

Psychology of Exceptional Learning

Public domain theories of learning

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Objectives At the end of this unit you should be able to

- describe the different types of knowledge people acquire, characteristics of each
- state the major issues explained by developmental theories of cognitive development,
- describe trends in intellectual abilities in Piaget's, Vygotsky's and Bruner's theories,
- suggest applications of each theory to teaching and education.
- suggest areas in which each theory may be modified.

Public domain theories of learning. They include

- behaviourist theories, that see learners as passive organisms shaped by their environment to behave in particular ways with no reference to mental representations.
- developmental models that see learners actively re-arranging their knowledge, ways of learning and thinking in predictable ways along a linear path.
- innate theories of learning. These propose aspect of acquiring knowledge is genetically determined.
- information processing models that focus on how learners process and retain knowledge.
- constructivist models that grew out of the developmental models.
- Gestalt theories of learning; the integrating 'flash of insight'.

Developmental theories : How we develop our information processing systems

As individuals grow, their ability to process information, that is, to think, changes qualitatively.

Theories need to explain

- how we make sense of items and events that we perceive; how we form mental categories or conceptualise - these are our knowledge units that detect units of meaning in the information. Do some types of detectors develop before others ?
- how we use symbols.
- how we link up ideas at any time; this is how we form links and networks and how we 'organise ideas' into new ideas
- how and when our knowledge changes
- how thinking activity is represented: as we develop, we can handle more information at once in our 'space' or 'window' for thinking
- how are individual differences in knowing explained.
- how we develop emotional link

Ways of examining the various theories

- how and what we know about items and events we perceive; how we make sense of them,
- how we learn to represent our knowledge at any time in various ways
- how our knowledge base changes; when does it change, under what conditions, how can we (as teachers) bring about change in what a person knows
- how thinking activity is represented
- how are individual differences in knowing explained.

Piaget's theory of cognitive development identifies various 'stages of thinking'. Each stage has characteristic ways of thinking, forming concepts, linking up ideas.

The person, the culture and the time. Piaget

- as a biologist
- influenced by Binet

The main concepts Piaget proposed

- we make sense of the world, know about items and events in it, using what we already know
- we symbolise the world and items in it in a number of ways; through actions -----> perceptions and images -----> real world concepts -----> abstract concepts
- Symbolic ability is learned first during the first two years of life
- our knowledge at any time is represented in terms of sets of related ideas (schemes) .
- our ways of knowing change qualitatively through a sequence of stages that is invariant across people.
- *When does our knowledge change ?* our knowledge changes in situation of cognitive conflict. When we are presented with a situation, problem, we want to explain but can't, that is, when we perceive our existing knowledge is insufficient for a particular goal or purpose. Words and language is not sufficient in changing what people know. Things that determine when how child moves from one stage to the next : several mechanisms:
 - maturation of the nervous system
 - physical experience; learners need to act on their environment)
 - social experience
 - a gradual re-organisation of knowledge by an adaptation process involving two processes;
 - assimilation ; links between the new ideas and person's existing knowledge.
 - accommodation ; existing knowledge changes to accommodate new idea.
- thinking consists of mental operations; physical actions become internalised.
- individual differences in knowing are explained through different rates of development.

Stages in intellectual development. The changes in intellectual abilities are grouped into broad age ranges. These are intended as approximate estimates and should not be used prescriptively. Piaget emphasised the sequential nature of the development rather than specific age levels.

1. Sensory-motor stage; 0 - 2 years; action understanding.
2. Pre-operational stage; 2 - 7 years; perceptual understanding; 2 sub-stages
 - (1) Preconceptual stage; 2 - 4 years; perceptual understanding and
 - (2) Intuitive stage; 4-7 years; intuitive understanding and
3. Concrete operation stage; 7- 11 years; real-world logical understanding.
4. Formal operational stage; 12 + years; abstract understanding.

Schemata : what we know at any time. Our knowledge is integrated in related sets of ideas. Thinking consists of mental operations; physical actions are internalised as mental actions.

Individual differences in knowing are explained through different rates of development.

Applications of Piaget's theory to teaching : learning is affected by development.

