



Cognitive Development

Details of seminar readings for this topic can be located on the last slide and also in Moodle Week 3



Influences on development

- **Maturation**

The development of the brain from birth onwards

- **Equilibration**

An innate response to conflict between the child's current schemes and the challenges of the environment (cognitive conflict)

- **Social transmission**

Information and opportunities provided by others

- **Experience**

Child's own opportunity to act on the world

Piaget's Theory of Cognitive Development

- Jean Piaget (1896-1980) – Swiss scientist
- Qualitative differences between reasoning and logic of adults and children
- Constructivist theory
- Children are
 - Active
 - Learning many lessons on their own
 - Intrinsically motivated to learn

'Little scientists'



Nature and Nurture

- Nature and nurture interact to yield cognitive development
- Child is born with inborn plan for cognitive development
 - unfolds as the child matures biologically
- Environment necessary - stimulus to allow skills to develop





Two main inbuilt mechanisms of development:

- **Adaptation**

The tendency to respond to the demands of the environment to meet goals

- **Organisation**

The tendency to integrate particular observations into a coherent knowledge base

Scheme/Schema

- Knowledge structure - an 'action of knowing'
e.g. looking, picking-up, holding
- Includes physical and mental actions
- Innate repertoire of simple sensory and motor schemes
e.g. looking, tasting, grasping (allows adaptation)
- Organised into mental schemes e.g. category of round objects
(physical actions of holding/looking)

Construction/re-organisation of schemes

- continuous
- responsible for advanced cognition

Adaptation

- Not all experience can directly fit into an existing scheme
- Three processes drive development:
 - Assimilation
 - Accommodation
 - Equilibration

Assimilation

- An event is absorbed into an existing scheme
- Children attend to events that fit into existing schemes.
- Interested in novel stimuli
- Lack of balance of cognitions – 'disequilibrium'



Accommodation

- Process by which current schemes are adapted in response to new experiences



Equilibration

- Process by which assimilation and accommodation are balanced to create stable understanding - periodic major changes
- Each equilibration ushers in a new phase of development

Piaget's stages of cognitive development

- Distinct **hierarchical stages** marked by points of equilibration in key areas
- **Qualitative** changes in cognition
- **Four** stages of cognitive development, each building on the previous one

Piaget's Cognitive Stages of Development

Stage 1

Sensorimotor
(Birth-2 Years Old)



Stage 2

Preoperational
(2-7 Years Old)



Stage 3

Concrete Operational
(7-11 Years Old)



Stage 4

Formal Operational
(adolescence - adult)



Sensorimotor stage (Birth-2 years)

- Infants rely upon their senses and actions to understand the world

e.g. they learn what dogs **look** like, **sound** like, **smell** like, (**taste** like?) and what patting one **feels** like



Sensorimotor Sub-stages

Sub-stage	Age	Description
1	Birth – 1 month	Infants use their innate reflexes e.g. sucking their lips
2	1 – 4 months	Infants begin to organize separate reflexes into larger behaviors, most of which are centered on their own bodies. Primary circular reactions - the endless repeating of newly accommodated schemes e.g. sucking their thumb

Sensorimotor Sub-stages

Sub-stage	Age	Description
3	4 – 8 months	Infants becoming increasingly interested in events outside of their own body. Secondary circular reactions are aimed at eliciting reactions outside their body. By the end of this sub-stage, object permanence has usually emerged.

Object permanence



- 4 months: no attempt to search for hidden object
- 4-9 months: visual search for object
- 9 months: search for and retrieve hidden object

Sensorimotor Substages

Sub-stage	Age	Description
4	8 – 12 months	Clear intentional means-end behaviour emerges. Combinations of schemes are operating. Imitation emerges. During this sub-stage, children make the A-Not-B error/perseverance error

A-not-B task (Diamond, 1985)



COURTESY OF BEN CLORE

- Babies of 10-months or younger typically make the **perseverance error**

Sensorimotor Substages

Sub-stage	Age	Description
5	12 – 18 months	Toddlers begin to explore potential uses to which objects can be put – tertiary circular reactions .
6	18 – 24 months	Ability to form enduring mental representations. The initial sign is deferred imitation .

