

How gifted students learn : Mapping research into effective teaching

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Aim : to develop a framework for implementing educational programs for gifted and talented students in regular classroom contexts that is based on contemporary research about how these students learn.

To do this we

- analyse definitions of giftedness and talent, including the latest international research findings and explanatory theories in the area of the nature and development of high cognitive abilities
- develop procedures for identifying gifted students, including early identification
- develop teaching procedures for gifted students that are based on their learning characteristics, identify the role of teachers and administrators in gifted education.
- examine and evaluate models and examples of programs for gifted students including acceleration, enrichment, extension and mentoring programs that are both classroom- and community-based.
- develop policy frameworks for the education of gifted students, including unified and coordinated sets of principles for constructing comprehensive programs that meet the unique intellectual, academic, creative and social-emotional needs of gifted students.

Defining gifted and talented students

Teachers entry beliefs about giftedness

What are the typical learning characteristics of students who are gifted ?

Regular classroom teachers frequently have inappropriate beliefs about gifted students and how they learn. These stereotypes influence how teachers recognise these students and how they teach them. The stereotypes frequently

- do not reflect the diversity of giftedness and do distinguish between different types of giftedness and talent.
- do not take account of how these students actually learn
- do not take account of how these students operate / present in the classroom, that is, their regular classroom personas. The stereotypes do not allow teachers to recognise accurately these students.

Classroom teachers need to know about

- how students who are gifted and talented learners learn, their learning characteristics and how these are displayed in the classroom.
- how to teach these students. This includes knowing how to
 - differentiate and elaborate the teaching of regular topics.
 - allow the gifted learning processes to 'evolve', that is, how students can learn driven by intrinsic motivation.
 - 'program' where necessary (for gifted students, this includes helping students see the need to be 'programmed', to do so in a way that is based on meaning rather than rote and to pave the programming themselves.
- how to provide feedback to these students. Feedback that makes comparisons with peers, that doesn't target the knowledge that is in place and that does not challenge further learning through open-ended questions is less effective.

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- how to advise and counsel parents.
- how to counsel these students; how to help them understand and use their exceptionality to advantage.
- how to see their gifted learning capacities in a social and cultural context, to
 - understand peer interactions and influences
 - deal with concerns and worries about cultural issues
 - help them learn in groups
 - perceive consequences and implications.
- the range of curriculum and pedagogic options available to them and when to use each, for example,
 - when to use vertical knowledge extension (acceleration) versus horizontal broadening.

In any program intended to help teacher growth, it is important that teachers' existing knowledge be identified. To examine what teachers already know about gifted and talented students, you can

- have them state their beliefs about the typical learning characteristics of students who are gifted. Ask *What are the characteristics of gifted and talented students?* Participants brainstorm. A typical list of characteristics:
 - giftedness isn't often reflected in academic learning and success
 - history - have a rich elaborated and differentiated set of ideas re a topic, give unexpected ideas and show breadth, have a reservoir of knowledge, able to use this to analyse situations, well organised for a self rather than in terms of cultural links (eg, text like) - a unique or ideosyncratic organisation
 - rapid retrieval
 - intrinsic motivation, inner drive to enquire, curious in specific domains, internal drive --> stickability, stubbornness, demanding, persistent
 - uneven development in areas of capacity
 - not easily programmed externally, for example, learning conventions of writing, spelling
 - have a level of empathy, maturity and understanding of emotional situation
 - teachers often say students are 'too emotional' but this is because these students have advanced cognition + emotion due to a lack of perceived power; they can predict, infer and think of possible outcomes and retrieve the relevant feelings that go with a lack of power. They need (1) acknowledgment of what they know or believe and (2) examine what actions they can take.
 - look beyond actual situations easily, infer, go beyond
 - intensity in the learning
- use the following chart to distinguish between gifted and bright able students.

For each of the following characteristics, indicate whether you believe it to more characteristic of gifted learners, able, bright learners or of neither group.

	gifted learners	able bright learners	neither group
Not easily programmed by others during teaching	r	r	r
Makes links between ideas in unexpected, divergent ways	r	r	r
Learns the ideas being taught well	r	r	r
Irritated by being structured or being directed to learn	r	r	r
Remembers well what was taught	r	r	r
Takes in new ideas as they are presented	r	r	r
Easily programmed by others during teaching	r	r	r
Is extremely curious to learn new ideas	r	r	r
Prepared to learn new ideas	r	r	r
Takes ideas apart, extends and question them	r	r	r
Thinks intensely about ideas being taught	r	r	r
Creates a new design or a way of thinking	r	r	r
Invents, builds new ideas	r	r	r
Receives new ideas from others well	r	r	r
May not present as achieving at a high level	r	r	r
Shows own opinions and feelings about idea	r	r	r
Infers, predicts about ideas "But what if ...?"	r	r	r
Understands the taught ideas well	r	r	r
Prefers convergent tasks	r	r	r
Usually satisfied with high level of success	r	r	r
Applies ideas taught well	r	r	r
Invents problems, assignments	r	r	r
Invents own ways of solving problems	r	r	r
Completes set problems, assignments	r	r	r
Often highly self-critical of own learning	r	r	r
Applies taught ways of solving problems	r	r	r
Initiates tasks, prefers open-ended direction	r	r	r
Completes set assignments well	r	r	r
Enjoys being structured, directed to learn	r	r	r
Prefers divergent problems	r	r	r
Links taught ideas with new ideas well	r	r	r
Achieves at a high level	r	r	r
Is interested, prepared to learn new ideas	r	r	r
Copies, imitates ideas well	r	r	r

Task 1 Develop a procedure for determining what classroom teachers know about gifted and talented learning.

An operational definition

An operational definition that differentiating between 'gifted' and 'talented' students :

- Talented student: one who displays exceptional creative ability in areas in which they have been explicitly taught.
- Gifted student: one who displays exceptional ability in areas in which they have not been explicitly taught.

Examples of creative behaviors and outcomes An outcome of thinking is creative if it

- shows high level understanding; rather than low level interpretation or application, the person has taken the ideas apart,
- shows novel connections between ideas quickly, shows that the person has inferred
- solves problems in unusual or novel ways

- asks complex questions about the ideas
- link ideas in lateral ways that are unexpected and surprise others ; it shows breadth of ideas
- shows evidence of thinking in several directions rather than in a single direction
- involved keep track of several ideas at once,
- shows the person was thinking in larger jump, skipping steps in the thinking,
- used imagination or fantasy, showed 'intellectual playfulness'.
- can be justified in some ways

Where this definition comes from

Definitions of giftedness Some definitions do not distinguish between giftedness and talent :

- Gifted and talented children have outstanding abilities and are capable of high performance. They need differentiated educational programs and services beyond those normally provided by the regular program to realize their contribution to self and society (Marland, 1972 definition of the U.S. Office of Education). Children capable of high performance include those with demonstrated achievement and / or potential ability in any of the following areas.
 1. General intellectual ability
 2. Specific academic aptitude.
 3. Creative or productive thinking.
 4. Leadership ability.
 5. Visual and performing arts.
 6. Psychomotor ability (this category was later deleted).
- Gifted and talented children and youth have demonstrated or potential abilities that indicate high performance capability in areas such as intellectual, creative, specific academic or leadership ability or in the performing and visual and arts, and who require services or activities not ordinarily provided by the school (Gifted and Talented Children's Education Act, 1978, Section 902) to fully develop such capabilities (PL 100-297, Section 4103).
- Giftedness is the product of three interacting clusters of traits; above average intellectual ability, high levels of creativity and high levels of task commitment. Gifted and talented children have or can developing this set of traits and apply them to any potentially valuable area of human potential (Renzulli & Smith's (1980) definition).
- Gifted indicates any child who is outstanding in either a general or specific ability in a relatively broad or narrow field of endeavour (Ogilvie, 1973).
- Giftedness is asynchronous development in which advanced cognitive abilities and heightened intensity combine to create inner experiences and awareness that are qualitatively different from the norm. The uniqueness of the gifted renders them particularly vulnerable. (The Columbus Group, 1991).

