Piaget's theory of education

School resources

Jean Piaget (1896 – 1980) was a psychologist and epistemologist who focused on child development. He developed a theory of human cognitive development (known as 'genetic epistemology') based on his interest in biology and particularly the adaptation of species to their environment. His theory that human intelligence was also an adaptive mechanism was controversial at the time. It challenged the dominant psychometric and behaviourist approaches to intelligence, which measured intelligence (IQ) as a fixed and inherited trait, or referred to external conditioning (behavourism) as the source of cognitive change. Piaget argued that humans were active meaning-makers who construct rather than receive knowledge, with much capacity to improve intelligence over a lifetime.

The main features of Piaget's educational theory

Piaget offered a unique experimental method for determining children's cognitive abilities, as well as a detailed explanation of how children develop logical and mathematical thinking. According to Piaget:

Development is understood as an increase in the complexity, mobility and systemisation of cognitive structures. Piaget saw thinking (the ability to reason, connect ideas and solve problems) as the result of cognitive structures that are gradually built within the brain as a result of direct exposure to and interaction with the environment.

Learning is a process of adaptation to environmental stimuli, involving successive periods of what Piaget called assimilation, accommodation, and equilibration. In assimilating knowledge, students incorporate their experiences and observations into the logic of their existing or developing understandings. For example, children might understand the phenomena of the life cycle of a butterfly in terms of their understanding of the human life cycle. Accommodation occurs when there is a conflict or mismatch between new information and the students' internal models, leading students to adapt their existing understandings and expectations to incorporate their new perceptions and experiences.

Learning is dependent not only on experience but also on students' maturation and their ability to absorb and learn from stimuli. Piaget observed that students were limited by their existing cognitive structures in developing new ways of understanding phenomena.

Development occurs in four progressive stages in which thinking progresses from 'concrete', egocentric thinking that is strongly tied to physical experiences, towards 'formal', abstract reasoning that involves mental rather than physical manipulation of concepts and ideas. Each stage represents a fundamental, qualitative difference in ways of perceiving the world, processing and responding to information, and developing concepts. The stages are:

- Sensori-motor (birth to 2 years): understandings of the world are limited to visual and tactile interaction with the world. Imitation provides a foundation for thinking in visual images.
- Pre-operational (2 to 4 years): thinking involves visual images about sensorimotor actions and experiences, and symbolic thought. Thought is focused on the particular without abstracting general principles, and relies on perception and intuition.

- Concrete operational (7-8 to 11-12 years): cognitive structures have developed sufficiently to be used as logical systems (termed "operations") and used across contexts rather than being specific to a certain type of problem in a particular context. At the operational stage of thought, children understand notions of reversibility (subtraction can cancel addition, a clay ball can be transformed into a sausage and back again) and associativity (an ability to identify several ways to pursue an objective, such as a range of ways to solve 25 x 25).
- Formal operational (11-12 to 16-17 years): abstract and decontextualised reasoning using verbal propositions, premises, ideas and concepts is possible without access to concrete objects. Students can hypothesise, problem-solve, note relations between ideas and things, hold a number of ideas in mind, and develop and relate concepts.

The age norms provided by Piaget were approximations, although Piaget believed that all humans undergo these stages, in this order, as they develop cognition and intelligence.

Learning depends upon students' 'hands on' interactions with objects rather than the transmission of information. Students need to experience concepts such as addition or capacity by interacting with things in their environment, and they develop logical and mathematical thought as they internalise these actions as thought processes.

Social factors have an important role in students' knowledge construction, as children gain knowledge both individually and by observing and acting with others in groups. Peer discussion which generates cognitive conflict is seen as a critical factor in cognitive development. Piaget thought that, while the development of cognition had a biological (innate and predetermined) basis, society also had an important role in providing appropriate possibilities for students to develop their cognition.

What empirical evidence is there for this theory in practice?

Recent developments in neuroscience have confirmed the flexibility of the brain and its ability to respond and grow with experience[1], which aligns with Piaget's theory of the construction of cognitive structures to account for and incorporate knowledge from different experiences[2]. Neuroscience also shows that as students grow older and develop, they add more advanced forms of thinking to their repertoire[3].

