

Analysis of Connecting Errors by Students' Field  
Independence-Dependence in Learning Chemistry  
Concepts with Multiple External Representations  
(다중 표상을 활용한 화학 개념 학습에서 학생들의  
장독립성-장의존성에 따른 연계 오류 분석)

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이 연구에서는 학생들이 현재의 과학 교과서에서 화학 개념 학습을 위해 제시된 외적 표상들을 연계하는 과정에서 범하는 오류 유형을 학생들의 장독립성-장의존성에 따라 조사했다. 1개 중학교 1학년 학생 196명을 '보일의 법칙'을 학습하는 BL 집단과 '샤를의 법칙'을 학습하는 CL 집단으로 배치한 후, 장독립성-장의존성 검사를 실시했다. 각 집단 학생들에게 물질의 입자성이 강조된 글과 그림으로 해당 개념을 학습하게 한 후, 연계 과정 검사를 실시했다. 연구 결과, '불충한 연결', '부적절한 연결', '무분별한 연결', '불가능한 연결', '연결 불이행'의 5가지 연계 오류 유형이 나타났다. 이 중에서도 목표 개념과 관계없이 '연결 불이행', '부적절한 연결', '무분별한 연결'이 많이 나타났다. 장독립적 학생들과 장의존적 학생들이 범한 연계 오류의 빈도 사이에는 통계적으로 유의미한 차이가 없었다. 이에 대한 교육적 함의를 논의했다.

## Analysis of Connecting Errors by Students' Field Independence-Dependence in Learning Chemistry Concepts with Multiple External Representations

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This study investigated connecting errors by students' field independence-dependence in learning chemistry concepts with multiple external representations in current science textbooks. Seventh graders (N=196) at a middle school were assigned to the BL and CL groups, which were respectively taught about "Boyle's Law" and "Charles's Law". A field independence-dependence test was administered. After learning the target concept with text and picture emphasizing the particulate nature of matter, a connecting test was also administered. Five types of connecting errors were identified: Insufficient connection, misconnection, rash connection, impossible connection, and failing to connect. 'Failing to connect', 'Misconnection', and 'Rash connection' were found to be the frequent types of connecting errors regardless of the target concepts. The frequencies and percentages of the types of connecting errors were not significantly different between the field independent and field dependent students. Educational implications of these findings are discussed.

**【Key words】** connecting error, multiple external representations, chemistry concept, field independence-dependence

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