Overcoming challenges in a STEM classroom using a drama in education approach: An exploration of imaginary and objective thinking.

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A research project under the supervision of Prof Carmel O'Sullivan and the support of Trinity Walton Club for STEM education.

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Introduction

This research project set out to investigate whether drama in education can assist at achieving the two major goals of Science, Technology, Engineering and Mathematics (STEM) education; a. STEM interdisciplinary learning and b. real-world problem based learning. This enquiry was developed upon the hypothesis that drama is by definition connected to human conflicts so it naturally embraces problem based learning. Also, in educational drama, knowledge is based on human action which is always holistic and cross-disciplinary so it might have the potential to promote learning across all STEM disciplines. In addition, based on Edward Bond's theory of imagination and objective conception of reality, this study attempted to examine whether drama, being an art form, can align with scientific thinking in a STEM environment. More specifically, this research aimed to explore the scientists' reaction towards imaginary frames that are tangled around scientific concepts, in order to investigate whether imaginary thinking is able to assist at better understanding of scientific concepts.

Main challenges of STEM education

Challenges at achieving STEM interdisciplinary learning.

STEM teachers often don't know how to design and apply interdisciplinary programs.

STEM teachers often think it's unrealistic to integrate all sciences in one session.

In a school setting, the categorisation of scientific knowledge into disciplines creates inflexible boundaries to any effort to develop integrative science and maths programs.

Challenges at achieving STEM real world problem based learning.

The STEM teachers often find it challenging to find a problem upon which they would develop a problem-based lesson plan.

Textbook real world scenarios often fail to present real life applications as they usually lack human endeavour.

Research Questions

Can drama as a teaching and learning methodology;

Help achieving interdisciplinary learning among the STEM strands?

Help promote real-world problem based learning in a STEM classroom?

How do STEM tutors respond towards drama as a teaching & learning methodology in their subject area?

Research Methods

Literature review of the fundamental theoretical and practical tools of drama in education.

Literature review of the already existing knowledge of the nature, aims and implementation challenges of STEM education.

Semi-structured interviews with the STEM tutors.

2 types of questionnaires, one for the students and one for the tutors.

Observation notes before and during the intervention, including non-participant observation.

Drama as a research tool, evaluating the participants' engagement, and STEM knowledge attribution.

Data was gathered from 10 drama sessions, with 2 groups of 65 teenagers. 6 STEM tutors, all researchers at the TCD School of Physics with no prior drama experience, were invited to get involved in the design and inplemetation of the drama sessions.

STEM tutors' response to drama

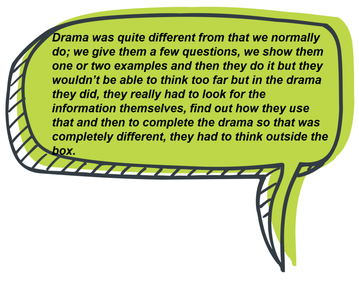
All tutors despite having any prior experience in classroom drama, got very actively engaged with the STEM drama sessions planning process, such as co-deciding the fictional frame and assisting at creating the resources.

All tutors agreed that drama has the potential to work as a framework for problem-based STEM learning.

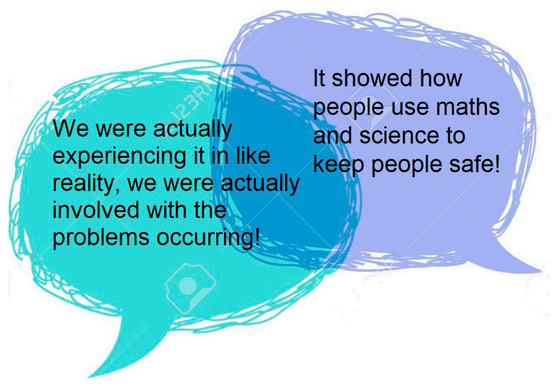
All tutors agreed that they can achieve STEM interdisciplinary learning through drama.

50% of the tutors said that drama helped the students to better understand a STEM problem.

50% of the tutors would use drama again to show the application of STEM skills in a real life context.



Young participants' response to the STEM drama



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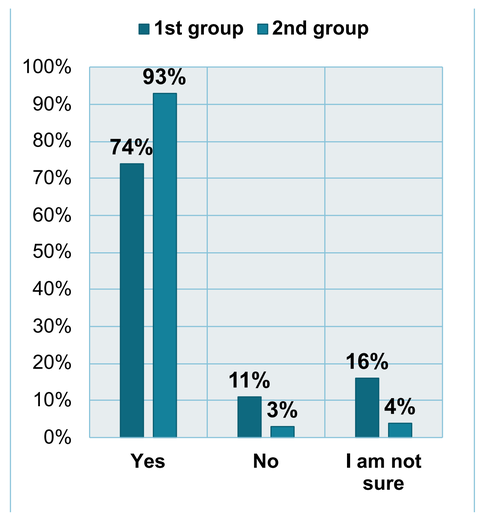
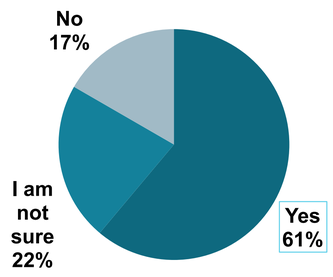


"Did this approach help you to see any links between science and real-life?"



"Did this approach help you better understand how scientists feel & work?"

I was thinking in a different way that I usually think [...] I am sure the problems we dealt with are problems that scientists are working on [...] I learnt that they (the scientists) need to do a lot of different things [...] They are under a lot of pressure [...] It showed how scientists have to explain and describe their workings to other people!

Conclusion

The findings of this study showed drama as a teaching and learning methodology can promote the main goals of the STEM education movement which are interdisciplinary learning across STEM disciplines and real-world problem based learning.

This study also showed that scientists guided by a trained drama teacher, were in a position to effectively develop complex imaginary frames and to tight advance scientific concepts around them indicating further theoretical implications about the nature of objective and imaginary thinking.

Discussion

Is imaginative thinking, in the simple form of thought experiments, or in the more complex form of theatre;
able to co-exist with objective thinking?
able to help at scientific concept understanding?
able to produce scientific knowledge?

References

Barakos, L., Lujan, V. & Strang, C. (2012) *Science, technology, engineering, mathematics (STEM): Catalyzing change amid the confusion.* Portsmouth: NH: RMC Research Corporation, Centre of Instruction.

Bowell, P. & Heap, B.S. (2012) *Planning process drama: Enriching teaching and learning.* London: Routledge.

Davis, D. (2014) *Imagining the Real: Towards a new theory of drama in education.* England: Trentham Books.

Tytler, R., Osborne, J. F., Williams, G., Tytler, K., & Cripps Clark. J. (2008). *Opening up pathways: Engagement in STEM across the primary-secondary school transition. A review of the literature concerning supports and barriers to STEM engagement at primary-secondary transition.* Canberra: Australian Department of Education, Employment and Workplace Relations.