Describing high ability knowledge and understanding

John Munro

What high ability knowing and learning looks like in IB

- What does gifted learning look like ?
- How can we link gifted learning with IB learning ?
- Implications for teaching provision
- What schools might do to enhance their provision for gifted learners

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High ability interpretations of teaching

How do the glands in the stomach know how much hydrochloric acid and enzymes to squirt out ? How do they know how much protein there is in the mouthful ?

If a person changed food they ate over three days, would the amount of hydrochloric acid build up and damage the lining of the stomach

Regular learners

How the human body digests food

A second student learns these ideas very rapidly, must faster than their peers and organises the ideas in the appropriate hierarchy

High ability interpretations of teaching

Regular learners

Pythagorus

$c^2 = a^2 + b^2$

3. 4, 5

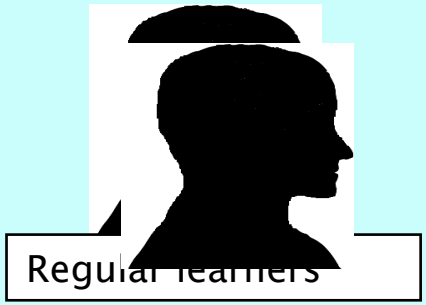
12, 5, 13

Is there a tetruplet relationship such as $d^2 = a^2 + b^2 + b^2$ whether there are sets of 4 whole numbers that satisfy it and how they could work them out.

I imagine cubes sitting on each side of a right angled triangle. Would $c^3 = a^3 + b^3$ hold for some whole numbers ? What would this look like spatially ?

A second student learns these ideas very rapidly with very little practice.

High ability interpretations : Grade 3



Regular learners

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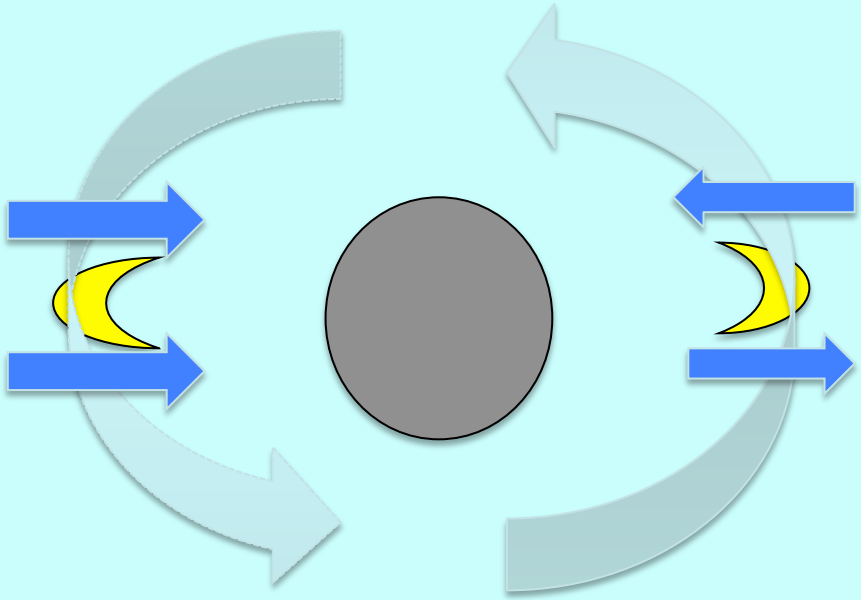
Minibeasts

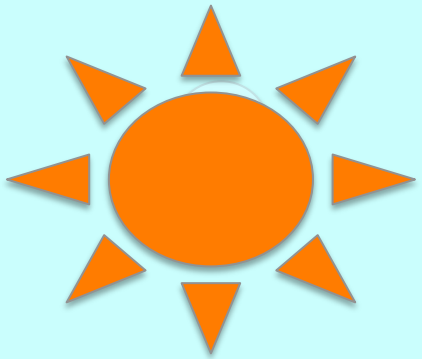
How many toes does a slater have ?
They can move so fast when they are so small. They must be able to push off with their feet really well.

If slaters breathe through holes in their sides, why doesn't their blood drip out as they run ?

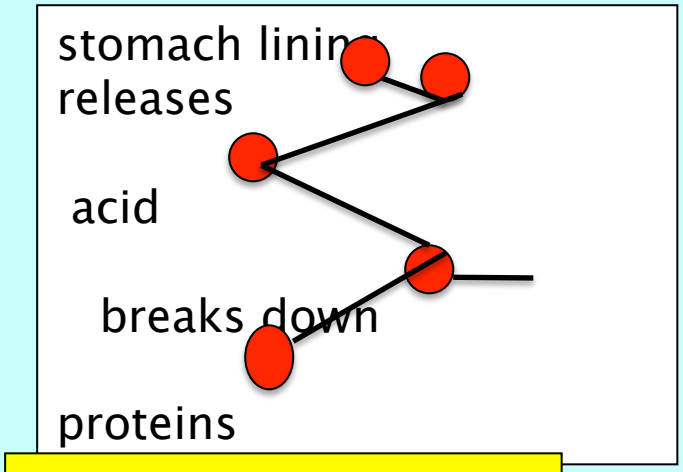
A second student learns these ideas very rapidly with very little practice.

The Moon is moving closer to the Earth

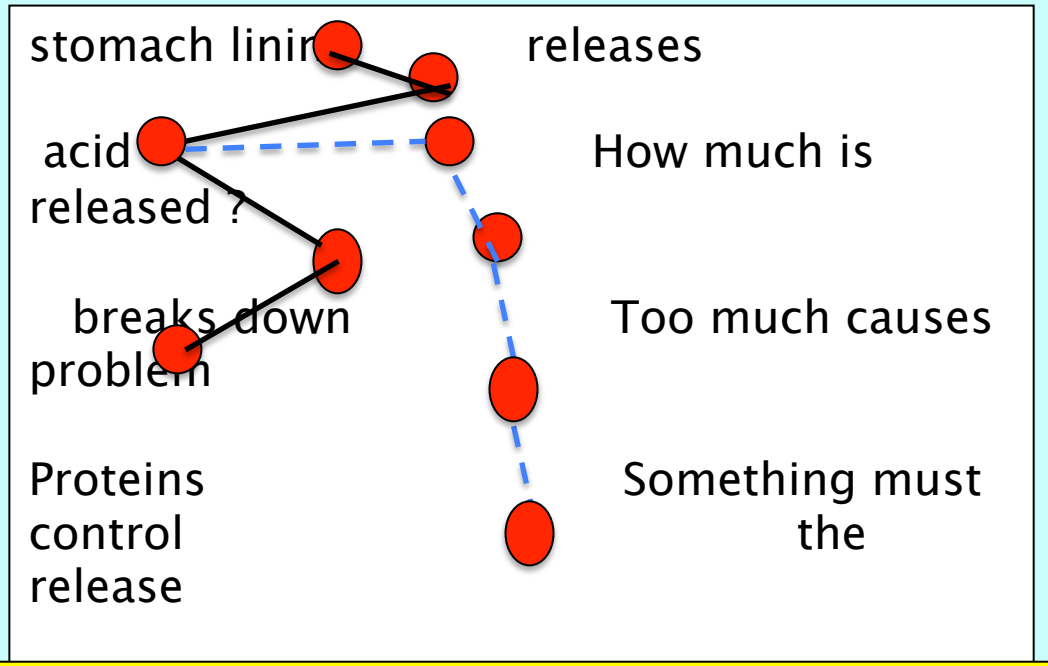




Use microscopic model to describe change in understanding of digestion

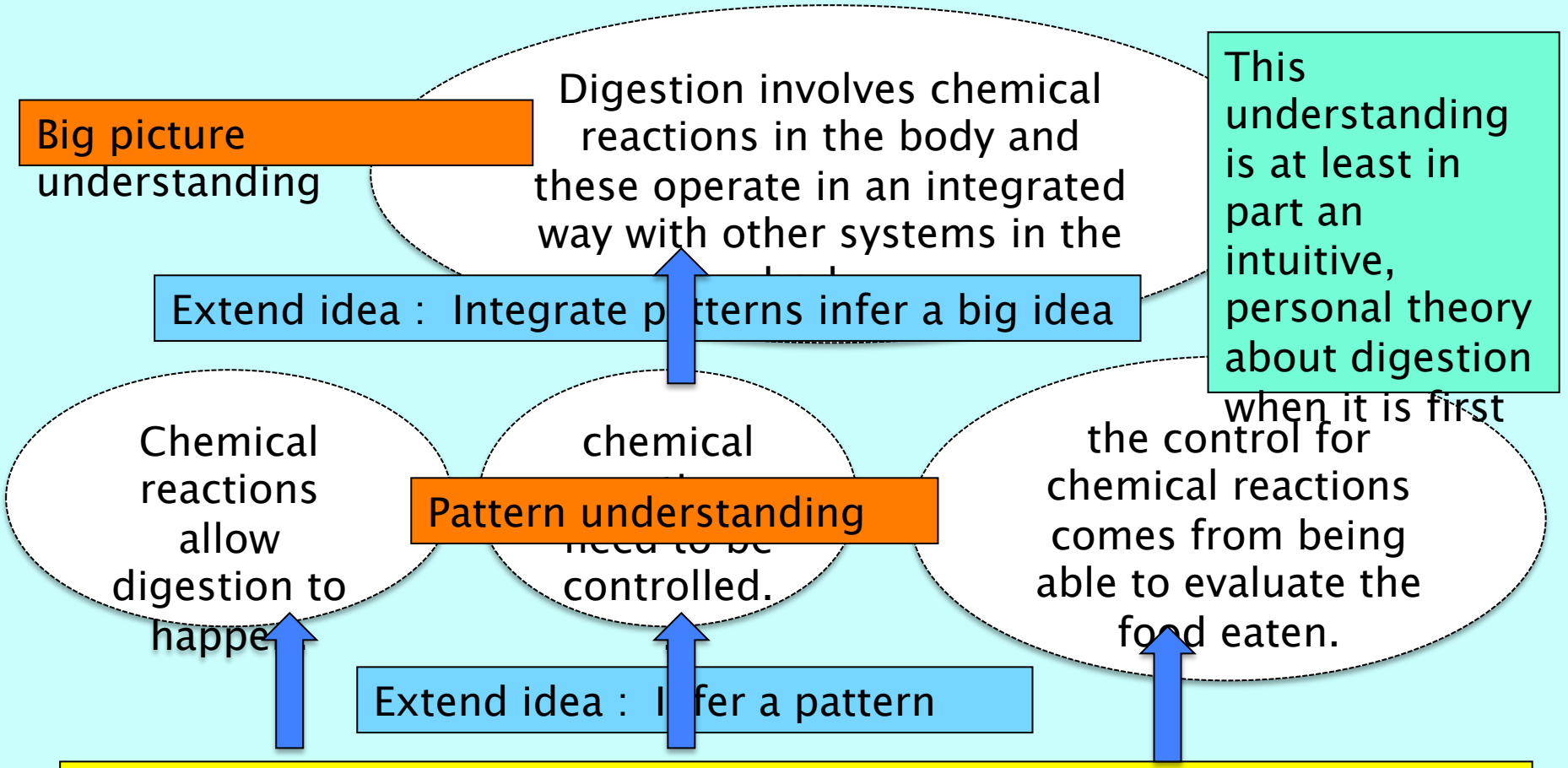


Regular learner programmed by teaching

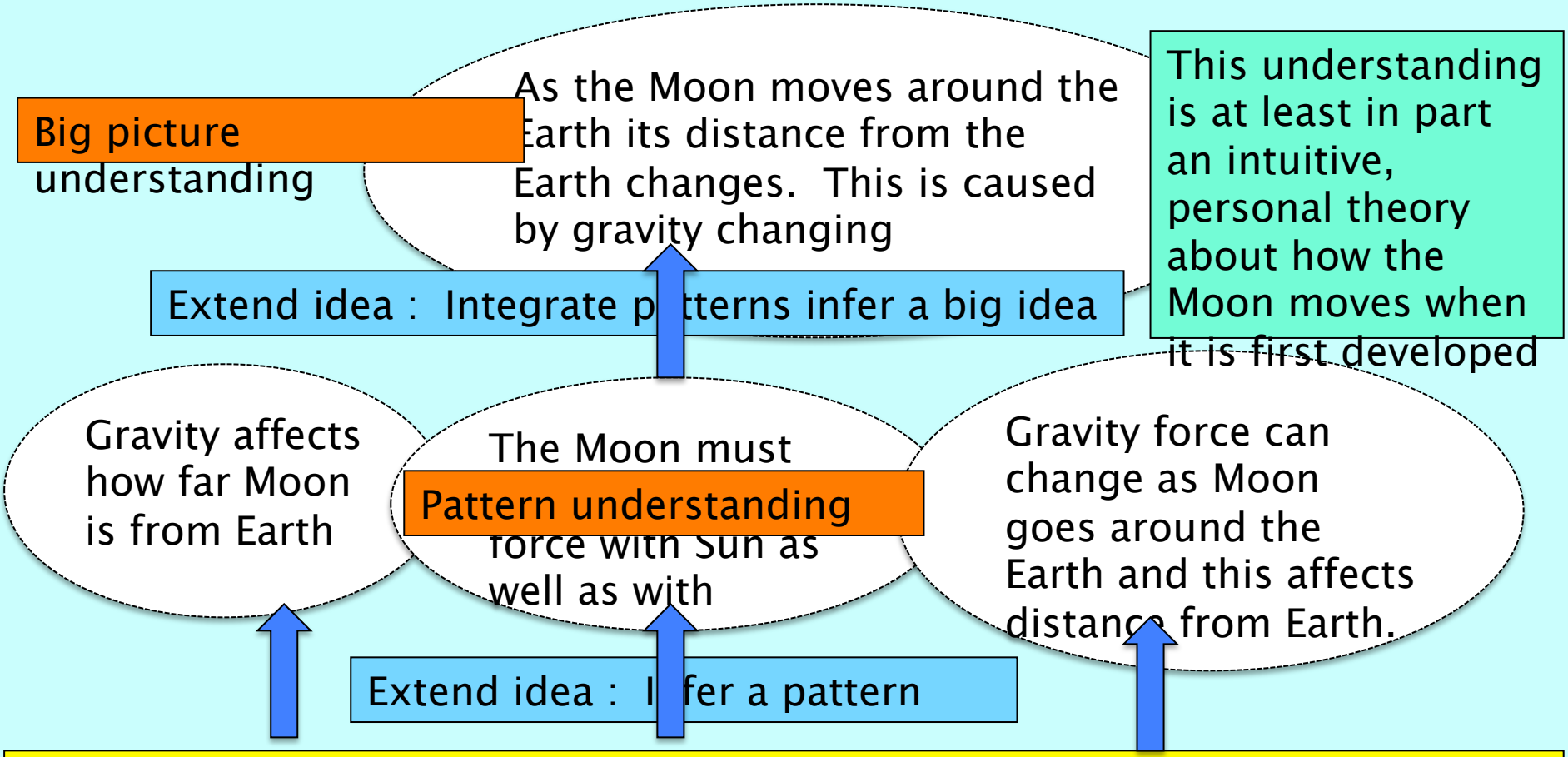


Gifted learner extends the knowledge from the teaching; infers an intuitive theory by making richer links

