

Thinking Outside the Algorithmic Box:

Exploring the Role of Creativity in Computational Thinking Education

Stacey A. Koornneef, Miriam Sturdee, Jeremy S. Bradbury

stacey.koornneef@ontariotechu.net, ms535@st-andrews.ac.uk, jeremy.bradbury@ontariotechu.ca

Motivation

- Computational thinking is traditionally taught in a logic-based and skill acquisition approach [1].
- Creativity and play have been proven to increase computational thinking acquisition and engagement [2,3]
- Lack of creativity in computational thinking education can disengage some learners
- Educators lack evidence-based guidance on developing inclusive, creative CT activities

RQ1: How does integrating tangible creative methods (drawing and sculpting) impact learners' motivation and engagement in CT?

RQ2: When expressing CT concepts using tangible creative methods, how do learners use that tangible creative method and how effective are they at explaining that CT concept?

RQ3: What forms of communication within tangible creative methods provide the most insight into learners' CT understanding?

"I liked that it was creative and allowed for the creation of different perspectives on familiar algorithms."

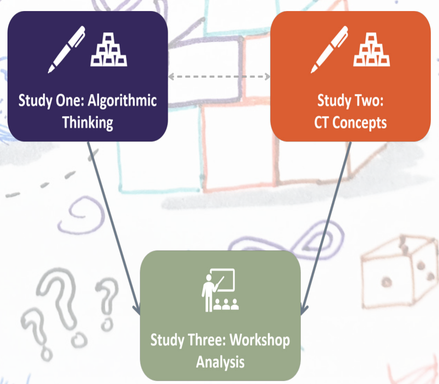


Study Design

Study One: Evaluate how sketching and drawing relate to algorithms through students creating artifacts, students evaluating artifacts, and instructor interviews

Study Two: Evaluate how sketching and drawing relate to computational thinking through students creating artifacts, students evaluating artifacts, and instructor interviews

Study Three: Develop and run a workshop using the findings from study one and two



Data Analysis

Written: We will use qualitative content analysis combined with a rubric to understand the correctness and what they use to explain the concepts.

Drawings & Sculptures: We will use a coding scheme to determine what the common aspects are within the artifacts. We will use peer analysis to determine the usefulness of 5 chosen artifacts for each concept and medium.

Some aspects that we will be using for coding include: Use of lines, Shapes, Arrows, Colour, 2D aspects, 3D aspects, Mathematical symbols, and Figurative Features

Potential Impact

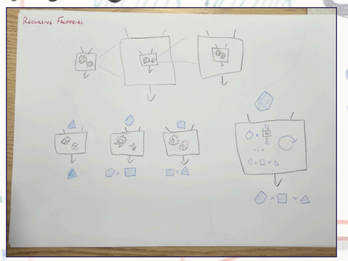
Provide a foundation for future research on integrating creativity into computational thinking education

Understand how creativity contributes to computational thinking learning

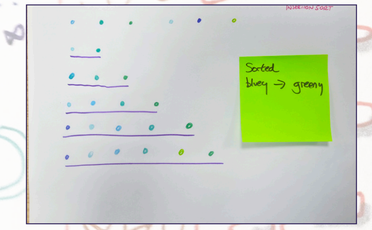
Identify how learners represent computational thinking through creative methods

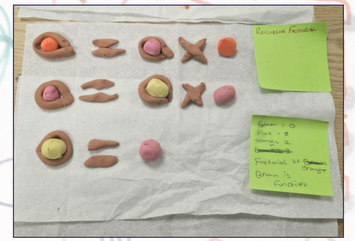
Help reach diverse student populations

Initial Results









University of St Andrews

References

[1] Yeni, S., Grgurina, N., Saeli, M., Hermans, F., Tolboom, J., and Barendsen, E. Interdisciplinary integration of computational thinking in k-12 education: A systematic review. Informatics in Education 23, 1 (2024), 223–278.

[2] Boden, M. A. The creative mind: Myths and mechanisms. Routledge, 2004.

[3] Plucker, J. A., Beghetto, R. A., and Dow, G. T. Why isn't creativity more important to educational psychologists? potetials, pitfalls, and future directions in creativity research. Educational psychologist 39, 2 (2004), 83–96.

OntarioTech UNIVERSITY