

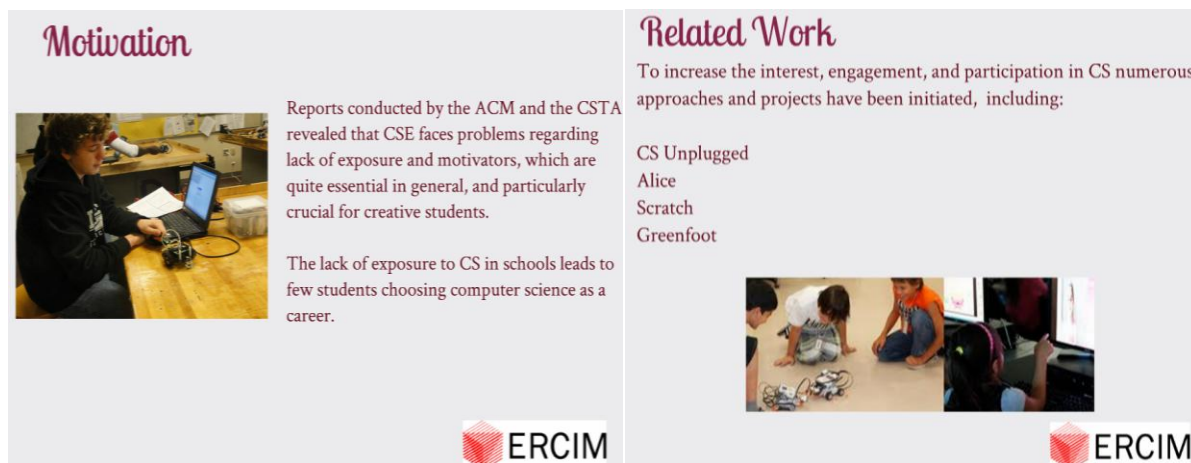
Teaching Computer Science to Young Children through Creativity. Benefits and Perspectives.

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[Prezi screenprints and transcript of text.]



Department of Computer and Information Science (IDI) of the Norwegian University of Science and Technology (NTNU) NTNU: 7 faculties, 53 dep. , 6000 empl. (3000 in research and education), 25.000 students IDI: 45 prof., 75 PhD stud., 6 groups.



Motivation.

Reports conducted by the ACM and the CSTA revealed that CSE faces problems regarding lack of exposure and motivators, which are quite essential in general, and particularly crucial for creative students. The lack of exposure to CS in schools leads to few students choosing computer science as a career.

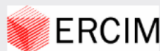
Related Work.

To increase the interest, engagement, and participation in CS numerous approaches and projects have been initiated, including: CS Unplugged, Alice, Scratch, Greenfoot.

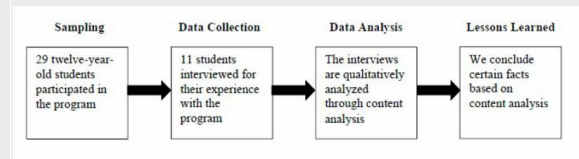
Research Question

The aim of this study is to qualitatively investigate the following question:

Do creative activities provide a mean to engage students into the field of Computer Science ?



Our Research Approach



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Our Research Approach

Sampling (29 twelve-year-old students participated in the program; Data Collection (11 students interviewed for their experience with the program; Data Analysis (The interviews are qualitatively analysed through content analysis; Lessons Learned (We conclude certain facts based on content analysis).

Data Analysis

We followed the method described by Glaser & Strauss, 1967

- After the transcription of the interviews we proceeded with a content analysis.
- Two researchers read all responses first, coding important keywords until categories emerged from similar codes.
- The two researchers discussed and reached consensus in categories.



Results

By analyzing students' responses, the content analysis procedures lead us to the fact that the content can be organized into three main categories:

- Overall experience
- Creativity as a mean for learning programming
- Motivating girls.



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Data Collection

A wide range of data was collected to address the research question, including interviews, photos, and observations.

- A semi-structured interviews were conducted with the children.
- The sampling process was conducted by convenience sampling.
- We interviewed more than the 1/3 of the total sample, we can assume that, due to the qualitative nature of this phase, our sample was sufficient.

We would require the views of the respondent participants to provide more sample questions.

- If you could suggest changes for the workshop, what would those be?
- What do you use your computer for, what do you like best?
- What does interest you most?
- What parts were easy and what were difficult?
- Do you find a workshop a good way to learn something?



