books, or by interacting with peers who are good readers. Because giftedness manifests
through multiple dispositions, there exist many ways through which giftedness develops and manifests.

**Implications for identification:** Multi-method assessments of giftedness should be used to observe the growth of a potential disposition relevant to the manifestation of giftedness. Standardized tests may not be the best way to assess giftedness. Furthermore, each disposition relevant to manifesting giftedness may be assessed using a different method. For example, some creativity skills can be assessed using observations, some by performance-based assessments, and others by paper-pencil tests.

**Implication for education:** Educational practices should provide multiple adaptations to foster a single disposition relevant to a particular talent. For example, some children’s dispositions may be stimulated when visiting a library, while others may be stimulated when they go on field trips.

The development and manifestation of giftedness require an interplay of intellectual and non-intellective dispositions. Giftedness emerges from multiplicative interactions between personal dispositions, including intellectual and non-intellectual ones, and the environment. Dispositions exhibit veto and compensation potentials [9]. The absence of one disposition necessary for the interaction can veto the emergence of giftedness. Therefore, non-intellective dispositions should not be considered catalysts; instead, they should be accepted as essential as intellectual dispositions to develop and manifest giftedness. For instance, motivation [10] is as essential as natural facilities [11] in manifesting giftedness. A lack of interest in a domain can preclude talent development in this domain, even if all the intellectual dispositions are fully developed.

**Implication for identification:** Besides intellectual dispositions, non-intellective dispositions, such as motivation, interest, and goal orientation, should be used to assess giftedness. Many theories of giftedness (e.g., the three-ring conception of giftedness, [12]) propose non-intellectual dispositions to be essential for giftedness. However, identification practices are not aligned with these theories.

**Implication for education:** Educational practices should be adapted to build a corresponding bridge between intellectual and non-intellective dispositions so that dispositions present mutual stimulations, resulting in multiplicative interactions. For example, a learning environment adapted to stimulate a particular intellectual disposition should first excite a corresponding non-intellectual disposition.

3. **Stimulus Conditions**

Personal dispositions’ manifestations are always relevant to stimulus conditions because a person manifests giftedness when interacting with stimulus conditions. The quality and relevance of stimulus conditions are essential for developing giftedness. An environment provides numerous potential stimuli [13]. Some of these stimuli are active; some are passive. Active stimuli happen in stimulations only. From a talent-development perspective, a passive stimulus becomes active, provided that it activates a person’s disposition. Nonetheless, passive stimuli (e.g., bicycle) for an individual may be active stimuli for others.

Stimulus conditions comprise external and internal stimuli [14]. Any environmental condition is an external stimulus, whereas an internal stimulus can be an aftereffect of an environmental stimulus or an aftereffect of a personal disposition. Just like how an external stimulus (environmental) can arouse emotions in a person, a personal disposition (e.g., memory) also can create a similar stimulation without an external stimulus. For example, both an external stimulus and thinking without an external stimulus have the potency to stimulate emotions. Both types are necessary for talent development as their interaction initiates and maintains engagement in talent development. Three propositions related to the specification of stimulus conditions and their implications for identification and education are discussed next.

**Stimulation is a personal experience.** Stimuli are generic [13], but stimulation is unique. Two children are stimulated differently by the same stimulus conditions. A storybook does not necessarily stimulate two children in the same way. One child asks questions
after reading the storybook, whereas another child may not be interested. Stimulation plays a significant role in talent development, as developing talents is fundamentally personal work. Thus, one should ask, “How is a person stimulated to engage in activities that develop talents” rather than “What type of stimuli-environmental adaptation is the best for developing talents.” In accordance with this perspective, searching for or creating the richest resources may not lead to exceptional talent development; instead, a stimulus condition that activates stimulation for a person should be constructed.

**Implication for identification:** Because stimulation is personal and thus more relevant to assessing personal dispositions than stimuli, the assessment of giftedness should not be generic; instead, it should be person-based and individually tailored to stimulate personal dispositions. A norm-based assessment often is employed to identify students with gifts in traditional identification of giftedness. This method of identifying gifted students is mostly generic, presenting the same stimuli to all students. Observations of personal stimulations with person-based stimuli in assessments can inform whether someone has dispositions relevant to a specific talent.