Piaget's ideas for supporting the development of cognition also have some substantiation in research. Teachers' planning for students to engage in experiences that provide cognitive conflict, (for example, by having children discover that some heavy things float while some light things sink to challenge their ideas that floating and sinking is related to an item's weight) have been found to have a significant positive effect on achievement[4], and providing students with manipulative materials (such as Cuisinaire rods, paper folding, and geometric sketches) that illustrate mathematical ideas has been found to support greater mathematical achievement[5].

Drawing on Piaget's unique experimental method, extensive research has confirmed and improved some of his ideas[6]. Yet because this method drew heavily upon experimental and artificial situations that may not have adequately reflected children's actual development[7], nor taken into account variations in students' development in different social and cultural contexts[8], many of Piaget's claims have been contested. Some of the abilities that Piaget attributed to maturation have been shown to be a function of experience[9], with children found to be more capable when the tasks presented to them are meaningful and relevant to them[10]. Neuroscientific research also shows that, rather than finite stages of development, it is more likely that there are cycles of development where periods of optimal performance are followed by spurts that result in new types of thinking and behaviour[11].

Piaget's influence on teaching practice

Piaget's ideas about learning and development have influenced constructivist theories of learning as well as child-centred pedagogies, and particularly a tendency for passive, background roles for teachers in children's education. Piaget theorised that the accommodation and assimilation cognitive processes could not be accelerated by instruction, and that most interactions were ineffective in influencing cognitive change unless positioned at the correct level between assimilation and accommodation and building very carefully from what the student already understands. Piaget suggested the teacher's role involved providing appropriate learning experiences and materials that stimulate students to advance their thinking. His theory has influenced concepts of individual and student-centred learning, formative assessment, active learning, discovery learning, and peer interaction. However, it has also sometimes been misinterpreted to suggest that direct teaching would be inappropriate, a claim that is clearly shown to be inaccurate in cognitive science research.

Individual learning

Piaget's focus on learning as individual development is reflected in the organisation of most education systems, where learning is individualised and students are measured on their individual rather than collaborative performances. Development is seen as individual rather than social or cultural, for example.

Student-centred teaching and formative assessment

Piaget also has also come to influence what is known as student-centred teaching, in which teachers begin with the student's existing understandings and help them build on and develop these (although note this doesn't preclude teachers identifying and planning carefully the content to be taught). Assessment practices that aim to find out what students already know and can do in order to inform subsequent teaching are important for teaching to be timely and relevant to each student's current capacity for structuring and restructuring knowledge. Teachers use assessment to understand students' prior experience and understanding and how they personally construct a topic or subject in their minds.

Active learning

Piaget thought that independent exploration and discovery were important at all stages of cognitive development in enabling students to lead their own learning in line with their current developmental understandings. Students at the stage of concrete operations require opportunities for hands-on learning, experimenting and testing of objects in order to build concepts, as well as later to work with verbal propositions. Students at the formal operations stage benefit from open-ended projects in which they can explore hypothetical possibilities and reasoning.

Discovery learning

Piaget's theory is also associated with the concept of 'discovery learning' in which students are invited to explore carefully planned activities and experiences that are designed to help them realise key observations and ideas. It is important to note that, although Piaget thought that students could discover some things for themselves, most of the time their development requires reflection and making connections to construct knowledge. In other words, teachers' structuring of students' discoveries is important.

Peer conflict

Piaget's ideas about the importance of cognitive conflict to stimulate the process of equilibrium are sometimes put into practice via opportunities for classroom discussion, which aims to enable students to come across ideas and theories which conflict with their own.

References & further reading

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Endnotes

1 Crossland, 2016.

2 Crossland, 2016.

3 Crossland, J. (2017). Optimal learning in schools – theoretical evidence: Part 2 Updating Piaget. The School Science Review, 98(364), 77-83.

4 Hattie, 2015, cited in Crossland, 2016.

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