Chapter 13: Cognitive Development in Middle Childhood

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From Papalia, Olds, and Feldman
Piagetian Approach: The Concrete Operational Child

• Cognitive Advances
  – Spatial thinking
  – Cause and effect
  – Categorization
  – Seriation and transitive inference
  – Inductive and deductive reasoning
  – Conservation
  – Number and mathematics

• Influences of Neurological Development and Schooling

• Moral Reasoning
Cognitive Advances

Space and Causality

• Better understand space
• Clearer idea of how far things are
• Remember route and landmarks
• Experience is important
• Ability to understand maps & models
• Ability to predict improves for levers and balance scales
  – Influence of physical attributes first
  – Influence of spatial factors second
Cognitive Advances

**Categorization**

- **Seriation**
  - According to one or more dimensions
    - Length: shortest to longest

- **Transitive inference**
  - Infer relationship between two objects
    - If A is bigger than B and B is bigger than C, A is bigger than C

- **Class inclusion**
  - Relationship of whole and parts
Class Inclusion: Flowers

More Daisies or More Flowers
Cognitive Advances

*Inductive and Deductive Reasoning*

- Inductive (simple, concrete operations): experimental thinking, specific to general, statistical probability
  - Second stack of blocks
  - My dog barks, her dog barks, so all dogs bark

- Deductive (complex, premise, formal operations): computational thinking, general to specific
  - First stack of blocks
  - All dogs bark, Spot is a dog, Spot barks
Cognitive Advances

**Conservation**

- Need to understand identity
- Need to be able to reverse
- Need to decenter
- Three types:
  - Mass
  - Weight
  - Volume
- Concept of horizontal decalage
  - Inability to transfer learning about one type of conservation to other types
    - Child masters different types of conservation at different ages
Cognitive Advances

*Number and Mathematics*

• By 6/7 years
  – Children count in their heads
  – Count on
    • To add 5 + 3 start counting at 5
    • May take another 2 – 3 years to reverse: subtract
  – Better at solving simple story problems
    • Easier if they know what function to perform and how much original number was
  – Intuitive procedures not taught in school but easier to learn (culture)
Cognitive Advances

Number and Mathematics

• Basic fractions intuitive, complex formulas later
  – Difficulty understanding combinations of fractions
    • $\frac{1}{2} + 1/3 = 2/5$ (initial thinking)
    • Later learn to convert to common denominator $\frac{1}{2} + 1/3 = \frac{5}{6}$
    • Difficulty with smaller denominator, bigger piece (ex. $1/4$ is smaller than $1/2$).

• Estimation progresses with age
  – Number line estimation, computational estimation, numerosity estimation, measurement estimation
Influences of Neurological Development and Schooling

- Shift from rigid, illogical thinking of early childhood to logical, flexible thinking depends on brain development and experiences
- Children who conserve volume have different brain waves from those who cannot yet conserve volume
  - Suggests use of different brain regions
- Today’s school children are not advancing through Piaget’s stages as rapidly as parents
  - Indicates too much drilling and not enough hands-on experiences
Moral Reasoning

• Younger children think the more damage an action causes, the naughtier the child
  – In spite of intent
    • Augustus helping filling his father’s ink pot makes big spot
    • Julian playing with ink pot makes small spot
    • Young children say Augustus was naughtier

• Immature moral judgments center on the degree of the offense, not considering intent
Moral Reasoning

• Piaget: moral reasoning occurs in 3 stages
  1. Rigid obedience to authority (2 – 7 years)
  2. Increasing flexibility (7 – 11 years)
  3. Equity (11 – 12 years and up)
Kohlberg’s Moral Reasoning

- Based on dilemmas
  - Heinz’ dilemma
  - Posed to boys aged 10, 13, 16 and more than 30 years later
  - Heart of each dilemma was justice
- Work began in 1950s
- Later modified by Carol Gilligan to reflect gender value differences, and later Gilligan modified her own assertions
  - Gilligan initially said girls see morality in terms of responsibility to show caring and avoid harm instead of justice and fairness
- Prosocial behavior and volunteer activity
Kohlberg’s Moral Reasoning