These definitions differ :

- some are operational, intended to guide the identification of gifted students (U.S. Office of Education). They refer to past outstanding achievements in a valued area of human activity.
- some stress superior creativity as a major criterion.
- some clarify the characteristics of these students (Renzulli, Gagne, The Columbus Group).

Giftedness versus talented Some definitions distinguish between talent (outstanding performance in a specific area such as art, music, science) and giftedness (high level broad-based general ability). Perleth & Heller (1994), Cohn, (1981) and Differentiated Model of Giftedness and Talent (Gagne (1991) distinguish between these two concepts as follows;

Giftedness -
 distinctly above average competences or aptitudes in intellectual, creative, socio-emotional or sensori-motor ability. They are

- untrained and displayed spontaneously.
- attributed in part to genetic sources
- observed in many of the tasks a person does.

They can be suppressed by environmental influences and are seen in young children.

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 motivation transforms giftedness into talent; through personal interests, personality traits and cultural influences

Talent
 distinctly above-average competence in one or more fields of performance such as fine arts or performing arts. They are skills or abilities that

- are developed systematically
- emerge gradually as the aptitudes are transformed into skills in particular areas of activity.

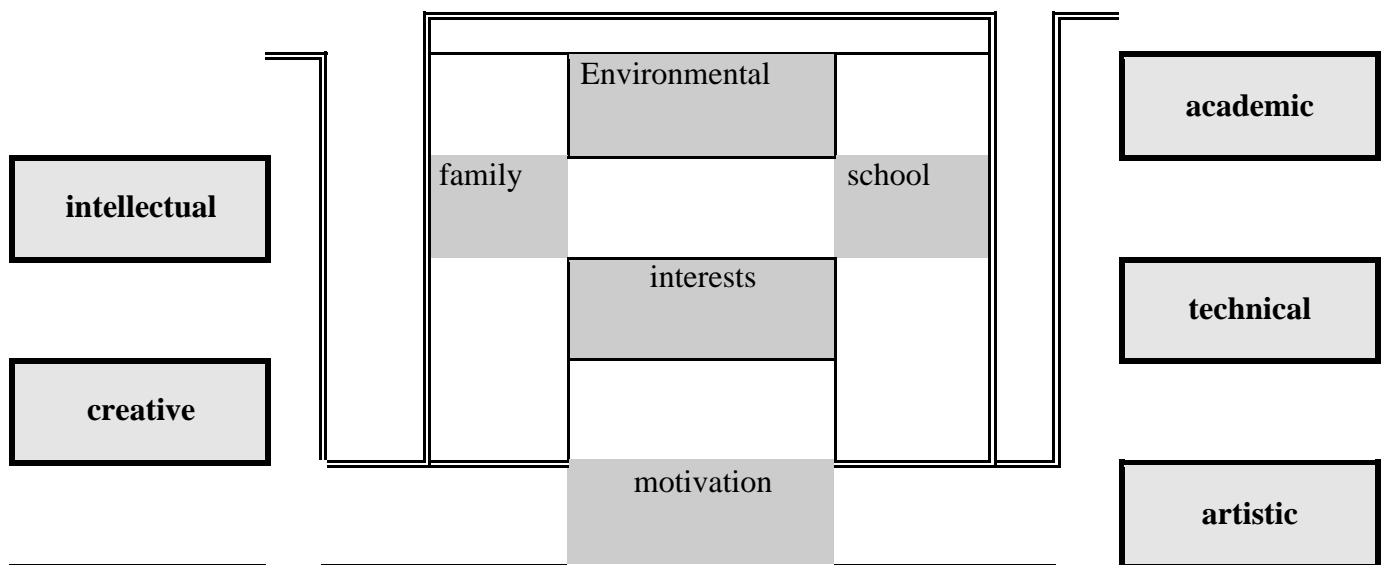
Individuals who are gifted may not necessarily be talented. are necessary.

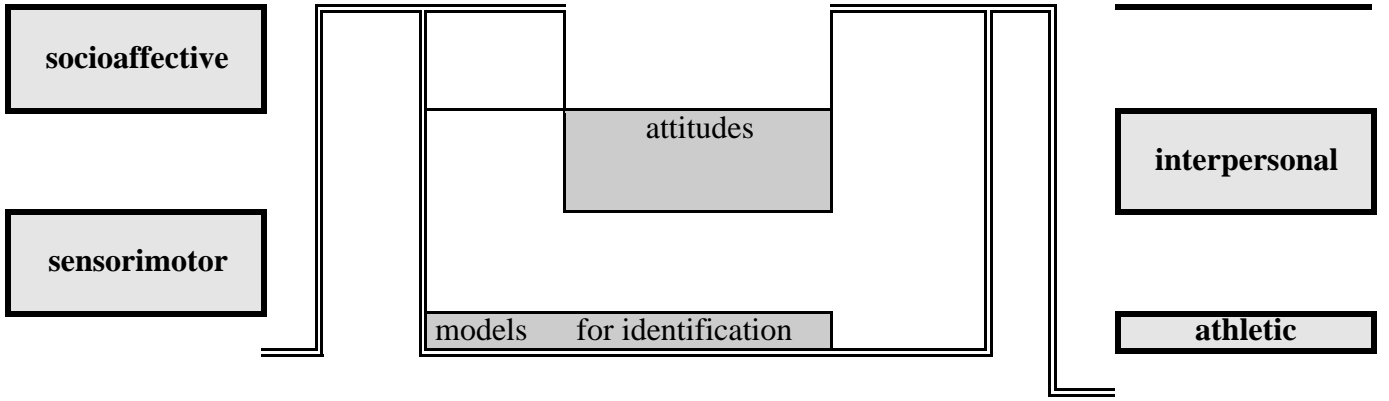
Areas of 'giftedness and talent

<ul style="list-style-type: none"> • main domains of giftedness (Cohn) multiple general capacities or aptitudes of high ability (G) • independent abilities (P & H)
<ul style="list-style-type: none"> • intellectual gifts, comprising quantitative, verbal, spatial (Cohn), • linguistic, mathematical, technical (P & H)
<ul style="list-style-type: none"> • creative abilities (originality, productivity, elaboration, flexibility) (P & H)
<ul style="list-style-type: none"> • artistic gifts, ability in fine arts, performing arts • creative (Gagne) • musical and artistic abilities (P & H)
<ul style="list-style-type: none"> • social gifts, leadership, empathic / altruistic ability (C) • socioaffective (G) • social competence (planning ability, leadership, control of social interactions) (P & H)
<ul style="list-style-type: none"> • sensorimotor (Gagne) • psychomotor (hand+ body motor skills) (P & H)
<ul style="list-style-type: none"> • practical intelligence (ability to manage daily and vocational challenges) (P & H)

specific talents (P & H)
<ul style="list-style-type: none"> • academic , technical (G) • maths, natural sciences, computer skills, technology, languages (P & H)
<ul style="list-style-type: none"> • artistic (G) • art (music, painting) (P & H)
<ul style="list-style-type: none"> • interpersonal (G) • social relationships (P & H)
<ul style="list-style-type: none"> • athletic (Gagne) • sports (P & H)

Gagne (1991) proposed a model in which learners have multiple general capacities or aptitudes of high ability. These are catalyzed through personal interests and personality traits and cultural influences into particular talents. This is the Differentiated Model of Giftedness and Talent:

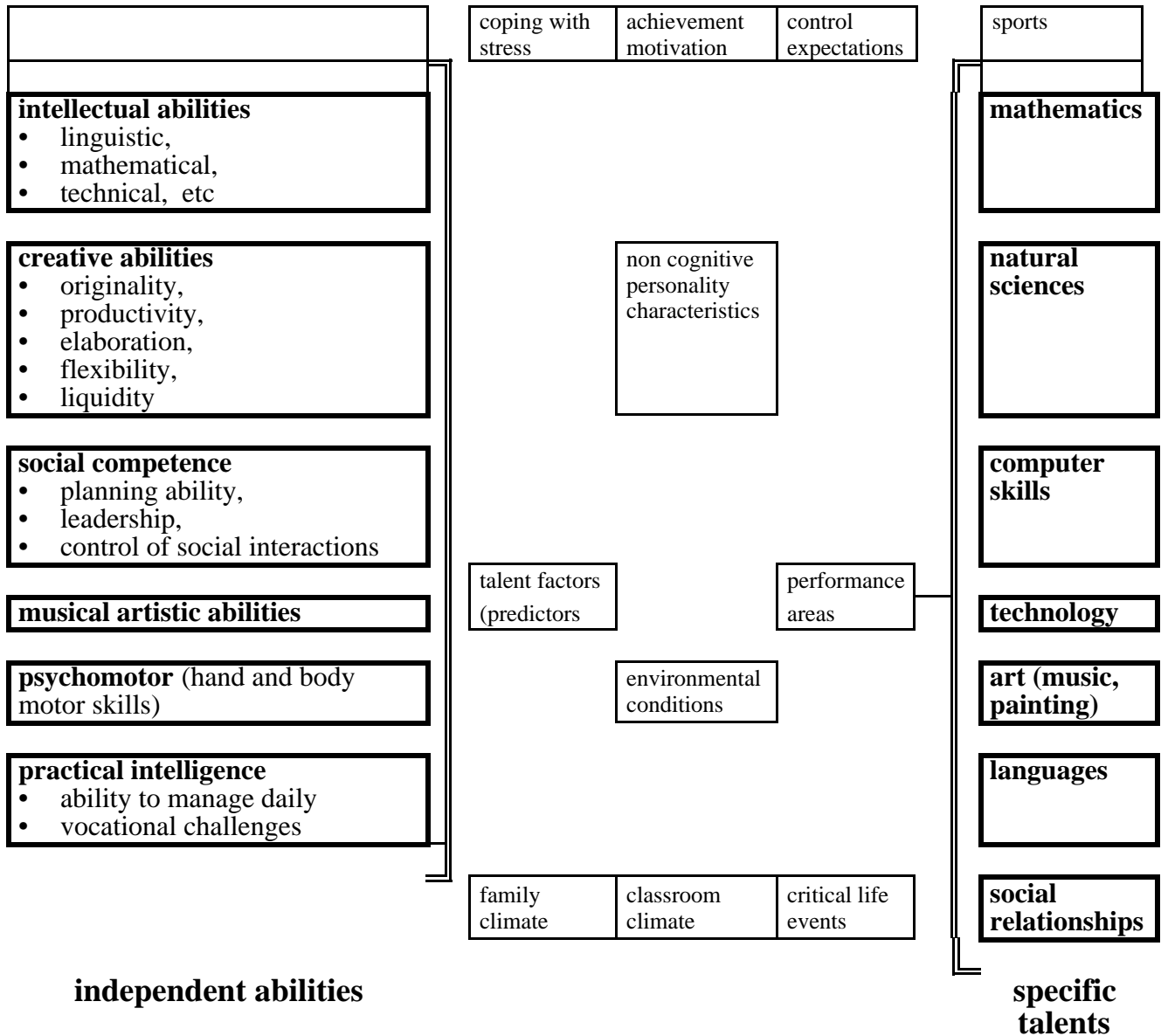




The model differentiates between giftedness and talent:

- The aptitudes are untrained and displayed spontaneously. They are attributed in part to genetic sources and can be observed in the majority of tasks a person performs. They can be suppressed by environmental influences and are most visible in young children.
- The talents are skills or abilities that are developed systematically. They emerge gradually as the aptitudes are transformed into skills in particular areas of activity.

Heller (Perleth & Heller, 1994) propose a similar multi-dimensional set of independent abilities that are associated with specific achievements or performances



2. Implications and limitations of each of the definitions. Operationalise each definition. What does each mean for selection and identification of students ?

Task 2 : In the schools that you visit, examine how teachers distinguish between giftedness and talent. What curriculum and teaching procedures are used to develop talent ?

Understanding how gifted and talented students learn

What do we do when we learn ?

We are interested in how gifted children learn. There are a range of questions we need to examine

- how does the knowledge of gifted students differ from that of students who are not gifted ?
- how do gifted students differ in how they think ? Evidence that they think faster, in greater depth, in larger steps at once ? Are they able to change that they know more easily ?
- do gifted students manage their learning and thinking more efficiently ?
- do gifted students have greater confidence in their ability to learn and think ?

To answer these questions we need to develop a framework for understanding knowledge and how it changes. Following is a description of a 'bof'. Work through it and use it to decide what a bof is and what you did to make this decision.

Peter knew enough about bofs to be aware of the danger he was in. He thought about his predicament . Bofs, he knew, were short-sighted, but had a very good sense of smell. They also had very sensitive hearing.

In the distance he could hear the roar of the river. Would that cover the noises that he was sure to make as he tried to escape ? Slowly and silently he turned and backed away from the clearing.

The bof couldn't see Peter, but knew that he was escaping; its sense of smell told it this. It padded along on its huge paws, claws sharp and extended. It moved its head from side to side, its nose pointing up and swinging like a radar scanner searching for its target.

Peter made his way to the waterfall. He stopped on the bank of the river, keeping as still as he could.. Then he saw the bof again. It was standing on a rise that ran along the bank. It was hungry. It was also angry because it had been deprived of its dinner. It padded up and down on the green grass carpet making a soft grunting noise as it moved, It furiously sucked in air through its dilated nostrils as it searched for Peter's scent. Its huge arms thrashed around as it groped for its quarry. Suddenly its pointed ears pointed in Peter's direction.

What, do you think, is a bof ? _____

What did you do to reach this decision ? How did you form your impression ?