**Implication for education:** Talent development programs should provide a personally meaningful experience. The relevancy of stimulus conditions to a set of dispositions essential for a specific talent domain increases the possibility of manifesting giftedness. Learning experiences irrelevant to a special talent may stimulate intellectual dispositions but not necessarily non-intellectual ones, resulting in additive interactions, not multiplicative ones.

A stimulus condition’s causal relevance to manifesting giftedness cannot be generalizable. Stimulus conditions are needed to manifest giftedness. However, no particular assembly of stimuli is required to express giftedness. A stimulus condition can be considered an INUS condition [15]. A particular stimulus condition may be sufficient but unnecessary for manifesting giftedness [16]. An entirely different assembly of stimulus conditions may create the same stimulation. For instance, a child’s artistic expression can be aroused by her mother’s love, a cat’s, or a dog’s love. A scientist’s creative thoughts can be stimulated by her research, a lecture another scientist offers, or a scientific article. The result can be the same manifestation of talent.

**Implication for identification:** A multi-trait-multi-method time series assessment of giftedness can be used to identify multiple conditions appropriate for identifying gifted students. For example, a particular set of conditions may be insufficient for stimulating some manifest properties of giftedness at a point in time due to developmental differences but sufficient for other dispositional properties. For example, ideational fluency may be sufficiently activated by simple science experiments at age seven, but it may require a different set of prompts to manifest at the same five.

**Implication for education:** There are more ways than one to foster dispositions of special talents. Stimulus conditions are qualitatively and quantitatively heterogenous [8]. A stimulus condition activates multiple dispositions for manifesting giftedness, from emotional arousal to creativity. Educational practices should provide multiple adaptations for talent development as an educational adaptation believed to be superior to other adaptations may be unnecessary but sufficient to foster a particular personal disposition.

**Talent development requires hierarchically organized stimulus conditions.** Hierarchically organized stimulus conditions increase the likelihood that the interaction between an individual and stimulus conditions adaptively continues. A nonhierarchical stimulus condition can lead to the disappearance of a particular behavior important for talent development. For example, gifted students who are bored in traditional educational settings show a lack of learning motivation [17]. In addition, the relevancy of the hierarchical organization of stimulus conditions to a specific talent domain increases the possibility that giftedness manifests.

**Implication for identification:** Stimuli used to assess giftedness should be progressively organized to maintain continuous stimulation for expressing giftedness and to assess higher-order dispositions. A hierarchical organization of stimulus conditions in assessments
should include intellectual and non-intellectual dispositions. Like intellectual dispositions, non-intellectual dispositions come in degrees.

Implication for education: Educational practices for talent development should be progressively adapted to personal dispositions so that adaptations continuously stimulate interactions between a person and the environment. Educational adaptations should apply two principles. First, educational adaptations should lead to progressive adaptations in personal dispositions. Second, educational adaptations should be advanced enough to further the interaction between a person and the environment. Stimulus conditions should include individually responsive enrichment in education by which students develop interest and start interacting with the environment.

4. Interaction

Interaction should have the lion’s share in talent development because the potential for giftedness manifests when interacting with stimulus conditions [2]. Indeed, research shows a sizeable unexplained variance after considering the main effects of many variables, such as intelligence, personality, motivation, practice, and environment, on talent development and exceptional achievement in specific domains, such as mathematics [18], sciences (e.g., [19]), music (e.g., [20,21]), sports (e.g., [22]), and general academic achievement (e.g., [23–25]). Interaction effects primarily account for unexplained variance in exceptional achievements.

Sternberg [26] recently postulated a three-step process to explicate the concept of giftedness. According to this view, a three-way interaction of an individual, task, and situation leads to exceptional achievement. Giftedness resides in the interaction of a person and tasks representing the sociocultural situational contexts. This new conceptualization implies a higher-order interaction in talent development. Thus, giftedness should be sought in higher-order interactions, not in a person. However, traditional practices (trait-based) for identifying gifted people assume that identifying a person’s intellectual predisposition will guarantee an efficient interaction between the person and environment since it relies on seeking giftedness in a person. This may be wrong because higher-order interactions require many personal dispositions to interact with each other.

