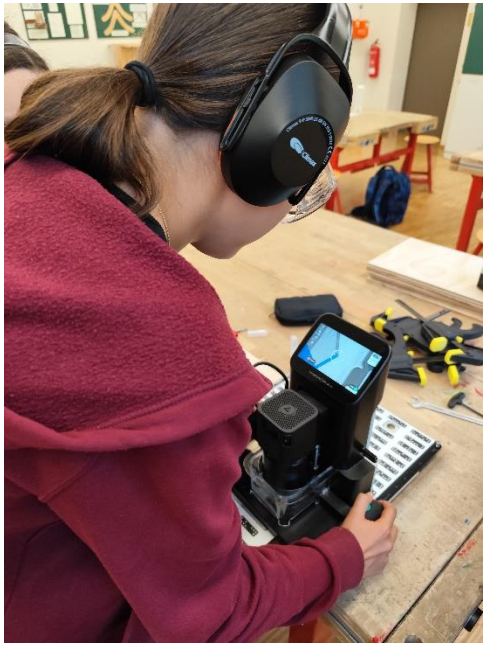
Dr. Theresia Palenta

Empowering Young Women in STEM through Creative Making: Insights from the Hands on! STEM Makerspace Project

New Perspectives in Science Education, Florence, 19.03.26

Outline

- Motivation
- Creative Workshops
  - Lasercutting
  - 3D-printing
  - Embroidery
- Role Models
- Conclusion



Motivation

- STEM subjects are still widely perceived as male-dominated fields
- Girls often report lower motivation and enjoyment in STEM subjects despite equal abilities
- Lower motivation leads to fewer women pursuing STEM education and careers
- This contributes to the STEM gender gap and the shortage of skilled professionals

How can we strengthen motivation and self-efficacy of girls in STEM?

Hands on! STEM Makerspace

Creative STEM Workshops
Hands-on making with digital fabrication tools
Connecting STEM with everyday interests

- Schools
- Youth clubs
- Public events
- ...

STEM Role Models
Direct interaction with women in STEM fields
Challenging stereotypes and providing career insights

STEM Network

Advanced STEM Projects

Hands on! STEM Makerspace

Creative STEM Workshops
Hands-on making with digital fabrication tools
Connecting STEM with everyday interests
- Schools
- Youth clubs
- Public events
- ...

STEM Role Models
Direct interaction with women in STEM fields
Challenging stereotypes

STEM Network

Advanced STEM Projects

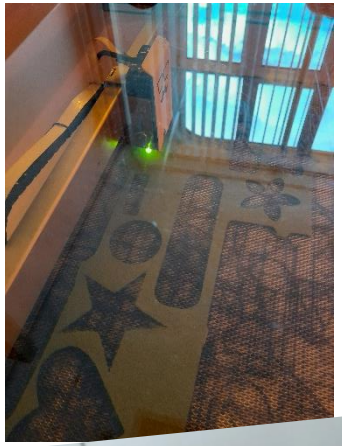
Project reach
running since March 2025
40+ workshops
650+ girls and young women reached

Creative STEM Workshops

mobile Makerspace Equipment

Lasercutting

- Large potential for creativity
- Different materials
- Different complexity
- Suitable for different ages
- Digital design in Inkscape

