Meta Learning & Thinking Skills

Frameworks for thinking

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Frameworks for thinking

A theoretical framework & Classificatory system

to help educators

to understand
the processes and products
of
thinking and learning

Common features and meta model

- self-engagement
- reflective thinking
- productive thinking
- building understanding
- information gathering

The nature of thinking and thinking skills

Thinking (Dewey's classic introduction)

- Thinking as a 'stream of consciousness' and the everyday 'uncontrolled coursing of ideas through our heads', including dreaming and daydreams (p. 3)
- Thinking as imagination or mindfulness
- thinking as synonymous with believing expressed in statements such as 'I think it is going to rain tomorrow': in this sense it is contrasted with knowledge and the level of confidence with which we express such a belief (p. 6)
- Reflective thinking as a chain of thought leading, through enquiry, to a conclusion (p. 9)
- Dewey's aim is defining and recommending reflective thinking as the basis of both rationality and action.

Thinking in education

- 'Thinking', particularly in educational contexts, is usually used to mean a consciously goal-directed process, such as remembering, forming concepts, planning what to do and say, imagining situations, reasoning, solving problems, considering opinions, making decisions and judgments, and generating new perspectives.
- When there is some uncertainty that a satisfactory end is achievable, it is useful to think.

Metacognition and self-regulation

- Refers to one's knowledge concerning one's own cognitive processes and products or anything related to them .
- Metacognition involves two major dimensions (Boekaerts and Simons, 1993). Firstly, it involves an awareness of one's own cognitive functioning (metacognitive knowledge) and secondly, application of one's cognitive resources for learning or problem-solving; described by Hacker (1998) as two components, metacognitive monitoring and metacognitive regulation.

Thinking skills in education

- thinking skills programmes typically involve six related types of thinking:
- metacognition
- critical thinking
- creative thinking
- cognitive processes (such as problem-solving and decision-making)
- core thinking skills (such as representation and summarizing)
- understanding the role of content knowledge.

Educational context 'thinking skills'

- This usage of the term 'thinking skills' implies that there are learning and teaching situations that can induce processes which produce desired mental activity. It is underpinned by a judgment that thinking can be improved with practice particularly through the skilled intervention of a teacher. It also implies the use of mental processes to plan, describe and evaluate thinking and learning.

Quote to think

- If teachers are to help students become self-regulated learners, their own selfregulation has to be unleashed as well. Traditional design theories of instruction run the risk of interfering with rather than supporting this goal. (Corno and Randi, 1999, p. 296.)

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Frameworks dealing with INSTRUCTIONAL DESIGN

Create a structured learning environment with emphasis on content or process, knowledge acquisition or creativity

Time sequence and overview Instructional Design

- See Word doc
- Bloom's taxonomy of educational objectives (cognitive domain) (1956)
- Feuerstein's theory of mediated learning through Instrumental Enrichment (1957)
- Gagné's eight types of learning and five types of learned capability (1965)
- Ausubel and Robinson's six hierarchically-ordered categories (1969)
- Williams' model for developing thinking and feeling processes (1970)
- Hannah and Michaelis' comprehensive framework for instructional objectives (1977)
- Stahl and Murphy's domain of cognition taxonomic system (1981)
- Biggs and Collis' SOLO taxonomy (1982)
- Quellmalz's framework of thinking skills (1987)
- Presseisen's models of essential, complex and metacognitive thinking skills (1991)
- Merrill's instructional transaction theory (1992)
- Anderson and Krathwohl's revision of Bloom's taxonomy (2001)
- Gouge and Yates' Arts Project taxonomies of arts reasoning and thinking skills (2002)

Highlighted model dealing with Instructional Design

- Bloom's taxonomy of educational objectives (cognitive domain) (1956)
- Anderson and Krathwohl's revision of Bloom's taxonomy (2001)

Krathwohl and Anderson

- Revising Bloom's Taxonomy
  - With thanks to Jacqueline Koch

About David Krathwohl

- Educational psychologist
- Dean of the education department at Syracuse University
- Former president of the American Educational Research Committee
- Inspired to pursue educational curricula by *Bloom's Taxonomy*
- Co-authored curriculum texts with Bloom and helped define cognition