The characteristics of the gifted understanding



The characteristics of the gifted understanding



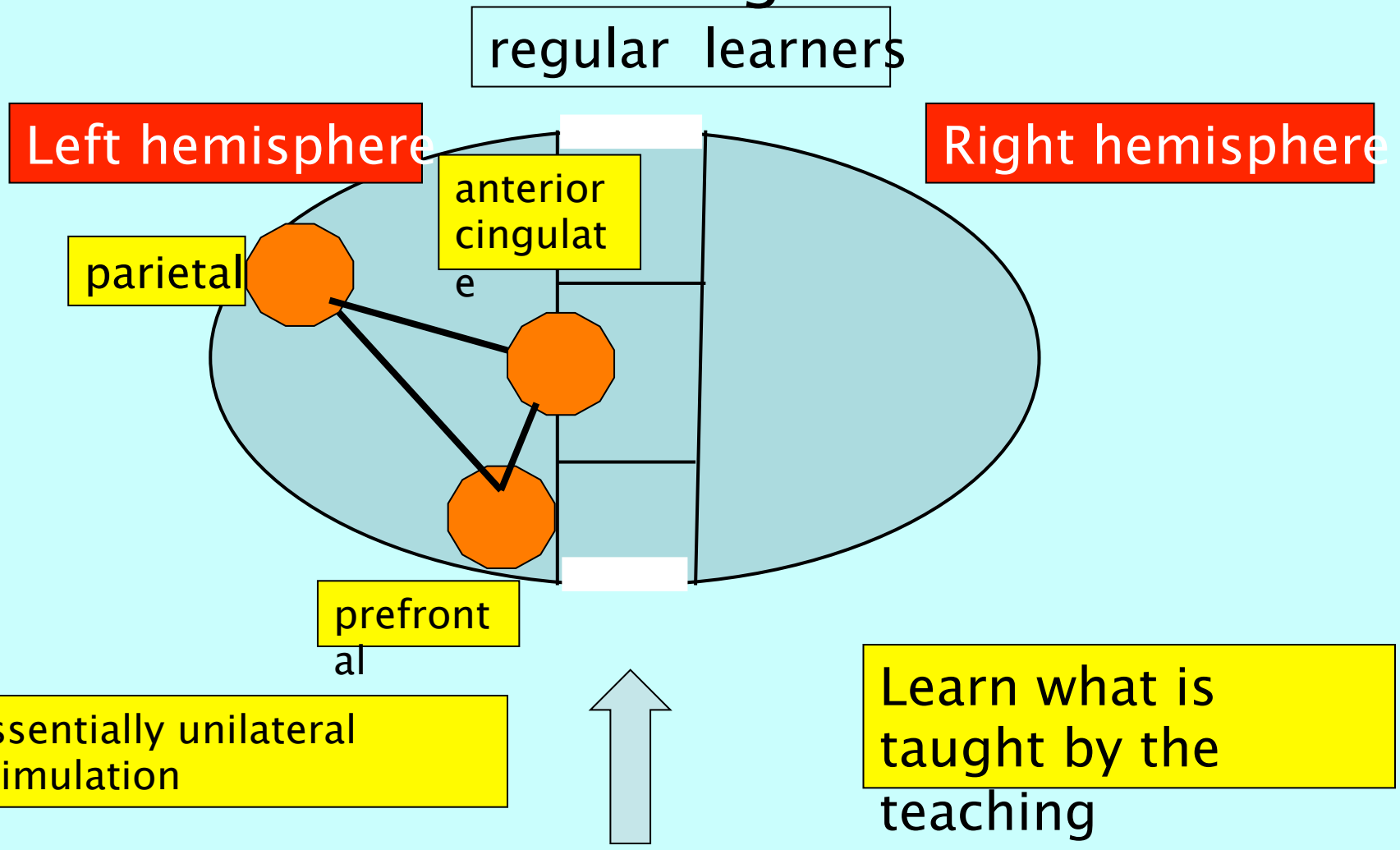
Brain processing by gifted learners

The cerebral cortices of gifted children and adolescents who are develop faster :

- Alexander, O'Boyle and Benbow (1996)

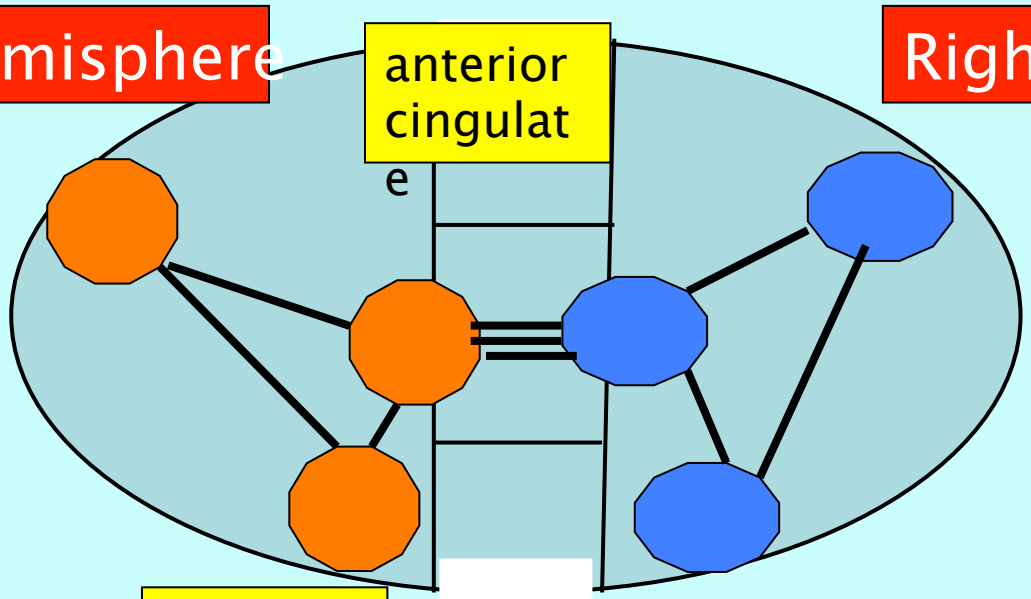
- Shaw et al (2006) longitudinal study of intellectual ability and cortical development

Brain activity during gifted versus regular learning



Brain activity during gifted versus regular learning

gifted learners

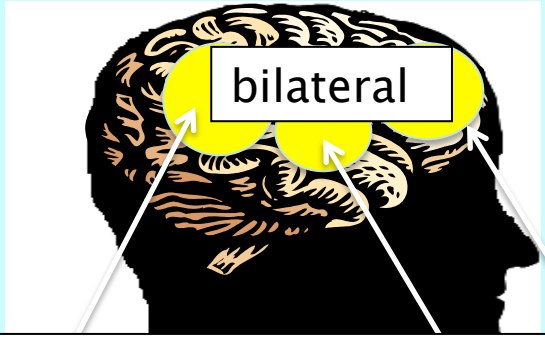


Essentially bilateral stimulation

Teaching information

Form intuitive theories about the teaching by inferring beyond the information

Brain processing by gifted learners



The bilateral stimulation patterns permits both sides of the brain at any time to contribute to thinking.

Enhanced interhemispheric communication via the corpus callosum, (increased grey/white matter ratio and glia/neuron ratio), assist in coordinating and integrating information between the cerebral hemispheres

Bilateral activation associated with enhanced arithmetic skill.

Left AG involved with manipulating mental representations and verbal arithmetic fact retrieval

Right AG allocates spatiovisual attention to salient features, uses and interrogates memories, integrates multisensory information and interprets events, links verbal concepts with spatial information and manages and

Bilateral activation -> enhanced information processing and attentional functions, metacognitive activity and self-management of learning and thinking, increased spatial attention and greater working memory capacity.

Bilateral activation -> mediates error detection, response to cognitive challenges, anticipating tasks, attention, motivation and modulating emotional responses, reward-based decision-making and learning. It detects and monitors mis-matches between input information and what an individual knows, detects errors and response to it.

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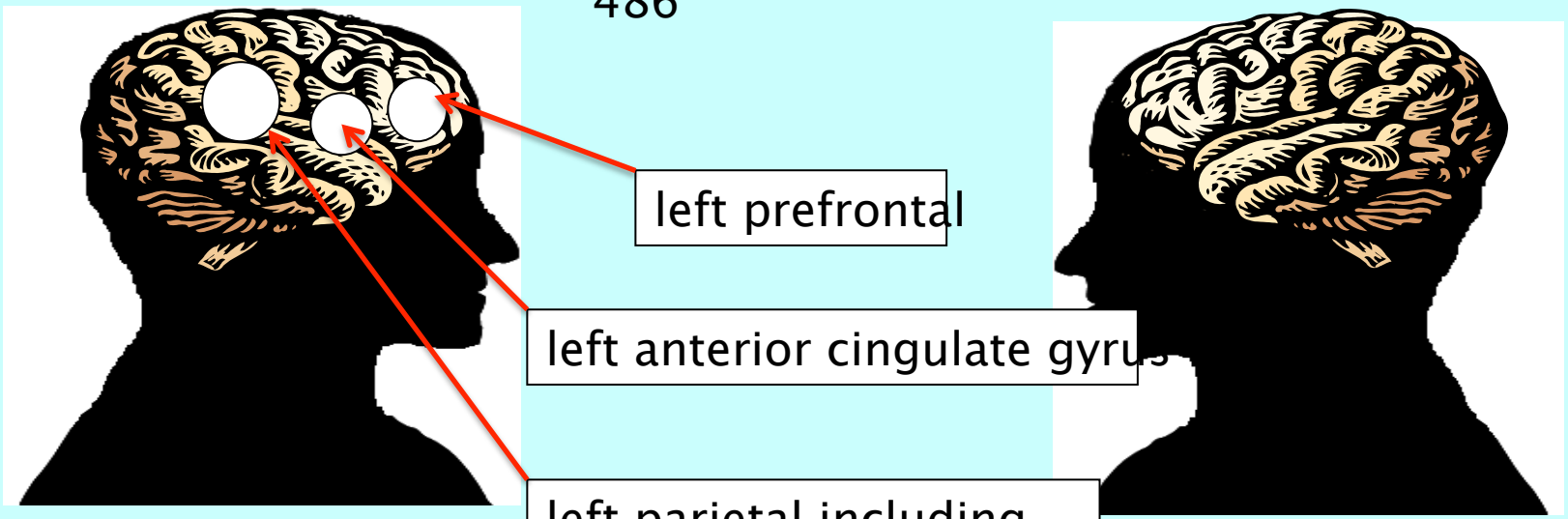
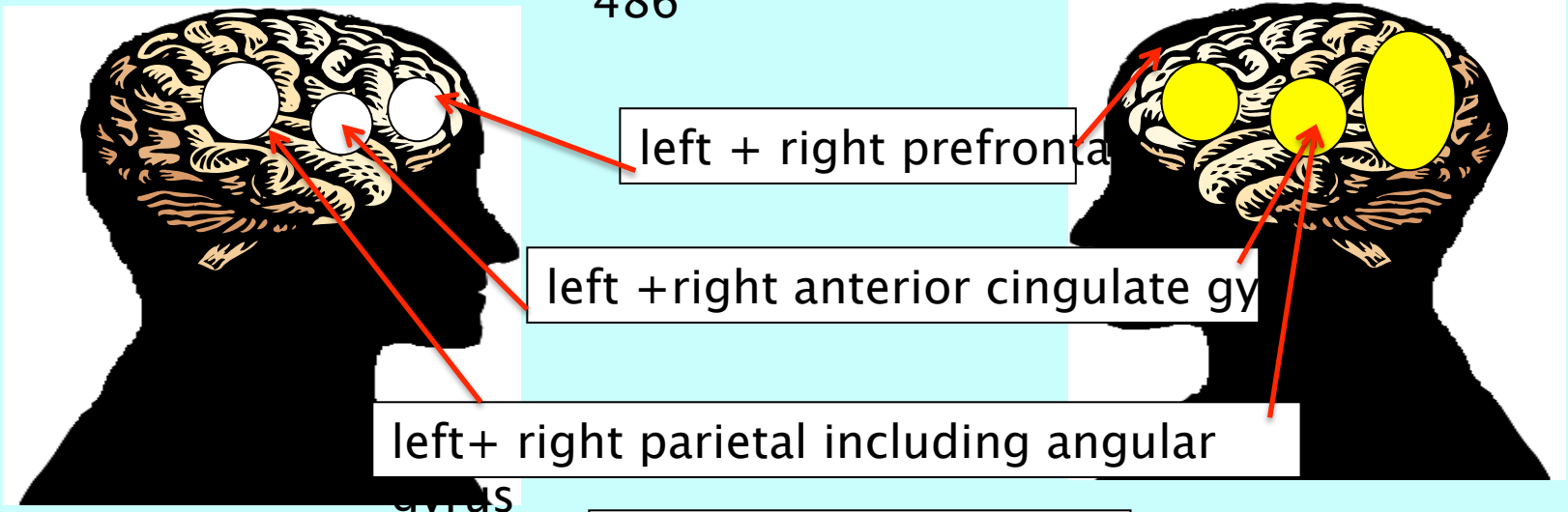
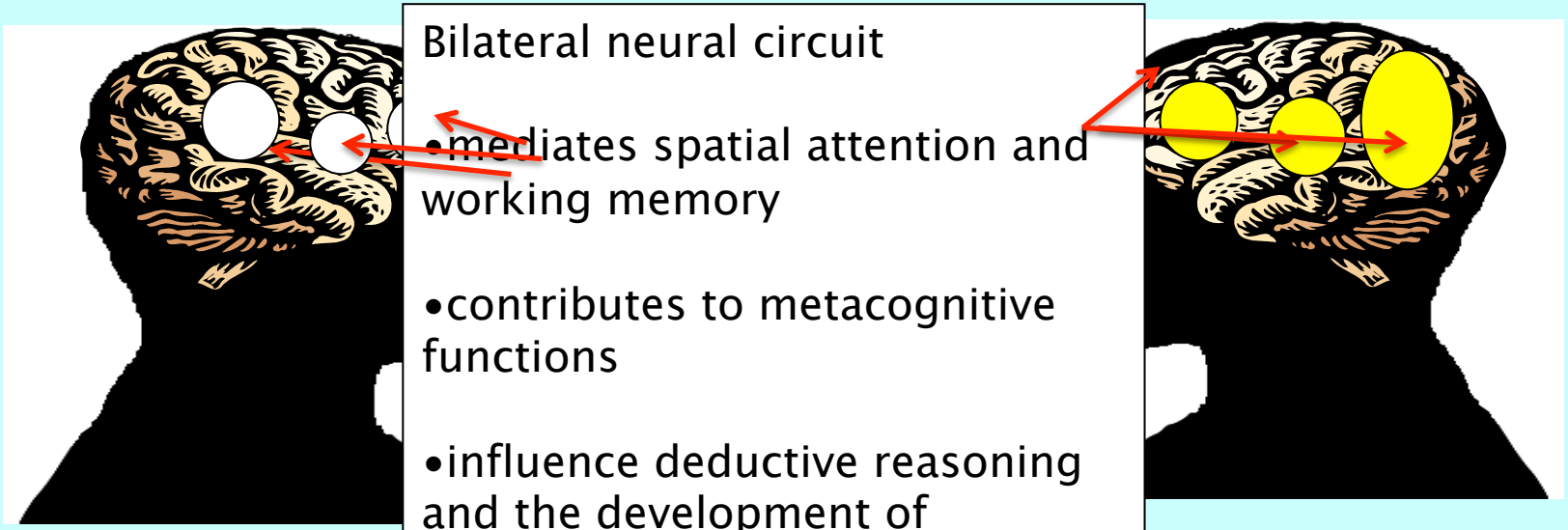
Cortical processing by average maths learners



