Psychology of gifted learning

Session 6A Metacognitive aspects of gifted learning

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Objectives of the session. At the end of this session you should be able to

- discuss the notion of metacognition
- discuss the research findings relating to the metacognitive behaviour of gifted children,
- discuss the implications of this research for an understanding of giftedness.
- discuss the implications for teaching.

Contents

A recurrent characteristic of gifted learning is the implementation of self-regulatory metacognition such as defining, focusing, persisting, guiding, coping, correcting, reinforcing, and solving. This could lead to a shift in the definition of giftedness from person to performance variables and the means by which this is implemented .

Metacognition/Self-regulated learning; describes how students become responsible learners regulating their own learning and performance. Self-regulation represents the highest level of metacognitive activity (Borkowski, 1996) and includes monitoring or self-checking, planning or goal-setting, and attending and rehearsing. Whether a distinction can be made between metacognitive and cognitive strategies, whether self-regulated learning strategies comprise metacognition and/or cognitive strategies or are separate constructs, need further examination.

Metacognition and giftedness

A recent review of research in this area (Alexander et al 1995, Carr et al 1996) looked at three aspects of metacognition:

- factual knowledge about thinking strategies,
- use of strategies, and
- cognitive monitoring.

A model for metacognition

The Good Strategy User Model - useful for examining metacognition in gifted students (Carr, Alexander & Schwanenflugel, 1996). 5 components

- strategy use; procedural knowledge about strategies
- specific strategy knowledge; factual knowledge about strategies
- metacognitive acquisition procedures for monitoring the effectiveness of strategies and creating new ones when needed
- relational knowledge which is knowledge about the relationships among different strategies such as how different math strategies might be related to each other
- general strategy knowledge which is a general belief that strategies can be beneficial.

Strategy use This refers to procedural knowledge of a strategy or how to use it. Three aspects of strategy use:

- independent strategy use- spontaneous use without prompting- gifted elementary children differ from non-gifted for use of more complex strategies
- near transfer of strategies to use in situations similar to those in which strategy was learnt- gifted elementary children do not differ from non-gifted in maintenance or near transfer

- far transfer of strategies to use in situations quite different from those in which strategy was learnt- gifted elementary children differ from non-gifted;
  - 4-5 year olds generalised a problem solving strategy (Kanevsky, 1990) in maintenance or near transfer
  - 8 year olds gifted students transferred an elaboration strategy to different situations better than non-gifted (Borkowski & Peck, 1986)
  - 9-10 year olds gifted students transferred a key board strategy to different situations better than non-gifted (Scruggs & Mastropieri, 1988)
  - 7-8 year olds gifted students transferred a problem solving strategy to different situations better than non-gifted (Kanevsky, 1990) and could see similarities within and across tasks better.
  - early secondary level students transferred problem solving information better (Span & Overtoom-Corsmit, 1986)

For both spontaneous and complex strategy use, few developmental differences are found during elementary school years. The ability to transfer a trained strategy seems to favour the gifted. However, Gifted children do not show advanced metacognition in all areas (Alexander, Carr,& Schwanenflugel, 1995).

Specific strategy knowledge ; factual knowledge about strategies, knowing when, where and why different strategies should be used; declarative metacognitive knowledge (DMK). Gifted students show better specific strategy knowledge: they know better

- the factors that affect memory (Alexander & Schwanenflugel, 1994; .
- strategies (Tallent-Runnels, Candler-Lotven, Oliverez, Walsh, Gray & Irons, 1993)

Gifted children have more factual information about strategies. Giftedness effects in the development of declarative metacognitive knowledge emerge early and are not domain specific. Investigators have examined kindergarten and first grade students' knowledge of variables affecting memory and attention via a metacognitive questionnaire (Schwanenflugel, Stevens & Carr, 1997). The gifted children demonstrated superior metacognitive knowledge over the non identified children. Although they did not generally differ in their understanding of the results of metacognitive experience, the gifted children were more likely to understand the reasons for the metacognitive experiences.

In general, DMK development seems to follow a monotonic pattern, with giftedness advantages appearing at all ages (Alexander, Carr,& Schwanenflugel, 1995).

Cognitive monitoring. This evaluates and changes strategy use and checks the limits of existing knowledge. It is a higher order or executive process that operates on strategies and knowledge such as determining whether a strategy is being effectively used. Gifted children are no better than average children in

- their feelings of knowledge judgments
- naming strategies they just used or detecting contradictions in text
- adopting alternative ways of solving problems.

The lack of difference may be because cognitive monitoring is more dependent on expertise in a particular knowledge domain than to giftedness.

Comprehension monitoring and giftedness Gifted children at the secondary-level differ from non gifted students in their use of metacognitive strategies on a comprehension-monitoring reading task (Hannah, & Shore, 1995). They were assessed metacognitive knowledge, metacognitive skill on a think-aloud error-detection reading task, error detection and comprehension. Metacognitive performance of the learning-disabled gifted students resembled that of the gifted sample more than that of the learning-disabled sample. Both showed similar performance trends and similar metacognitive strategy use. Comprehension monitoring seems to be equally difficult for gifted and non gifted children at all ages(Alexander, Carr,& Schwanenflugel, 1995) .