Shift from simple sensory and motor schemes to the use of the first symbols around 18 months



Preoperational stage (2-7 years)

- Internal representations - language and mental imagery
- Alternative perspectives
- Powerful schemes - operations

Preoperational Stage (2-7 years)

Notable acquisition - symbolic representation



Preoperational Stage (2-7 years)

Major limitation – egocentrism



Related limitation – centration

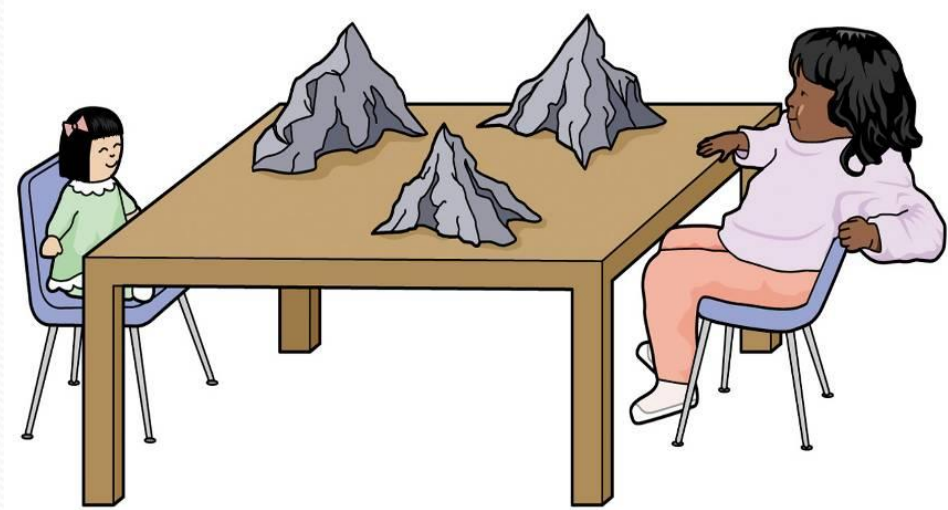


Lack understanding of the conservation concept



Egocentrism

- Piaget's Three-Mountains Task

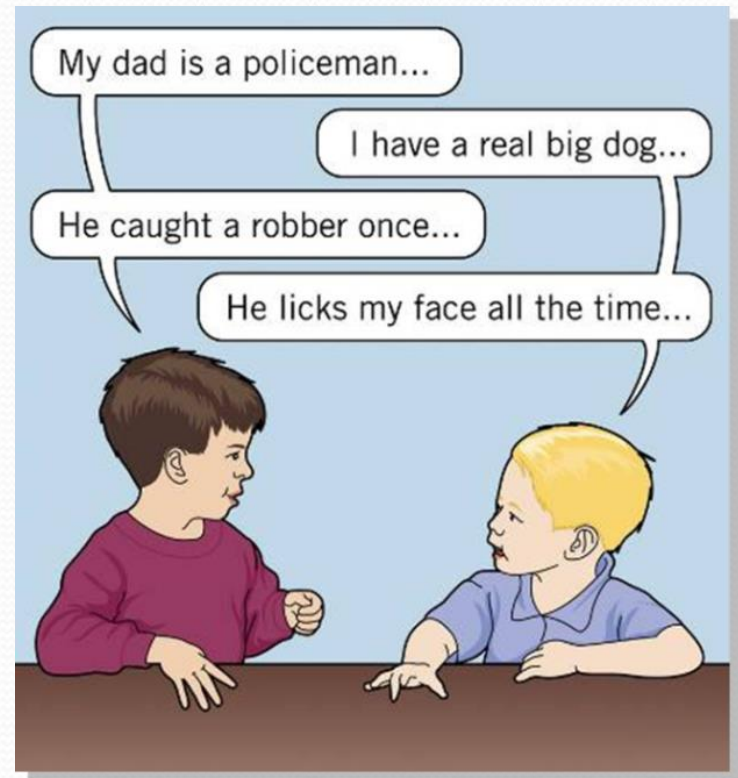


- Preoperational child
 - limited perspective taking (Level 1 - John Flavell)
- Level 2 – 'theory of mind'
 - working out precisely what a particular person experiences

