

Relationship between metacognition and identity development in physics.

Paul Irving and Eleanor C Sayre,
Physics Department, Kansas State University

Phenomenographic Methodology

- A phenomenographic study usually focuses on a relatively small number of subjects, and identifies a limited number of qualitatively different and logically interrelated ways in which a phenomenon or a situation is experienced.
- 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 (more aspects or fewer aspects) of the same phenomenon are experienced (Marton & Booth, 1997).
- Therefore, it is the variation in the way in which aspects of a particular phenomenon or object are discerned, that constitutes an individual's

Themes of Expanding Awareness

These are used to distinguish the critical aspects in the variations in the ways of experiencing a phenomena and highlight the structure of these critical aspects, allows for a better understanding of how they relate hierarchically.

Three themes of expanding awareness were found in this study:

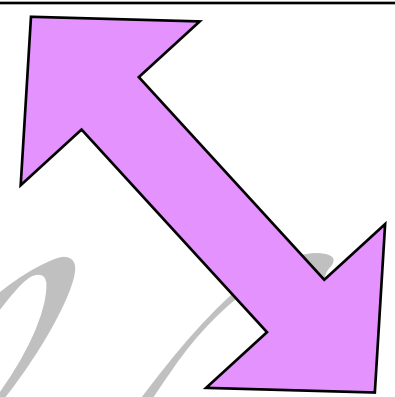
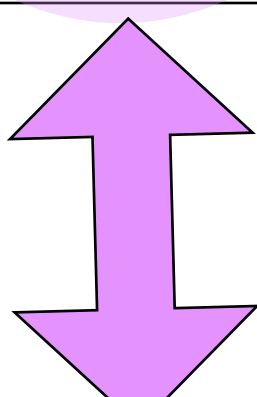
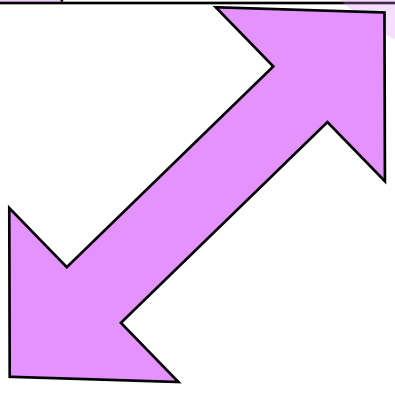
Career definitiveness refers to how definitive a student conceives their future career and also refers to how long they have had that career path in mind.

Level of Interest refers to how much of an inherent interest the students have in Physics and also at which point they began to have this strong belief.

Metacognitive level refers to the amount of awareness a student possesses in regards to how they approach their learning, exams and ability to self assess.

Stages of Identity Development

Themes of Expanding awareness	I am Student	I am Physics Student	I am Physicist
Career Definitiveness	No specific career chosen	Plan that lacks specifics	Specific job chosen
Level of Interest	Transferred in college	Interest since high school	Interest since childhood
Metacognitive Level	Lack of self awareness	Evolved sense of awareness	Complete self awareness



I am Student Stage of Development

Students in this stage of identity development categorized by:

- Do not identify themselves as physicists
- Not sure what a physicist is or what they do
- Not metacognitively developed and poor conceptions of understanding/learning/approach to learning
- No specific career path chosen

I am Physics Student Stage of Development

Students in this stage of identity development categorized by:

- Do not identify themselves as physicists yet
- Know what a physicist is and does but feels not at that level yet due to lack of experience/knowledge/ PhD
- Aware of approach to learning + adaptive
- Career path = Research/PhD unspecified Physics area

I am Physicist Stage of Development

Students in this stage of identity development categorized by:

- Identify themselves as Physicists
- Hold expert equivalent opinions on what it means to be physicist
- High level of metacognition with ability to tailor approach, equipped to self assess and a higher level conception of understanding/learning
- Very specific career path which they have had for a long time

Relationship between metacognition and identity

- The emphasis on metacognition as an influencing factor in identity development correlates with previous research.
- In many ways metacognition is in essence an indicator of the amount of awareness one has.
- It makes sense then that the more aware a student is the more they may have examined what it means to be a physicist and hence become more attuned to what being a physicist means and when one has reached that level.
- Metacognition can be improved through instruction.
- Course designers should attempt to integrate metacognitive instruction into some elements of a physics course in order to not only encourage identity development but also the quality of learning which has been indicated to improve when students learn in metacognition-prompting environments.