

DEVELOPING CRITICAL THINKING IN STEM: A PROPOSED TOOL

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Background

Within the university sector, there is a strong consensus that critical thinking is essential with a vast majority of educators stating that developing students' ability to think critically is an essential goal of undergraduate education. But in effect, critical thinking is in general not widely or efficiently taught in higher education (Arum and Roska, 2011).

Aims

To demonstrate:

- that employers of STEM graduates expect critical thinking skills in graduates,
- that students are not necessarily aware of their critical thinking skills or struggle to articulate them,
- that a pilot tool focusing on fostering critical thinking had positive impact on student disposition towards critical thinking, and,

Description of intervention

A model of critical thinking in STEM has been developed and a corresponding pilot teaching tool has been designed. The tool contains icons, short videos and quizzes aimed at explaining and assessing the understanding of the main concepts of critical thinking in STEM context. This tool is designed to be used in conjunction with authentic, ill-structured assessment tasks and has been tested in 2015 and 2016. The present study present qualitative and quantitative results that have been used to validate the relevance of this project.

Design and methods

Qualitative and quantitative data have been collected in this study. An anonymous online survey was conducted on industry representatives (n=17) looking at their company's expectations concerning graduate critical thinking skills. Students were anonymously surveyed (n = 33) and completed the California Critical Thinking Disposition Inventory (n=115) to assess perception of critical thinking education, skills and articulation of their skills.

Results

Relevant Industry survey results indicate a need for increased university education of critical thinking skills, especially within context. STEM students' survey showed the awareness of the students about the discrepancy between the skills required as graduates and those being explicitly developed. In focus group and survey, students indicated understanding the importance of critical thinking in employability but many did not feel confident in articulating examples or instances of critical thinking. Pre and post-intervention analyses provide positive initial results indicating an increase in student disposition and awareness around critical thinking (2015-PreTest, n=50, median=302.5; 2015-PostTest, n=42, median=315.5). These positive results align with in-class pre-post intervention assessment indicating increased understanding of critical thinking concepts.

Conclusions

This proof-of-concept study shows the relevance and effectiveness of the critical thinking tool and justifies its extension and further collaborative development amongst interested parties in the university sector in order to increase students' employability.

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References

Arum, R. and Roska, J. (2011), *Academically Adrift: Limited Learning on College Campuses*. University of Chicago Press

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