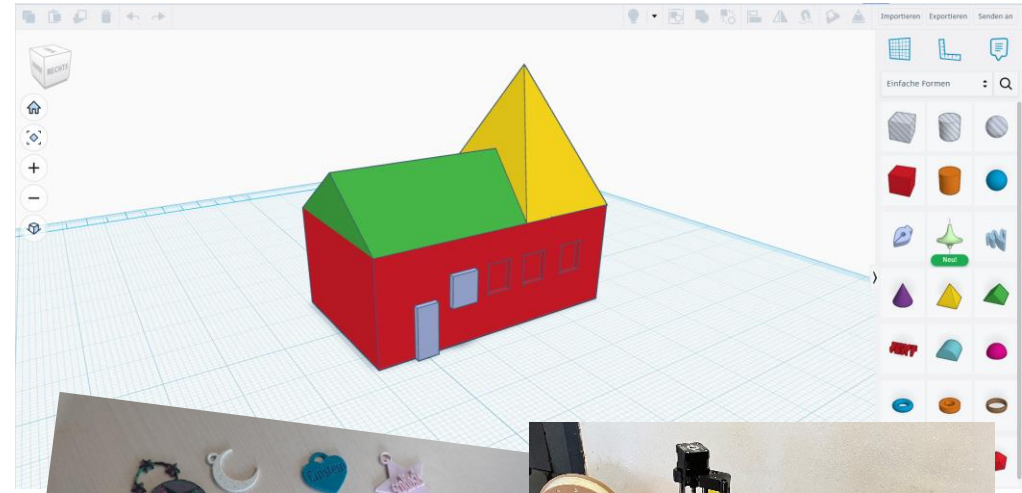


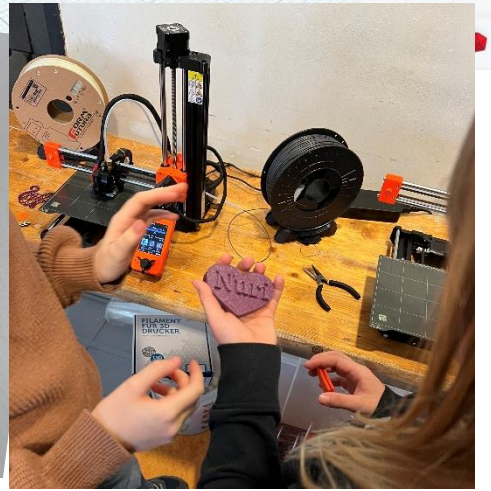
Lasercutting

- Introduction to optical basics
- Fast performance
- Low error rate

3D Printing

- 3D design in Tinkercad
- Intuitive interface
- PC or tablet
- Spatial imagination
- Huge fascination of printing process „growing“



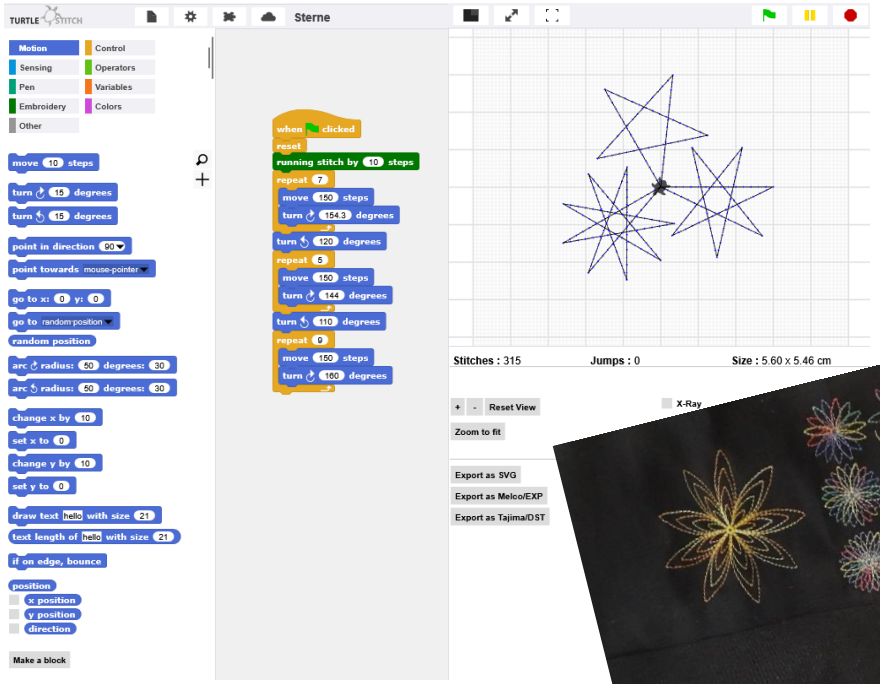


3D Printing

- Self-efficacy of making
- Time consuming
  Overal dimensions and/or prepared parts