• Level I:  Preconventional morality
  – Obey rules to avoid punishment or get reward
  – 4 – 10 years

• Level II:  Conventional morality
  – Internalized standards of authority figures, want to be “good”, please others, maintain social order
  – 10 years
  – Black/white thinking, many never move beyond

• Level III: Postconventional morality
  – Recognize conflict between standards, make own judgments, based on own principles and beliefs
  – 14 years, if ever
Information-Processing Approach: Attention, Memory, and Planning

• How Do Executive Skills Develop?
• Selective Attention
• Working Memory Span
• Metamemory: Understanding Memory
• Mnemonics: Strategies for Remembering
• Information Processing and Piagetian Tasks
How Do Executive Skills Develop?

• Executive function:
  – Regulate and sustain attention
  – Process and retain information
  – Plan and monitor behavior

• Prefrontal cortex
  – Region that allows planning, judgment, decision making

• Home environment
  – Quality, cognitive stimulation, maternal sensitivity predicted attention and memory performance in first grade
Selective Attention

• School-age children:
  – Can concentrate longer
  – Can focus on the information they need and want
  – Can screen out irrelevant information
  – Fifth graders better than first graders at choosing what information to keep and what to discard
    • Name of a pet in a movie may be discarded

• Selective Attention:
  – Ability to deliberately direct attention to and shut out distractions
    • Relies on executive function of inhibitory control and suppression of unwanted responses
  – Due to neurological maturation
Working Memory Span

• Increases greatly in middle childhood
• Lays the foundation for wide range of cognitive skills
• Improvements in processing speed
• Improvements in storage capacity
Metamemory: Understanding Memory

- Between 5 and 7 years, frontal lobes develop significantly and reorganize
- *Metamemory* improves: knowledge about the processes of memory
  - First graders know that you remember better if you study longer
  - First graders know that people forget things with time
  - First graders know that relearning something is easier than learning it for the first time
  - Third graders know that some people remember better than others
  - Third graders know that some things are easier to remember than others
Mnemonics: Strategies for Remembering

- Devices that aid memory are called mnemonic strategies
- Most common strategy for children and adults: external memory aids
  - Make a list, set a timer, put in physical location
- Other strategies:
  - Rehearsal: conscious repetition
  - Organization: form mental categories
  - Elaboration: imagine a scene or story
    - Young children benefit from our elaboration; older children make their own so it’s meaningful to them
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Definition</th>
<th>Development in Middle Childhood</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>External memory aids</td>
<td>Prompting by something outside the person</td>
<td>5- and 6-year-olds can do this, but 8-year-olds are more likely to think of it.</td>
<td>Dana makes a list of the things she has to do today.</td>
</tr>
<tr>
<td>Rehearsal</td>
<td>Conscious repetition</td>
<td>6-year-olds can be taught to do this; 7-year-olds do it spontaneously.</td>
<td>Ian says the letters in his spelling words over and over until he knows them.</td>
</tr>
<tr>
<td>Organization</td>
<td>Grouping by categories</td>
<td>Most children do not do this until at least age 10, but younger children can be taught to do it.</td>
<td>Luis recalls the animals he saw in the zoo by thinking first of the mammals, then the reptiles, then the amphibians, then the fish, and then the birds.</td>
</tr>
<tr>
<td>Elaboration</td>
<td>Associating items to be remembered with something else, such as a phrase, scene, or story</td>
<td>Older children are more likely to do this spontaneously and remember better if they make up their own elaboration; younger children remember better if someone else makes it up.</td>
<td>Yolanda remembers the lines of the musical staff (E, G, B, D, F) by associating them with the phrase “Every good boy does fine.”</td>
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</tbody>
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Information Processing and Piagetian Tasks

• Information processing helps explain Piaget’s advances in cognitive processes
• Improvements in memory may contribute to mastery of conservation
• Case, neo-Piagetian theorist, suggests as a child’s application of a concept or scheme becomes automatic, it frees space in working memory
  – Explains horizontal decalage
Psychometric Approach: Assessment of Intelligence

- The IQ Controversy
- Influences on Intelligence
- Is There More Than One Intelligence?
- New Directions in Intelligence Testing
The IQ Controversy