Centration

- Focus on a single element of a situation
 - Underlies egocentrism – self used as frame of reference

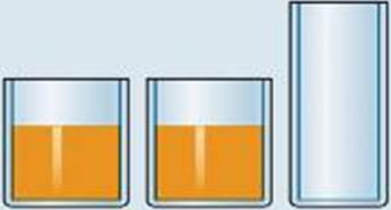
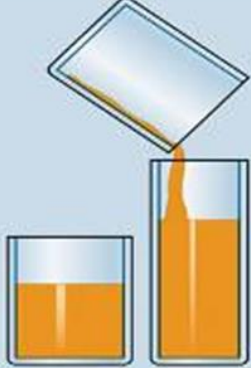
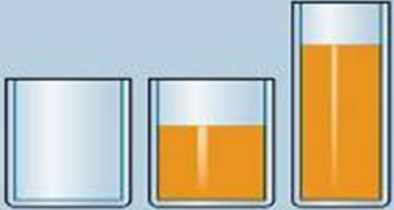
- e.g. egocentric conversations.....



Conservation

- Centration underlies failure of conservation task
 - A quantity or an amount stays the same regardless of an external change in shape or arrangement
- Preoperational children lack understanding of the conservation concept

Procedures Used to Test Conservation include....

	PHASE 1	PHASE 2	PHASE 3
CONSERVATION OF LIQUID QUANTITY	 "Do they have the same amount of orange drink or a different amount?"	 "Now watch what I do" (pouring contents of one glass).	 "Now, do they have the same amount of orange drink or a different amount?"
CONSERVATION OF SOLID QUANTITY	 "Do they have the same amount of clay or a different amount?"	 "Now watch what I do" (stretching one piece of clay).	 "Now, do they have the same amount of clay or a different amount?"
CONSERVATION OF NUMBER	 "Is there the same number or a different number?"	 "Now watch what I do" (spreading one row).	 "Now, is there the same number or a different number?"

- Conservation of:

- Substance
- Length
- Number
- Liquids
- Area



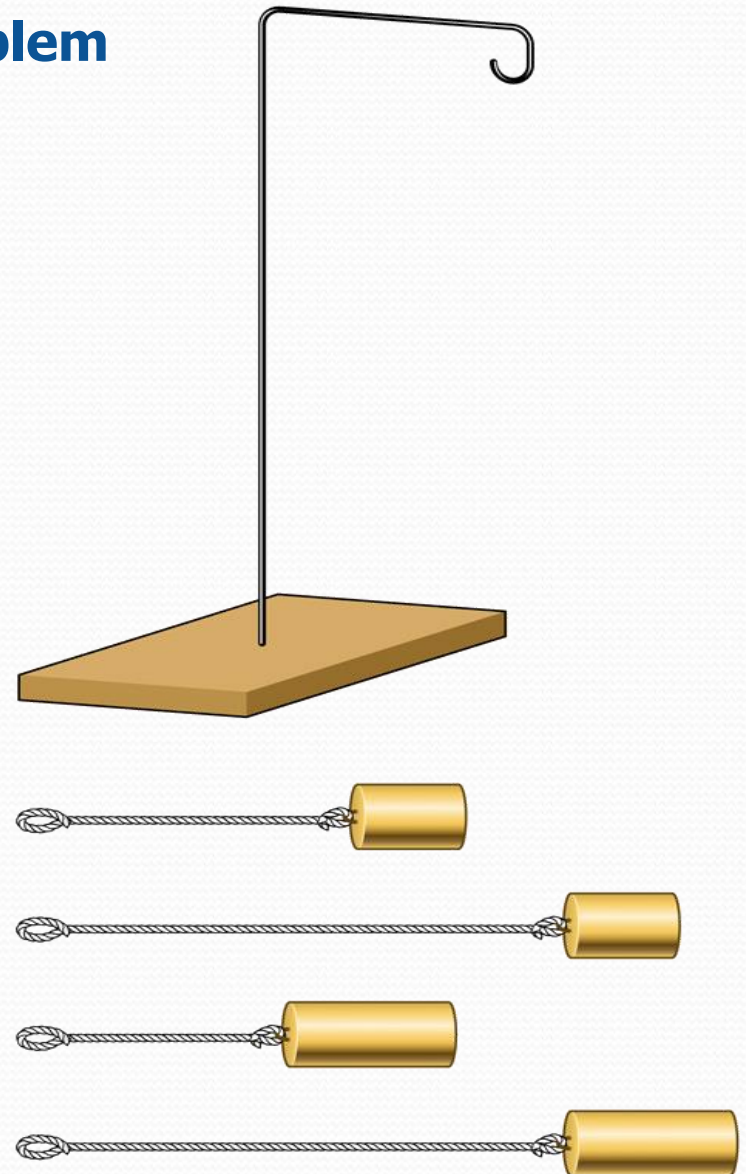
- **Reversibility:** reversed in sequence, returned to original state
- **Transformational reasoning:** understanding of the process of change
- **Horizontal decalage:** individual differences re. different conservation abilities.