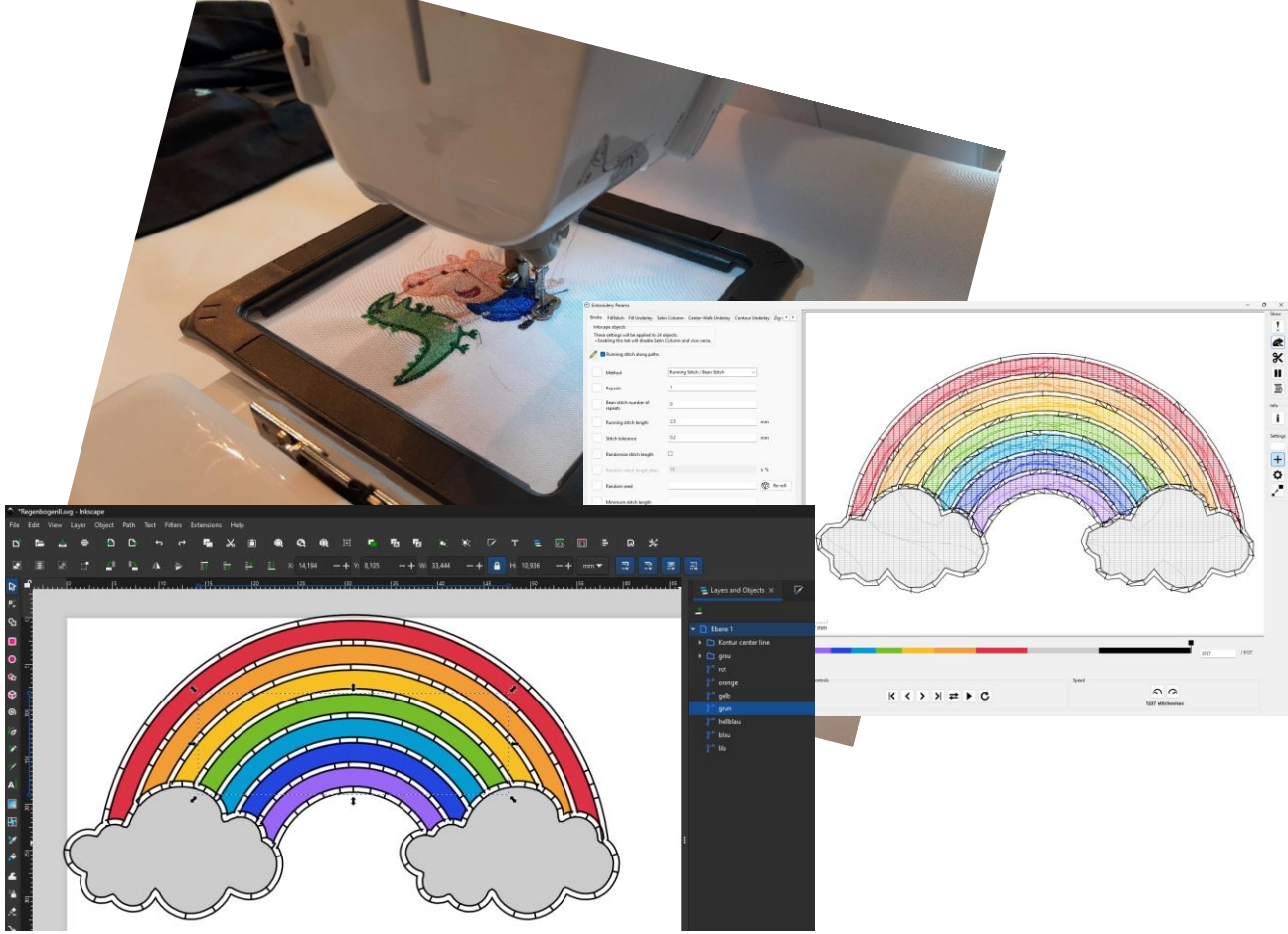
Embroidery

- Turtlestitch
- Coding with blocks
- Geometric patterns
- Iterativ trial and error approach



Embroidery

- InkStitch – add on for Inkscape
- Different stitch types
- Suitable for simple pictures, line Art, Silhouettes
- Introduction to embroidery machine



Combined Workshops

- A lot combinations possible
- Networked thinking
- Problem solving

Feedback

What did you particularly like?

Role Models

Online Gallery

Dr. Maria CHERNYSHEVA (Engineer, Research Group Leader Leibniz Institute of Photonic Technology Jena)

For me, STEM feels like art: exploring the unknown and creating something that has never existed before. Research and engineering are creative disciplines, where ideas, teamwork, and experimentation come together. STEM is not only about knowing answers, but about daring to ask questions. This freedom to explore is what makes science so inspiring.

Image: Sven Döring

Dr. Marija ĆURČIĆ (Physicist, Assistant Professor Uni Belgrade, Serbia)

I didn't always know I would become a scientist, but I always loved solving puzzles. In my work on quantum optics, STEM has given me the tools to turn this love and curiosity into discovery. Quantum optics may sound intimidating, but at its core it's simply about understanding how light behaves, with plenty of room for creativity and imagination.

Image: private

Dr. Maria DIENEROWITZ (Physikerin, Professorin Ernst-Abbe-Hochschule Jena)

Physik und besonders Optik haben mich schon in der Schule fasziniert: Zuckerwasser kann die Polarisation von Licht drehen, unsichtbar und ohne komplizierte Geräte. Forschen heißt für mich gemeinsam denken, diskutieren, Lichter aufgehen und Ideen funkeln lassen. Eine Neugier, die mich auch im Alltag mit meinen drei Kindern begleitet.

35 women with short statements about fascination of STEM, challenges and opportunities

Conclusion

- Creative maker workshops create **low-threshold entry points into STEM**
- Hands-on design and fabrication foster **motivation and self-efficacy**
- Participants experience that **technology is accessible and manageable**
- Role model formats complement the workshops by providing **realistic career perspectives**

Conclusion

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- Participants ex **nd manageable**
- Role model fo ding **realistic career perspe**

Combining creative making and role models can support girls and young women in developing confidence and a sense of belonging in STEM fields.

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Thank you for your attention.

Theresia Palenta