To learn a new idea most students	Gifted students
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<p>need a challenge or reason for learning : they</p> <ul style="list-style-type: none"> • differ in their motivation to learn: whether they are self-motivated or motivated by others. Motivation to learn ranges from extrinsic to intrinsic. • differ in their motives for learning; their purpose can be to <ul style="list-style-type: none"> • reproduce or memorise information (superficial or shallow motives) • 'take ideas apart' (deep motives). • learn ideas to satisfy external criteria, get good marks (achieving motive). 	<ul style="list-style-type: none"> • learn well by having their knowledge challenged, by being able to frame up questions that they pursue. • are more likely to show intrinsic motivation to learn. They resist extrinsic motivational orientations. • are more likely to show deep motives for learning, to want to 'take ideas apart', question and extend them by linking with what they know. They often resist learning for superficial or achieving motives.
<p>need to know where they will end up, be assisted to 'see' the goals</p>	<ul style="list-style-type: none"> • learn well by forming an impression of where they will end up, see their goals
<p>make links with and use what they know re topic</p> <ul style="list-style-type: none"> • they link the information with what they know about a topic in different ways : by <ul style="list-style-type: none"> • talking to themselves about the ideas, build ideas in linguistic ways. • thinking scientifically about the information. • forming images or mental pictures about the information • thinking of the key actions and use this to learn. • differ in how fast and efficiently they handle information • what they know about how to learn, how to think, their thinking or learning strategies • use what they feel about themselves as learners of the ideas (self efficacy) • identify what they don't know about the topic • recode what they know to match the teaching 	<ul style="list-style-type: none"> • can have superior existing knowledge of a topic that is better differentiated and elaborated in a range of forms: <ul style="list-style-type: none"> • verbal, abstract, 'semantic' form (verbally gifted) • imagery, experiential form (visual spatial gifted). • procedural form • scientific-mathematical form (math/ scientifically gifted) • musical form • learn in idiosyncratic ways. They are often not easily programmed externally and need to align what they know with the teaching. • process information faster and efficiently, show cognitive efficiency (e.g., memory span) (Saccuzzo, Johnson & Guertin, 1994), show higher efficiency in elementary processes (Geary & Brown, 1991) that determine more complex processes. • need to see that they will be allowed to manage and direct aspects of the learning, that they are valued for what they know and how well they can manage the learning. • are curious, good at questioning a topic or the ideas they will learn about. • need to have the opportunity to recode what they know to match the teaching • often set unrealistically high standards and goals for themselves.
<p>need to see a pathway to the goal</p>	<ul style="list-style-type: none"> • prefer to set their own pathway that they can follow to the goal .
<p>learn new ideas in specific contexts by</p> <ul style="list-style-type: none"> • using a range of learning strategies: <ul style="list-style-type: none"> • actions, imagery, familiar language; • recode imagery, action knowledge • answering questions • decide how a new idea is like what they know • change their minds, make and correct mistakes, • talk about the ideas in different ways ? • make a picture of the ideas, imagine them • holding information they can in short term memory or the thinking space. • using the information in different ways; <ul style="list-style-type: none"> • some segment it into parts, work on each part; analytic sequential thinking. • some make rapid guess about main idea and check or confirm their guess; global wholistic thinking. • differ in how they manage and direct the learning (their 'metacognition'):. some <ul style="list-style-type: none"> • manage their learning; plan, monitor their progress and review how they have learnt • look for direction from others to learn 	<ul style="list-style-type: none"> • know how to use their knowledge better. • learn in idiosyncratic ways. They are often not easily programmed externally and need to align what they know with the teaching. • ask questions spontaneously <i>How can I get from ...to .. ?</i> • explore possible options, trial ideas, interpret ideas as problems to solve • use analogy, make comparisons well, think about ideas in different ways; for example, think intuitively, in imagery or action ways • link and categorise ideas at a high level • look for cause-effect or consequences • often do not need much practise to learn new ideas • often do not get the appropriate corrective feedback • recall better from short term memory and use higher level organizational strategies such as category naming and clustering (Coyle, Read & Gaultney, 1998; Gaultney, Bjorklund & Goldstein, 1996). They showed higher level of stability in strategy use with high levels of recall. Short term memory ability matches their area of giftedness ; math gifted learners do better on number memory tasks while artistically gifted learners do better on visual tasks (Dark & Benbow, 1991, 1994). • prefer to use global wholistic thinking more than analytic sequential thinking (Brown & Yakimowski, 1987). • show superior metacognitive knowledge, more able to monitor comprehension

deepen what they have learnt; abstract it, link it more broadly with what is known <ul style="list-style-type: none"> link episodic, abstract and procedural aspects of idea review, consolidate what was learnt decontextualize, summarize, organize, link with what is known, main/subordinate ideas. elaborate and extend ideas through questioning look at ideas from different perspectives 	<ul style="list-style-type: none"> use more complex cognitive or thinking strategies than non-gifted students show better far transfer of strategies to situations quite different from those in which strategy was learnt, eg problem solving strategy, use strategies more spontaneously show superior problem-solving strategies, are more flexible in shifting from one strategy to another for complex problems and transfer understanding from one problem to related problems more effectively
invest positive emotion in the new knowledge <ul style="list-style-type: none"> interest level, value use of ideas students as successful learners of ideas 	invest positive emotion in the new knowledge if they managed and directed the learning
store what they have learnt in memory, practise remembering it	store easily what they have learnt in memory, practise remembering
identify how they learnt, what they did that helped them to learn	because many gifted students learn rapidly in idiosyncratic ways, rather than being programmed to think, it is useful for them to reflect on how they went about learning.
see themselves making progress	see themselves making progress
automatise what they have learnt so it can be more easily used	many gifted students automatise what they have learnt in meaning ways rather than through being taught rules. they often do not automatise ideas by rote
transfer and generalise the new knowledge	show far transfer and generalise the new knowledge far beyond the context in which it was taught
organise what they have learnt for assessment purposes	organise what they have learnt for assessment purposes

Serial - analytic versus synthetic-global strategies Learners think about ideas in two main ways:

- analytic strategies that analyse ideas into parts step by step way and sequence them
 - wholistic strategies that integrate ideas with other ideas, treat each ideas as a whole.
- Many gifted students use one wholistic strategies at a high level.

Serial - analytic strategies	Synthetic-global strategies
<ul style="list-style-type: none"> Work on bits of information step by step Learn step by step, delay giving answer. Focus on detail and specific facts. Think in direction provided. More likely to learn the conventional ways of thinking Take things apart, work on the parts Easily programmed by external information by analysing and taking on board small changes at a time Follow other people's directions well Think by linking the parts in conventional ways. Analyse, sequence ideas in taught ways Find it easy to learn the 'rules of play' of situations when these are explicit Prefer less flexible convergent learning Learn other's explanations, procedures Show what they know in conventional, acceptable, taught ways 	<ul style="list-style-type: none"> Look for overall patterns, scan Leap in and answer quickly, guess impulsively Focus on overall idea, miss or ignore detail Think by moving in several directions at once. Develop their own ways of thinking. May think very quickly and not reflect on how they thought. Think in wholes Not easily programmed by external information, attempt to align what they think with parts of information Prefer to direct, manage their thinking, flexible, not phased by unanswered questions. Think by imposing their personal links, drawing in ideas that may seem irrelevant, 'off the track', lateral. Arrange, sequence ideas less predictably. Don't take on the 'rules of play' when these are explicit, use their own rules of play Prefer flexible, open-ended learning contexts Prefer to work out own explanations, sometimes using other peoples' explanations. Show what they know in less conventional ways; have difficulty using conventional ways of display

Task 3 Use the learning framework above to develop a procedure for assisting classroom teachers to identify gifted learning while they are teaching a unit of content to a group of students.

Metacognition and giftedness

- Metacognition describes how students become responsible learners regulating their own learning and performance.
- Self-regulation is the highest level of metacognitive activity (Borkowski, 1996) and includes
 - monitoring or self-checking,
 - planning or goal-setting, and
 - attending and rehearsing.
- Gifted learners use self-regulatory strategies such as defining, focusing, persisting, guiding, coping, correcting, reinforcing and solving.

The Good Strategy User Model is useful for examining metacognition in gifted students (Carr, Alexander & Schwanenflugel, 1996). Three components:

component	gifted and average students
knowing how to use a particular strategy	gifted elementary students <ul style="list-style-type: none"> • use more complex strategies • use strategies more spontaneously and independently • don't differ from non-gifted students in near transfer of strategies to use in similar situations • show far transfer of strategies to use in situations quite different (for example problem solving, elaboration)
knowing when, where and why different strategies should be used	Gifted children have better knowledge about why particular strategies work
knowing how to evaluate, check and change strategy use	Gifted children are no better than average children in <ul style="list-style-type: none"> • judging the effectiveness of a strategy, • adopting alternative ways of solving problems.

Gifted students use the same strategies and rules during problem solving as average learners; they don't show qualitative strategic differences (e.g., Gaultney, Bjorklund, & Goldstein, 1996; Jackson & Butterfield, 1986). However, they use the more advanced rules, use strategies more efficiently and learn new strategies more easily (Geary & Brown, 1991). They show superior problem-solving strategies and flexibility in shifting from one strategy to another for the complex problems, and transfer understanding from one problem to related problems more effectively (Kanevsky, 1992)

To collect metacognitive data to decide if students are gifted Metacognition in a particular talent domain may become important after the early learning years, when children have learned the basics of their field and become immersed in strategy and self analysis.