About Lorin Anderson

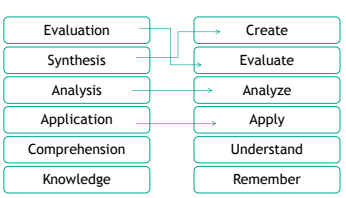
- Former student of Benjamin Bloom
- Received PhD from University of Chicago
- Distinguished professor emeritus at University of South Carolina
- Considered a cognitive psychologist
- Interested in researching the quality of education of impoverished children worldwide

Description of the model

- Restructured Bloom's taxonomy of the cognitive domain
- Changed taxonomy words from nouns to verbs
- Includes more information about how the taxonomy interacts with different types of knowledge

- For example, Bloom's first taxonomy was knowledge; Krathwohl and Anderson's first taxonomy is remembering, or the recalling of knowledge or factual information from memory.

Changes in taxonomy



What they mean

Create	Reorganize, plan, produce
Evaluate	Make judgments, check, critique
Analyze	Break material into organizational parts
Apply	Use learned material in new situations
Understand	Interpret, classify, infer
Remember	Retrieve, recall

More about cognition

- Four different knowledge types
  1. Factual
     Knowledge required for certain subjects
     Includes necessary facts and key words
  2. Conceptual
     Ability to classify, understand principles, generalizations and theories
  3. Procedural
     Knowledge used to perform specific skill within subject
  4. Metacognitive
     Awareness of one's cognitive strengths and weaknesses and how one best works to solve problems

How cognition relates to the taxonomy

- Teachers can better and more easily assess how students' cognitive processes work at each level of the taxonomy

Cognition	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual						
Conceptual						
Procedural						
Meta-cognitive						

Examples of the model

- **REMEMBERING**
  - Activities
    - List main events of story
    - Create a historical timeline
    - List important pieces of information
    - Recite a poem, speech or monologue
    - Create a chart of information
  - Questions
    - What is … ?
    - How many … ?
    - When did that occur?
    - Who did … ?
    - What happened after …?
    - Describe the main character…

Examples of the model

- **UNDERSTANDING**
  - Activities
    - Illustrate the main idea.
    - Create a cartoon strip.
    - Write a script and perform a play.
    - Create a chart to illustrate flow.
    - Summarize the main points.
  - Questions
    - How would you explain… ?
    - Redefine in your own words.
    - Can you illustrate that point?
    - Can you outline the process?
    - Clarify the main idea.

Examples of the model

- **APPLYING**
  - Activities
    - Construct a model.
    - Create a puzzle or game.
    - Dress up in clothes from that era.
    - Make a model to show the principle.
    - Design an advertising and marketing campaign.
  - Questions
    - What characteristics can be used for grouping?
    - Think of another instance when…
    - How would the outcome change if …
    - What questions would lead to a specific outcome?

Examples of the model

- **ANALYZING**
  - Activities
    - Make a chart to show relationships.
    - Write a report about the pros and cons.
    - Critique a piece of art by form, color, texture, genre, etc.
    - Create a graph to show how x affects y.
  - Questions
    - Explain how x is similar to y.
    - Explain how x is different from y.
    - Why did those changes occur?
    - What other outcomes exist?
    - Why was x the outome?
    - What caused x to change?

Examples of the model

- **EVALUATING**
  - Activities
    - Write a list of judging criteria for …
    - Debate a social issue.
    - Convince others of the importance of five ethical principles.
    - Consider what changes are needed.
    - Write an opinion paper about…
  - Questions
    - Is there a better way to … ?
    - State and defend position x.
    - How could you improve …?
    - Who will be affected?
    - How will they be affected?

Examples of the model

- **CREATING**
  - Activities
    - Invent a robot that does …
    - Journal about your feelings …
    - Create a new product and sell it.
    - Create a plan to end world hunger.
    - Describe an ideal spring day.
    - Create a futuristic city.
  - Questions
    - Design a model to show …
    - Name different ways to …
    - Find a new way to use an old item.
    - Define in your own feelings…
    - Develop a new plan to …

Pros

- Teachers can easily assess student performance.
- Teachers can progress from one level of cognition to the next.
- Teachers can evaluate type of cognition versus level of cognition.
- Teachers can ask essential questions and find activities to meet different levels of cognition.
- Students have myriad ways to find activity that best fits their cognition.
- Students draw on different types of cognition to solve problems.
- Activities relate to real-world applications.