Concrete operations stage (7-12 years)

- Logical, not just intuitive thinking.
- Coherent categories
- De-centration
- Relativism – egocentrism declines
- Reasoning limited to concrete situations
- Next equilibration point - operators extended to abstract events

Inhelder and Piaget's Pendulum Problem

- Task – to determine the influence of weight, string length, and dropping point on the time it takes for the pendulum to swing back and forth
- How would YOU do this?
- Tendency for children below age 12
 - unsystematic experiments
 - incorrect conclusions



Formal Operational Stage (12 years+)

- Ability to think abstractly and to reason hypothetically
- Ability to reason:
 - about physical things
 - solely on basis of verbal statements
- Alternative worlds
- Many possible outcomes

Formal operations stage (12 + years)

Adolescents

- Systematic thinking and reasoning about what might be
- Abstract concepts e.g?

'justice', love, 'the mind' etc.

- Universal stage?
Piaget - not universal

Piaget: Language and Thought

- Language **reflects** cognitive development
- Language does not **drive** thought
- Egocentric speech generally of little value





Summary of Piaget's theory

- Altered thinking about child cognitive development
- Concepts: "active learners"; "self-discovery"; construction of new knowledge
- Interaction between innate capacities and the environment – cognitive development (nature/nurture)
- Series of universal hierarchical stages of cognitive development

BREAK



10 MINUTES!

Critique of Piaget's Theory



Vygotsky's Sociocultural Theory



Critique of Piaget's Theory

- How do we critically evaluate Piaget's theory? (or ANY theory?)
 - Read about it! Not just textbooks – journal articles
 - Identify evidence that supports or challenges the theory
 - Alternative theories? Compare and contrast theories



Miller (2002) - four key strengths of Piaget's Cognitive Theory:

1. Recognition of central role of cognition in human development

- Challenged previous emphasis - behaviourism and social learning
- Encouraged developmental psychologists to ask different questions
 - changed the focus from 'what children do' to 'how children think'
- Opened up new directions for research and education



Miller (2002) - Four key strengths:

2. **Provided a rich description of specific previously unidentified phenomena** we encounter as we develop

e.g.

- Object permanence
- Egocentrism
- Transformational reasoning
- Specific abilities developing through steps
- Ability of children to think about very different things

3. **Wide scope**

- Describes and explains cognitive states, transitions between those states
- Implications for other areas of development (e.g. social and emotional development)

Miller (2002) - Four key strengths:

4. **Ecological Validity**

- Evidence and examples are based on “real world problems” that children would actually encounter in their environment as they develop



Weaknesses of Piaget's Theory

- Insufficient support for a “stage notion” of development

e.g. a child may develop an understanding of conservation of substance earlier than conservation of weight

- Infants and young children more cognitively competent than Piaget recognized?

e.g. Siegler (1995): over half of 5 yr-old children who were classed as “non-conservers” still got it right sometimes