• WISC-III most widely used individual test that measures intelligence
  – Ages 6 – 16
  – Measures verbal and performance abilities

• Stanford-Binet Intelligence Scale also used

• Otis-Lennon School Ability Test (OLSAT8)
  – Kindergarten – grade 12

• IQ scores in middle childhood fairly good predictors of school achievement
  – But may not tell potential

• Tests are timed so penalizes a deliberate child

• Doesn’t measure native ability, infers intelligence from what children know, influenced by schooling, culture, and family
Influences on Intelligence: *Genes and Brain Development*

- Moderate correlation between brain size and general intelligence, especially reasoning and problem solving abilities
  - Remember: males have more gray matter
- One study found gray matter in frontal cortex is largely inherited, varies widely among individuals
- Another study suggests key is not amount of gray matter but pattern of development of prefrontal cortex
  - In the most intelligent 7-year-olds, cortex doesn’t peak in thickness until 11 or 12 years
    - Opposed to 8 years in children with average IQ
- Reasoning, problem solving, executive function linked to prefrontal cortex, other grain regions with strong genetic influence contribute to intelligent behavior, as well as speed and reliable transmission of messages
- Family, school, culture play a role as well
Influences on Intelligence

Influence of Schooling on IQ

• School increases tested intelligence
  – Delayed starting of school decreases IQ and may not catch up
• IQ scores drop during summer vacation
Influences on Intelligence

Influences of Race/Ethnicity on IQ

• Average test scores for black children historically lower by 15 points
  – Gap has narrowed in recent years
• Average IQ scores of Hispanic children are between black and white children
• While genetics influence individual intelligence, no evidence indicates ethnic, cultural, or racial group differences
• IQ differences largely or entirely attributed to inequalities in environment
  – Income, nutrition, living conditions, health, parenting, early child care, intellectual stimulation, schooling, culture, oppression, discrimination
    • Affects self-esteem, motivation, academic performance
• High SES strengthens genetic influence, low SES overrides it
Influences on Intelligence

Influence of Culture on IQ

• Cultural bias: tendency to include questions that use vocabulary or ask for information or skills more familiar to some cultural groups than others

• Intelligence tests may be built around dominant thinking style and language of white people or European ancestry
  – Minority children put at disadvantage

• Test developers have tried to design culture-free tests
  – Unable to eliminate all cultural influences

• Now produce culture-fair tests

• Sternberg says intelligence and culture are inextricably linked
  – Behavior seen intelligent in one culture may be viewed as foolish in another
  – Defines successful intelligence as the skills and knowledge needed for that society or culture
Gardner’s Theory of Multiple Intelligences

- Gardner, neuropsychologist and educational researcher at Harvard University originally identified 7 distinct kinds of intelligence
  - Conventional intelligence tests tap only three: linguistic, logical-mathematical, and spatial
  - Other four: musical, bodily-kinesthetic, interpersonal, intrapersonal
  - Later added 8th: naturalist
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<tr>
<td>Linguistic</td>
<td>Ability to use and understand words and nuances of meaning</td>
<td>Writing, editing, translating</td>
</tr>
<tr>
<td>Logical-mathematical</td>
<td>Ability to manipulate numbers and solve logical problems</td>
<td>Science, business, medicine</td>
</tr>
<tr>
<td>Spatial</td>
<td>Ability to find one’s way around in an environment and judge relationships between objects in space</td>
<td>Architecture, carpentry, city planning</td>
</tr>
<tr>
<td>Musical</td>
<td>Ability to perceive and create patterns of pitch and rhythm</td>
<td>Musical composition, conducting</td>
</tr>
<tr>
<td>Bodily-kinesthetic</td>
<td>Ability to move with precision</td>
<td>Dancing, athletics, surgery</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>Ability to understand and communicate with others</td>
<td>Teaching, acting, politics</td>
</tr>
<tr>
<td>Intrapersonal</td>
<td>Ability to understand the self</td>
<td>Counseling, psychiatry, spiritual leadership</td>
</tr>
<tr>
<td>Naturalist</td>
<td>Ability to distinguish species and their characteristics</td>
<td>Hunting, fishing, farming, gardening, cooking</td>
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Is There More Than One Intelligence?

