General chemistry students’ beliefs about chemistry and learning chemistry: An international comparison

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Beliefs/Attitudes & Learning

Researchers have found a number of student attitudes and beliefs that both influence and are influenced by learning experiences. (see 1) In addition, attitudes and beliefs about learning have been found to be important predictors of students’ performance in post-secondary science coursework. (see 1) Moreover, improved attitudes have been shown to be correlated with improved learning outcomes. (2)

The Colorado Learning Attitudes about Science Survey (CLASS) was built upon existing attitudes/beliefs surveys (MPLEX, VASS, EBAPS) to focus on students’ beliefs about physics, learning physics and problem solving in physics instead of expectations for learning or perceptions of learning the discipline. The CLASS has been extensively validated with a wide variety of student populations, both science and non-science majors. In addition, most of the statements on the CLASS have consistent expert responses so that a comparison can be made between novice and expert beliefs. Expert-like beliefs/attitudes, as measured by the CLASS, are clearly correlated with future program of study.

The version of the CLASS, the CLASS-Chem, is largely similar to the original with some additional statements, such as those on the atomic-molecular perspective of chemistry. (3)

Both universities are large, 4-year or higher, and public with high research activity (Carnegie Classifications).

Student Population (Fall 2007):
25,080 undergraduate students
“Average” High School Rank = 79.5th percentile
~ 47% Female ~ 53% Male
~ 1% International students
~ 10% Minority students

1-Year Chem Population (Fall 2008):
896 enrolled
~ 57% Female ~ 43% Male
~ <10% English as a Second Language ~ 55% Freshmen

Student Population (Fall 2006):
35,860 undergraduate students
“Average” H.S. Rank (Sc) ≥ 94 (96 PISA adjusted)
~ 55% Female ~ 45% Male
~ 15% International students

Ethnic Minority
1-Year Chem Population (Fall 2008):
1,730 enrolled
59% Female 41% Male
~ 50% English as a Second Language ~ 90% Freshmen

1st Semester General Chemistry CLASS-Chem Results

US ‘06 N=403, 49% participation, ~58% Freshmen. US ‘07 N=551, 62% participation, ~57% Freshmen. US ‘08 N=622, 70% participation, ~55% Freshmen.

Canada ‘08 N=885, 51% participation, ~90% Freshmen.

(Notes: participation = matched pre/post participation)

This Problem Solving category (one of three) includes 7 statements such as: “If I want to apply a method used for solving one chemistry problem to another problem, the problems must involve very similar situations.”

Both schools show gains in the Atomic-Molecular Perspective category, however, there are no significant differences between the schools’ Pre and Post scores on average.

Discussion

• Despite different demographics, schools have similar CLASS-Chem scores.
• Canadian Personal Interest scores: significantly higher Pre and Post.
• Canadian Problem Solving scores: significantly higher Pre-CLASS-Chem.
• Negative shifts after gen-chem appear larger for Can students, esp. in:
  • Personal Interest and Problem Solving categories
• Both institutions suffer the largest negative shift in students’:
  • Personal Interest
  • Real-World Connection

References


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