

# The development of concept through the national curriculum



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The National Curriculum was introduced into the English educational system after the Education Reform Act in 1988. The concept of child psychology was addressed and heavily influenced by the work of Jean Piaget. Piaget was the forerunner of the 'constructivist theory of knowing' and put forward the first systematic theory of Cognitive Development. His theory states there are four consecutive stages of cognitive development that are achieved at different ages throughout a child's life. As with all high profile theories, not all experts agreed. Lev Vygotsky thought the cultural background of children had a major impact on cognitive development, 'Any function in the child's cultural development appears twice, or on two planes. First, it appears on the social plane, and then on the psychological plane.' (??, 1981, pg 163). The main difference between Piaget and Vygotsky's theories is Vygotsky believed even if a child did not possess the necessary skills or knowledge to complete a task, if they were surrounded by someone who did, they were likely to succeed when steered in the right direction. Whereas Piaget stated a child's cognitive development is limited by what they are in affect 'ready' to learn. By applying Piaget's theory to the National Curriculum a more 'child-centred' approach can be practiced within the School System. Piaget once said 'Education, for most people, means trying to lead the child to resemble the typical adult of his society .... but for me and no one else, education means making creators .... you have to make inventors, innovators and not conformists' (Binguier, 1980, pg 132).

Forces and Motion form a significant amount of Physics at all Key Stages in the National Curriculum. Forces have a fundamental role in how the Earth is positioned and how objects are held on the Earth. It is vital children are

taught where and how Forces and Motion affect us and how they determine day to day living.

Jean Piaget published the first logical theory of cognitive development which when placed in an educational context can be used to improve the educational system for all students. Piaget focused on how children learn, adapt to an environment and any changes that may occur. He thought children must have constant interactions with the outside world. Piaget also discussed the theory of moral education and believed children make moral judgements by observing those around them, ' the child is someone who constructs his own moral world view, who forms ideas about right and wrong, and fair and unfair, that are not the direct product of adult teaching and that are often maintained in the face of adult wishes to the contrary' (Gallagher, 1978, pg 26). He thought education and the way children are taught can have a significant effect on development.

Piaget's theory states there are four main areas of Cognitive Development. The first, Sensori-motor, occurs between birth and the age of two. Children learn through their senses and actions, however are egocentric. The evidence Piaget gathered showed children in this stage interact with their environment by manipulating objects, this is known as intelligence in action (Michael W. Eysenck, 2000, Pg 411). Towards the end of the sensori-motor stage children begin to develop object permanence.

The second of Piaget's stages, pre-operational, is split into two sub-sections, Preconceptual (aged two and four), and Intuitive (aged four and seven). A main characteristic of this stage is illogical thinking and centration. During

this period it is not possible to change a child's opinion on something they believe to be true. For example if two glasses with equal amounts of water are shown to a child, then one is transferred into a larger glass, a child would state it contains less water than the other, even though they fully observed the process (Michael W. Eysenck, 2000, Pg 413).

The third stage occurs between aged seven until approximately twelve and is known as Concrete Operational. At this point logical thinking develops allowing thoughts to be organised coherently. However children are still unable to think abstractly and logical thinking is confined to real objects and subjects that can be seen. Children are able to concentrate on more than one factor, for example when asked to select similar objects, the second object chosen will be similar to the first in dimensions and the third chosen will be similar to the second in colour (Michael W. Eysenck, 2000, Pg 411).

The thought process behind the use of experiments is understood as they comprehend planning, carrying out, presenting and concluding the results.

The fourth stage is Formal Operational which occurs from aged twelve upwards, where children are able to comprehend abstract ideas allowing subjects such as Space and Gravity to be explored. Prior to this children cannot realise intangible ideas and concepts. An important step in formal operational is when children come across a situation they do not understand, they are able to change the way they think in order to understand it. For example formulate a hypothesis and carry out a systematic test to produce results to support an answer.

At Key Stage 1, children are aged between five and seven and are at the Intuitive stage in Piaget's Theory. Forces and Motion are introduced to the children in the first year of Key Stage 1 using the module Pushes & Pulls. During this, children can expect to learn things such as how objects move and the different types of movement. Children may be asked to move in different ways and then asked to discuss which parts of their bodies move. Language skills advance in the intuitive stage however Piaget states this is a consequence of basic cognitive advances. Assessments are kept in line with Piaget's theory and can include labelling objects according to their movement for example push or pull.

During year two of Key Stage 1, Forces and Motions are again taught however knowledge is expanded in the module Forces and Movement. The subjects covered reinforce knowledge previously taught in order to develop pupil's knowledge. Language and vocabulary is extended by introducing words such as twist, squeeze, stretch and pull out. Investigational skills begin to develop as children are taught how to suggest a question and predict what will happen. The 'fair test' concept is also encouraged and expanded. These are fundamental skills that are developed at a later stage.

Pupils move on to Key Stage 2 at the age of seven and continue until aged eleven. According to Piaget's they are Concrete Operational, the third stage, meaning logical reasoning can be applied to real objects. Forces and Motion are taught in Year 4 (aged eight) in the module Friction. Specific topics are re-capped in order to consolidate previous facts. Children are encouraged to use new equipment such as a forcemeter to carefully measure a force. New vocabulary and ideas are also introduced at this stage, for example 'newton'

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as the unit of force. Investigational skills are progressed by getting pupils to plan an experiment and follow it through.

