

Pupils' reflections on the use of a digital self-assessment tool to identify and measure development of 21st century skills during maker activities in schools

Background

- Makerspaces – learning environments enhancing development of 21st C skills.
(e.g. Sheffield et al., 2017; Sheridan et al., 2014)
- 21st C skills - creativity, problem-solving, critical thinking, and digital literacy, communication etcetera. (e.g. Bell 2010; Davies et al., 2011, Jang, 2016).



- Interest in integrating makerspaces in schools. (e.g. Oliver, 2016).
- Integration of makerspaces in school – challenges. (e.g. Godhe et al., 2019; Lin et al., 2020; Walan & Gericke, 2023).
- How to assess development of 21st C skills?



Assessmake 21 project – development of DSAT, pilottesting and evaluation of the tool



<https://www.assessmake21.eu/>

Skills My Portfolio My Badges **Examples** Defintions

Collaboration

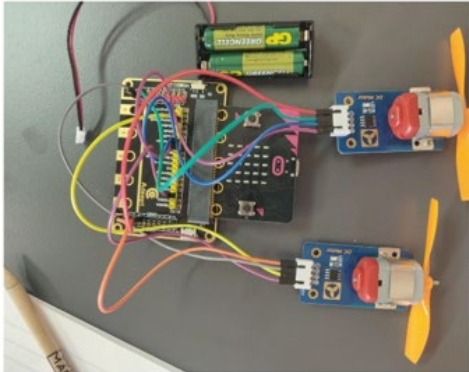
Creativity

Problem-solving

Life/Social Skills

Communication

I am very happy with the result my group and I created. We all contributed to make the two fans spin, we searched information together, we experimented with many ways and we programmed the Micro:bit together.

A photograph of a Micro:bit board connected to two small blue fans with yellow propellers. The board is populated with various components like a battery, resistors, and jumper wires.

Definition

Skills My Portfolio My Badges Examples Definitions

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Based on skills you used during your making session you will complete the following challenges

Collaboration

3 Challenges

Creativity

3 Challenges

Problem-solving

3 Challenges

Life/Social

1 Challenge

Communication

3 Challenges

[Start](#)

Skills My Portfolio My Badges Examples Definitions

Collaboration 1 ●●●●●●●● 2 3 4 ∞

Creativity 1 2 ●●●●●●●● 3 4 ∞

Problem-solving 1 2 3 ●●●●●●●● 4 ∞

Life/Social skills 1 2 3 4 ●●●●●●●● ∞

Communication 1 ●●●●●●●● 2 3 4 ∞

Skills My Portfolio My Badges Examples Definitions

What were you doing that made you pick Creativity?

Generate ideas

Experiment

Implement ideas

Skills My Portfolio My Badges Examples Definitions

How does Contributing collectively make you feel?

<input type="checkbox"/> Happy	<input type="checkbox"/> Satisfied
<input type="checkbox"/> Honest	<input type="checkbox"/> Ambitious
<input type="checkbox"/> Stressed	<input type="checkbox"/> Anxious
<input type="checkbox"/> Weak	<input type="checkbox"/> Compassionate
<input type="checkbox"/> Empathetic	<input type="checkbox"/> Overwhelmed
<input type="checkbox"/> Focused	<input type="checkbox"/> Bored
<input type="checkbox"/> Angry	

[Done >](#)



Research questions

- *How do pupils respond to the design of the digital self-assessment tool?*
- *How do pupils respond to use of a digital self-assessment tool in terms of understanding and identifying development of 21st century skills during makerspace activities in formal educational settings?*

Methodology

- The participants came from two different lower secondary schools, from six different classes ranging from grade 7 to 9 (pupils at age 13-15 years).
 - Different kind of makerspace activities. Each session ending up with use of the DSAT.
- 14 qualitative group interviews with 65 pupils from lower secondary school
 - Thematic analysis. (Braun & Clark, 2006).

Results

Theme	Subtheme
The use of the DSAT	Purpose of using the tool
	Functional issues with the tool Suggestions for improvements of the tool
The 21 st century skills	Understanding
	Development of 21 st century skills

- “I think in retrospect, to be able to check later what we have done, to learn from it, maybe.” (G3).
- “I don’t understand why you should use it.” (G3).
- “It was complicated words... if you don’t read 24/7... it was difficult to understand.” (G12).
- “They could have made a video before, so it was possible to see how to use the tool.” (G11).
- “It makes you reflect. For instance, about how you collaborate with others... so you can improve... if you notice that you never collaborate, you can start doing that.” (G14).
- “You collaborate automatically and improve communication automatically when you collaborate.” (G9).

Discussion and conclusion

- Not all pupils have understood the purpose of using the DSAT. The tool not being intuitive enough? Not good instructions?
- How used were the pupils to self-assessment?
- Designing a self-assessment tool is a difficult task!
- The role of the teacher is important, only written definitions in the tool is not enough.
- Pupils became aware of the 21st century skill when using the DSAT and when participating in makerspace activities, a result also found in other studies. (e.g. Sheffield et al., 2017; Sheridan et al., 2014; Vuorikari et al., 2019).
- Some of the 21st century skills are understood as overlapping, for instance collaboration and communication, and life/social skills were difficult to fully understand.
- To be able to work with adjustments, not possible in the tool.
- If self-assessment tools are to be used by pupils, they need to practice.

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Questions?

Thank you for your attention!