Weaknesses/Questions

- Piaget's theory does not fully explain the **mechanisms of development**

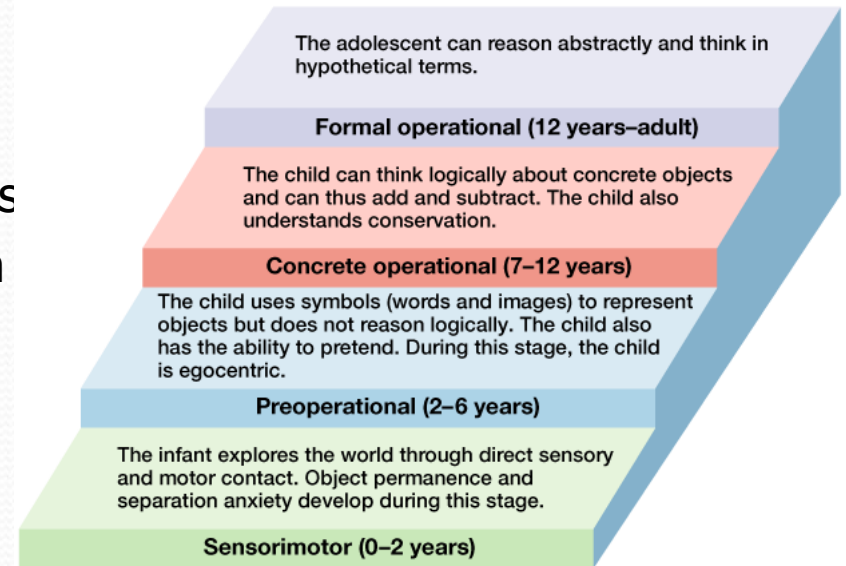
i.e. **how** a child moves from one stage to another

- Concepts of assimilation, accommodation and equilibration are an intuitive framework
- but how does a child move through these concepts?

Weaknesses/Questions

- **Are Piaget's stages universal?**

- Cross-cultural studies - cultural factors influence speed of progression through stages - but they still proceed in the same sequence



- e.g. Dasen (1994) – Australian Aborigines: show slower acquisition of stages and may not always achieve formal operational thought.

Weaknesses/Questions

- Piaget's theory lacks acknowledgment of **social and emotional influences** on development
 - Role of social factors in learning and cognitive development?
 - Saw child as a developing "scientist" developing independently from its social world?
- In contrast - Vygotsky's theory focuses on child development as **a social process**
- BUT – Piaget's concept of 'co-operation'?

Weaknesses/Questions

- **Underestimation of cognitive abilities**
 - Many Piagetian concepts found to appear earlier than first identified by Piaget
 - Methods used to assess abilities influential to results
 - Infants and young children appear to be more cognitively competent than Piaget recognized

Weaknesses/Questions

Object Permanence - Bower & Wishart (1972)

- How an object is made to disappear influences the infant's response

Ballargeon, Spelke and Wasserman (1985)

- Object permanence in 5-month-olds
 - Possible and impossible events
 - Stopping or 'moving through' the occluded box



Weaknesses/Questions

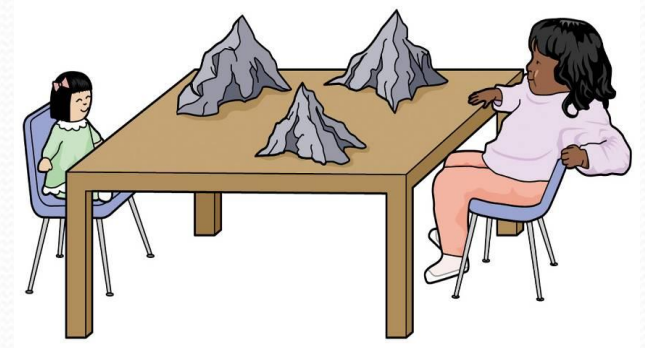
Centration

- Classic centration tasks involving e.g. brown and white beads may be too difficult.
 - Donaldson (1978): used sleeping cows and asked “are there more black cows or more sleeping cows” – more correct answers
 - Siegal (2003): most children still fail this task – suggests conceptual difficulties.