- Intellectual "readiness" to learn. Matching what we teach with what students know.
- Changes in ability to form concepts, to sequence, to impose order Teaching ideas in a developmentally appropriate way. Analyse ideas taught from a developmental perspective.
- Framing up challenges to stimulate learning.
- Need to facilitate the use of existing knowledge
- Need to encourage students to work actively on ideas they are learning.
- Understand individual differences in learning from a developmental perspective.

Summary of Piaget's Theory

- Thought develops through qualitatively different stages. Learners go through the stages in the same order. They discover reality by building it first through physical activity that is internalised.
- Contrast Piaget with the traditional psychometric approach. The psychometric approach is interested in quantitative differences in intellectual ability with age and examines the performance of people of all ages on the same set of tests. Piaget's approach is interested in qualitative differences

Vygotsky's theory of cognitive development How does our culture, the language our culture uses, the signs and symbols that it uses, influence how we make sense of information? This was examined by Vygotsky. Vygotsky explains

- the types of detectors we use,
- the ways in which we link units of meaning by using the language of our culture
- our culture tells us how to make sense of meaning in information and directs our attention to what is important, most useful in information
- ***How we make sense of items and events that we perceive through our senses***
Vygotsky proposed that we make sense of the world through our social interaction with others, particularly in how we jointly solve social problems; the origin of learning and thinking is in social processes. Cognitive development is "the conversion of social relations into mental functions".
- ***What do we learn?*** Vygotsky proposed that what we learn through this interaction are socially determined and valued tools and signs. These ---> bases for thinking and learning. Thinking is internalised physical activity in the social context of work.
- ***How we represent our knowledge at any time*** We symbolise the world using socially determined and valued tools and signs that ---> bases for thinking and learning. Individual learning capacities at any time determined by what learners have internalized about their society.
- ***How our ways of knowing change*** . Our ways of knowing change qualitatively as we develop in a sequence that is determined by the major modes of thinking and problem-solving in a culture and vary across cultures. Our knowledge base changes when we are presented with social problems that we want to solve. Words and language are the basis for changing what people know.
- ***Thinking consists of mental operations; physical actions become internalized.***

Sequence in intellectual development. Our learning capacities at any time are determined by what we have internalised about aspects of our society. Our ways of knowing change qualitatively as we develop in a sequence that is determined by the major modes of thinking and problem-solving in a culture and vary across cultures. The direction of intellectual development is towards the learner learning language as the main sign system. Each stage is seen as being relatively stable and is preceded and concluded by a 'crisis' or transformation that leads to the next stage:

- ***infancy*** (0-1 years); the period of affiliation 'elementary processes' based in conditioned and unconditioned reflexes determined by environmental stimulation.
- ***early childhood***, (2-4 years); the period of play Words are learnt and used as labels rather than as symbols. They learn grammatical structures but don't understand the logic.
- ***pre-school period***, (4-7 years) Children use external signs and operations symbolically to assist in solving problems, for example, uses fingers for counting and speak aloud while thinking (egocentric speech). Children speak aloud to themselves to help solve problems. They use it first at the end of an activity, then during the activity and eventually at the beginning of the activity to guide the problem-solving activity. During this period language and thought initially develop separately. They become fused, allowing the child to use language to manage and control thinking. Speech starts to be used for thinking and thoughts are put into language.
- ***school period***, (7-14 years) the period of learning. Children engage mental activities such as count in their heads. The egocentric speech is internalised and manages thinking. .

1. How tools and signs are used in a culture Tools and signs are used in a culture---> ways of thinking; thinking is internalized physical activity in the social context of work. Gradual use of signs---> intellectual development.

Children first learn to use actions signs, then visual signs and finally symbolic signs. The tools and signs are not the actual physical entities but the meaning the person links with them. Children first

learn to use actions signs as attempts to achieve goals and their culture 'conditions' these to operate as signs, for example, reaching for a toy---> pointing gesture. Adult's reaction to reaching changes it to pointing (a sign) via a social exchange process. When child internalises this meaning and uses the action as pointing, the interpersonal activity has become intrapersonal.

