Naive Physics Concepts and Their Developmental Change: Through a Comparison between Sound and Heat

かわなべ　　たかし
Kawanabe Takashi

【主要論文要旨】

Students acquire various concepts through our everyday experiences even before formal education. These, called naive concepts, often differ from scientific concepts taught at school since they are intuitively generated by individuals and deeply connect to specific circumstances. Developmental and educational psychologists have shown that these scientifically incorrect naive concepts that students bring into science classes hinder them from achieving a deep understanding. Therefore, it is necessary to develop new effective instructional methods that take students' naive concepts into consideration. And for this purpose, detailed investigations of naive concepts and conceptual change are required.

The main purposes of the present study were to clarify characteristics of students' naive concepts of sound and heat and to examine processes of conceptual change with development. The former was examined in Study 1 to 6, and the latter in Study 7 to 10 And Study 10 was a preliminary one to obtain useful implications for educational practices. According to the results, the following three points were suggested. First, even after formal education, both sound and heat were considered to be kinds of matter though, in reality, they are not. Second, for both phenomena, most children before formal learning considered that they would go faster when going down than when going up, due to gravity. On the other hand, most university students considered that upward velocity of sound was slower than its downward velocity, while heat was not considered the same way. Instead, they explained that heat going up was faster than that going down. And third, developmental change of naive concepts of sound and heat was strongly influenced by the contents of learning.

Finally, based on these results, proposals for existing theories of naive concepts and conceptual change and for educational practice were made.