*Sternberg’s Triarchic Theory of Intelligence*

* Triarchic theory of intelligence: three elements
  * Componential: analytic aspect, solve problems, monitor solutions, evaluate results
  * Experiential: insightful or creative, how approach novel or familiar tasks, think originally
  * Contextual: practical, how you deal with environment, size up a situation and decide what to do: adapt, change, or get out of situation
New Direction in Intelligence Testing

• Sternberg Triarchic Abilities Test (STAT) new
• Kaufman Assessment Battery for Children evaluates diverse cognitive needs and abilities for children with autism, hearing impairments, language disorders, and various cultures and linguistic backgrounds
• Dynamic tests based on Vygotsky’s theories
• Identifying what a child is ready to learn, dynamic testing may be useful
  – But conventional psychometric tests will remain dominant
    • Heavily researched and readily available
Language and Literacy

• Vocabulary, Grammar, and Syntax
• Pragmatics: Knowledge about Communication
• Literacy
Vocabulary, Grammar, & Syntax

- Vocabulary grows, use of precise verbs
  - Hitting
  - Slapping
  - Striking
  - Pounding
- Learn words have more than one meaning
  - Run
- Simile and metaphors common
- Syntax more sophisticated
  - “Caleb promised Debbie to wash the dishes” is understood that Caleb will wash the dishes
- Use of subordinate clauses
  - The boy who delivers the newspapers rang the doorbell
Pragmatics: Knowledge about Communication

- Major area of linguistic growth
  - Practical use of language to communicate
- Includes conversation and narrative skills
- Gender differences
  - Boys use more controlling statements and make more negative interruptions
  - Girls remarks are more tentative, conciliatory
- Stories have introductory information about setting and characters, talk about time and place, complex episodes as they mature
Literacy

Reading

• Children identify words one of two ways
  – Decode (sound out, phonics)
  – Visually based retrieval (whole language)
    • Uses contextual cues
    • Popular but research doesn’t support claims
  – Many experts recommend blending of both approaches

• Early reading difficulties may be overcome
  – Social skills associated with achievement
Literacy

Writing

• Writing goes hand in hand with reading

• Difficult for young children
  – Must think about spelling, punctuation, grammar, capitalization as well as forming the letters

• Vygotsky’s model suggests children work in pairs for better solutions to problems and fewer syntax errors
The Child in School

- Entering First Grade
- Influences on School Achievement: An Ecological Analysis
Entering First Grade

- School is a major formative experience
- School helps children:
  - Gain knowledge
  - Develop skills
  - Develop social competence
  - Stretch their bodies and minds
  - Prepare for adult life
- 3 out of 4 US children go to kindergarten
  - Some are eager; some are anxious
- Positive correlates with achievement
  - Interest, attention, active participation
Best Outcomes for First Graders

• At-risk 1st graders (low SES, academic problems, attention problems, behavior problems) progressed when:
  – Teachers offered strong instructional and emotional support
    • Frequent literacy instruction
    • Evaluative feedback
    • Engaging students in discussions
    • Responding to their emotional needs
    • Encouraging responsibility
    • Creating positive classroom environment
Influences on School Achievement
An Ecological Analysis

Self-Efficacy Beliefs

• Bronfenbrenner predicts a child’s characteristics, immediate family, classroom environment, messages children receive from peers and larger culture influences school outcome
• Students high in self-efficacy more likely to succeed
• Self-regulated learners set challenging goals and use appropriate strategies to achieve them, try hard, persist, seek help when necessary
• Students who don’t believe in themselves become frustrated and depressed
Influences on School Achievement: An Ecological Analysis

Gender

• Girls:
  – Tend to do better in school than boys
    • Less likely to repeat grades
    • Have fewer school problems
    • Outperform boys in national reading and writing assessment
    • Aim for mastery of subject matter
    • Better classroom behavior
    • Adopt more effective strategies for learning
    • Better on times tests
  – Have less confidence in abilities
Influences on School Achievement: An Ecological Analysis