The module Forces in Action is taught in Year 6 (age ten) and includes gravity and weight. The basis of all topics covered have been previously taught, this shows the continuity of the topic throughout the two Key Stages. This allows the children to logically recall this information and expand it. As the children are still in the Concrete Operational stage they are able to apply logical thinking however only to real objects. It is important forces are used to explain phenomena in everyday life to show the importance and impact they have. Towards the end of this unit the concept of Gravity is introduced, however according to Piaget children at this stage cannot comprehend abstract theories.

During Key Stage 3 children are on the border of the final stage, Formal Operational. During which individuals are able to think logically and rationally about potential events and abstract concepts. In Year 7 the pupils are taught the module Forces and their Effects. Children are advanced by being taught the difference between mass and weight and how to relate forces in action to changes in motion. This provides a direct link back to modules Forces & Movement and Friction in Key Stage 1 and 2. At this stage the pupil's learn why it is essential to repeat measurements and experiments to prove reproducibility and reliability of results. They are introduced to the concept of different variables within an experiment and the importance of controlling these.

During the final year of Key Stage 3, Year 9 (age 13) Forces and Motions is covered in three separate modules. The first, Gravity and Space introduces the concept of abstract thinking about objects and forces. This links back to the module Forces in Action from Key Stage 2. Gravity is previously touched upon in Key Stage 2, however according to Piaget's theory they are unable to fully comprehend abstract concepts. As a lot of new information is taught during this module, the pupils greatly expand their knowledge.

Investigational skills are expanded in this module and pupils are made aware that Scientists research concepts together and interpret the evidence.

The second forces module in Year 9 is called Speeding Up and is directly linked to several modules previously taught in Key Stage 1 and 2 such as Pushes & Pulls and Forces in Action. It expands earlier topics by allowing pupils to consider the relationship between forces on an object and its movement. It introduces balanced and unbalanced forces and how these explain the movement of falling objects.

The final module is Pressure and Moments. This involves the notion of moments and again builds on previous information provided to the pupils. This is a major step for children as most of these topics have not previously been taught. However there is still continuity as all the previous knowledge about friction and gravity play an important part in understanding these concepts. As with previous modules the investigational skills of the pupil's are further developed with anomalous results being introduced and precision measurements are reiterated.

Due to the separation of individual Sciences at Key Stage 4, Forces and Motions as a topic can be found in several subjects, for example Physics and Additional Science. Areas covered include how to describe the way things move and what is momentum, this again demonstrates continuity through the Key Stages. Ideas are also expanded, for example when learning about momentums, children are expected to be able to calculate momentum and how momentum can be used to calculate other values such as Force.

At AS / A-Level, children are no longer in compulsory education however Forces and Motion feature within Physics courses. Mechanics is introduced as a new topic which includes relating force to waves. The subject of momentum is expanded and establishes circular and oscillatory motion. The course Physics in Context firmly places physics in a range of contemporary environments. It introduces students to new and exciting areas of physics and develops essential knowledge and understanding. The modules allow pupils to consider how knowledge of forces and motion underpins everyday activities such as transport and record breaking in sport.

The concept of Forces and Motion within the National Curriculum is introduced at the beginning of Key Stage 1 and is carried throughout compulsory education and post sixteen studies. Initial knowledge is expanded and consolidated at the start of each module and all units link together. Although the modules are not carried out in consecutive schooling years, I believe that with structure of the National Curriculum, continuity is kept by recapping at the beginning of each unit. It is clear progression within the subject occurs within the unit and there are also areas for gifted and talented students to excel. From looking at the National Curriculum, Piaget's <https://assignbuster.com/the-development-of-concept-through-the-national-curriculum/>



theory has had a major impact, as the level at which the information is pitched directly relates to the characteristics observed by him. For example in Key Stage 2 pupils are Concrete Operational and only able to relate to real objects and ideas. Therefore Forces such as speed and movement are mainly covered. In Key Stage 4 pupils are Formal Operational and can comprehend abstract thinking, therefore Gravity, Space and Moments are introduced. However as with all major theories, there are areas that do not fully explain the concept, in this case the cognitive development of children.

Psychologists such as Bower (1982) challenged Piaget's theory and put forward the idea that Piaget had a tendency to underestimate the cognitive ability of children. Bower hid a toy behind a screen and when the screen was lifted a few seconds later, the toy was longer there. The three to four month old children in his study showed a 'surprised' reaction thus suggesting object permanence can be present much earlier than Piaget published (Michael W. Eysenck, 2000, pg 411). Lev Vygotsky's contributions must also be acknowledged who along with other publications researched the zone of proximal development. This stated that although children may appear to lack certain skills when tested in a controlled environment, if tested again when surrounded by someone with the necessary knowledge they are more likely to succeed. Although parts of Piaget's Theory have been questioned and to some extent disproved, as a whole no other theory has come close to explaining, in detail, the way in which children's thinking and learning progresses.

## References

### Books

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