Enhancing Undergraduate Students' Nano-literacy through an Instructional Module

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Abstract

This poster reports a preliminary effort to help undergraduate students achieve nano-literacy through a 3-hour lecture-based instructional module in a materials science course for non-majors. Analysis of students' responses to a nano-literacy survey indicated that they made gains in nano-literacy during the module, but their explanations of two real-life nanotechnology applications revealed that few students were able to do so using scientific reasoning.

Study Goal

Evaluate the efficacy of an introductory nanoscience module in enhancing undergraduate students' nano-literacy

Background

• Definition of *nano-literacy*: The capacity and readiness to approach, comprehend, and deal with phenomena involving nanoscience

• The rapid development of nanoscience requires a workforce that is nano-literate, as well as a population that is capable of grasping nano-related phenomena and technologies in their lives

• Educators are faced with the challenge of how to help young students in schools today to become such citizens (Foley & Hersam, 2006)

Study Design

• Participants were 69 students enrolled in a non-major material science course (Spring 07)

• An introductory module to nanoscience and nanotechnology (M. Hersam) was delivered in three consecutive lectures

• Participants completed an online nano-literacy survey immediately before (pre) and after (post) the module was delivered

  • *Pre- and Post-survey*: 27 Likert-like items (1-5 scale) assessing students' perception of their knowledge of nanotechnology and their ability to explain it and engage in discussions on the topic (18 items), as well as their attitudes towards nanoscience and nanotechnology (9 items)

  • *Post-survey only*: Two additional open-ended items requiring explanation of the mechanisms behind two real-life nanoscience applications covered in the module

Results

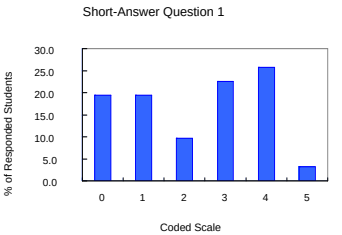
• Pre- and post-responses on the 27 Likert-like items were compared using paired t-test

  • Significant increase for 16 out of 18 items assessing students' self-perception of their knowledge and ability to participate in nano-related activities

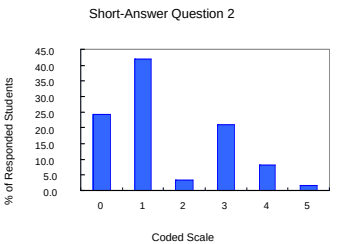
  • No significant change for 7 out of 9 items assessing students' attitudes towards nanoscience and nanotechnology, though ratings generally indicate a positive attitude

• Two post-survey open-ended items were coded on a 0-5 scale by two researcher (inter-rater agreement of 83%)

Code	Reasoning	
0	No response	
1	No, I can't or I don't know	
2	Irrelevant responses	
3	Claim + Intuitive Justification	Explain or reas on by everyday social language
4	Claim + Scientifi c Justification	Explain or reason by using school science or scientific language
5	Claim + Scientifi c Justification + Nano-science	Explain or reason by using school science or scientific lan guage in the context of nano-science



Open-ended Q1 (Explanation of Docker pants)



Open-ended Q2 (Explanation of anti-bacteria fridge)

Conclusion

• The module was effective in enhancing students' *self-perception* of their capacity, but not necessarily their *true ability*, in explaining nano-related issues

• Pedagogical suggestion: Incorporate knowledge-application opportunities and reflection moments into the class to help students gain a fair assessment of their knowledge