Think aloud	students think aloud while doing a simple task (Ericsson & Simon, 1993). Record and analyze what they say, with other data such as writing, drawing, videos, behavioral observations that reveal the cognitive processes (Hong & O'Neil, 1992).
Portfolios :	Reports from 4 people over period on a student's ability in 4 areas (Shaklee, 1993): <ul style="list-style-type: none"> • acquisition and retention of knowledge • application and comprehension of knowledge • creation of knowledge and • perusal of knowledge Metacognition is one indicator of the application and comprehension of knowledge.
Problem-solving tasks	Analyse and score contextual problem solving tasks for fluency and flexibility
Dynamic assessment procedures	In particular domains (Bolig & Day, 1993) to measure the rate of learning transfer and rate of learning, particularly for far transfer

Task 4 Develop a procedure that classroom teachers can use to identify gifted learning by observing students' use of metacognition.

Developmental trends in gifted learning. As well as looking at how gifted students go about learning at any time, it is useful to look at how gifted students develop intellectually. This allows us to look at issues such as early identification.

<p>Piaget proposed</p> <ul style="list-style-type: none"> • we make sense of the world by using what we know • we symbolise the world in various ways; actions--> images -->real world concepts --->abstract concepts • thinking consists of mental operations; physical actions are internalised. • our knowledge consists of sets of related ideas (schemes) . • our ways of knowing change qualitatively through a sequence of stages <ul style="list-style-type: none"> • sensory-motor stage; action understanding. • pre-operational stage; perceptual understanding; 2 sub-stages <ol style="list-style-type: none"> (1) perceptual understanding and (2) intuitive understanding • concrete operation stage; real-world logical understanding. • formal operational stage; abstract understanding. • our knowledge changes in situation of cognitive conflict; two adaptation processes; <ul style="list-style-type: none"> • link new ideas with what we know; • change what we know. 	<p>Gifted children differ qualitatively in how they develop thinking. The order of stages is consistent but organize their knowledge differently; they</p> <ul style="list-style-type: none"> • move through stages faster (Hix, 1990; Lempers, et al., 1987) of up to 2 years (Carter, 1985). Moderate and highly gifted students do not differ in speed (Bekey & Michael, 1987) and can do at least one formal operations task by age 9 or 10. • show domain specificity in formal operations (Berninger and Yates, 1993). • once they can conserve, move through sequence rapidly, do so simultaneously in several contexts (Roberts, 1981). • having learnt a concept, apply it more widely and use wide active inference (Heller, 1979) • have richer and more differentiated networks of meanings (Heller, 1979). This allow them to search for stimuli that help to complete their structure and show generalized assimilation, applying a scheme to all stimuli available. • operate as big picture thinkers, pattern seekers and form general principles that apply to all domains, following feedback from few encounters • don't generalize as much within a domain on the most difficult problems; have general principle but don't consistently apply it.
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<p>Vygotsky proposed</p> <ul style="list-style-type: none"> • we make sense of the world through our social interaction with others, particularly in how we jointly solve social problems • we symbolise the world using socially determined and valued <ul style="list-style-type: none"> • tools; actions for solving problems • signs; gestures, icons, symbols • Zone of proximal development' ; difference in how a person can solve problems without and with social support. • Self talk as a mediator for managing learning Provide opportunities for negotiating meaning in learning. 	<p>Implications of Vygotsky for giftedness Do gifted students</p> <ul style="list-style-type: none"> • have past social interactions, social problem-solving that differ from others ? Do their parents begin to mediate learning earlier, manage parent-child interactions differently ? Parents of pre-school gifted children model and foster metacognitive strategies more than parents of normal ability children, particularly during problem solving (Moss, 1990). Gifted preschoolers more likely to predict consequences, reality test and monitor their thinking • internalise different social tools and signs ? • internalise tools and signs more easily ? • differ in their cultural experiences ? • have more highly developed iconic and linguistic coding systems ? • operate more easily in the ZPD (easier to scaffold, self-scaffolding) ? How might gifted students manipulate the ZPD ? <ul style="list-style-type: none"> • Can have their existing knowledge be scaffolded by higher level thinkers ? • Do they need to be scaffolded in ways that allow them to pursue their own interests in learning ? • Some gifted students show a smaller ZPD when peers or teachers provide the scaffold; they prefer to manage their own rather than learn in mixed ability groups. • learn self talk more easily ?
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Task 5 Use the developmental trends in intellectual ability above to recommend ways of identifying early evidence of gifted learning.

Characteristics of gifted and talented learners learning

Superior learning processes Gifted children learn quickly and see connections between ideas faster than their peers. They

- achieve developmental milestones earlier than normal
- see connections between ideas quickly, learn new information and solve problems rapidly
- ask complex questions and seek the opportunity to answer them for themselves
- see cause and effect relationships rapidly, try to discover the how's and why's of their world.
- link ideas in lateral, creative ways and often surprise us with the direction their thinking seems to have taken, give unexpected responses to questions ,
- keep track of several ideas at once,
- think in larger jump, skip steps in their thinking,
- require fewer repetitions of an idea to learn it.
- use imagination, fantasy and humour at a high level, show 'intellectual playfulness'.
- have a well-developed memory, particularly for the areas of interest
- make decisions quickly
- may have difficulty learning in particular areas, for example rote learning, spelling, handwriting, rote recall of arithmetic information.
- may show carelessness in handwriting and similar routine tasks
- ignore details in some areas.
- may have difficulty saying how they thought through or solved problems, because
 - they are thinking faster than they can vocalize or
 - they don't believe they need to communicate to others how they think.

- pursue an idea or argument tenaciously, express opinions uninhibited, argue their point in a clear, seemingly logical and reasonable manner and will talk back, debate any issue. Parents need to be prepared to be good listeners.

Learning outcomes. These students usually have a wide general knowledge and an extreme knowledge in areas of interest that is commensurate with that expected of older pupils. They

- know about things of which other pupils seem unaware.
- show early fluency and are expressive
- may demonstrate advanced vocabulary, particularly in areas of interest and communicate ideas fluently
- have high sense of moral values

Motivation to learn and learning style Gifted students are 'self-driven' and motivated to 'want to know'. They learn spontaneously without direct teaching. They have high levels of intrinsic motivation. When they are put in learning situations in which they have less control over the learning and why they are learning, they experience high levels of frustration. They

- show a passion for learning, are highly motivated, intense, enthusiastic, study in areas that interest them and can become very absorbed in a topic. They can become overly consumed.
- extremely curious, constantly question and enjoy discovering new idea. They need the opportunity to explore new ideas.
- frequently learn independently, prefer to direct their own learning, may have difficulty in situations in which their learning is directed and in which their curiosity is not challenged and rebel if not interested.
- may question learning situations and become discipline problems in directed, closed learning contexts or in repetitive tasks. They may rebel against conformity.
- can concentrate for prolonged periods and show high levels of perseverance, not easily distracted from tasks of interest. This high level of energy expenditure may lead to complications in other areas.
- may become bored and frustrated if
 - the learning pace is too slow
 - if tasks are routine
 - if tasks are not challenging

They may daydream because in school they already know much of the material being taught. Teachers may think they are not listening when they really are. They need a lot of variety to keep their busy minds fed.