Cons

- Asks teachers to tailor lessons to six levels of thinking.
- Does not ask teachers to consider overall unit or what goals they want to accomplish.
- Assumes achieving creativity is the main goal of learning any objective.
- Does not ask for specific learning objectives.
- Does not consider essential questions.

Frameworks dealing with PRODUCTIVE THINKING

Developed for use in understanding critical and 'productive' thinking.
Focus on problem solving

Time sequence of the productive-thinking frameworks

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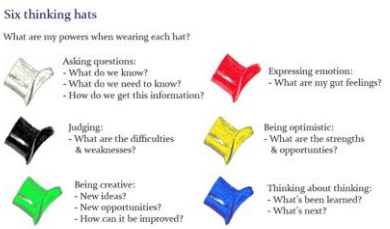
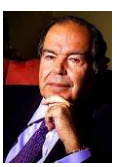
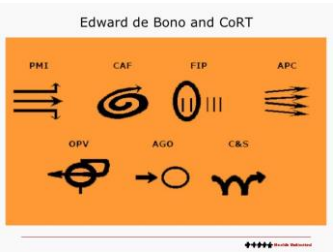
- Altshuller's TRIZ Theory of Inventive Problem Solving (1956)
- Allen, Feezel and Kauffie's taxonomy of critical abilities related to the evaluation of verbal arguments (1967)
- De Bono's lateral and parallel thinking tools (1976 / 85)
- Halpern's reviews of critical thinking skills and dispositions (1984)
- Baron's model of the good thinker (1985)
- Ennis' taxonomy of critical thinking dispositions and abilities (1987)
- Lipman's modes of thinking and four main varieties of cognitive skill (1991/95)
- Paul's model of critical thinking (1993)
- Jewell's reasoning taxonomy for gifted children (1996)
- Petty's six-phase model of the creative process (1997)
- Bailin's intellectual resources for critical thinking (1999b)

Highlighted models dealing with Productive Thinking

- De Bono's lateral and parallel thinking tools
- Lipman's model of thinking







Matthew Lipman


Matthew Lipman

- Lipman, a Philosophy professor at the time, developed P4C in the 1970s. He was concerned with the Deweyan notion of creating an education for a healthy democracy –an education that would develop a critical citizenry with respect and empathy for others in the community.

- Philosophy For Children (P4C) does not refer to teaching children traditional philosophy, rather, it is a pedagogic approach developed by Mat Lipman that centres on teaching thinking skills and the ability to question and reason. It is a student-led, enquiry based approach to learning.

Main purpose

- To make learning meaningful
- To encourage active enquiry
- To promote democracy
- To encourage good judgement

The 4 Cs of P4C

Thinking mode	*Thinking focus*	Thinking Habit
CRITICAL	*ABOUT THINKING*	**Reflective(ness)**
CREATIVE	*FOR YOURSELF*	**Thoughtful(ness)**
CARING	*OF OTHERS*	**Considerate(ness)**
COLLABORATIVE	*WITH OTHERS*	**Reasonable(ness)**

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Socratic Questioning – the MTV steps to understanding and good judgement

1. Questions of **Meaning**:
Could you explain more clearly (or give an example)?
How does X relate to Y? (or, How is X different from Y)?

2. Questions of **Truth** (and **Validity**)
Is that true? (or, What makes you think - or assume - that?)
Does that follow? (or, What follows from that?)

3. Questions of **Value**
What is interesting, or important, in this?

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Frameworks dealing with COGNITIVE STRUCTURE & DEVELOPMENT

Focus on cognitive structure and/or cognitive development

Focus on analysing the concept of intelligence and component of self-regulation

Time sequence of theoretical frameworks of cognitive structure and/or development

- Piaget's stage model of cognitive development (1950)
- Guilford's Structure of Intellect model (1956)
- Perry's developmental scheme (1968)
- Gardner's theory of multiple intelligences (1983
- Koplowitz's theory of adult cognitive development (1984)
- Belenky's 'Women's Ways of Knowing' developmental model (1986)
- Carroll's three-stratum theory of cognitive abilities (1993)
- Demetriou's integrated developmental model of the mind (1993
- King and Kitchener's model of reflective judgment (1994)
- Pintrich's general framework for self-regulated learning (2000)