In order to give the sense of the interview guide, we are presenting some example questions:

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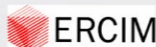
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The Program of the Activity

- Creative Session 1. Create physical characters
- Tutorial 1. : sprite animation, change costume, movement, sound and graphic effect;
- Creative Session 2. Compose a storyboard and start creating scenes in Scratch.
- Tutorial 2. Scratch tutorial, part two: change scenes, synchronization (broadcast and when-receive), check the value of a variable, actions from sensors;
- Creative Session 3. Make your story lively.
- Presentation of the artworks



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Overall Experience	Example of Students Comments
<p>Overall, there was great enthusiasm for the workshop as a new way of learning CS.</p> <p>Students perceived the activity as: Positive and creative learning experience Learning was relatively easy, interesting, and pleasant.</p> <p>Almost all of the students commented that they enjoyed it and that it was a very interesting activity.</p>	<p>I thought it was really fun to learn about the computer, how to make that, and it was fun to make our own character and experience how it was creating something of our own</p> <p>It did raise my interest in the workshop and I think it was enough; I looked very forward to the workshop.</p> <p>I learned lots of new things about programs and how that kind of stuff works, cause I haven't really, we haven't done that in school and so that was interesting</p> <p>I like to build, that we got to build it and not just make it on the computer, but we actually got to build it</p>

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Creativity as a means of learning Programming	Examples of Students Comments
<p>One of the positive aspects of the project was that it made them more interested in arts.</p> <p>Very enthusiastic reactions about the creative part of the workshop, and the majority of the participants could see the link with creativity.</p> <p>The workshop introduced them to 'different versions' of creativity and offered them new perspectives on CS using materials and creativity.</p> <p>The workshop broadened students' perspectives on CS and/or programming.</p> <p>The combination of writing a story and creating characters was very attractive to the students.</p>	<p>I am really interested in art and creating things, but I am not that interested in science and yeah well I want to know how the world works and stuff like that</p> <p>I thought it was really fun to learn about the computer how to make that, and it was fun to make our own character and experience how it was creating something of our own</p> <p>Yes, the advantage is that it is more creativeness you get more ideas to work</p>

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Motivating girls

Girls were challenged and acquired new knowledge about computer science based on the activities with Scratch. Girls became curious about computer science and also gained some new perspectives with regards to what computer science can be.

I always thought that programming was really hard and something that I would not be able to do myself, but it was something that I could do myself..

Actually I didn't find it like it was CS thing, I thought it was more about art I think because we made that animation



I changed my mind, I thought that those programs, on the computer like that was only for stuff, because my dad did that. But now I found out you can make movies and things for children too.

Conclusions

Students described the workshop as a positive and creative learning experience, in which learning was relatively easy, interesting, and pleasant.

The workshops raise students' awareness about CS creativity and motivate them to learn programming.

The program had a particularly positive effect on girls. It offered them new perspectives with regards to what CS is and that it is not limited to boys, giving them more confidence to cultivate an interest in the topic.



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Limitations

Qualitative method which entails some disadvantages.

Findings cannot be generalized to similar situations, as this study was conducted in a particular context, and the aim was to study and evaluate this particular project.

The number of students was small

The workshops were done as structured activities; it would be interesting and useful to see how the results would differ if this arrangement was offered as a regular activity at school.


Further Work

In the next step of this ongoing project, we continue our research with mixed methods (both qualitative and quantitative)

Improve and optimize the workshop experience for our young participants.

Expand our workshop syllabus and make it more attractive by incorporating new materials, sensors, and actuators

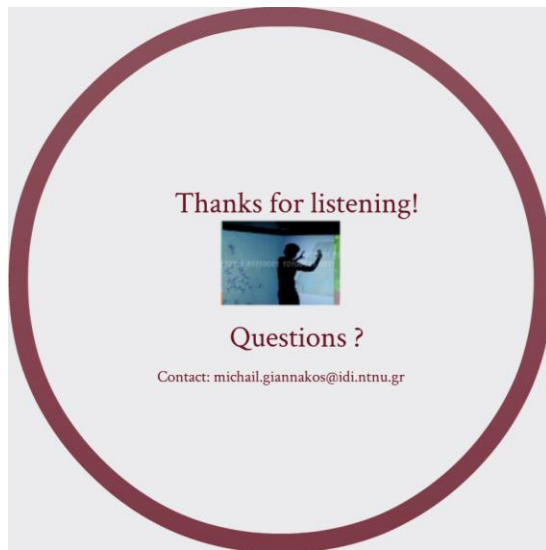
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**Questions?**

Thanks for listening!

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