

## A Practical Study on Participatory Digital Fabrication for Inclusive Wayfinding and STEM Learning

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### INTRODUCTION & AIM

This study investigates the impact of **participatory digital fabrication** in inclusive education, allowing students to co-design spaces and learning tools.

Grounded in *Universal Design for Learning (UDL)* and *creative co-design*, the project aims to turn communication barriers into shared challenges that foster:

- Active Participation** & inclusion within the school community.
- Spatial Accessibility** through tangible student-led solutions.
- Hands-on STEM Learning** connected to the common good.

### METHOD

**Participants | 30 Students > 3 Teachers**

**Iterative Process (4 Phases)**

The intervention followed a design-thinking iterative workflow:

**Empathize → Think → Make → Improve**

**Identify:** Students mapped accessibility and orientation needs in shared school spaces.

**Create:** Designed and 3D-printed tactile, high-contrast signage.

**Extend:** Developed **5 angle-learning kits** for peer tutoring with younger pupils.

**Data Collection**

Mixed methods were used to evaluate the process:

Assessment rubrics & student self-assessment

Focus groups

Formative feedback loops

### RESULTS & DISCUSSION

**Tangible Outcomes**

The co-design and fabrication phase successfully delivered:

**9 Tactile Restroom Signs** (including 1 fully accessible sign) to improve school orientation.

**5 Manipulable Geometry Kits** deployed for peer-tutoring activities.

**Educational Impact & Discussion**

Qualitative data and formative feedback highlights that participatory fabrication fosters:

**Student Agency & Collaboration:** Driven by a shared sense of social responsibility.

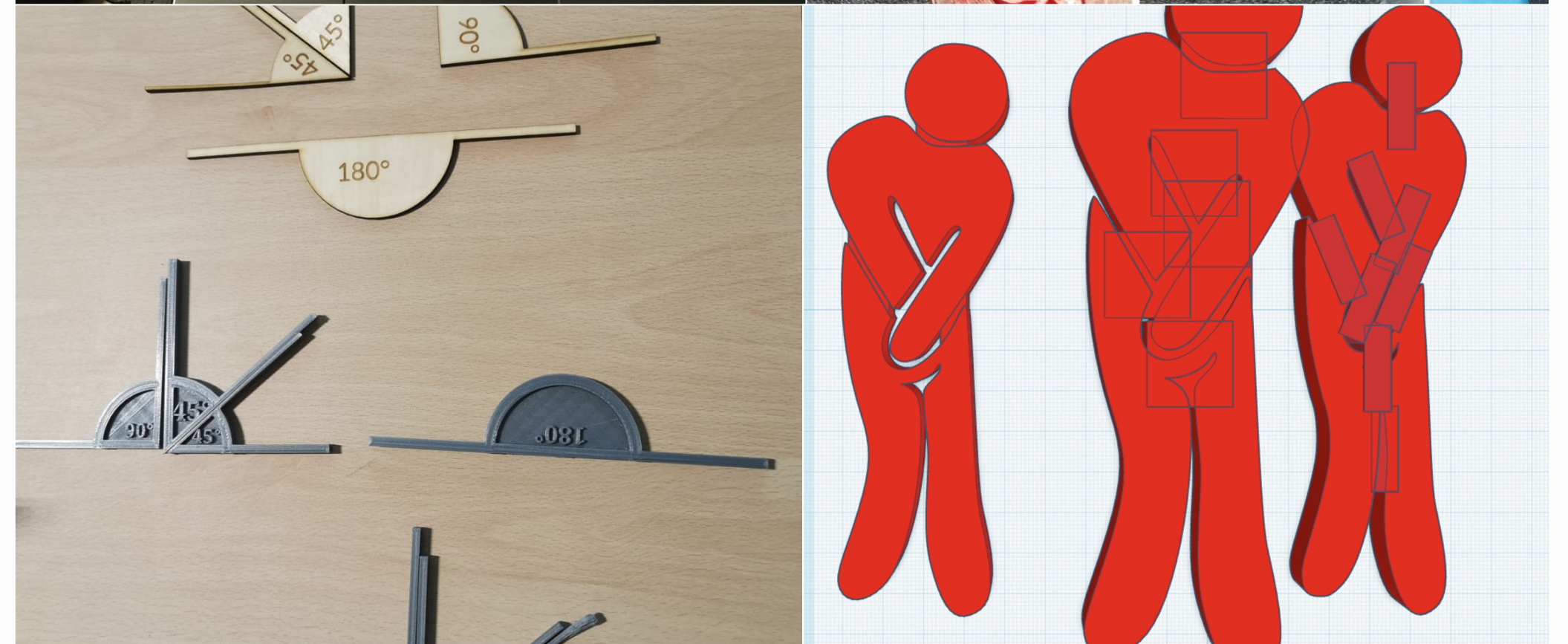
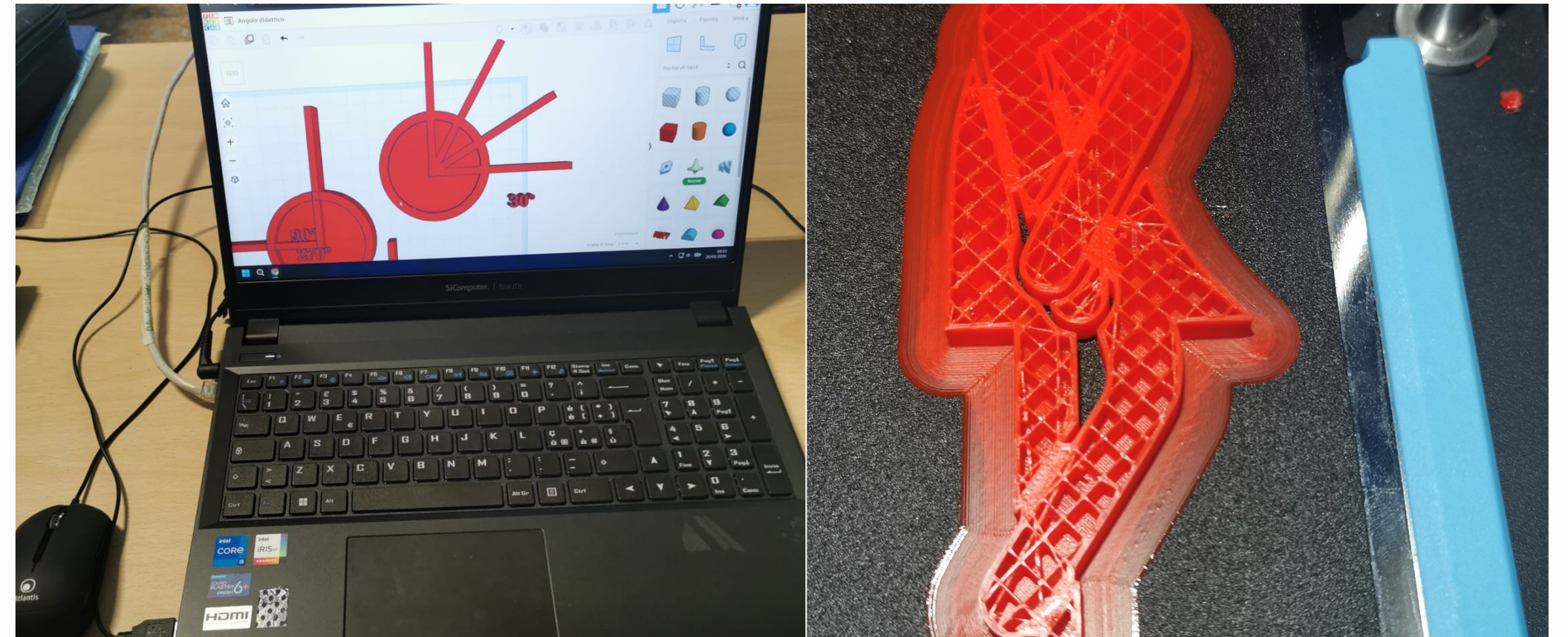
**Inclusive Design Awareness:** Students began viewing school spaces as shared environments that can be collectively improved.

**Deepened STEM Engagement:** Hands-on activities significantly supported students' conceptual understanding of geometry.

### CONCLUSION

**Participatory digital fabrication acts as a powerful bridge between inclusive design, technology-enhanced education, and STEM pedagogy.** > Even small-scale interventions can effectively transform schools into more accessible, collaborative, and educationally meaningful spaces, while offering scalable value for the wider educational community.

### VISUAL EVIDENCE: FROM NEEDS TO PROTOTYPES



### KEY OUTPUTS

30

students

9

tactile signs

5

angle kits

### FUTURE WORK / REFERENCES

**Longitudinal Impact:** Assess the long-term educational and social impact of participatory fabrication on student cohorts.

**Scalability & Guidelines:** Standardize the co-design methodology to create replicable guidelines for other educational contexts.

**Technology Integration:** Explore advanced digital fabrication tools and broader accessibility challenges in schools.

**References**

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