Interpersonal interactions They may feel different from peers and alienated because they don't get the necessary positive affirmation from peers and teachers but not understand why. They may

- not value their exceptional abilities; they may not get the affirmation because they don't know how to show what they know so that it fits with the group expectations.
- have difficulty identifying with a peer group; they may
 - feel they have less in common with peers, (their peers may not comprehend their ideas and they feel that there is something wrong with them).
 - have difficulty communicating with same-age peers because of interest difficulties, and with older children who find them emotionally immature; they seem 'the odd one out', experience loneliness and isolation and not feel part of any group.
- not find suitable role-models in the peer group.
- over conform in the peer-group situation when they find social acceptance difficult. They are often sensitive to rejection by others and try to conform so that they do not appear different. They may display heightened perceptions and sensitivities.
- want to dominate peer groups and group interactions and to direct group learning activities
- be not as carefree and as easy-going as class peers but instead are more serious.
- have difficulty understanding and valuing the learning of others, be irritated by class peers who do not understand the ideas at the same depth.
- appear to lack confidence in their interaction with their peers, have difficulty trusting others
- feel for others and events in the world, worry about children who they see being unfairly treated, take on the problems of others and world problems as personally affecting them, they have a heightened awareness of moral values,

Self-perceptions and affective aspects of talented children learning. They

- often have low self-esteem that restricts their preparedness to produce academically. Their self-talk is frequently more pessimistic than optimistic and they need to learn more optimistic scripts as options.
- set high (often unrealistically high) standards and goals for themselves and judge themselves harshly, self-critical.
- may be more anxious, often put stress on themselves and feel stress from others due to unrealistic expectations.
- are 'perfectionists', may worry about expectations that they should be 'perfect' and yet know that they aren't. If their giftedness or creativity is perceived to be threatened, they withdraw; they frequently lack the analytic strategies necessary for dealing with the threat more constructively.
- may have difficulty understanding the importance of 'risk-taking' in learning, may have a real sense of failure and may become school refusers.
- are frequently interested in consequences, the future, etc., but may see consequences that peers don't, tend to worry, appear to be less self-confident, less sure of self.
- may have difficulty resolving inner conflicts, unsure of themselves.

Uneven rates of development These students often show uneven rates of development. They show an 'asynchrony' in development so that they may

- present as emotionally or physically immature.
- show specific learning disabilities in particular areas, for example rote learning, spelling, handwriting, rote recall of arithmetic information.

This set of characteristics provides a basis for the identification of students who may be gifted and for the development of effective teaching procedures.

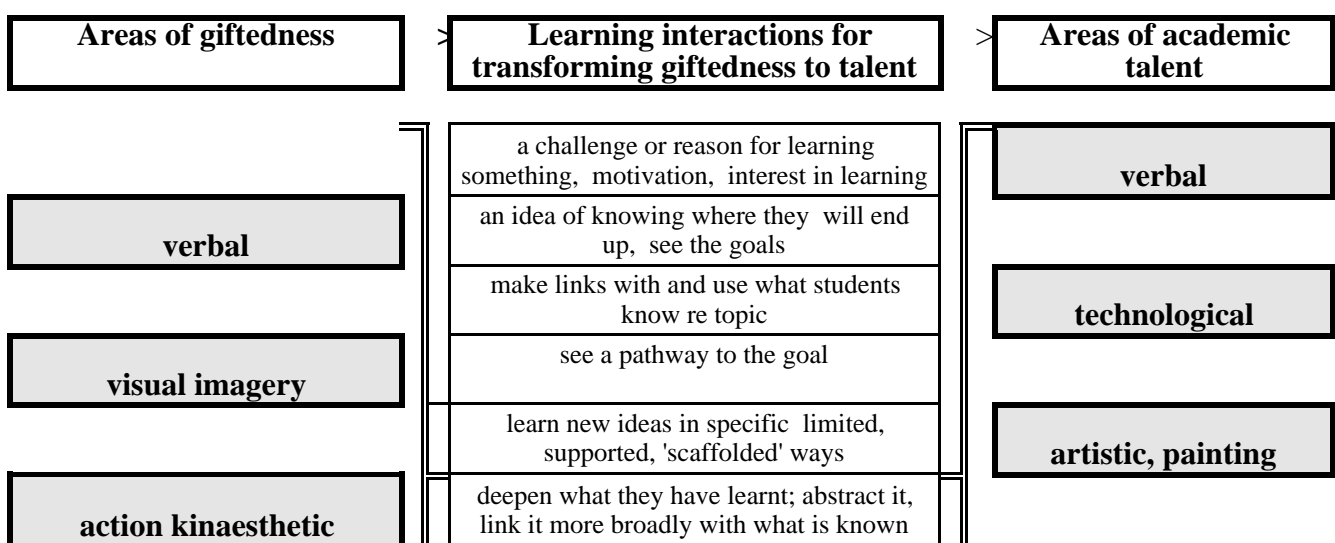
Implications of the definitions for gifted and talented students:

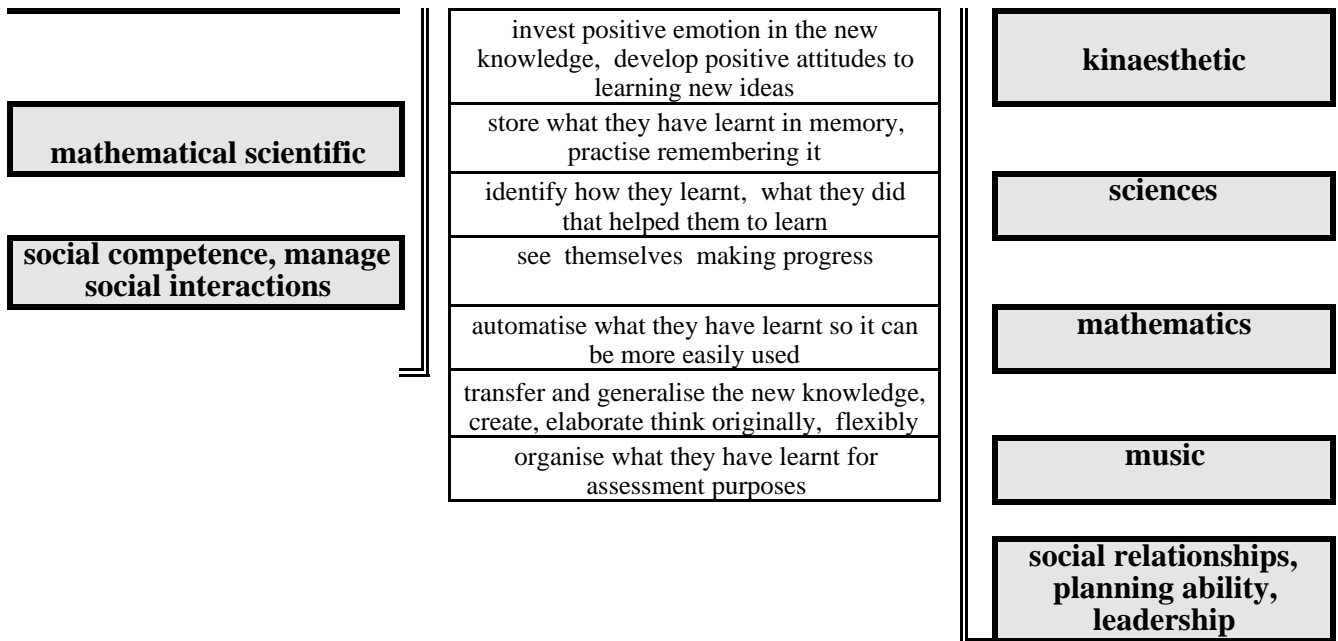
- understanding them
- selecting and identifying
- teaching.

Proposed model of learning

Model for converting multiple general capacities or aptitudes of high ability into particular talents.

John Munro





Implications for identification

Superior general intellectual ability ?
Gifted characteristics ?

High intrinsic motivation ?
Deep approach to learning ?
High level metacognition ?

Specific academic aptitude in a particular area ?
Creative or productive thinking ?
Superior achievement ?

Implications for teaching gifted and talented students Whether in acceleration or horizontal broadening programs, the learning characteristics of gifted students lead to particular teaching implications.