Models dealing with COGNITIVE STRUCTURE & DEVELOPMENT

- Gardner's theory of multiple intelligences
- Pintrich's general framework for self-regulated learning

Gardner,'06 *MI: New Horizons*

- Intelligence seemed to be quantifiable.
- Just as you could measure someone's height, you could measure someone's actual or potential intelligence.
- There was one dimension of mental ability along which we could array everyone.
- Gardner presents a radically different view of the mind, recognising different and discrete facets of cognition, acknowledging that people have different cognitive strengths and contrasting cognitive styles (pps.3-5)

Howard Gardner's Theory of Multiple Intelligences

- The idea that intelligence is fixed, that the brain changes its architecture only in early life, and that all brain damage is permanent, belongs to the past. Evidence abounds that throughout life, the human brain restructures itself according to what it learns …. The concept of plasticity offers hope to educators, who impart the importance of lifelong learning to students. (*Educational Leadership* Nov. 2001)

Howard Gardner's Theory of Multiple Intelligences

INTELLIGENCE	***CORE OPERATIONS***
Linguistic	syntax, phonology, semantics
Musical	pitch, rhythm and timbre
Logical-Mathematical	number, categorisation, relations
Spatial	accurate mental visualisation
Bodily-kinesthetic	control of one's own body
Interpersonal	awareness of others' feelings, etc.
Intrapersonal	awareness of one's own feelings
Naturalist	recognition and classification of objects in the environment

MI-key features

- based on real- world intelligence
- pluralistic view of intelligence
- all intelligences are universal
- intelligences are educable
- unique profiles of, that develop & change
- each involves sub-abilities/manifestations
- they work in combination, not isolation

Quote

- It is not about how smart you are but about how you are smart.

Pintrich: self regulated learning

- Definition:
- An active, constructive process whereby learners set goals for their learning and the attempt to monitor, regulate and control their cognition, motivation an behaviour, guided and constrained by their goals and the contextual features in the environment.

Pintrich areas for self regulated learning

Phase	Cognition	Behaviour
Forethought, planning and activation	Target goal setting Prior content knowledge activation Metacognitive knowledge activation	Time and effort planning Planning for self-observations of behaviour
Monitoring	Metacognitive awareness and monitoring of cognition	Awareness and monitoring of effort, time use, need for help Self-observation of behaviour
Control	Selection and adaptation of cognitive strategies for learning, thinking	Increase/decrease effort Persist, give up Help-seeking behaviour
Reaction and reflection	Cognitive judgments Attributions	Choice behaviour

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ALL-EMBRASING frameworks

Time sequence of the all-embracing frameworks

- Romiszowski's analysis of knowledge and skills (1981)
- Wallace and Adams'' Thinking Actively in a Social Context' model (1990)
- Jonassen and Tessmer's taxonomy of learning outcomes (1996/7)
- Hauenstein's conceptual framework for educational objectives (1998)
- Vermunt and Verloop's categorisation of learning activities (1999)
- Marzano's new taxonomy of educational objectives (2001a; 2001b)
- Sternberg's model of abilities as developing expertise (2001)

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Purpose

- Covering personality, thought and learning
- Focus is broad

Wallace and Adams'' Thinking Actively in a Social Context' model (1990)

TASK

- Gather / organise • systematic exploration, using senses and memory • question available data • problem recognition
- Identify • search for additional information • explore goals • question – what is needed? • represent information clearly
- Generate • produce ideas • consult with others • compare options
- Decide • look at possible consequences • other people's views for and against • establish priorities • select a course of action • make a case for the chosen course of action • plan steps and ways of monitoring
- Implement • monitor progress and check efficiency • consider alternatives and revise plan if necessary
- Evaluate • how far goals have been achieved • efficiency of personal and group processes and strategies
- Communicate • justify decisions • evaluate the evidence that informed decisions • exchange ideas on interaction and group organisation • recall, recount and explain succinctly
- Learn from experience • analyse and reflect on the problem-solving process • compare present with past performances • revise the whole problem-solving procedure • see how to generalise and transfer what has been learned

Marzano's new taxonomy of educational objectives (2001a; 2001b)

Marzano's six levels of educational objectives

Discussions & questions