Signs used in 3 ways to interpret and explain experiences;

- iconic signs are images or pictures of what they stand for,
- indexical signs that have a cause-effect relationship with what they represent
- symbolic signs that have an abstract relationship with what they represent.

Tools are also learnt through internalisation of actions. It is the action, not the physical tool that is what the person internalises. Example of tools becoming ways of thinking:

Problem	Tool	Way of thinking
Store and process information	computer	use computer model of brain, people use computer terms to talk about how they think
Ride of waves in the sea	surf board	use of surfing in the Internet

Language (main sign system) ----> highest level thinking processes Language is internalized to become inner speech, the basis for thought, when egocentric speech disappears usually 5 - 7 age range. With internalization signs are used in increasingly elaborative ways to extend understanding. Language frees them from the constraints of their immediate environment and provides the basis for decontextualization.

The negotiation of meaning : Learners learn new signs and tools by matching their personal understanding of them with the conventional understanding accepted by the group.

'Zone of proximal development' ; difference in how a person can solve problems without and with social support. It identifies those functions that are being acquired. When we are supporting a person to learn by working in the ZPD we are taking some of the information-processing load- we are 'holding' some of the knowledge for the person, using our meaning links to lead the learner through the set of ideas. This lead to proposition that learning precedes development ; learning initiates or activates developmental processes and 'pulls them along'. Teachers should not wait until students are developmentally ready to learn ideas, but rather teach to facilitate the developmental gain.

'Intersubjectivity' - quality of the social interaction between partners; for successful learning

- partners need joint understanding of the task; not the traditional teacher-pupil interaction..
- work together to co-construct solution to problem and decide how to solve it.
- shared power and authority, inequality only in understanding of idea.

Adults are frequently more effective as partners for children than peers; because they

- promote more advanced planning strategies,
- provide more verbal instruction ,
- elicit more participation and
- are more sensitive to guiding instruction within the learner's ZPD.

Peers are often more effective in taking account of the perspectives of others.

Cultures determine the level of thinking of their members. Cultures lie along a continuum of social evolution; the more highly evolved the culture, the higher level the thinking processes of its members.

- compare the models of learning in 16th and 20th century European cultures.
- trends in categorising by adults reflect level of evolution of their culture. Level of context - bound thinking indicates cognitive development.

How do individuals categorised familiar items ?

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from non literate cultures categorise on how they go together in real life	literate individuals categorise in more generic decontextualised ways
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Individual development must be seen relative to the social contexts in which people live.

Applications of Vygotsky's theory to teaching : development is affected by learning which is in turn socio-culturally determined.

Intellectual "readiness" to learn? Readiness is not a useful concept; the zone of proximal development, how far learners can develop with social support should be a focus in teaching. Learning initiates and 'pulls along' developmental processes. Teachers shouldn't wait until students are developmentally ready to learn ideas, but rather teach to facilitate the developmental gain.

Self talk as a mediator for managing learning Help learners improve their ways of mediating their thoughts, for example, their understanding of visual imagery and inner language (self talk, self instruction) in learning. Ability to manage one's self as a learner, direct learning and become an independent learner can be achieved with a focus on using language to mediate learning.

Provide opportunities for negotiating meaning in learning. Learners need to match their personal understanding of ideas with the conventional group understanding; the negotiation of meaning. For symbols and procedures that have culturally determined meanings, learners need to negotiate a shared understanding by transforming their empirical experiences into the culturally agreed meaning. They do this by guessing at what they might mean. They analyse, try out and share their guesses with other members to see how well they work, to take account of what others think, to question, challenge, debate and argue points of view, monitor and use evaluative feedback that indicates how close they are to what the group intends and modify their understanding. Learners also map cultural knowledge (symbols, words and concepts) into their own experiences.

Various issues complicate the negotiation process. A learner can belong to different social-cultural groups and may need to negotiate different meanings for the same words, symbols, concepts, for example, formal versus informal non-school everyday mathematics.

Students learn that ideas have a control or power value. Learners learn within a network of social-cultural interactions that direct the learning activity. The social knowledge is bound within the language in which they think. Groups impact on how learners show what they know;

- groups value some ideas more than other ideas. Tensions can arise when the ideas valued by different social groups, or how they allow the ideas to be displayed, clash.
- groups guide the course of learning towards socially valued outcomes or acceptable ends by responding evaluatively to the learning outcomes displayed.