Gifted students	Instructional implications
need a challenge or reason for learning <ul style="list-style-type: none"> learn well by having their knowledge challenged, by being able to frame up questions that they pursue. are more likely to show intrinsic motivation to learn. They resist extrinsic motivational orientations. are more likely to show deep motives for learning, to want to 'take ideas apart', question and extend them by linking with what they know. They often resist learning for superficial or achieving motives. may be more difficult to motivate to learn ideas in areas that don't interest them initially. 	<p>Show gifted students an aquarium with goldfish and plants and a container of oil. Ask "What is the link between these ? What do these have in common ? How did this form ? Do you think the little fish and plants like this formed oil ? How long did it take to form ?" Tell the students that fish like the goldfish form oil. How do they think it happens ? Allow the students to say what they think, possibilities. Ask questions that help them take their ideas apart and to analyse them.</p> <p>Encourage them to set goals in areas where they are not interested. Whenever you have students frame up goal for learning idea in a subject such as history, bring together the two key ideas - in this case oil and small animals and plants.</p>
need to know where they will end up <ul style="list-style-type: none"> learn well by forming an impression of where they will end up, see their goals 	<p>Have students say that they will be able to explain how small marine animals and plants formed oil</p>

<p>make links with and use what they know re topic</p> <ul style="list-style-type: none"> • can have superior existing knowledge of a topic that is better differentiated and elaborated in a range of forms: <ul style="list-style-type: none"> • verbal, abstract, 'semantic' form (verbally gifted) • imagery, experiential form (visual spatial gifted). • procedural form • scientific-mathematical form (math/scientifically gifted) • musical form • process information faster and efficiently, show cognitive efficiency (e.g., memory span) (Saccuzzo, Johnson & Guertin, 1994), show higher efficiency in elementary processes (Geary & Brown, 1991) that determine more complex processes. • need to see that they will be allowed to manage and direct aspects of the learning, that they are valued for what they know and how well they can manage the learning. • are curious, good at questioning a topic or the ideas they will learn about. • need to have the opportunity to recode what they know to match the teaching • often set unrealistically high standards and goals for themselves, self-evaluate and become self-critical.. 	<ul style="list-style-type: none"> • To help them link with and use what they know re topic, present the stimulus materials in different ways, for example, in imagery ways, in actions. • Have them collate what they do know about the topic, what questions they can answer. They can draw a concept map of what they know in the different areas. • Give them more time to think through the ideas by themselves, to allow some ideas to stimulate other linked ideas in their minds. • Encourage them to be curious. • Have them say what they will do to learn about the topic, plan the route their learning might take. Let them see that they have a role in managing and directing their learning. • Have them identify what they don't know about the topic, unanswered questions they have, for example, <ul style="list-style-type: none"> • Why was it only small animals and plants that decayed to make oil ? • Did different kinds of animals make oil of different quality ? • Did the sand and silt that accumulated in the water have to be of a particular type / have a particular density range ? • Did the water need to be in a certain temperature range ? • How long did it take for the animal matter to decay ? • Would there be oil forming in parts of the world now ? • Help them deal with their often unrealistically high standards and goals for themselves. Let them see <ul style="list-style-type: none"> • how making mistakes can help them learn more in the future • that judging themselves harshly doesn't lead to best outcomes • that they can deal with situations in which they believe their creativity is threatened • how they may be putting unnecessary stress on themselves and how they can deal with this • Help them set realistic standards and goals for themselves, see that they can learn better when they allow themselves to make mistakes be 'partly right'.
<p>need to see a pathway to the goal learn well by forming an impression of where they will end up, see their goals</p>	<p>Encourage them to develop their own plans for learning about how oil was formed, the path they might follow, the questions they will answer, the materials they might need. They can decide when they might need to contact experts in the area, questions they might ask.</p>

<p>learn new ideas in specific contexts</p> <ul style="list-style-type: none"> • know how to use their knowledge better. • learn in idiosyncratic ways, are not easily programmed externally and need to align what they know with the teaching. • ask questions spontaneously <i>How can I get from ...to .. ?</i> • explore possible options, trial ideas, interpret ideas as problems to solve • use analogy, make comparisons well, think about ideas in different ways; for example, think intuitively, in imagery or action ways • link and categorise ideas at a high level • look for cause-effect or consequences • often do not need much practise to learn new ideas • often do not get the appropriate corrective feedback • recall better from short term memory and use higher level organizational strategies. • prefer to use global wholistic thinking more than analytic sequential thinking • show superior metacognitive knowledge, more able to monitor comprehension 	<p>Use teaching that encourages them to</p> <ul style="list-style-type: none"> • say the questions they are pursuing at any time • use a range of information sources about how oil was formed, ask , suggest some of the information sources that they could use and how they will locate information. Have them plan how they will collect different sources of information. • think about the story of oil in a range of ways: verbally, images, actions. Allow them to show the rich set of links they have of the history of oil. Encourage them to ask complex questions re the topic, generate their own questions and seek the opportunity to answer them for themselves, for example, about the history of oil, for example, Do you get oil of different quality from different types of vegetation or animals ? • interpret ideas as problems to solve, explore possible options, possibilities, trial ideas, interpret ideas as problems to solve. • allows them to use both global 'big picture' and analytic 'bits picture' thinking. Gifted and talented students are more flexible in their thinking and can often tolerate ambiguity and unanswered questions. <ul style="list-style-type: none"> • Allow students to begin to learn about oil in a 'big picture' way, to think in larger jumps, skip steps in their teaching, to do fewer repetitions of an idea to learn it. • List questions they think the teaching might answer, what questions they might be able to answer having learnt. Supplement bit by bit sequential teaching. • Help them learn how to learn in more conventional ways, to learn how to be structured or programmed by others in some contexts. . • Encourage them to reflect on, keep track of how they learn, what works for them. • think and reason by using analogy, comparing and categorising. Use cue questions if necessary to suggest possible analogies. • think in different ways about how animal and plant matter forms oil, for example, to be intuitive, to visualise the ideas, act them out to see the outcomes, etc. See 2.4 below for a framework for teaching gifted students to elaborate what they know. • make concrete or visual models of the ideas. • work at their own pace • look for cause-effect or consequences, practise, • take a greater role in managing and directing their learning, allow them to monitor their comprehension at any time and to take remedial action if necessary with less external intervention. • give them corrective feedback that recognises the ideas they have in place and possible directions / options they have for working on next. • Give students a range of ways of showing what they know about ideas. Many gifted students find it hard to display their knowledge in some formats because they haven't automatized them. They become frustrated because they can't show what they understand to teachers or peers. They also need to learn gradually how to 'read' and to sum up peer groups, to see what it is that the group values at any time and take this into account. <p>They can use the framework below to convert the information, data to knowledge. See 2.3 below for teaching ideas here.</p>
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<p>deepen what they have learnt; abstract it</p> <ul style="list-style-type: none"> link episodic, abstract and procedural aspects of idea review, consolidate what was learnt decontextualize, summarize, organize, link with what is known, main/subordinate ideas. elaborate and extend ideas through questioning look at ideas from different perspectives 	<p>Use teaching that encourages them to</p> <ul style="list-style-type: none"> link ideas in lateral, creative ways, for example, to operate intuitively, to give unexpected responses to questions, for example, Why might you get oil of different quality from different types of vegetation or animals? Students can link the type of hydrocarbon with the animals that lived in an area. use imagination, fantasy and humour at a high level, show 'intellectual playfulness'. Provide opportunity to explore an idea in depth, debate or argue an issue. have a well-developed memory, particularly for the areas of interest. recode knowledge into different forms, eg., recode imagery knowledge to scientific knowledge. This helps them get positive feedback for what they know. consolidate and review explicitly what they have learnt, explore how far it can be transferred, applied, generalised. They can show new knowledge in language forms, in iconic forms, through action sequences, in symbolic ways, etc. review, consolidate what they have learnt about how oil is formed, to link the episodic, semantic and procedural aspects of idea at once. decontextualize, summarize, organize ideas into main/subordinate ideas, show the new ideas they have learnt in various ways, for example, in poster, comic strip, concrete model. express, communicate what they have learnt about how oil is formed in conventional ways.
<p>invest positive emotion in the new knowledge</p> <p>are assisting by having them invest positive emotion in the new knowledge</p>	<p>Have then discuss</p> <ul style="list-style-type: none"> how the new ideas interested them, have increased their curiosity, the value of the new knowledge, how they could use the new ideas how it was their ability as students that allowed them to learn the ideas at the level of complexity they did.
<p>store what they have learnt in memory,</p> <p>store what they have learnt in memory when they are more interested in the ideas</p>	<p>Have them say</p> <ul style="list-style-type: none"> the new ideas they have learnt as concisely as possible how they have changed what they already knew how they might use the ideas in the future
<p>identify how they learnt,</p> <p>because many gifted students learn rapidly in idiosyncratic ways, rather than being programmed to think, it is useful for them to reflect on how they went about learning.</p>	<ul style="list-style-type: none"> Have them identify new self-talk, self scripts, ways of thinking in historical ways, in the domain of history that they could use in other areas of knowledge. What have they learnt about 'being historians? What are the types of questions historians ask? What are the types of knowledge historians pursue? Have them keep a record of the ways in which they went about pursuing the topic, the ways of thinking that worked for them. They can keep a diary of how they worked through the topic, say whether particular types of thinking strategies such as visualising worked.
<p>see themselves making progress</p>	<p>Have them review the new knowledge they have gained, the questions they can now answer, the directions they can move in the future.</p>
<p>automatise what they have learnt</p> <ul style="list-style-type: none"> many gifted students automatise what they have learnt in meaning ways rather than through being taught rules. they often do not automatise ideas by rote 	<p>Have them review the links between ideas, try to compress the ideas into a few 'chunks' of knowledge.</p>
<p>transfer and generalise the new knowledge</p> <p>show far transfer and generalise the new knowledge far beyond the context in which it was taught</p>	<p>Have them</p> <ul style="list-style-type: none"> suggest the key questions their new knowledge answers, analyse the new knowledge from a range of perspectives, for example, they formulate higher order Bloom-type questions, de Bono 6 hats questions engage in 'far transfer' of the ideas. <p>See 2.5 and 2.6 below for ideas here.</p>
<p>organise what they have learnt for assessment purposes</p>	<p>Have them decide how they will display their knowledge. Give them functional ways in which they can communicate their new knowledge</p>