Cortical processing by gifted maths learners



Cortical processing by gifted maths learners



Bilateral neural circuit

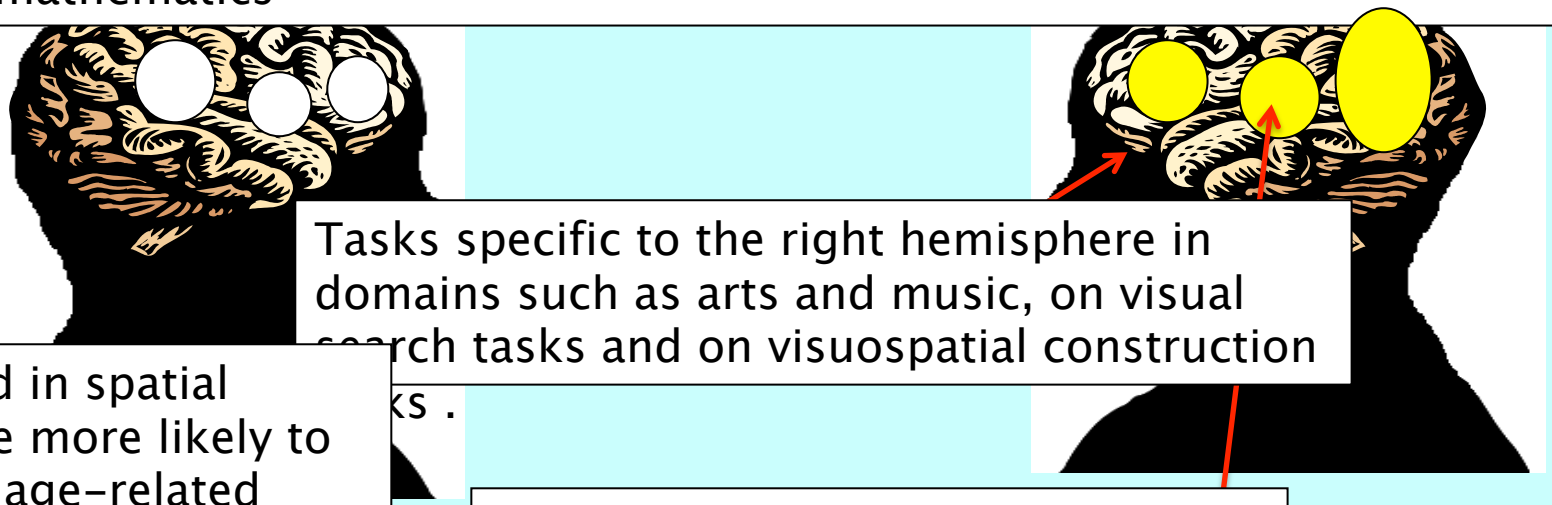
- mediates spatial attention and working memory
- contributes to metacognitive functions
- influence deductive reasoning and the development of cognitive expertise

Left hemisphere

Right hemisphere

Similar cortical processing by gifted learners over multiple domains

The enhanced right-brain activation is shown by gifted in multiple domains in addition to mathematics



Tasks specific to the right hemisphere in domains such as arts and music, on visual search tasks and on visuospatial construction

Those gifted in spatial activities are more likely to show language-related disorders including dyslexia than non-gifted peers

Tasks usually reserved for the left hemisphere

Educational Implications

During a teaching episode

Average learners

Gifted learners

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The understanding of non-gifted students is usually less elaborated or extensive and more closely linked with the teaching information.

Gifted learners differ in

- the extent of elaboration and differentiation of the meaning networks they form
- the quality of the links
- amount of knowledge they can think about at once
-
- extent of their inferences or extensions and syntheses.

During learning : bi-lateral thinking and far transfer

Stimulate LH

Information in

Stimulate simultaneous RH

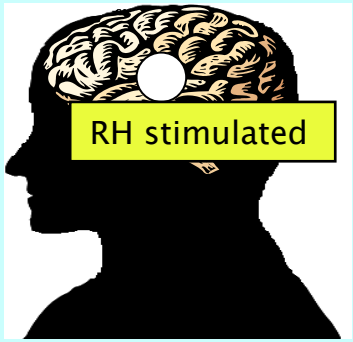
Analogize → far transfer

More elaborated and differentiated understanding

During learning : infer patterns and integrate into an intuitive theory

Inform ion in

I think this is like …
It reminds me of ….
This is about ….
(drawing out the main idea)…



A intuitive hierarchical nderstanding of the information

Describing high achievement

Does student learn only the taught content or additional ideas not targeted by the teaching by making links with topics not mentioned?

Does student show a depth of understanding not usually showed by peers at this level ?

Does student seem to learn by being 'acted on' by the teaching and rely on others to organise the teaching and pathway followed ?

How broad is the high achievement ?

How active was the student in managing the learning independently ?

Profile of high achiever

Did the student seek to manage or direct aspects of the learning, spontaneously and incidentally ?

Where did the motivation to learn the ideas come from ?

How does the student use the knowledge ?

Did the student or others decide they would learn the ideas?

Did the student learn the ideas because they expected / required to or did they seek to learn the ideas spontaneously?

Does the student transfer spontaneously the ideas to other situations not mentioned by the teaching, the ideas ?

Multiple ways of forming a gifted understanding

Some high ability learners learn faster.

They form the intended message much faster than their peers. They form a network of concepts that is programmed by the information more rapidly.

They infer, 'see the big picture', link and organize the ideas in the intended ways, see the subordinate ideas. They have a desire to be programmed and mange their own learning.

In a given time they can construct more k… ready to explore it sooner than peers.

School house gifted

Some high ability learn differently.

Other high ability learners spontaneously form a broader understanding that 'goes beyond' the teaching.

The understanding at this time is an intuitive theory about digestion that has not yet been validated. It may be shown to be inaccurate or illogical.

They form a big picture intuitive understanding that involves inferr… already know.

Creative intellectual gifted

Multiple ways of showing patterned and expert understanding

Novice understanding

- use new ideas in restricted ways,
- understand them in parts, separate 'tentative' ways, try them out to see how they 'fit',
- intuitive rather than logical understanding.

Patterned, more general, understanding

•use new ideas in more general, patterned, rule oriented and abstract ways,
•form more abstract concepts and relationships,
•use conventional language and symbolism

Expert understanding

•understand and use 'big ideas' in topic,
•use them fluently and automatically,
•manage and use their knowledge efficiently,
•think about two or more patterns, rules or general propositions at once.
•Think broadly about an issue.

Form linear knowledge extensions faster to induce patterns, convert information meaning links spontaneous more efficiently

Recognize and encode appropriatev various types of meaning i tion – the topic, the eaning, the details. They select and use the main idea, prioritize ideas and organise details and imtermediate ideas around these. They are experts of the topic mainly in terms of the information from which they learnt.

HAKI learners

Form linear knowledge ext to i s and e novel links

HAKE learners

Form big picture understanding and think cr in br unexpected novel links ; make far transfer.

HAKC learners

What does high ability knowledge look like ?

Domain specificity

The high achieving learners often have broader conceptual networks in some domains only; they do not show advanced development universally.

Verbally gifted

Musicall y gifted

Gifted leaders

Nonverbally gifted, high achieving in imagery

Gifted in perceptual motor domains such as sports

What does high ability knowledge look like ?

Domain specificity

The high achieving learners show multiple knowledge profiles based on their thinking patterns.

Show high achievement consistently

Show high achievement intermittently

Knowledge internalizers

Knowledge creators

Knowledge extenders

High ability underachievers

High ability hidden ability students

High ability emotionally disengaged students

What does high ability knowledge look like ?

Show high achievement intermittently

High ability underachieving students who show the 'dual' exceptionalities of giftedness and learning difficulties, often due to a specific analytic sequential processing difficulty associated with using phonological and symbolic information and organizing idea

High ability hidden ability students who seek to avoid appearing to be different from their peers.

High ability emotionally disengaged students who are dis-engaged from classroom learning and show an on-going negative emotional disposition to their classroom and school because their knowledge is not valued or acknowledged and their lack of positive identity in it.

Betts and Neihart 6 types of giftedness

Revised Profiles of the Gifted & Talented

Type	Feelings & Attitudes	Behaviors	Needs	Adult/Peer Perceptions	Identification	Home Support	School Support
The Successful	Complacent Dependent Good academic self-concept Fear of failure Extrinsic motivation Self-critical Works for the grade Unsure about the future Eager for approval Entity view of intelligence	Achieves Seeks teacher approval Avoids risks Doesn't go beyond the syllabus Accepts & conforms Chooses safe activities Gets good grades Becomes a consumer of knowledge	To be challenged To see deficiencies To take risks Assertiveness skills Creativity development Incremental view of intelligence Self knowledge Independent learning skills	Liked by teachers Admired by peers Generally liked & accepted by parents Overestimate their abilities Believe they will succeed on their own	Use many multiple criteria Grades Standardized test scores Individual IQ tests Teacher nominations Parent nominations Peer nominations	Parents need to let go Independence Freedom to make choices Risk-taking experiences Allow child to be distressed Affirm child's ability to cope with challenges	Subject & grade acceleration Needs more than AP, IB & Honors Time for personal curriculum Activities that push out of comfort zone Development of independent learning skills In-Depth Studies Mentorships Cognitive Coaching Time with Intellectual Peers
The Creative	Highly creative Bored & frustrated Fluctuating self-esteem Impatient & defensive Heightened sensitivity Uncertain about social roles More psychologically vulnerable Strong motivation to follow inner convictions Wants to right wrongs High tolerance for ambiguity High Energy	Expresses impulses Challenges teacher Questions rules, policies Is honest and direct Emotionally labile May have poor self-control Creative expression Perseveres in areas of interest (passions) Stands up for convictions May be in conflict with peers	To be connected with others To learn tact, flexibility, self awareness and self control Support for creativity Contractual systems Less pressure to conform Interpersonal skills to affirm others Strategies to cope with potential psychological vulnerbilities	Not liked by teachers Viewed as rebellious Engaged in power struggle Creative Discipline problems Peers see them as entertaining Want to change them Don't view them as gifted Underestimate their success Want them to conform	Ask: In what ways is this child creative? Use domain specific, objective measures Focus on creative potential rather than achievement	Respect for their goals Tolerate higher levels of deviance Allow them to pursue interests (passions) Model appropriate behavior Family projects Communicate confidence in their abilities Affirm their strengths Recognize psychological vulnerability & intervene when necessary	Tolerance Reward new thinking Placement with appropriate teachers Direct & clear communication Give permission for feelings Domain specific training Allow nonconformity Mentorships Direct instruction in interpersonal skills Coach for deliberate practice
The Underground	Desire to belong socially Feel Unsure & Pressured Conflicted, Guilty & Insecure Unsure of their right to their emotions Diminished sense of self Ambivalent about achievement Internalize & personalize societal ambiguities & conflicts View some achievement behaviors as betrayal of their social group	Devalue, discount or deny talent Drops out of GT & advanced classes Rejects challenges Moves from one peer group to the next Not connected to the teacher or the class Unsure of direction	Freedom to make choices Conflicts to be made explicit Learn to code switch Gifted peer group network Support for abilities Role models who cross cultures Self understanding & acceptance An audience to listen to what they have to say (to be heard)	Viewed as leaders or unrecognized Seen as average & successful Perceived to be compliant Seen as quiet/shy Seen as unwilling to risk Viewed as resistant	Interviews Parent nominations Teacher nominations Be cautious with peer nominations Demonstrated performance Measures of creative potential Nonverbal measures of intelligence	Cultural Brokering Normalize their dissonance College & career planning Provide gifted role models Model lifelong learning Give freedom to make choices Normalize the experience Don't compare with siblings Provide cultural brokering Build multicultural appreciation	Frame the concepts as societal phenomena Welcoming learning environments Provide role models Help develop support groups Open discussions about class, racism, sexism Cultural Brokering Direct instruction of social skills Teach the hidden curriculum Provide college planning Discuss costs of success