Weaknesses/Questions - **Ego-centrism**

- Swiss Mountain Scene - too difficult for a child to understand?
- If task presented in a more meaningful way, 3½ year olds can answer correctly

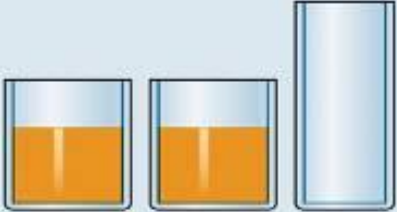
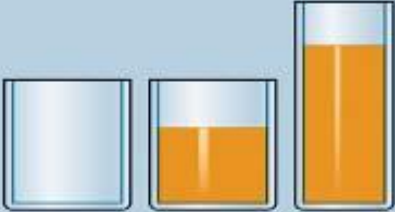
(Borke (1975)



- Gelman (1979) - 4 year-olds :
 - adjust speech when explaining to someone in blindfolds
 - Simplify speech to talk to 2 year-olds

Flavell et al. (1990): Level 1 and level 2 perspective taking

Procedures Used to Test Conservation

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Weaknesses/Questions - **Conservation**

- The ability to conserve may come earlier than claimed by Piaget
- Without the pre-transformation question, conservation occurs in 6 year olds.
 - Rose & Blank (1974): wording of question affects accuracy of conservation
 - Donaldson (1978): standard version of task pushes child to give the wrong answer - same question twice
- Siegal (2003): if child asked to predict (not witness) the outcome they are more likely to be correct.



Critiquing the theory.....

- The methods used?

Were they scientific?

(what do you know from what you have read so far?)



Piaget's theory - Conclusion

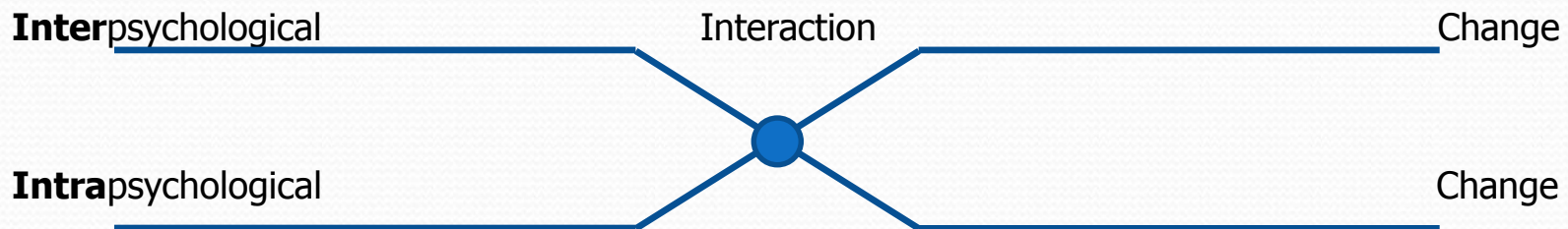
- One of the most influential psychological theories
- Stage theory of development – much support but also some modification
 - e.g. Flavell (1971, 1982)
- Alternative theories - e.g. Vygotsky's approach takes into account the powerful role of social processes in cognitive development

Vygotsky's theory of psychosocial development

- What do you know of Vygotsky's Theory?
- **Not** a 'theory of cognitive development in childhood' like Piaget's
- Lev Vygotsky (1896-1934) - Russian theorist - Marxist background
- Challenged emphasis on solitary learning
- Social interaction is required for cognition and learning
- Literary works translated after his death (dates in 60s, 70s, 80s)

Basic constructs of Vygotsky's theory

- Psychological phenomena social in two ways:
 - **Cultural artifacts** - symbols, objects and language mediate how children organise their mental structures – knowledge is socially constructed (co-constructed)
 - **Cultural values** - what are the reasons for particular behaviours?
e.g. are events due to 'fate' or are they controllable? So – can society be influenced by changing behaviour?



People become 'human' through the internalization of their culture



Examples of the influence of culture –

- Alexander Luria: Uzbekistan 1931
 - problem solving: mathematics involving questions about cycling/walking, arithmetic/sharing food
- Reed and Lave: Brazil 1981
 - street children and mothers - school/home mathematics

Higher Mental functions

Vygotsky:

“Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals”

(1978, p.57)

Vygotsky, L. (1978). Interaction between learning and development. *Mind and Society* (pp.79-91). *Harvard University Press: Cambridge. MA.*

Human development influenced at three levels

- **Phylogenetic:**

- Development of the human species through evolution
Tools e.g. language, communication over time

