"WHITE BOX MINDS" – A COMPUTATIONAL PERSPECTIVE ASSESSMENT OF 3RD GRADE STUDENTS IN A CITY WIDE COMPUTATIONAL THINKING PROJECT

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ABSTRACT

Computing enables and drives many technologies that are integral in todays' society, therefore computational thinking has become a required skill for the 21st century. The conceptual framework of this study was to measure computational thinking of young students undergoing a creative computing course. The course held at 11 elementary schools in Israel emphasized teaching technology creation to prepare young students to the challenges of the digital era by enriching their capabilities of programming and computational thinking. This research has theoretical and practical consequences for educators and curriculum directors.

RESEARCH QUESTIONS

1. What are the reported outcomes of a computing course for students in the computational thinking dimension of "Perspective"?
2. How can educators identify and link their computational curriculum to young students' interests?

COURSE GOALS

1. Equip students with tools to become productive technology creators
2. Sharpen the 21st century computational thinking skills
3. Inspiring and igniting their creative spark

RESEARCH METHODS

204 3rd grade students from 11 schools participated in the research. All have undergone a computing course during school time.

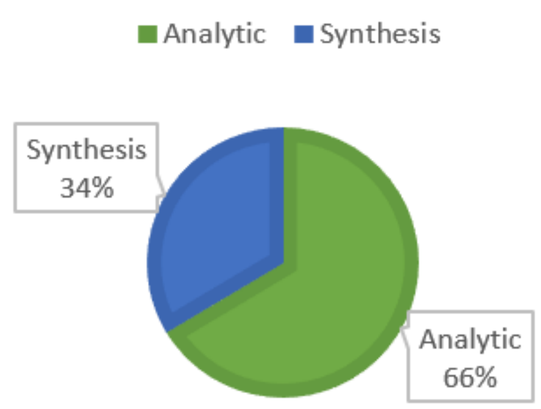
Four instruments were used to collect the data:

1. A post-course self-descriptive questionnaire about technological understanding and perception. Each statement corresponds to a computational perspective sub dimension as described in CTAF (Brennan & Resnick, 2012).
2. A final course questionnaire, in which students were asked to pose a technological question of their interest. This instrument is based on a naturalistic approach for defining student's concerns.
3. Artifact based interviews held with a selection of interested students. These meetings were conducted after the end of the course to gain in-depth understanding of student`s computational views on an ever-changing technological world surrounding them.
4. Analysis of the projects the students have created at the end of the course. This gave the opportunity to try and understand the manner in which the students articulated themselves through game programming.

RESULTS

1. Most students displayed "finding" creativity over "making".
2. All factors had a high average score of over 4 (out of 5).
3. Interest category of "Interrogating technology" and "Creating technology" most appealed to students.
4. Students asked more spontaneous questions than school related questions.