Helping gifted history learners elaborate the ideas in a range of ways:

<p>Cultural-historical thinking Think about the ideas in historical –cultural ways. When did these processes begin to occur ? How long did they take ? When did man begin to mine oil? How did cultural factors make the mining of oil relevant or useful ?</p>	<p>Affective thinking Think about the ideas in emotional ways.</p>	<p>Logico mathematical thinking Think about the ideas in scientific ways. What are some of the key scientific concepts that are mentioned ? What scientific processes are involved ?</p>
The history of how oil was formed		
<p>Verbal linguistic thinking Read the data re oil forming. Paraphrase and summarise it. Tell yourself the questions it answers. Interview an ‘expert’ about how oil was formed. What questions would you ask. You be the expert being interviewed. Prepare a 5 minute speech about how oil was formed. Make up six easy and difficult questions for another group about how oil was formed. Debate the topic “There is likely to be many still undiscovered oil reserves around the world.</p>	<p>Imagery episodic thinking Collect pictures, diagrams of how oil was formed. Visualise specific instances. Reflect on these, analyse specific instances. Note what they have in common. Draw diagrams that show how it formed. Develop an icon to represent the process.</p>	<p>Action thinking Think about the actions involved in forming oil. Build models of how oil was formed. Have students act out what could have happened to make oil. Have them act out the various changes. What are the key actions in forming oil ? If you wanted to make oil in a factory, how would you apply these actions ?</p>

Task 6 Apply the instructional framework above to a topic that a classroom teacher may teach at the primary or secondary level.

Implications for teaching gifted and talented learners learning

This model suggests that learning can vary in a range of ways. We can use it to develop a framework for integrating the characteristics of gifted and talented learners :

- how they learn : the specific learning processes they implement.
- what they learn: their learning outcomes.
- why they learn : characteristics of their motivation to learn and learning style.
- their interpersonal interactions during learning, cultural influences on learning
- their self-perceptions and self efficacy as learners
- the comparative rate of development of their knowledge overall.

Encourage students' spontaneous pursuit of knowledge. Help them learn to deal with boredom. This may lead to disengagement from learning, poor study habits and a lack of interest in education. Where this arises,

- help them see open-ended aspects of the ideas
- encourage them to teach you about the ideas
- try to make up games involving the ideas

Provide opportunities for the self-driven aspects of pursuing knowledge.

- foster interest in problem solving contexts such as conservation, population change, climate change, waste disposal
- encourage self-selection of learning materials
- encourage students to be both producers and consumers of new ideas; they
 - consume or use other people's ideas
 - produce their own, add new ideas

Help them to understand the distinction between them and how they need both.

- encourage communication with similar-minded students using the Internet.

Help students become aware of the range of resources available for doing this;

- Internet, data bases, computer, library
- teach them how to access sources in community, for example, business, interest groups (for example, historical societies), specialist scientific institutions (zoo, museum, CSIRO, marine societies), cultural institutions (National Gallery)

Assist with 'information organising' as well as 'information providing'.

- Foster students' interest in others who were / are gifted in various ways. This can help them
 - see they are not alone
 - see options, ways that others used to deal with the types of problems that they might face
- Reading or seeing the biographies of gifted scientists, writers, dancers, artists, etc can provide important support.

Involve them in situations outside of regular school in which they can extend their knowledge and work with peers who think in similar ways and who can provide models, for example

- debating
- drama groups
- dance, ballet
- sporting groups
- pen pals, Internet pal

Help them keep their sensitivities in perspective. They often show an advanced 'moral conscious'. Although their logic is adequate here, their lack of experiences limits the options that they can see for themselves or others.

Help students understand their giftedness

- not all children need to learn in the same way, although some people might think you should
- they may be strong in some areas but not in others
- some children, peers, may not understand what they say or know.

Help them improve their peer group social interaction skills.; help them

- see what they do have in common with peers
- learn more effectively in peer group, set up situations in which they engage in group problem-solving and sharing activities
- learn the skills necessary for joining in peer group activities
- understand that not all children think in the same way
- learn various ways of showing their peers what they know in acceptable ways

Help them extend and integrate their knowledge

- teach students different types of questions to ask about set topics
- help them learn ways of researching topics of interest, for example,
- encourage them to investigate real problems in everyday life
- encourage them to see tasks as open-ended challenges
- provide suitable role-models for learning, for example, mentors, Night of the Notables.

Help them deal with their 'mental energy'. These children are mentally energetic; they can become totally absorbed or focused in an idea or activity, leading to the "Just A Minute" syndrome.

Gifted students manage their learning effectively. Help them use their independence as learners in functional ways. Present ideas as challenges or problems. Allow small groups to generate their directions for pursuing the challenge or problem.

The teaching can

- give learners increased opportunity to make decisions about what and how they will learn and how they will manage the learning
- allow to learn independently and to direct their learning, to have time to operate independently

- teach students to improve how they learn,
Encourage them to say how they went about thinking and learning.

Task 7 Develop a checklist for assessing the extent to which a teaching unit meets the needs of gifted students in regular classrooms.

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