The quality of interaction is a matter to consider in talent development. All interactions do not necessarily lead to the development of exceptional talents because developing exceptional talents requires progressive adaptations of interactions [27]. Nevertheless, progressive adaptations of interactions do not occur without corresponding adaptations in personal dispositions and environment. This implies a higher-order interaction between intellective dispositions, non-intellective dispositions, and the environment. A reciprocal causation between dispositions and environment may lead to progressive interaction, creating multiplier effects in talent development. The person-environment correlation model offered by Stanovich [28] explains how such interaction effects occur in development.

Talent development requires higher-order interactions. As the manifestation of giftedness requires the interplay of many personal and environmental variables, interactions between person and environment should not be constrained to intelligence and environment only but should include higher-order interactions, the combined interaction of several variables. In higher-order interactions, one or more factors shape the interaction between two or more factors [29]. The combined effect of multiple factors can be larger than their main effects on talent development (e.g., skill attainment), or the interaction effect of an independent variable can be larger than its main effect on a dependent variable. Higher-order interaction effects are observed in many domains of talent development. On musical competence, for example, the joint effect of training, intelligence, memory, SES, and personality (openness to experience) is as large as the sum of their main effects [21]. Intelligence (intellectual disposition) and personality (non-intellectual disposition) indirectly affect musical competence through mediating music training (stimulus condition). Similarly, the interaction effect of intelligence with engagement (deliberate practice) is much higher than its main effect on musical achievement [20]. Individuals with higher intelligence and certain personality characteristics may benefit more from musical training.
Talent develops through a recurring feedback process between a person and the environment. This process has the potency to multiply the main and interaction effects of personal dispositions and stimulus conditions. It also creates new interactions. That is, talent development essentially requires a multiplicative process, which leads to higher-order interactions. A multiplicative process reduces the environment’s and intelligence’s contribution as single variables in talent development. Nevertheless, it maximizes their contribution to interactions. Furthermore, their interaction effect depends on non-intellective dispositions, as they are jump-starters for interactions. For example, an adolescent with the most advanced intellectual skills in the richest family does not necessarily become a high-achieving adult, provided she interacts efficiently with her environment, resulting in multiplicative effects on her achievement. Studies of giftedness have reported a multiplicative effect (e.g., [30]).

Implication for identification: The assessment of giftedness should include both measures of dispositions and the observation of interactions (e.g., engagement quality) with stimulus conditions used to assess giftedness. Alternative assessments, particularly observation-based, of giftedness can be suggested to assess interactions that could be used as expressions of giftedness. The assessment of interactions can provide information about discrepancies, if any, between intellectual and non-intellectual dispositions, whereby a more accurate profile of giftedness can be obtained.

Implication for education: Educational practices should consider curricular connections among personal dispositions and learning-oriented environmental adaptations to initiate and maintain higher-order interactions between the person and the environment. Higher-order interactions can be observed in the classroom over time when students engage in classroom activities. A higher-order interaction may be evident if the quality of personal dispositions and instructional activities mutually increase.

Non-intellective dispositions initiate interaction between a person and the environment (e.g., inquisitiveness), while the interaction is mediated and maintained by personal dispositions and the environment. Ziegler [27] put forward a hypothetical link between actions and goals. Personal goals lead to actions. Enjoyment is the primary goal. Then, other goals, such as skill acquisition, may be achieved. Applied to developing special talents, a child’s initial interest in attaining a skill can initiate mutual causation between the child’s dispositions. For instance, assume that the first skill for a three-year-old child to develop football talent is to hit a ball. The child takes action to hit the ball if she is curious about hitting the ball. If she enjoys hitting the ball, her parents will respond to her, and she may keep doing the same action, gradually improving her skills, such as coordination and muscle strength. The better she hits the ball, the more satisfaction she enjoys; the more she enjoys hitting the ball, the more she practices with the ball, leading to a feedback loop. The child’s curiosity (non-intellective) initiates the action of hitting a ball. Her ability, interest, enjoyment, and her parents’ actions mediated and maintained the child’s interaction with the ball. Nonetheless, an intellectual disposition can stimulate a non-intellectual disposition that can sometimes start an interaction.

Implication for identification: Most assessments of giftedness include intellectual dispositions only, assuming that intellectual skills are the single cause of exceptional achievements. However, achievement requires jump starters for the interaction between an individual and the environment. In most cases, the jump-start is a non-intellectual disposition (e.g., goal orientation). The assessment of domain-specific non-intellective dispositions should be a component of assessing giftedness. Too general non-intellectual dispositions (e.g., being interested in everything) may not work as a jump-starter.