1. Creativity type

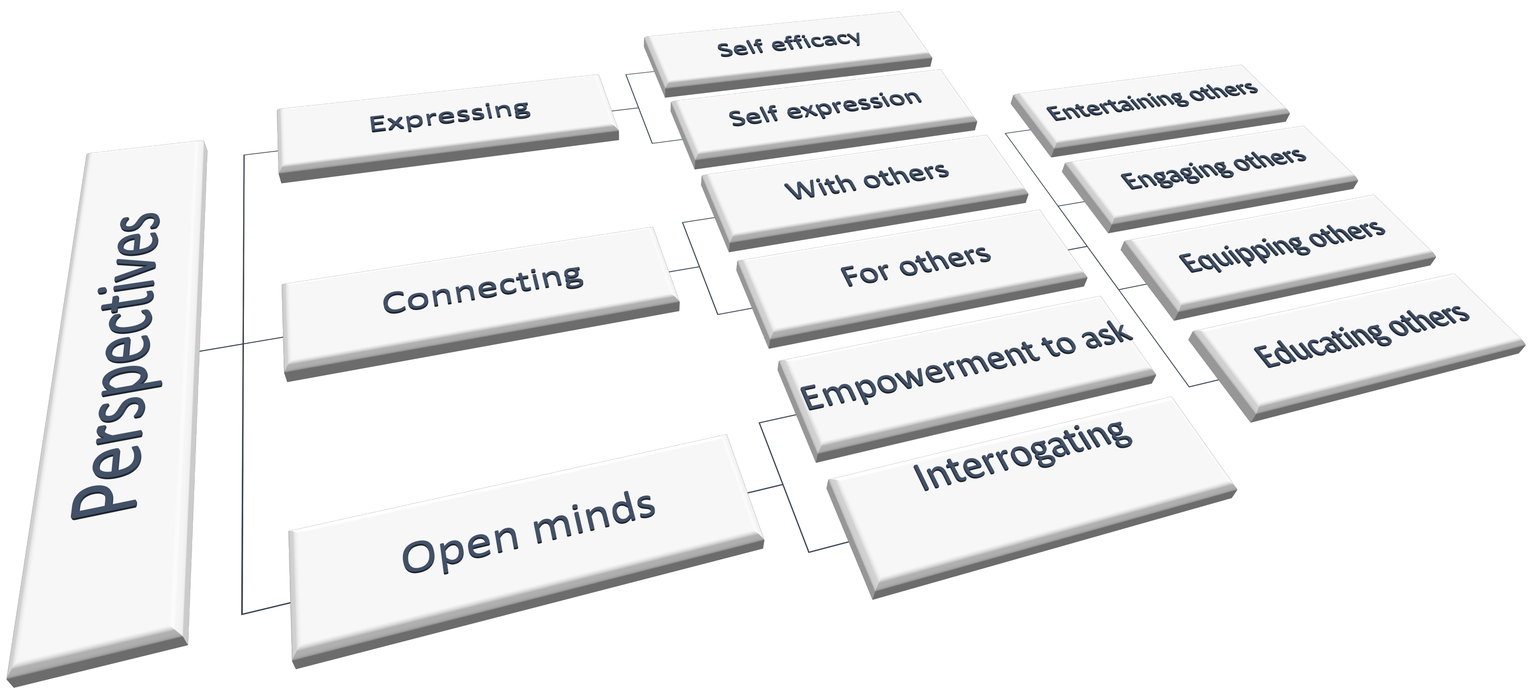


- Synthesis relates to the processes of making/inventing
- Analytic is associated with finding/discovering

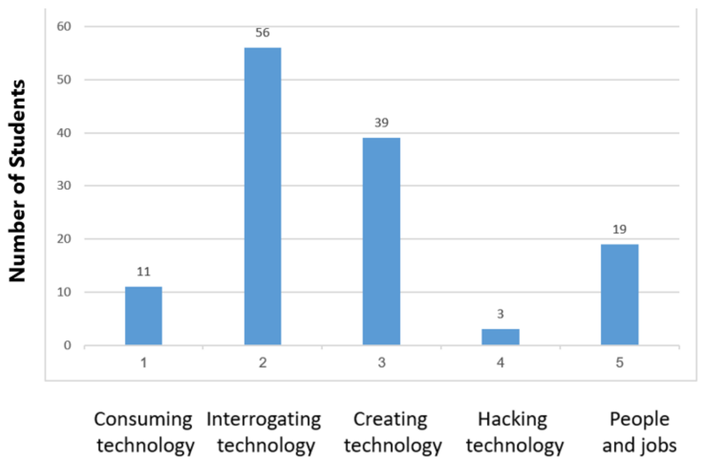
2. Computational perspective domains

Id	Name	Avg	Std
1	Expressing	4.17	**0.85**
2	Connecting	4.14	**1.06**
3	Open minds	4.29	**0.84**

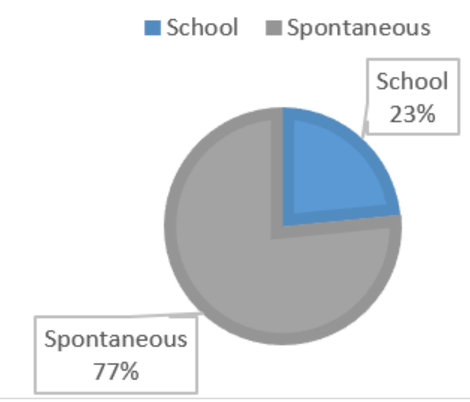
COMPUTATIONAL PERSPECTIVE



3. Fields of Interest



4. Motivation source



- "School" questions related to the course curriculum,
- "Spontaneous" questions were of none course related

CONCLUSIONS

- The study showed that students can see computation as more than something to consume.
- They value creating technology for self-expression while doing so with others and for others.
- Students can feel a connection between the technologies that surround them and their abilities to negotiate the realities of the technological world. They have a sense of empowerment to ask questions about and with technology and a genuine interest in technology.
- Course goals have been achieved but specific changes to the course syllabus could positively improve both the learning experience and teaching practices. These changes stem from considering two main factors: The students fields of interests and their source of motivation.
- The method of identifying student's interests as presented in this study contributes to deepening the existing knowledge in the field and can serve as a tool for educators to improve the attractiveness and relevance of curricula.
- In a broader educational perspective, curriculum creator of non-STEM subject matters can take a step towards interdisciplinary learning using computer game programming as a method to address to student's interests.

REFRENCES

Brennen, K. and M. Resnick. (2012). New Frameworks for Studying and Assessing the Development of Computational Thinking, in Annual Meeting of the AERA. 2012: Vancouver, Canada.