Summary In summary, the metacognition of gifted students is not uniformly higher than that of average students. Gifted children seem to have generally better declarative metacognitive knowledge and better ability to transfer strategies to situations distinct from those in which the strategy was learned (Carr, Alexander & Schwanenflugel, 1996). They show better performance than other students on some aspects of metacognition; they

- have more factual knowledge about metacognition than other children, and this advantage seems to be present consistently across age levels.
- are better at far transfer, using strategies in contexts far different from that in which strategies were learned.

However, they do not display

- consistently better strategy use, maintenance, or near transfer (using strategies in situations similar to those in which the strategy was taught). One area in which they may differ is in spontaneously using prior knowledge (Coleman & Shore 1991). High and average achieving high school physics students differed in the cognitive processes used and on outcomes. High achievers made more correct metastatements and more references to prior knowledge.
- better cognitive monitoring ability compared to average children, monitoring their strategy use (evaluating and changing strategies as needed).

Metacognition is important to the development of high achievement in a domain.

Limited support exists for gifted students being more spontaneous in their strategy use than other students, with some evidence in upper elementary age and young adolescent students.

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

Gifted children

- not only know more, but know more about what they know and know how to interconnect their accumulating knowledge, monitor more proficiently, and guide their own thoughts when they work on a task better than do less able children (Shore & Kanevsky, 1993).
- who monitor comprehension also use more strategies in a flexible manner (e.g., Schwanenflugel et al., 1997).

Motivational orientation and giftedness

Linked with metacognition is the trend from extrinsic to intrinsic motivation. This trend is in turn dependent on student self efficacy and self attribution of learning.

Gifted students perceive themselves as being cognitively more competent than average students and consequently less likely to attribute failures in school tasks to lack of ability; demonstrating more knowledge of strategies and achieving higher levels of reading competence (Chan, 1996). This study compared the motivational orientations (beliefs about the causes for school successes and failures and self-perceptions of competence) and metacognitive abilities (knowledge and reported use of learning and reading strategies) of 143 Grade 7 intellectually gifted students from a selective high school in Australia with 133 average-achieving age peers from comprehensive schools. Four measures of motivation and metacognition were obtained and academic competence using a reading comprehension task.

The gifted adolescents

- display more functional and adaptive motivational orientations .
- have greater confidence in their own personal control over successes or failures in school tasks (control over the amount of effort to put in and in the use of strategies),
- demonstrate more knowledge of learning strategies, and
- achieve higher levels of reading competence.

Metacognition, intelligence and giftedness

One way of looking at the relationship between metacognition, intelligence and giftedness is in terms of Sternberg's (1980, 1983, 1984, 1985) "triarchic" theory of intelligence and sub theory of insight (Shore & Dover, 1987). The interactions among the elements of the triarchic theory explain giftedness. This analysis leads to the issue of whether giftedness is a subset of intelligence or vice versa.

Collecting metacognitive data for gifted students

Case studies and naturalistic research are frequently used to examine the developmental path of metacognitive skills in gifted individuals (Cheng, 1993). Metacognition within a particular talent domain may become important after the early learning years, after children have learned the basics of their field and become immersed in strategy and self analysis.

Think aloud : instruct participants to think aloud while engaging in a task (Ericsson & Simon, 1993). Investigators record and analyze the think-aloud protocols and other accompanying data such as writing, drawing, video-tapes, or behavioral observations that reveal the cognitive processes, and compare them against the hypothesized processes obtained from the task analysis (e.g., Hong & O'Neil, 1992).

Difficulties arise when the tasks are not simple or well-defined, but complex and open-ended. For example, to investigate the cognitive mechanisms of different types of gifted performance, e.g., performance of intellectually gifted and of creatively gifted, finding or developing tasks that will differentiate the underlying mechanisms of the two types of performance is not easy. Tasks for the creatively gifted to manifest their creativity should be developed by establishing creative opportunities to generate solutions to open-ended problems, so that individuals can generate ideas that they have never thought of before in this creative context.

Portfolios : containing reports from 4 people over 12 weeks on a student's ability in 4 areas (Shaklee, 1993):

- acquisition and retention of knowledge
- application and comprehension of knowledge
- creation of knowledge and
- perusal of knowledge

Metacognition is one indicator of the application and comprehension of knowledge.

Problem-solving tasks : two contextual problem solving tasks which are scored for fluency and flexibility.

Dynamic assessment procedures within particular domains (Bolig & Day, 1993); this allows the ability to measure the rate of learning transfer and rate of learning, particularly for far transfer.

Implications of metacognition for understanding and constructing giftedness

Reasons why clear differences between gifted and average students in metacognition don't emerge:

- asymptotic developmental paths; younger gifted children are more likely to show metacognitive differences than older gifted children
- the use of IQ only to identify giftedness; this ignores factors such as task commitment, strong knowledge base and social support.

One reason that specific strategy knowledge and IQ have not been correlated in the higher ranges of IQ is because, in this range, IQ ceases to be a critical cognitive variable for good performance.

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