Gender

• Boys:
  – More interested in how smart they look in class
  – Advantage in spatial skills
    • SES makes a difference
      – High SES boys do better than high SES girls
      – Low SES boys did not do better than low SES girls
Influences on School Achievement: An Ecological Analysis

**Parenting Practices**

- Parents of achieving children create an environment for learning
  - Place to study
  - Books and supplies
  - Set times for meals, sleep and homework
  - Monitor television
  - Show interest in children’s lives
  - Talk with them about school and being involved in school activities

- Parents who are involved in schools have children who do better in school
- Use intrinsic motivation (more effective)
- Authoritative parenting
Socioeconomic Status

• Powerful factor in educational achievement
  – Family atmosphere
  – Choice of neighborhood
  – Parenting practices
  – Presence or absence of stress
  – Stability of household
  – Chaos versus order
  – Can affect parents’ ability to provide an environment that enhances learning

• SES not the only factor in school achievement
  – Households who use intrinsic motivation
  – Social capital: networks of community resources
Peer Acceptance

• Children who are liked and accepted by peers do better in school
• Children who are not liked by peers:
  – Have poorer academic self-concepts
  – More symptoms of anxiety or depression
  – Lower reading and math grades
The Educational System

• Educational philosophies have conflicted
  – “Child-Centered”
  – “Three R’s”
  – “Back to the basics”
  – No Child Left Behind (NCLB)
    • Emphasizes accountability, parental options, expanded local control and flexibility
    • 50 national education, civil rights, children’s and citizens groups have called for substantial changes
      – NCLB emphasizes punishment rather than assistance for failing school
      – Rigid, largely unfunded mandates rather than support for proven practices
      – Standardized testing rather than teacher-led, classroom-focused learning
The Educational System

- Students learn better when taught in a variety of ways.
- Students learn better when emphasizing creative and practical skills as well as memorization and critical thinking.

Sternberg’s Triarchic Theory

- Componential Intelligence: Ability to think abstractly, process information effectively.
- Experiential Intelligence: Ability to formulate new ideas, to combine seemingly unrelated facts or information.
- Contextual Intelligence: Ability to adapt to changing environmental conditions and to shape the environment so as to maximize one’s strengths and compensate for one’s weaknesses.
The Educational System

School Environment

- Children learn better and teachers teach better in:
  - Comfortable, healthful environment
  - Small class size
    - Especially in early grades
    - Findings are mixed
The Educational System

• Current Educational Developments
  – Social promotion
    • Some loved the change
    • Others warned it could lead to lowered expectations, poor performance, dropping out of school
    • Chicago’s public schools retention policy did not improve third graders’ test scores, hurt sixth graders’ scores and greatly increased eighth-grade and high school dropout rates for retained students
  – Identify at-risk students early and intervene before they fail
    • Alternative schools, programs for at-risk students, smaller classes, remedial instruction, counseling, crisis intervention, summer school
The Educational System

• Some parents home school
  – Legal in all 50 states
  – 1.1 million US students homeschooled

• Some parents choose charter schools
  – 1 million US children attend charter schools
    • Tend to be smaller
    • Have unique philosophy, curriculum, structure, or organizational style
    • Parents generally satisfied
    • Studies on effects on student outcomes have mixed results
The Educational System

Computer and Internet Use

- 2003 91% children and adolescents used computers at home or school
- 59% used the Internet
  - Fewer black, Hispanic, and American Indian children
  - Fewer poor children
- Focus on “visual literacy”
- Children need to critically evaluate information
Educating Children with Special Needs

• Second-Language Education
• Children with Learning Problems
• Gifted Children
Second-Language Education

• 2004 19% of US population spoke language other than English at home
  – Primary language Spanish
  – 5% have difficulty speaking English

• English-immersion approach (ESL): immersed in English in special classes

• Bilingual education: taught in two languages
  – Typically outperform all-English programs in English proficiency
  – Public opinion turned against, enrollment declined from 37% to 17%
  – Eliminated in 2002 as part of NCLB

• Dual-language learning
  – English- and foreign-speaking children learn together
Children with Learning Problems

