# **Upper-Level Physics Students' Conceptions of** Understanding

## **Phenomenographic Methodology**

- logically interrelated ways in which a phenomenon or a situation is experienced.
- Booth, 1997).

### **REU and Upper-Level Physics Students' Conceptions of Understanding**

Category	Description
A	Understand when can us apply
B	Understand when can uvisualize and apply in differences
C	Understand when can te someone else
D	Understand when can exp more than one way, use an
B	Understand when can age mathematical descriptic consolidate knowledge

#### Discussion

Waterhouse and Prosser (2000) found similar conceptions of understanding but significantly did not distinguish two distinct levels within their "understand when can solve problems" and "understand when you can explain it to others or yourself" categories. Indicates different levels of sophistication within understanding as application and understanding as explaining. The "understand when you consolidate your knowledge" category from Waterhouse and Prosser also has the significant difference of the students of this group indicating that this consolidation requires using a mathematical description or applying a mathematical model to the concept that is being attempted to be understood.



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•A phenomenographic study usually focuses on a relatively small number of subjects (18 students in this case), and identifies a limited number of qualitatively different and

•A particular way of experiencing something reflects a simultaneous awareness of particular aspects of the phenomenon. •Another way of experiencing it reflects a simultaneous awareness of what aspects or fewer aspects) of the same phenomenon are experienced (Marton &

•Therefore, it is the variation in the way in which aspects of a particular phenomenon or object are discerned, that constitutes an individual's experience of that phenomenon. •In the case of this study it is the variation in how students conceive the phenomenon of understanding in relation to learning and understanding physics concepts.

#### Explanation

e and	Understanding is when students understanding to solve
ise, ferent	Understanding is when students can in different contexts and can b visualization of a c
each	Understanding is when you feel y your interpretation of a concept
lain in alogies	Understanding is when you feel you understanding in multiple ways
pply on, ge	Understanding is when understand apply mathematical n

know they can apply e problems

an apply understanding be applied to gain a concept

you can communicate pt to someone else

you can explain your 's and use analogies

concept deeply and can nodel to it

Understanding is the use and application of one's understanding/knowledge of a concept.

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/erence Erlbaum Associates. standing University Physic

Understanding is when you can explain your understanding to someone else.

Understanding is incorporating and linking new concept to understanding of previous concepts.