- **Historical:**

- Developmental sequences in cultures over time
- Language, cultural artifacts
- Memory, thought and social cognitions become culture-specific

- **Ontogenetic:**

- Development of the individual through the lifespan (Vygotsky's focus)
 - Initial emphasis on biological factors – later on culturally mediated signs, symbols and thought processes
- Explains diversity in individual development across cultures

Zone of Proximal Development

- Within ontogenetic level – ZPD
- ZPD: Distance between the tasks a child can do independently and their potential competence at those tasks, which can be achieved with the assistance of adults or more expert peers
- ZPD: Guidance must be set within a child's ZPD
 - Too low - will not increase child's ability
 - Too high - will not achieve, may be discouraged
- Microgenetic analysis: study of the development of competence at a single task or activity

Scaffolding



- Another child or adult will guide learning (scaffolding) within the child's zone of proximal development
- As the child develops the zone of proximal development shifts
- Language provides dialogue, which the child can internalize to guide their own exploration of the problem
- Memory aids

Speech and Language

- Most important psychological tool
- Powerful interplay between mind and language
 - babbling without thought
 - around 2 years: thought and language linked
 - around 3 years: speech split (communicative and private speech (aloud))
- Private speech (aloud) = egocentric speech - becomes inner speech
- Egocentric speech:
 - Vygotsky – speech guides the thought process
 - Piaget – speech reflects the thought process

Language

- Most important psychological tool
- Phylogenetic, Historical and Ontogenetic levels (slide 25)
- Language – the key to “**collaborative learning**”
- Set conventions, which set parameters for thought

e.g. Pacific Islands – move from oral literacy to written literacy

Vygotsky and Play

- Play - main avenue of development for children
- Collaborative **pretend play** – children learn to co-ordinate ideas and plans
 - Tear drop soap – co-construction
 - 'La Banca' (Corsaro, 2003) - subversion
- Vygotsky; **collaboration** (new knowledge co-constructed between individuals)
- Piaget: **co-operation** (new knowledge constructed within each individual)

- 
- Vygotsky's child: an 'apprentice'
 - Piaget's child; a 'scientist'
-
- Reason - result of social processes (Vygotsky)
 - Start off with little ability to think or do things by ourselves
 - Gradual move toward self-sufficiency and independence through participating in social activities
 - Cognitive development occurs through internalisation of problem-solving activities developed through social interaction

Evaluation of Vygotsky's Theory

- A testable theory
- Practical model (ZPD)
- Some concepts ambiguous – undeveloped due to lack of time?

e.g.

Stages of thought and language only broadly outlined - how exactly does cultural and language-mediated experiences change structures and functions of thought?

<u>CONCEPT</u>	<u>PIAGET</u>	<u>VYGOTSKY</u>
Culture	One influence on development	The main focus of development
The social world	Cognitive development primarily in the mind of the child	Cognitive development guided primarily by the social world
Cognitive development	Linear hierarchical universal stages	Complex shifting of roles within collaborative activity
Language	Language not a primary driver of cognitive development	One of most important tools in cognitive development
Problem-solving	Independent process	Interactive process

Do Piaget's & Vygotsky's theories have anything in common?

- Neither theory is nativist
- Both theories see a role for maturation
- Both interested in changes in cognitive abilities
 - (Piaget – stages; Vygotsky – ZPD)
- Both acknowledge importance of interaction
 - Piaget – interaction between child and environment
 - Vygotsky – social interaction between individuals and social and cultural world
- Both agree that the child tries to make sense of the world, which develops the mind.

BUT

The two theories CANNOT be combined to make a single theory!

Read to aid your seminar activity

Make notes towards **your own** critique of Piaget's and Vygotsky's theories

Remember: at level 5, a high essay grade requires a **higher level of critique** than that required at level four

Seminar Reading

COMPULSORY READING

- Alves, P. F. (2014). Vygotsky and Piaget: Scientific concepts. *Psychology in Russia: State of the Art. Vol. 7(3), 24-34.*
- Lourenco, O. (2012). Piaget and Vygotsky: Many resemblances, and a crucial difference. *New Ideas in Psychology. Vol. 30, 281-295.*