Betts and Neihart 6 types of giftedness

Type	Feelings & Attitudes	Behaviors	Needs	Adult/Peer Perceptions	Identification	Home Support	School Support
The At-Risk	Resentful & Angry Depressed Reckless & Manipulative Poor self-concept Defensive Unrealistic expectations Unaccepted Resistive to authority Not motivated for teacher driven rewards A subgroup is antisocial	Creates crises and causes disruptions Thrill seeking Will work for the relationship Intermittent attendance Pursues outside interests Low academic achievement May be self-isolating Often creative Criticizes self & others Produces inconsistent work	Safety and structure An "alternative" environment An Individualized program Confrontation and accountability Alternatives Professional Counseling Direction and short term goals	Adults may be angry with them Peers are judgmental Seen as troubled or irresponsible Seen as rebellious May be afraid of them May be afraid for them Adults feel powerless to help them	Individual IQ testing Achievement subtests Interviews Auditions Nonverbal measures of intelligence Parent nominations Teacher nominations	Seek counseling for familiy Avoid power struggles Involvement in extracurricular activities Assess for dangerous behavior Keep dialogue open Hold accountable Minimize punishments Communicate confidence in ability to overcome obstacles Preserve relationships	Don't lower expectations Diagnostic testing Non-traditional study skills In-depth Studies & Mentorships G.E.D. Academic coaching Home visits Promote resilience Discuss secondary options Aggressive advocacy
Twice/Multi Exceptional	Learned helplessness Intense frustration & anger Mood disorders Prone to discouragement Work to hang on Poor academic self-concept Don't see themselves as successful Poor academic self concept Don't know where to belong	Makes connections easily Demonstrates inconsistent work Seems average or below More similar to younger students in some aspects of social/emotional functioning May be disruptive or off-task Are good problem solvers Behavior problems Thinks conceptually Enjoys novelty & complexity Is disorganized Slow in information processing May not be able to cope with gifted peer group	Emphasis on strengths Coping strategies Skill development Monitoring for additional disorders - especially ADHD To learn to persevere Environment that develops strengths To Learn to self-advocate	Requires too many modifications because of accommodation Seen as "weird" Underestimated for their potential Viewed as helpless Seen as not belonging in GT Perceived as requiring a great deal of structure Seen only for disability	Measure of current classroom functioning Achievement test scores Curriculum based assessment Examine performance over time Look for pattern of declining performance paired with evidence of superior ability Do not rely on IQ scatter analysis or test discrepancy analysis	Focus on strengths while accomodating disability Develop will to succeed Recognize & affirm gifted abilities Challenge in strength areas Provide risk-taking opportunities Assume college is a possibility Advocate at school Family Involvement Nurture self-control Teach how to set & reach realistic goals	Challeng in area of strength is first priority Acceleration in area of strengths Accommodations for disability Ask, "what will it take for this child to succeed here?" Direct instruction in self-regulation strategies Give time to be with GT peers Teach self-advocacy Teach SMART goal setting
Autonomous Learner	Self-confident Self-accepting Hold incremental view of ability Optimistic Intrinsically motivated Ambitious & excited May not view academics as one o their highest priorities Willing to fail and learn from it Shows tolerance and respect for others	Appropriate social skills Works independently Set SMART goals Seek challenge Strongly self directed Follows strong areas of passion Good self-regulators Stands up for convictions Resilient A producer of knowledge Possesses understanding & acceptance of self	More support not less Advocacy for new directions & increasing independence Feedback about strengths & possibilities Facilitation of continuing growth Support for risk-taking On-going, facilitative relationships Become more adept at managing themselves A support team	Admired & Accepted Seen as capable & responsible by parents Positive influences Successful in diverse environments Psychologically healthy Positive peer relationships	Demonstrated performance Products Nominations Portfolios Interviews Standardized Test scores Awards	Advocate for child at school & in the community Provide opportunities related to passion areas Allow friends of all ages Remove time & space restrictions for learning Help them build a support team Include in parent's passions Include in family decision making Listen Stay out of their way	Allow development of long-term, integrated plan of study Remove time & space restrictions Develop multiple, related in-depth studies, including mentorships Wide variety of accelerated options Mentors & cultural brokers Waive traditional school policies & regulations Stay out of their way Help them cope with psychological costs of success

Gifted knowledge in culturally and linguistically diverse contexts.

The characteristics of gifted knowledge in culturally diverse students. The characteristics that describe how gifted culturally diverse students use their gifted knowledge include the following: these students are likely to

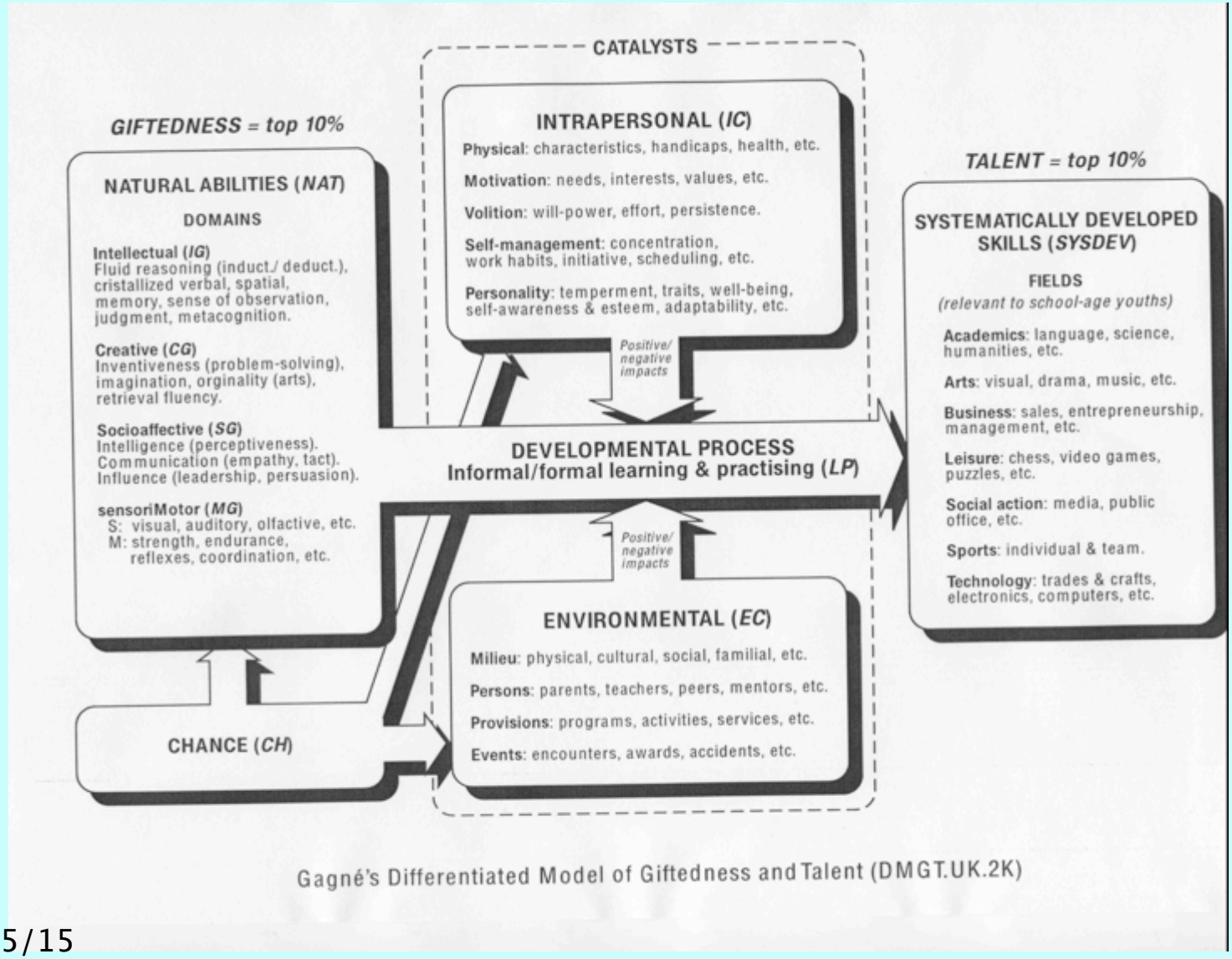
- display advanced reasoning, creative, divergent and innovative thinking that often generates unexpected and unusual ideas and high level problem solving strategies.
- be resourceful and adaptable; they can 'read' and relatively easily adapt to situations and respond adaptively.
- be strongly self motivated to learn and to understand their world.
- have comparatively well developed vocabularies in their mother tongues.
- learn new concepts quickly, look for and construct deeper meanings and make unusual and subjective links between ideas.

Gifted knowledge in culturally and linguistically diverse contexts.

The characteristics of gifted knowledge in culturally diverse students cont.

- spontaneously generate challenges, enquiries and questions about their world. The questions show they are critical, evaluative thinkers who synthesize ideas in their own ways. They actively explore and experiment.
- assemble a comparatively large memory for both school and extracurricular topics.
- be aware of building their own interpretations and understanding of topics and their own points of view.
- have a keen sense of justice and morality, recognise and pursue inconsistencies and perceived unfairness.
- display leadership skills in a range of ways, for example, they may persuade others to their point of view, take the initiative in joint activities.
- show an intense interest in their world and in understanding it.
- comprehend and use humour beyond their age.

The complex interactions in DMGT



Gagné's Differentiated Model of Giftedness and Talent (DMGT.UK.2K)

Giftedness versus talent

Differentiated Models of Giftedness and Talent (***DMGT type models***) distinguish between talent (outstanding performance in a specific area such as art, music, science) and giftedness (high level broad-based general ability).

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.

motivation transforms giftedness into talent through personal interests and personality traits

Catalysts for learning

Environmental and cultural influences facilitate learning

Chance affects most components of the process

Talent

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.

How I am defining giftedness and talent

Gifted knowing, thinking and learning in particular domains + emotional attributes. Their knowing includes earlier talented knowledge and skills .

teaching

supportive cultures

Higher interpretations or understanding that are intuitive theories about the topics. These contain both links that are programmed by th teaching and links based on inferences generated by gifted learners through their far transfer thinking.

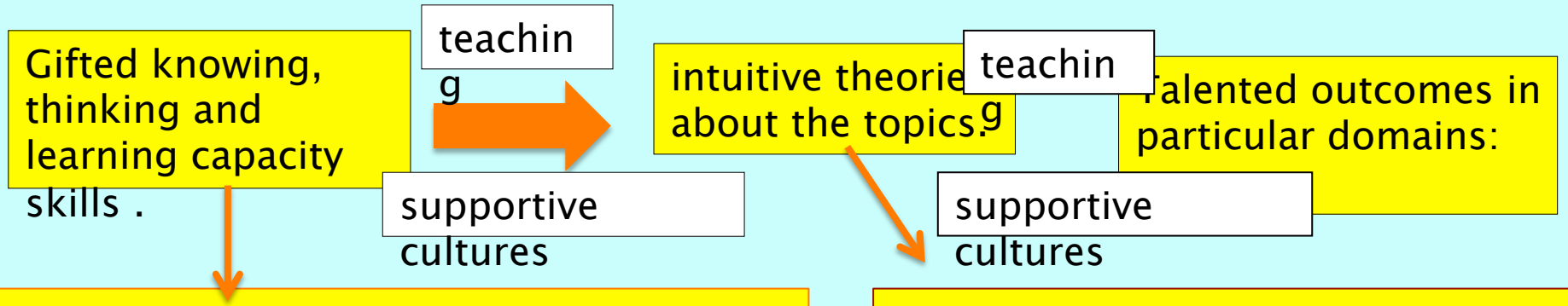
teaching

supportive cultures

Talented outcomes are productions that can e in verbal and/or nonverbal formats in particular domains. They include

- higher level skills or knowledge about topic
- creative productions and understanding,
- solutions to problems.
- responses to tasks, questions

How I am defining giftedness and talent



- infer patterns, the main/big ideas, to think hierarchically and to organize concepts in more complex ways.
- fluid analogizing or 'far transfer'
- process the teaching information in larger chunks
- use, selectively and spontaneously, higher level more complex thinking

The theories

- include ideas and links not mentioned explicitly in the teaching; and
- differ in how they organise the ideas, with some prioritised big ideas and others being more subordinate.

What does giftedness and talent look like in classrooms ?

Gifted knowing, thinking and learning capacity

Intuitive theories about the topics.

Talented outcomes in particular domains

- use higher level more complex thinking strategies selectively and spontaneously.
- infer patterns and think hierarchically
- form big ideas, to to organize concepts in more complex ways.
- form more propositions that are aligned with the topic or theme
- make more cross links, fluid

This is the 'long term working memory' or 'knowing and thinking aspect of the gifted learning capacity

Their intuitive theories

- act as a 'mental mediator' between the gifted learning capacity and the talented or creative outcomes
- include ideas and links not mentioned explicitly in the teaching;
- differ in how they organise the ideas, with some prioritised big ideas and others being more subordinate.

This is the 'short term working memory' activity of the gifted learning capacity

Gifted learning in terms of the IB learner profile

	Gifted learner characteristics
Inquirers	Have high problem identification skill, see ideas that don't fit much more readily, are motivated intrinsically to frame up goals and challenges
Knowledgeable	Have richer, more elaborate conceptual networks, richer vocabulary and form more complex propositions and intuitive theories about ideas.
Thinkers	use thinking strategies much more readily, and spontaneously, infer, engage in analogistic thinking or far transfer, more able to compare, evaluate, synthesise and bring in new ideas,
Communicators	May have difficulty communicating their thinking and understanding, may need to learn how to do this, to infer what the audience knows, need to provide opportunities for learning wisdom

Gifted learning in terms of the IB learner profile

	Gifted learner characteristics
Principled	often are principled conceptually, worried or worry when their peers are treated unfairly or without respect.
Open-minded	More able to tolerate ambiguity and to see the perspectives of others, can deal with multiple points of view
Caring	Show high levels of caring empathy, compassion and respect, particularly in an 'abstract' way; they worry and don't have experiential knowledge to know that things with be OK
Risk-takers	They can take big risks but on their terms. Whether they take risks depends on their perception of a context and are sometimes not prepared to share their risk-taking. They operate as perfectionists.
Balanced	Some show 'asymmetric development; some ways of knowing and doing are better developed than others and they show an imbalance in how they operate; they show high intellectual and emotional ability and lower physical and social interaction ability
Reflective	They show higher level metacognition and reflective ability. They may 'over-reflect' on and over-evaluate their impressions of their world and their strengths and weaknesses .

Who are the gifted learners in the IB classroom?

Gifted thinking.

Students have more elaborated and differentiated conceptual networks than their not-gifted peers that allow them to 'encode' the teaching information and to 'make meaning links that are more complex than their peers.