**Mental Retardation**

- IQ <70
- Deficiency in age-appropriate adaptive behavior
  - Communication, social skills, self-care
  - Before age 18
- < 1% US children mentally retarded
- 30 – 50% cause unknown
  - Genetic disorders, traumatic accidents, prenatal exposure to infection or alcohol, environment
Children with Learning Problems

Learning Disabilities

• Dyslexia: Famous people
  – Nelson Rockefeller, former Vice President
  – Tom Cruise
  – Whoopi Goldberg
  – Cher
  – Nolan Ryan
  – Jay Leno
  – Albert Einstein

• 80% of children with learning disabilities are dyslexic

• Runs in families
Children with Learning Problems

**Learning Disabilities**

- Dyslexia most commonly diagnosed learning disability
- Often near-average or higher-than-average intelligence
- Difficulty processing sensory information
- Genetic

- Less task oriented
- More easily distracted
- Less likely to use memory strategies
- Some haven’t been taught properly
- Some are anxious
- Some have trouble reading or hearing direction
- Some lack motivation or interest
- Some have developmental that may disappear
Children with Learning Problems

Hyperactivity and Attention Deficits

• Most common mental disorder in childhood
  – Chronic
  – Inattention
  – Distractibility
  – Impulsivity
  – Low tolerance for frustration
  – Too much activity at the wrong time in the wrong place

• 3 – 7% US school children (disputed)
  – May be underdiagnosed or overdiagnosed
Children with Learning Problems

Hyperactivity and Attention Deficits

- Famous people
  - John Lennon
  - Senator Robert Kennedy
  - Robin Williams
  - Sylvester Stallone

- Genetic, heritability 80%
  - Gene-environment interaction

- Inattention persists after impulse control and hyperactivity declines

- Academic problems, cumulative family stress, troubled peer relationships

- Drugs (not under 6), behavioral therapy, counseling, training
Educating Children with Disabilities
• 13% of US children in special education
  – IDEA
    • FAE (free appropriate education)
    • LRE (least restrictive environment)
    • IEP (individualized education plan)
    • Due process (if you don’t agree)
  – 45% have learning disabilities
  – 17% speech or language
  – 9.5% mental retardation
Gifted Children

Identifying Gifted Children

- Akira Kurosawa (movie director): backwards
- Sir Isaac Newton (physicist, mathematician, astronomer): did poorly in school
- Thomas Edison (inventor): “too stupid to learn”
- Winston Churchill (British PM): failed 6th grade
- Enrico Caruso (tenor): told he could not sing
- 6% student population gifted
- Some are globally gifted, some are gifted in one area
  - Gardner’s intelligences
Gifted Children

What causes Giftedness?

• Strong intrinsic motivation
• Years of rigorous training
• Naturally occurring endowed ability
• Tend to grow up in enriched family environments
  – Intellectual or artistic stimulation
  – Parents recognize and nurture child’s gifts and promote independence
  – Parents have high expectations, hard workers, high achievers themselves
• Born with unusual brains that enable rapid learning in a particular domain
Gifted Children

*Lewis M. Terman and the Lives of Gifted Children*

- Longitudinal study of gifted children
  - Identified 1500 California children with IQs of >135 (top 1%)
  - None grew up to be illustrious
    - Lack of close correlation between high IQ and adult eminence
  - Profoundly gifted >180 social and emotional difficulties
Gifted Children

Defining and Measuring Creativity

• Guilford: two kinds of thinking
  – Convergent
    • IQ tests measure, single correct answer
  – Divergent
    • Wide array of fresh possibilities
  – Critique: a child who scores high in creativity on a test may not be creative in everyday life
Gifted Children

Educating Gifted Children

• 68% of schools have special programs for gifted children

  – Enrichment
    • Deepens knowledge and skills
    • Extra classroom activities
    • Research projects
    • Field trips
    • Expert coaching

  – Acceleration
    • Speed up education
Gifted Children

- Julian Stanley: Seeking and Nurturing the Profoundly Gifted
  - Selected even more gifted children than Terman
  - Didn’t use IQ but college entrance examinations
  - Vast majority of children/participants said accelerating education promoted academic progress and social-emotional development
Knowing others is intelligence.
Knowing yourself is true wisdom.

-Lao Tse