Through feedback, learners' perceive power in the interaction and this can affect their preparedness to negotiate and show what they know. Teachers and peers use this power to direct the thinking and the outcomes of the group. They display this valuing through body language and verbal responses.

Learners learn by co-operatively solving relevant social problems. Provide opportunity to learn by collaboratively solving social problems that have relevance. Reciprocal teaching is an example combining intersubjectivity and scaffolding:

- readers working jointly to construct meaning from a text.
- the dialogue is structured to emphasise four main comprehension strategies;
 - questioning about the main points,
 - clarifying to resolve difficulties in understanding,
 - summarizing to capture the gist of the text and
 - predicting to forecast what might happen next

Teacher initially leads and models the strategies and transfers control to students.

Encourage a student focus on ways of thinking and learning Encourage students to learn ways of thinking, cognitive and metacognitive thinking strategies, share with others how they go about solving problems, try out other people's ways of solving problems, etc.

Develop ways of assessing learning that take account of the ZPD Don't only assess what learners can do independently but also what they can do with group support or teaching.

Bruner's theory of intellectual development

Categorization Humans understand their world by categorizing events or objects in terms of similarities. A category is

- a set of objects or events that have similar properties.
- a rule specifying those characteristics or attributes necessary for class membership

Value of categorisations

- reduces complexity of environment
- permits the recognition of objects
- reduces need for constant learning by:
 - permitting recognition of new objects without any actual new learnings
 - permits going 'beyond the information given'

How does cognitive development occur? Intellectual development is shown by multiple ways of processing information, rather than a stage-like progression through modes. Two aspects

Representation - how the child codes and processes past experience Three systems or modes are used to construct models of the world

- action - enactive mode; earliest system, events and objects represented by motor responses, object and action are not separated, representation by action provides a one-way sequential record of events and this limits possibility for transformation
- imagery - iconic mode; based on achieving an image and its isolation from related actions, translating successive actions into a simultaneous representation permits transformations not possible with enactive representation
- language - symbolic mode; translation of experience into language. This mode derives its flexibility and power from using language as an tool for transformational thinking.

All modes reduce complexity of environment, need for constant learning and permit ordering or relating of groups of events.

Integration - how one's means of representing the world affects ability to solve problems, by organizing separate acts of information processing into plans or sequences of operations.

- for enactive representation, learned behaviour patterns are used to solve problem.
- for iconic representation, information in the image is translated into a sequence for action.
- symbolic representation facilitates planning of operations - child can deal with things that are remote in space, similarity and time from present and can devise plans for action and that organize behaviour simultaneously at several levels of complexity.

Similarities and differences between Piaget and Vygotsky

Similarities include

- cognitive development involves qualitative changes in thinking
- change emerges from the need to resolve a conflict between ideas
- the roles of learners and their environments are inseparable
- mental actions and operations are internalized physical actions.

Differences include

- the role that social interactions play in development (for Piaget, the physical environment with a balance between the physical-logical environment and organismic factors and for Vygotsky a greater emphasis on the social environment and social-cultural factors)

the response or operand positive reinforcement operand / response is conditioned

Essential aspects of this type of learning

- the environmental consequences that follow the child doing something - re-inforcement.
- the concept of gradually shaping a behaviour; learner displays behaviour increasingly closer to the desired behaviour to receive reinforcement (successive approximations).

The value of feedback in learning : Importance of the provision of feedback, for example,

- when does it need to be provided ?
- how much ?
- how often
- did you need to know what you were being reinforced for ?
- the value of reinforcing yourself ?

How is reinforcement given in group situations - Bandura's Social Learning Theory and the notion of vicarious reinforcement : children who watched

- model play quietly and then aggressively to achieve goals were more likely to act aggressively later
- model play quietly and achieve goals non-aggressively were less likely to act aggressively

Learners actively shape or manipulate their information-processing knowledge; prioritise ideas.

Later derivative theories (cognitive-behavioural) have attempted to overcome many of these limitations.