- interpret new information very rapidly, chunk it more efficiently, 'put together' more information into a bite
- look for and analyse 'big picture' patterns and rules in information.
- more likely to 'see' problems, uncertainty or inconsistencies between the teaching information and what they know and frame up challenges, spontaneously ask complex questions about ideas.
- make wider links with what they know, draw in a broader range of ideas, make 'far' links between topics that they know, link ideas in lateral, broad unexpected ways, think in larger jumps, skip steps in thinking.
- retain knowledge in which they are gifted more efficiently in working memory.
- infer more broadly, see novel connections between ideas quickly.
- learn a topic by keeping track of several ideas at once and can think about several aspects at a time, rather than sequentially, one at a time. They categorise issues and problems more efficiently and use their conceptual networks automatically.
- are self motivated to think and learn about a topic and to solve problems they perceive and are task focused in how they do this.

Who are the gifted learners in the IB classroom?

Gifted thinking.

- use imagination or fantasy, show 'intellectual playfulness'.
- show focused, intense interest in a topic
- differ in how easily they spontaneously and selectively use these ways of making sense.
-
- monitor and direct their learning; plan how they will learn, review progress

Classroom teaching needs to facilitate and foster this

12/05/15

What gifted and talented knowledge looks like

Characteristic of topic learning	What this looks like in a classroom?	What it means for effective teaching?
show high understanding, takes the ideas apart rather than low level interpretation or application		
see novel connections between ideas quickly, infer		
solve problems in unusual or novel ways		
spontaneously ask complex questions about ideas		
link ideas in lateral, broad unexpected ways		
keep track of several ideas at once, think in several directions		
think in larger jump, skipping steps in the thinking		
use imagination, fantasy, play intellectually.		
show focused, intense interest in a topic		
self – motivated to think and learn about the topic		
differ in how they use these ways of making sense spontaneously and selectively		
monitor and direct their learning; plan how they will learn, monitor their learning, review progress		

Using the capacity to infer to identify gifted learners pre-teaching

How could you this capacity to form these intuitive theories to identify students who can form them ? What types of tasks could you use to assess at the pre-teaching identification phase ?

Components of more advanced learning capacity to assess	Types of pre-teaching identification tasks
more enhanced network of meanings	Draw a possible concept map of the topic
greater ability to ask questions	Suggest questions the topic might answer for them
higher ability to generate possible mental images of the topics	Describe richer plausible networks of images
higher thinking ability; use of broader range of cognitive strategies, selective use and use of metacognition	Ask students to say what they will do to learn, the ways in which they will plan how they will learn or solve a task
higher ability to make fluid analogies, far transfer	Say what other topics they think of when they hear the topic, what the topic reminds them of.

Procedures for identifying gifted learning capacity in the inquiry based IB classroom.

Prior to learning a topic :

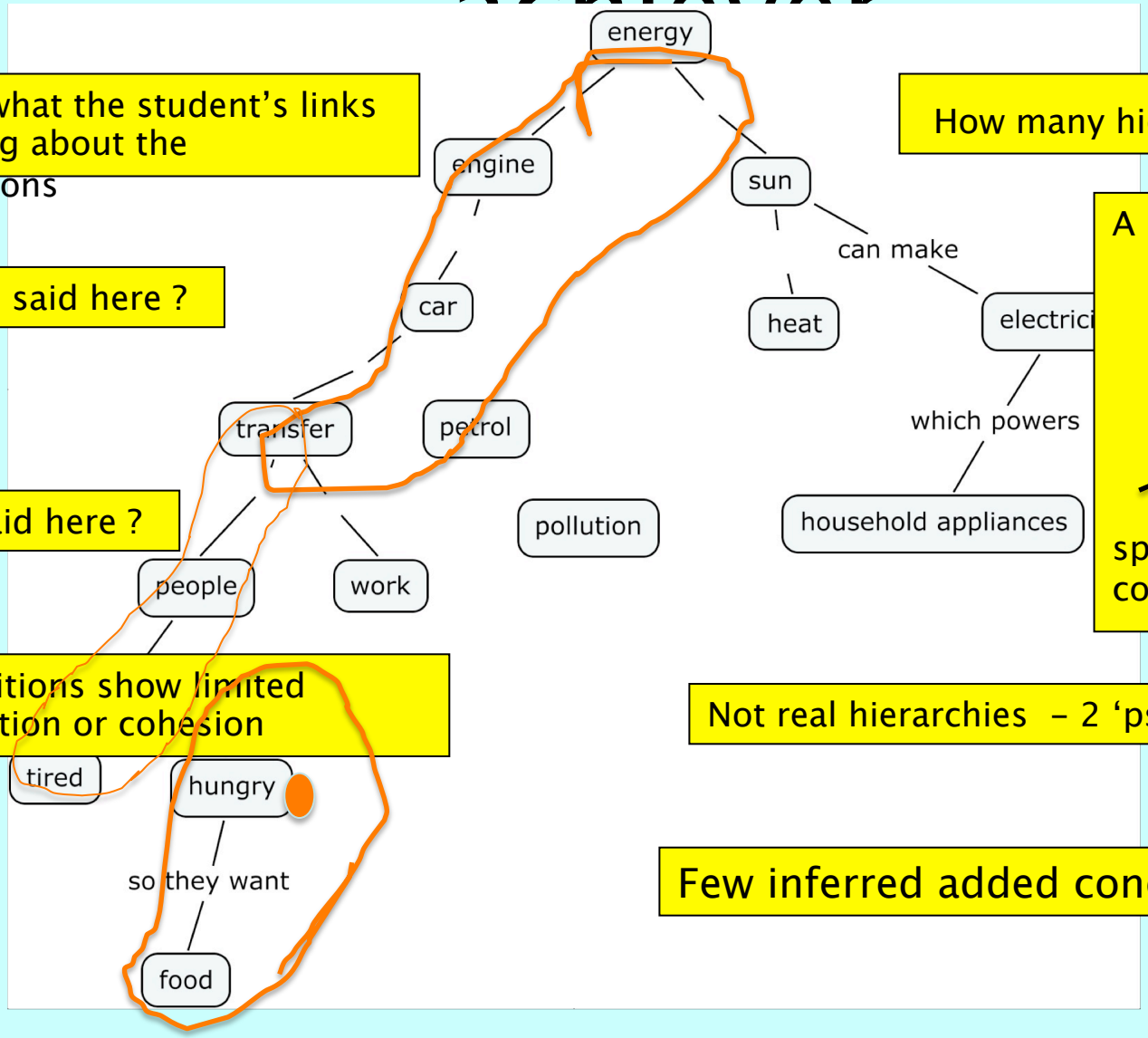
- Ask them to draw a concept map of what they might know /think about the topic. Analyse the responses to identify those that show greater conceptual complexity and differentiation of the ideas.
- Visual imagery: 'Imagine yourself in the context'.
- Infer the vocabulary and show how they might be linked
- Infer questions the topic might answer; Ask them to suggest questions they might think about as they learn the topic. Again you can organise their responses in terms of the patterns and trends they show.
- Students 'tell all they know' about a topic and probe for knowledge that is more elaborated and developed.
- select from a list the key concepts for a topic, key pictures, match word or/and pictures, label a diagram about the topic
- draw a picture or diagram of the ideas they have about the topic, make a model
- write a brief response that indicates what they know about the topic, unanswered questions,

The use of energy in everyday life

Draw a concept map using the list of concepts below. The focus question that you are trying to answer with your concept map is: **What do you know about energy?** When drawing your concept map, **include any other concepts** that you think might help explain about energy.

- Energy
- Transfer
- Work
- People
- Household Appliances
- Cars
- Food
- Tired
- Petrol
- Fossil fuel
- Electricity
- Heat
- Sun
- Pollution
- Engine

Concept map of average achiever



Look at what the student's links are saying about the propositions

How many hierarchies ?

What is said here ?

A hierarchy has

general concept

intermediate concept

intermediate concept

specific concept

specific concept

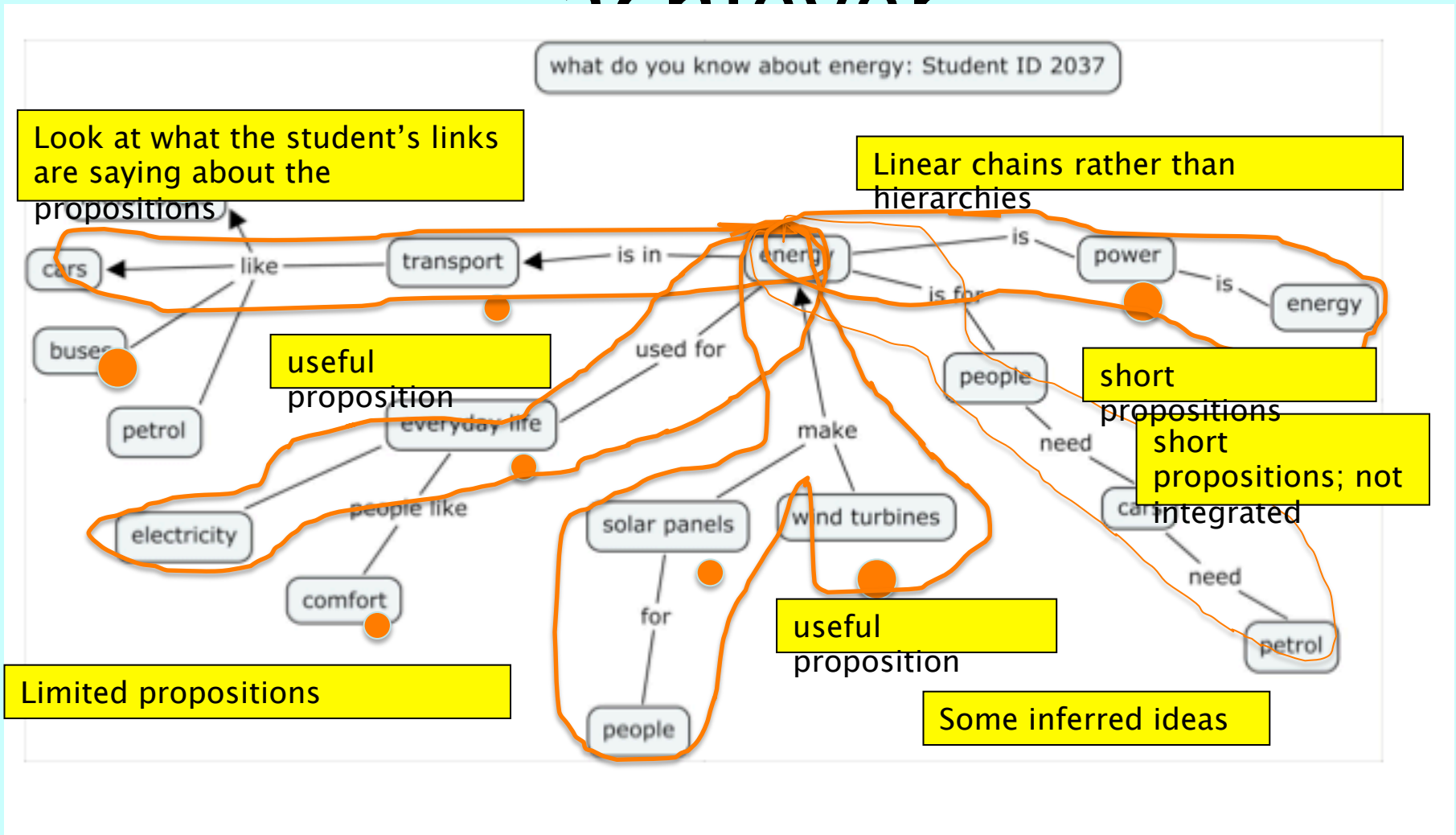
What is said here ?

Propositions show limited integration or cohesion

Not real hierarchies – 2 'pseudo hierarchies

Few inferred added concepts

Concept map of average achiever

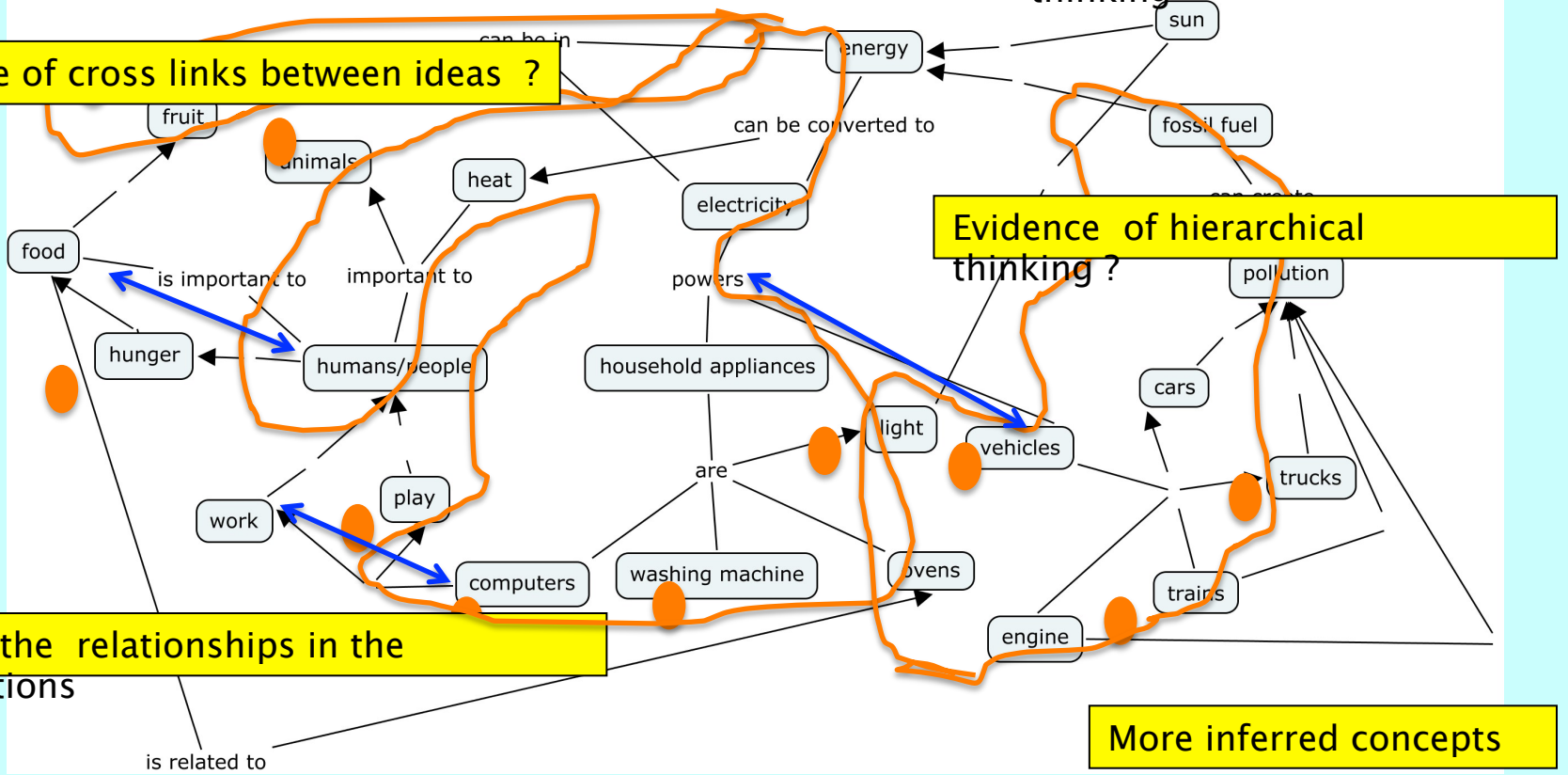


Concept map of high achiever

More evidence of cross links between ideas

Some evidence of big idea thinking

Evidence of cross links between ideas ?