Implication for education: Educational adaptations should be built on the idea that intellective dispositions can be effectively used when non-intellective dispositions are sufficiently active. The primary question should be, “How do students engage in learning activities?” when developing instructional activities.

An interaction requires evolutionary changes for exceptional talent development. Analogous to the diversification and advance in the evolution of species [31], talent devel-
Development depends upon interactions that require two types of adaptations, both in person and in the environment. The first one is focused diversification. The second one is advancement. These adaptations can potentially lead to “multiplier effects” [32] in developing special talents. Focused diversification for individuals applies to the number of specialized skills and knowledge needed to achieve excellence in a talent domain. On the other hand, advancement for individuals implies growth in each skill and knowledge level necessary to attain excellence in this domain. Both focused diversification and advancement require the effective use of environmental resources and efficient interactions with the environment. Focused diversification at the environmental level includes increased opportunities and resources (teachers, schools, courses, mentors, teams, etc.) in a talent domain in which the person has a keen interest and goals. Advancement at the environmental level implies the quality of opportunities and resources. A person cannot achieve exceptionality provided she gradually improves the quality of the environment in which she attempts to develop exceptional talents.

**Implication for identification:** Growth in talent development should be used to assess giftedness. Assessments may include focused diversification and advancement in a talent domain. The attainment of and progress in special skills essential to talent development in a domain can be used as a manifestation of giftedness. In addition, the efficient use of environmental resources may be used as a gauge of talent estimates. Static assessments provide valuable information about a person’s past growth in a talent domain and make estimates accordingly, but do not show how this person benefits from resources to develop talents.

**Implication for education.** Educational practices should provide adaptations to support the diversification and advancement of special skills critical to developing talents. Both quantity and quality of skills are important for talent development because special talents are composed of various skills. For example, an exceptional basketball talent requires various skills, such as dribbling, rebounding, passing, shooting, endurance, acrobatic ability, agility, and speed. Advancement only in one skill is insufficient for an exceptional basketball player. In addition, each increase in skill development should follow a corresponding resource advancement.

5. Conclusions

The FCG is not concerned with identifying the intellectually smartest students for gifted education programs but with selecting students whose personal dispositions fit these programs. The fittest students display an adaptive network of personal dispositions and interact efficiently with opportunities and resources provided for talent development. In contrast, the smartest students who lack adaptive dispositions may not develop adaptive interactions leading to talent development. Research shows that insufficient adaptation in the learning environment is one of the major causes of underachievement among gifted students (e.g., [33]). According to the FCG principles, formal identification is unnecessary for gifted education programs. Rather, a selection process should be carried out to search for students who develop adaptive interactions with the educational environment because identification assumes that giftedness exists in a person, whereas selection assumes that giftedness exists in the interaction. Identification may produce underachievers as it is static, whereas selection generates overachievers as it is dynamic. Thus, a norm may not be the best criterion for identifying gifted students.

Students can be selected for gifted education programs through a self-selection and adaptive retention process [34]. Self-selection refers to the process through which students who believe they have high ability, motivation, and interest in gifted education programs can apply to these programs. However, self-selection produces too many applicants, some of whom may be misfits in the programs. Adaptive retention can correct this misfit throughout the learning process. Some self-selected students may not develop exceptional achievement, learning motivation, and interest throughout the program. They should be guided to find education programs that are more appropriate for their talent development. The fittest students remain in the program.
Talent development is uniquely multiplicative, requiring progressively more complex higher-order interactions between personal dispositions and stimulus conditions as parts of a larger learning environment. Expertise-reversal-effect models [35] and trait-treatment interaction models [36] can be good educational adaptations for talent development. Nonetheless, a unilateral view of giftedness applied in gifted education programs usually tends to offer the same education for all students, with a primary goal of raising academically advanced pupils. This understanding of giftedness and the approach used to educate these pupils are not aligned with the view addressing diversity in gifted education: One size does not fit all [37]. Because talent develops through higher-order interactions with evolutionary changes in personal dispositions, educational practices should focus on environmental adaptations that promote higher-order interactions creating multiplier effects in talent development.

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