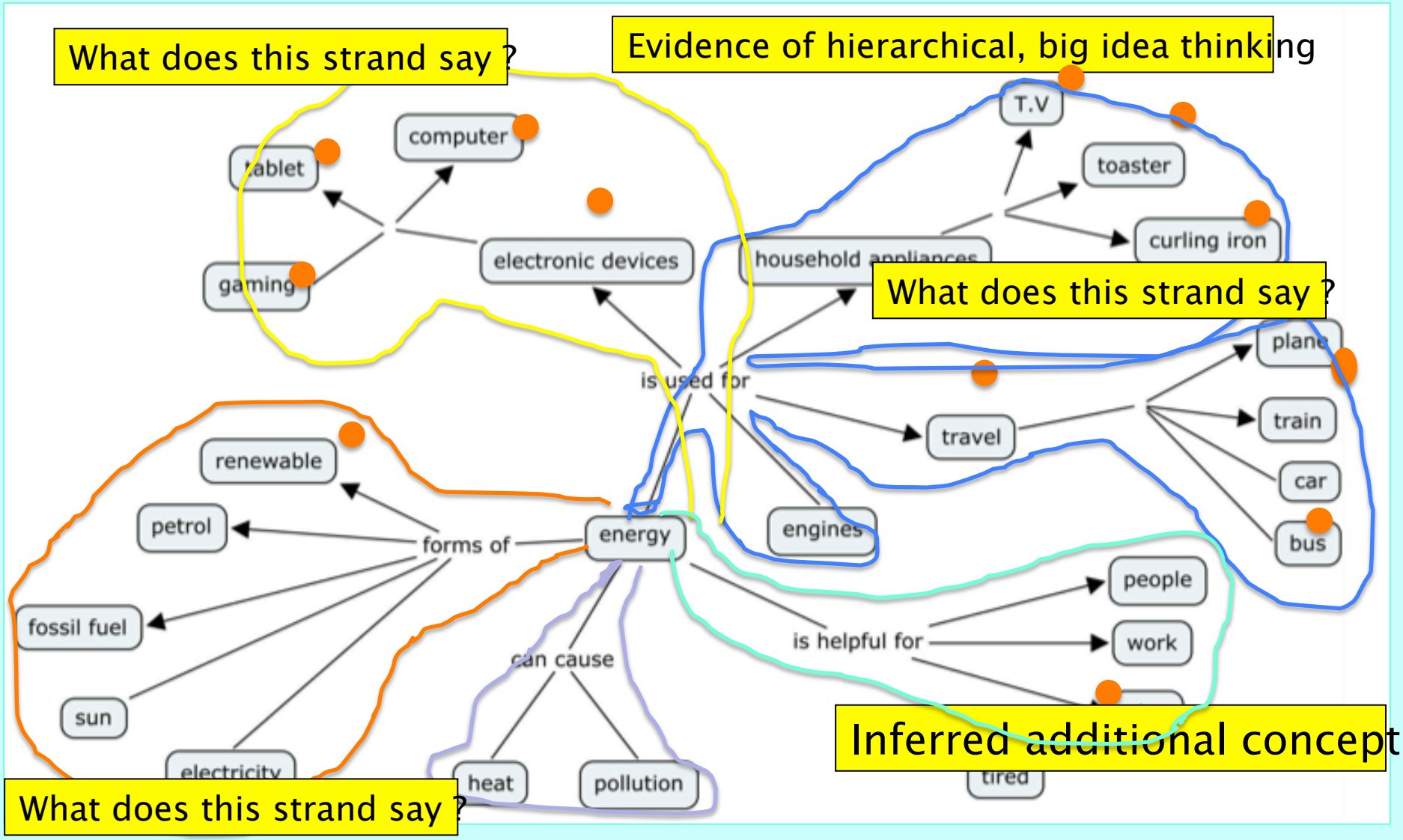
Evidence of hierarchical thinking ?

Look at the relationships in the propositions

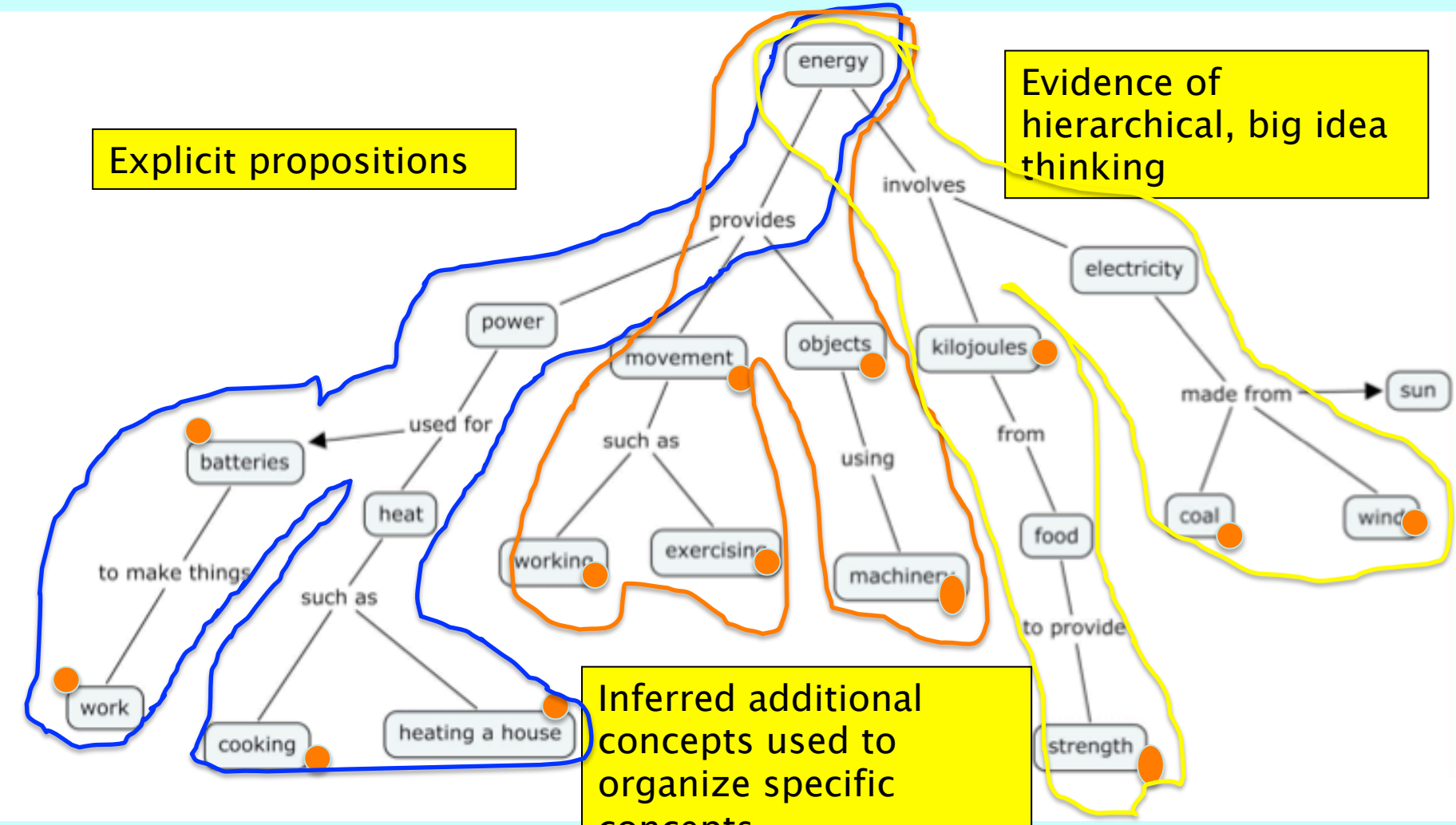
More inferred concepts

Some propositions have more complex relationship

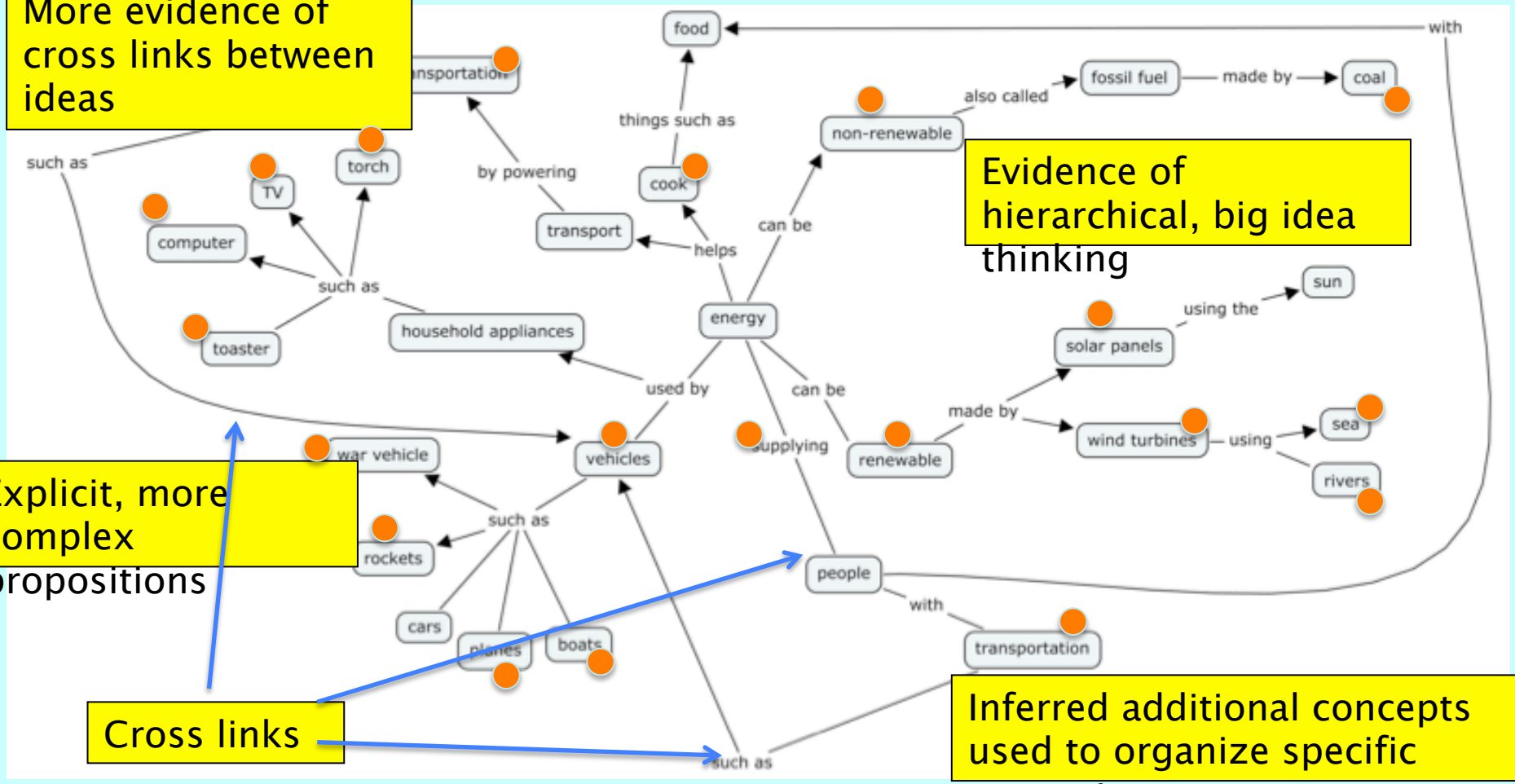
Concept map of verbally gifted student



Concept map of student gifted verbally + nonverbally



Concept map of student gifted verbally + nonverbally



More evidence of cross links between ideas

Evidence of hierarchical, big idea thinking

Explicit, more complex propositions

Cross links

Inferred additional concepts used to organize specific concepts

What the findings say about the learning capacity of gifted learners?

When learning a topic, these learners are more likely to

1. think in more complex relationships about the concepts; they maintain a semantic thread across a network of concepts. They don't need to refer to specific concepts. Their concepts are highly related to the main idea.

2. think spontaneously in and infer in big idea ways, to organize ideas in hierarchies. They prioritize concepts and organise them hierarchically rather than in linear links.

3. infer cross links between networks of ideas

It is not only what they know but also how they know it

How useful is concept mapping for identifying gifted learning capacity in classrooms ?

Concept mapping

- Is easy procedure for teachers to use
- Is embedded in the topics they will teach
- helps teachers see what the gifted learners know in an open-ended yet controlled way
- provides data that help teachers 'see' instances of gifted learning and to form reasonable expectations of them,
- helps teachers plan follow up teaching and to differentiate the topics taught.

How findings can inform our more general understanding of gifted learning ?

The focus on how gifted students link ideas

- Provides an alternative to the use of intelligence measures for identification.
- Focuses on the quality of the knowledge of these students.
- Provides an alternative to 'Where is the cut-off ? Where do we draw the line ?

Goal of the diffuse problem solving procedures

focus on students' ability to use their knowledge and thinking in an integrated, focused way to solve authentic problems appropriate to their culture and their learning history. Not a focus on answering conventional 'IQ type tasks'.

Their goal was to identify the following characteristics of knowledge and thinking :

- The ability to link ideas in richer, more differentiated and elaborated ways, with evidence of 'far transfer' links between concepts.
- The capacity to reflect on what they know and how they link problems or issues with what they know.
- Allow students to show their knowledge on tasks that are referenced in their cultures
- respect and acknowledge their learning and/or cognitive styles
- provide appropriate motivation and engagement opportunities.

The characteristics of complex social problem types

The complex social problems had the following characteristics :

- they are ill-defined, may need to be clarified and lack a single solution path.
- they need adaptive responses to new or changing situations.
- they are solved in "real-world" settings with time constraints and competing demands.
- they may interact with other issues in the context; some solutions may not be consistent with the broader goals and values of the collective.
- the information needed to solve them may not be obvious or readily available.

Example of diffuse problem

A situation that needs to be improved

The world's coral reefs are dying because of above-average water temperatures. Lord Howe Island has a reef. It has been badly bleached in recent years. Warmer than-usual waters, light winds and little cloud cover have caused it. The warmer water and more light kills the tiny animals that make the corals.

Example of diffuse problem

A situation that needs to be improved

Some people in Kenya live in places called slums. In slums, lots of people live close together. Their houses are tiny and are made of things they can get easily. They use mud, tin sheets and wood. In a slum it is also very hard to get clean water.

Many children in the Kibera slum catch killer diseases. These include malaria, scabies, trachoma and diarhoea. They are caused by the pollution of water sources. The water has been polluted because animal wastes, sewage and rubbish has been put in it.

Young children are most likely to die from these illnesses. In slums, deaths from poor cleanliness and lack of safe water are much higher in slums than in non-slum areas.

Experts say a healthy childhood needs safe water and being clean. There are two parts to being clean. You can keep yourself clean and you can keep the area around you clean.

In houses in the slums, people don't do things that keep the water clean. They don't protect it from things that cause disease. They use unsafe ways of getting rid of rubbish and unhygienic food preparation. These make an unsafe environment that cause health risks.

Water scarcity makes it difficult to maintain personal hygiene. Both have harmful effects especially for children

Procedures for identifying each problem solving strategy.

The questions used to cue student thinking about each aspect

Identify and describe	Cue questions
• the main problem	Say in your own words, what you think the problem is
• a solution.	What would the situation look like after the problem has been solved? What would you hope to achieve?
• the actions needed to solve the problem.	What do you think you would need to do to solve the problem? List as many things as you can think of.
• the information/ assistance they would need to solve problem.	To do these things what do you need to know? Say these as questions you want answers to.

Procedures for identifying each problem solving strategy.

The questions used to cue student thinking about each aspect

Identify and describe	Cue questions
• obstacles and difficulties in implementing their solution.	What difficulties do you think you would face? List as many as you can.
• ways of overcoming them.	What could you do you to overcome these difficulties?
• people likely to be affected by your problem solving activity.	You have solved the problem. Which other groups of people may be affected by this?
• how your solution would affect the community.	What effect do you think your actions would have on the local community?
• how to monitor the effectiveness of the solution.	What could you do to help you see if your solution was working?

Administration of the diffuse problem.

Procedures for scoring each criterion.

Each response was scored in terms of its cognitive complexity. Two dimensions;

1.the number of relevant ideas and

2.the complexity of the thinking (literal versus inferential, divergent, far transfer).

The assessment rubric

Unpack and understand the problem

To what extent does the student:

- recognize various aspects of problem rather than on one aspect
- restate problem by mentioning plausible ideas not explicitly stated
- prioritize the information, interpret and define issues and problems in unique ways

Assess each response using the key

problem	single idea	multiple ideas
literal	1	2
inferential	3	4

The assessment rubric

identify the goals or solution to the problem.

To what extent does the student:

- frame up viable, plausible solution,
-
- evaluate the proposed solution from various perspectives,
-
- take sensible risks that can lead either to success or to failure

Assess each response using the key

solution	partial solution	comprehensive solution
literal	1	2
inferential	3	4

The assessment rubric

additional information / assistance needed to solve the problem.

.

To what extent does the student:

- recognize the knowledge of others that may be relevant to the solution.
- recognize the need for multiple sources of information, including sources not mentioned in the problem.
- recognize need for collaborative thinking about the problem and proposed solutions, with different

Assess each response using the key

The additional information	Either expert or social information	Both expert and social information
Stated directly	1	2
inferential	3	4

Training teachers to assess students' responses to the problems

The preparation of the Admissions and Identification Team as skilled assessors included the following:

The Team in professional learning activities

1.examined the use of the diffuse problem solving procedure as a tool for identifying gifted student knowledge and thinking. This included

- observing a video of two sixth grade children working through it and
- analysing and discussing its use.

2.reviewed and modified the scoring procedures.

1.prepared sample student responses to each aspect of the problem solving task that they could use as indicators of different quality responses for each aspect. These were used later to assist in scoring the quality of each student's responses to each aspect.

2.collaborated in scoring each student's responses.

Using the regular-pattern-big idea sequence to differentiate a topic

The teacher forms an impression of what gifted understanding of a topic might 'look like'.
You frame up more cognitively complex versions of key concepts/topics in the curriculum and generate a 'knowledge pathway' for each concept/topic.
To do this you can take account of how the gifted students think in the subject or domain. Plan a knowledge pathway for the topic.

Depth of investigation	Level of inference
Literal unders	
Identify a pattern across d s	
Trend : link pattern with rs that m	
Rules – formulate the tr rule	
Link values, attitudes with the rules	
Understanding big ideas	

Regular student's understanding

Direction of teaching for gifted

Big ideas understanding

Multiple ways of showing patterned and 'big' understanding

Novice understanding

- use new ideas in restricted ways,
- understand them in parts, separate 'tentative' ways, try them out to see how they 'fit',
- intuitive rather than logical understanding.

Patterned, more general, understanding

•use new ideas in more general, patterned, rule oriented and abstract ways,
•form more abstract concepts and relationships,
•use conventional language and symbolism

Big understanding

•understand and use 'big ideas' in topic,
•use them fluently and automatically,
•manage and use their knowledge efficiently,
•think about two or more patterns, rules or general propositions at once.
•Think broadly about an issue.

Form linear knowledge extensions faster to induce patterns, convert information meaning links spontaneous more efficiently

HAKI learners

Recognize and encode appropriatey various types of meaning i tion – the topic, the eaning, the details. They select and use the main idea, prioritize ideas and organise details and imtermediate ideas around these. They are experts of the topic mainly in terms of the information from which they learnt.

Form linear knowledge ext to i s and e novel links

HAKE learners

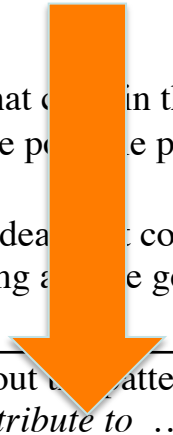
Form big picture understanding and think cr in br unexpected novel links ; make far transfer.

HAKC learners

Planning the probe questions to guide to each level of complexity

These questions guide students develop a more in depth knowledge of a topic

Challenge to learn	Frame up complex questions about the topic
Understand topic literally	Regular student understanding
Identify patterns in the ideas	Ask students to • Infer/ identify patterns that c in tl attern and infer, predict or decontextualise p e p • Look for more general idea contain or include the ideas you are teaching. Often summarizing and forming a e general topic can help.
Identify / infer possible trends	• question, speculate about t atterns, generate unknown new ideas , and possibilities; *How did the patterns affect / contribute to …. ?* • link two or more patterns into a possible causal or consequential trend. *How / why did the trend affect/change the direction of the pattern ?* • make far transfer links, identify their boundaries and use analogies,



Direction of teaching for gifted

Planning the probe questions to guide to each level of complexity

These questions guide students develop a more in depth knowledge of Egyptian culture

Generate possibilities	• think about more of the aspects, elaborate and extend the ideas through questioning and link them more broadly with what you know . • think more broadly about an issue and see possibilities and optic … *What might happen if ..? ;*
Identify generalities, rules	• abstract or generalize from two or more patterns or rules, form … and understand rules. • re-organize and re-prioritize aspects of their knowledge so that t … an think in terms of main and subordinate ideas at once, for example, *Make X the main idea … d of Y. How does the interpretation change ?*
Identify / infer ethical issues	• link moral / ethical issues with the rules or general propositions : *What / how/why should/might …..?*
Identify / infer big ideas	• build principles in the set of topics • infer how the 'big ideas' could be used to solve problems and make decisions, see possible moves and options: *"If this happens, then.., but because of .. I would….* and to generate creative knowledge.

Big ideas understanding

Knowing at the regular, pattern and big ideas levels

Structure of leaves, the functions that occur and photosynthesis

Challenge for learning	How do trees breathe and produce food ? students
Literal understanding of the topi	• describe the structure of leaves and the various functions that occur. • describe photosynthesis and the ingredients of the reaction $6H_2O + 6CO_2 +$ light ⚿ $C_6H_{12}O_6 + 6O_2$ • comprehend the process for particular leaves.
•Identify a pattern across details	extend the p on to r evi They identify gate otosy link photosyn ct of f, th growing, features of a its chlor ur of the light, imp
Big picture : link patterns w factors that may influence	analyse why leaves photosynthesise dapted to this. They link this with the health of a plant and use tis to select ts • link the cell structure with the chemistry of photosynthesis and respiration. climate change of photosynthesis and some of the limiting factors of ccess to H_2O, CO_2, light and O_2 affect the rate of photosynthesis reaction s in water plants (for example, how light intensity affects the growth of elodea), how ocean plants photosynthesize, investigate photoplankton activity in experiments • Analyse photosynthesis in bacteria, how green sea slug photosynthesises, the symbiotic relationship between plants/algae and other organisms e.g. corals and zooxanthallae

regula

r

Big ideas

Tasks to identify the entry point of each student

Teaching information to provide a knowledge base for each level

Directed /scaffolded teaching to guide knowledge building at each level

Knowing at the novice, pattern and regular levels

States of Matter	
Challenge for learning	What are the different forms in which an item can exist ?
Literal understanding of the topic	• describe the physical properties of the three states of matter; solids have a fixed shape and can't be squashed, liquids flow and take the shape of its container, gas fill their container and are compressible. • Describe the particle structure of matter; they say what particles are, draw diagrams, describe the motion ...s and the affect of adding/removing heat energy, changes of state.
•Identify a pattern across details	Investigate the properties of the three states of matter in real life contexts and decide where they would see the differe... e.g., what is glass? What is mantle – slowly flowing solid, the plasticity of so... ny/how? Investigate the... point a mat... ro... the sources of... some solids be... en energy/f... end... how some soli... l/or ductile... how some sub... e staying in... grap... cross-linking the carbon atoms
Big pictur... link patter... with factor... that may influence it	...how non-Newtonian fluids e.g. paint or cornflour differ from Newtonian fluids and the ...f plasmas, liquid crystals, and foams ...the kinds of energy that can cause changes of state occur. • Investigate the motion of particles and chemical reactivity, how particles interact with other particles, and the impact of energy on reaction rate • Investigate how change of state is used in the home, industry and the community

regula r

expert

Tasks to identify the entry point of each student

Teaching information to provide a knowledge base for each level

Directed /scaffolded teaching to guide knowledge building at each level

Planning the probe questions to guide to each level of complexity

These questions guide students develop a more in depth knowledge of Egypt to examine further detail of Egyptian culture

Challenge for learning	How does hieroglyphics differ from contemporary written languages as a ... the people who used it?
Literal understanding ... topic	...osetta stone. Describe the characters of Egyptian writing. Explain the origin of each.
Identify a pattern across details	What patterns are in symbols on Narmer's Palette and the Rosetta stone ? What was the purpose of each for communication? How is Narmer's Palette ...
Trend : link pattern with factors that may influence it	... evelop in this way?
Rules – formulate the trend a ... a rule	Did rules apply to hieroglyphics or were they set as a result of the ...evelopment and use of an artistic code of writing?
Link values, attitudes with the rules	In what ways were written messages used for the public good and to foster ...s.
Understanding big ide...	... help cultures to develop, for example, its technology and industrial base

Regular understanding

Direction of teaching for gifted

Expert understanding

Planning the probe questions to guide to each level of complexity

These questions guide students develop a more in depth knowledge of writers use language to communicate humour

Challenge for learning	How do writers use language to communicate humour
Literal understand of the topic	achieve
Identify a pattern across details	Link multiple types of humor in narratives : Infer multiple types of humor in narratives for example, 'laugh at life', 'slapstick', sarcasm', 'self deprecating' purposes and goals and how different types of language and text structure form them.
Trend : link pat with factors that influence it	Link trends in humor with different types of genre : Infer how different genres of writing (for example, different t ieve ing' purposes and goals.
Rules – formula e trend as a rule	Infer how different genres of writing (for example, narrative, poem, jingle, an advertisement) use different types of language to achieve different types of humor, for example, 'laugh at life', 'slapstick', sarcasm', 'self deprecating' purposes and goals.
Link values, attitudes with the rules	What power do writers seek try to use when they use humour to communicate ? What can we
Understanding bi ideas	readers, including sadness, scorn, amusement and happiness, for example, black humour and irony.

Regular student understanding

Direction of teaching for gifted

Big ideas understanding

Teacher's thinking to anticipate high ability understanding

Novice understanding

Regular students learn specific topic about how and why life changed in the past, and identify aspects of the past that remained the same. They describe the experiences of an individual or group over time. They recognize the significance of events in bringing about change.

Extend ideas in I direction

Link life at Lake Mungo 40,000 years ago with the food that was available and what these tell about the environment

Patterned understanding

What do we believe about the environment at Lake Mungo 40,000 years ago ? How do historians and archeologists use existing evidence to 'put together a knowledge of the past ?

Extend ideas in 2 or more direction

Link life at Lake Mungo at various times in history and link with changes in the food eaten and the tools used and the environment

Big picture understanding

Compare life at Lake Mungo 40,000 years ago with life there 20,000 years ago. How did the food eaten and the tools used changes. How are climate and history linked ?

Understanding gifted learners form without explicit teaching

Differentiating a topic in Grade 5 English : Identify how writers use language and text structure to achieve humorous purposes and goals

Regular students are taught to identify how writers use language and text structure in narrative A to achieve humorous purposes and goals

Pattern learners spontaneously link humorous purposes and goals in A with how it is done in narratives B, C … and generate theories about how writers use language and text

Pattern thinking links the idea taught in a

Big picture learners spontaneously link humorous purposes and goals in A with how it is done in narratives B, C …and other genres and generate theories about how writers use language and text structure to achieve it

Big picture thinking links the idea taught in two or more patterns

picture knowledge and derstanding covers the domain space

Understanding gifted learners form without explicit teaching

Differentiating a topic in Year 4 maths – Apply place value to rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems

Regular students are taught solve tasks such as

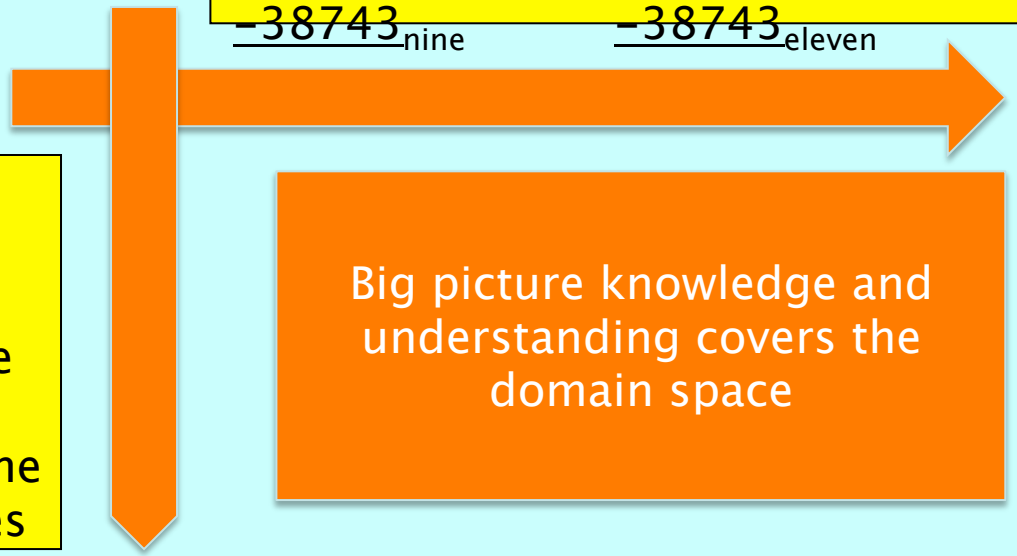
74232 by renaming

−38743

Pattern learners spontaneously link this with subtracting in base 9 or 11 for example

74232_{nine} and 74232_{eleven}

-38743_{nine} -38743_{eleven}



Big picture learners spontaneously interpret place value as an arbitrary grouping of numbers that influences the domain of numbers that is available to operate within. The student can use different bases in multiplication, addition, etc.

Big picture knowledge and understanding covers the domain space

How to differentiate the teaching for an 'big ideas' understanding of a topic

Use this sequence to differentiate the teaching

To teach for a novice understanding: teach the students to

- Understand the topic literally and superficially, recall of specific details
- understand the topic in parts, separate 'tentati ways, need to try them out to see how they 'fit',
- Understand the topic more in intuitive rather tha in logical ways.

Patterned, more general, understanding: teach the students to

- identify patterns in the ideas 'new concepts and relationships,
- link two or more patterns into a possible causal or consequential trends. *How / why did the trend / pattern / change direction ?*
- question, speculate about the patterns, generate unknow *did*
  ontribute to …. ?

What does this look like for topics you will teach ?

What questions will you use to guide gifted learners to link ideas into 'big ideas' ?

ig idea understanding: teach

- formulate and understand rules and any moral / ethical issues linked with them
- use big ideas to solve problems and make decisions, *"If this happens, then.., but because of .. I would….*
- plan how they will use their new knowledge in creative, novel ways
- think more broadly about an issue and see possible moves and options.
- build principles in the set of topics.

Example of how to scaffold gifted students' thinking in teaching / learning

Sequence for removing scaffolding in gifted learning and move to self management and direction of learning activity. Example : living in ancient cultures.

For one culture in each aspect, provide a learning pathway that guides the students' thinking appropriately.

For a second culture, provide the gifted students with a guiding question pathway

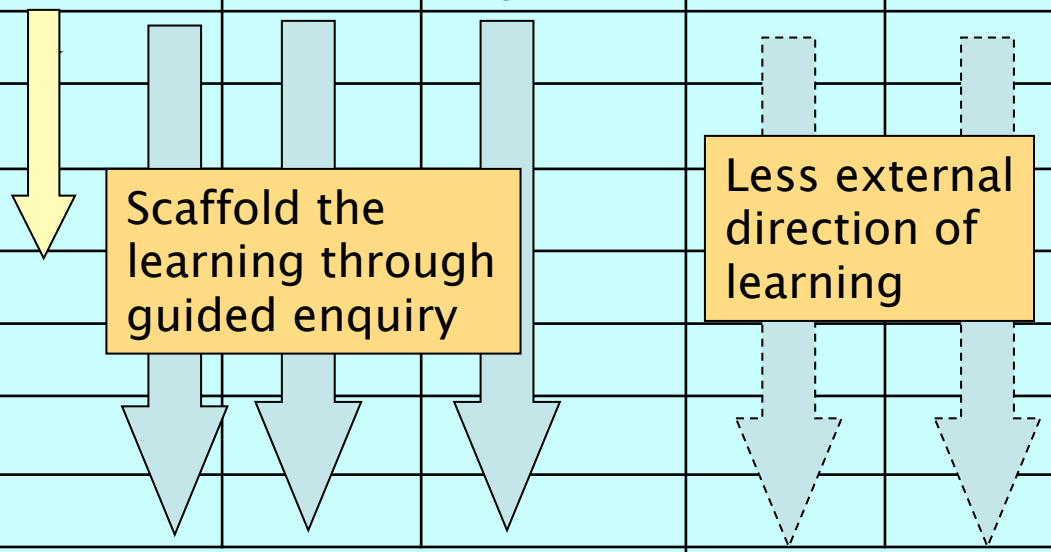
Students draw out similarities and differences and infer their causes. They infer / predict for other cultures.

They investigate their predictions in a third culture. They design their own research for ommunication in Athens, Japan or China. Their output is assessed in terms of the knowledge generated, the transfer of research skills and the capacity to make links between cultures.

Students draw out their findings re the knowledge that underpinned ancient cultures and the implications of this knowledge for our culture.

Integrating the aspects: History example

	Egypt			Rome	
	communic	technol	religion	commun	technol
Paradox					
Literal understanding of key ideas					
Identify patterns in the ideas					
Identify / infer possible trends					
Generate possibilities, unknown ideas					
Identify the generalities, rules about topic					
Identify / infer ethical issues re topic					
Consolidate, integrate for one culture, predict	synthesize re question : What was known in ancient Egypt?			What was known in ancient Rome ?	
Review how they learnt about the topic	What are key questions I asked re Egypt ? What ways of thinking helped me ? Develop self direction.			What key questions /ways of thinking helped re Rome ?	
Identify / infer big ideas + predict future.				What was known to both cultures?	
Link big ideas with broader knowledge					



Planning learning activities for key topics

Differentiate student understanding to generate more complex levels of understanding

Student indicators of each level of understanding -> pre unit tasks

Big picture understanding

Plan teaching materials and how learning and teaching will be implemented and monitored

Patterned understanding

Plan how student's new knowledge will be assessed and shared with peers

Convert topic to student knowledge

How will you evaluate the success of the differentiated teaching ?

Develop learning activities for key concepts

Develop learning activities for key concepts/topics at each level by planning the questions/challenges you can use to guide students to form each level of understanding and the information they could use to assist them to do this.

Key probe questions to guide the learning pathway

Decide how you will link the differentiated c… will gifted students access/use the regular teaching ? (for example, jigsaw, accelerated progress)

Information sources that are accessible, subject associations, mentors

You could use popular models for curriculum … Tomlinson, Renzulli, Braggett, Kaplan) to a…

Regular coaching of learning, individual and small groups

A key focus here is the use of the diffuse pro… The necessary challenges for gifted learning … 'type' of gifted understanding will be fram… sources /mentor opportunities to inform … will be collated and organised.

Regular consolidation and monitoring of what has been learnt

Diffuse problem to apply new knowledge

The c… could be planned collaboratively with institutions such as CSIRO, university and the outcomes of this planned mapped into the learning activities that are designed.

Teacher's thinking to anticipate high ability understanding

Novice understanding

Regular students learn specific topic in science, eg., digestive system

Extend ideas in I direction

Link the digestive system in humans with other topics within the domain of digestion and other individual systems in the human body or other single aspects of living

Patterned understanding

How is digestion managed by nervous sy… in … oth…

Problem /challenge : how are health problems caused by the release of enzymes in the stomach ? How would this be managed for C 21 diets ?

Extend ideas in 2 or more direction

Link with trends across disciplines, for example, history : Predict digestive system variations in different animals

Big picture understanding

Link the digestive system in humans with other

Problem /challenge : how would today's digestive system be different from that in humans 1000 years ago ? How will our digestive system need to adapt to predicted changes in diet over the next 100 years ?

Teacher's thinking to anticipate high ability understanding

Novice understanding

Regular students learn specific topic in maths, eg., Pythagoras, $c^2 = a^2 + b^2$

Extend ideas in I direction

Link with another trend eg.,

- more than one right angled triangle, more that two squared terms
- use in building, architecture, civil engineering

Patterned understanding

High ach… = $a^2 + b^2$ i… use in se… difficult … Pythagor… 3D surface, explore $d^2 = a^2 + b^2 + c^2$

Problem /challenge : how can Pythagoras be used to identify the properties of more complex shapes?

Extend ideas in 2 or more direction

Link with more general trends for example, in both algebra and geometry

Big picture understanding

Gifted s… relations… the sum … look like…

Problem /challenge : can you find numbers that satisfy $d^2 = a^2 + b^2 + b^2$ or What would $c^3 = a^3 + b^3$ look like spatially ?

Teacher's thinking to anticipate high ability understanding

Novice understanding

Regular students learn specific topic about how and why life changed in the past, and identify aspects of the past that remained the same. They describe the experiences of an individual or group over time. They recognize the significance of events in bringing about change.

Extend ideas in I direction

Link life at Lake Mungo 40,000 years ago with the food that was available and what these tell about the environment

Patterned understanding

Problem /challenge : What does the study of life at Lake Mungo 40,000 years ago tell us about how to study our past. Where else in Australia might we look for evidence of earlier cultures ?

Extend ideas in 2 or more direction

Link life at Lake Mungo at various times in history and link with changes in the food eaten and the tools used and the environment

Big picture understanding

Compare life at Lake Mungo 40,000 years ago

Problem /challenge : What does the comparison of life at Lake Mungo tell us about how to study our past and about how cultures develop ? What can we infer the cultures at Lake Mungo knew ?

Opportunities for talented outcomes in IB programs

Display of gifted learning opportunities in the diploma program. Extend this to the MYP and the PYP

TOK : gives gifted learners with the opportunity to show their understanding of knowledge.

Gifted learners -naive philosophers.

Their advanced metacognition and reflective capacity allows them to synthesize an advanced theory of knowing and learning

Extended essay : provides the opportunity for all types of gifted learners to display their research skills at a very high level.

The holistic scale measures creativity.

The other dimensions on which the extended essay is assessed also contribute to the creative outcome.

Creativity activity and service. Again this provides the opportunity for all types of gifted knowing to be displayed, for example, practical giftedness.

Do creatively gifted students do better on ToK and EE ?

Correlation between TTCT and outcomes for the extended essay (N= 125) and ToK (N = 108)

(Pearson coefficients)

	Extended essay				Theory of Knowledge		
Torrance subtest	general	subject	H criteria	total	written	oral	total
Figural fluency	.08	.13	.11	.12	.08	.03	.08
Figural originality	.10	**.18***	.13	.13	**.16***	.05	**.16***
Figural elaboration	.00	.02	-.01	.03	.05	.18**	.08
Figural abstractness	.16	**.25****	**.18***	**.21****	**.27****	**.15***	**.30****
Figural resistance to premature closure	.05	.11	.07	.12	**.16***	-.03	.13
Verbal fluency	.07	**.19***	.12	.14	**.30****	.11	**.30****
Verbal flexibility	.06	**.21***	.12	.12	**.30****	.12	**.31****

What happens during the EE ?

Link each phase of the stages model of creativity with aspects of their learning profiles; the learning strategies they used (analytic versus wholistic, verbal-abstract versus imagery), their ways of thinking (deep versus surface) and their learning motives.

phase of creativity	approach to learning	cognitive srategy used
select a topic	deep strategies made this easier	analytic strategies made this harder
define, refine the issue		imagery strategies made this easier
decide the specific issue / questions to target	achievement motives made this easier	
search for, collect data / information to support the issue / question	achievement motives made this easier, surface strategies and motives made this harder	verbal strategies made this easier
assemble, collate information to report the outcome	surface strategies and motives made this harder	
write a first draft		
write a semi-final draft	achievement motives made this easier, surface motives made this harder	
write a final draft		analytic strategies made this easier
develop an action	achievement motives made this easier	

Implications for supervisors

These data indicate that the use of

- deep strategies found it easier to select a topic,
- achievement strategies found it easier to develop action plans,
- surface motives and strategies found it easier to access and search for information,
- surface motives found it easier to assemble, collate and prioritize their knowledge
- to decide the specific questions to pursue and to write the semi-final draft
- a verbal preference made it easier to collect information and data,
- an imagery preference made it easier to identify unanswered questions,
- an analytic preference made it harder to select a topic but easier to write the final draft.

Supervisors need to be aware of the influence of the learning factors on the various phases, and how to guide students to switch their thinking to get the best outcomes.

Evaluate your current provision for gifted learners in your classroom /school.

- How well does the school identify gifted learning in its multiple forms?
- What steps does the school take to implement talent development from gifted learning in its multiple forms?
- What do teachers know about recognising giftedness and identifying talent?
- How are talented outcomes used by the school as models for other students' outcomes?

What are you taking home ?

How to optimise the chance that gifted learning in your IB classroom will lead to talented outcomes

- Have procedures for recognising gifted learning capacity and talented outcomes – the intuitive theories.
- How to use enquiry and problem solving to identify giftedness in your teaching.
- Use formative assessment tasks and tools and identify gifted learning capacity.
- Maintain a climate for gifted learning and environment that supports it.
- For each topic, identify high levels, differentiated group teaching, ask gifted learners to work at higher levels, compare and infer.

IB converting giftedness to world talent

Gifted knowing, thinking and learning in particular domains + emotional attributes. Their knowing includes earlier talented knowledge and skills .

Higher interpretations or understandings are intuitive theories about the topics. These contain both programmed by the teaching and links based on inferences learners through their far transfer thinking.

IB curriculum

supportive cultures

Talented outcomes are productions that can be in verbal and/or nonverbal formats in particular domains. They include

- higher level skills or knowledge about topic
- creative productions and understanding,
- solutions to problems.
- responses to tasks, questions

Very best wishes with your important work in this area in the future