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# **HIGH TECH LEARNING ENVIRONMENTS**

**ARE TEACHERS READY FOR THE FUTURE?**

**Report from research in Kromeritz October 2019.**

# CONTEXT

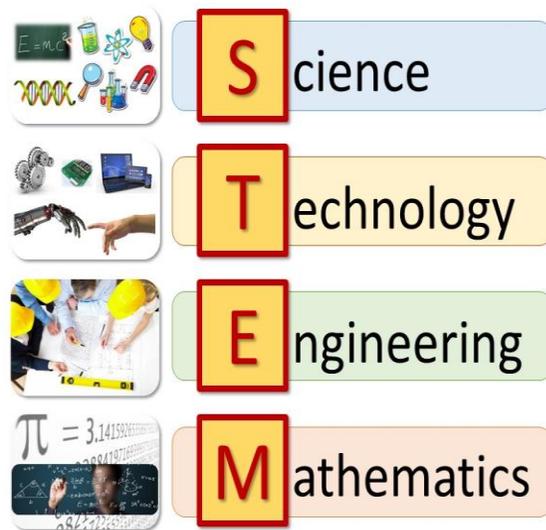
- Erasmus+ project
- Aim to establish a practical European framework for STEM education in innovative out-of-the-classroom learning environments (such as Fablabs or Makerspaces).
- Focus on teachers' self-efficacy to support student learning in Fablabs and Makerspaces.
- Partners from Flanders, Sweden, Italy, Greece, Bulgaria and Czech Republic.



[www.artifexlab.eu](http://www.artifexlab.eu)



# BACKGROUND



STEM COMPETENCIES  
(OECD, 2018)



21<sup>ST</sup> CENTURY SKILLS



INFORMAL LEARNING  
ENVIRONMENTS  
(SCHWARZ & STOLOW, 2006)

# BACKGROUND CONTD.

High tech informal learning environments  
– Fablabs and makerspaces



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High tech informal learning environments  
– Fablabs and makerspaces



## Teachers' self-efficacy (confidence) in three aspects:

- Teaching in informal learning environments, in general and in high tech environments such as Fablabs and makerspaces.
- Using high tech equipment.
- Teaching 21st century skills. (Not analysed yet)

# RESEARCH QUESTIONS

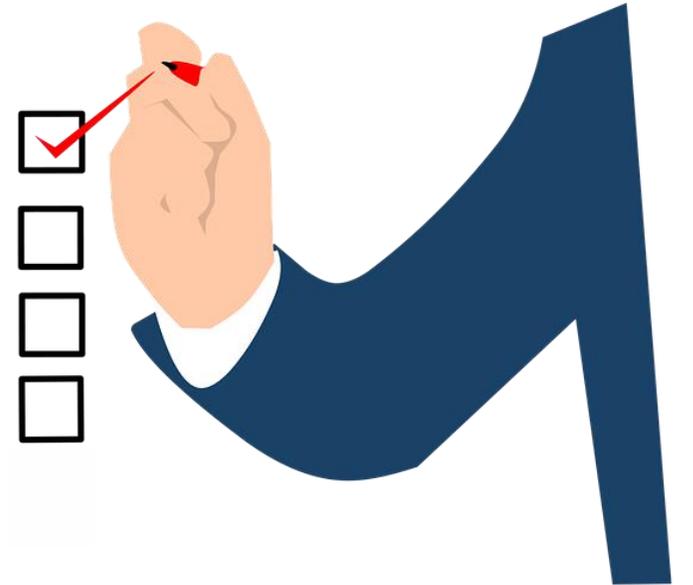
- **RQ1** : How self-effective do teachers feel to
  - (a) teach in these informal learning environments and
  - (b) use the technological equipment?
- **RQ2** : How do teachers differ with regard to these two reported self-effectivity measures?
- **RQ3** : How do teachers identify their own role in these learning environments?

# METHOD - PARTICIPANTS

- Distributed to teachers through different networks, for instance Facebook groups, in Sweden and Flanders.
- Participants: 347 teachers.
- 70% Swedish, 30% Flemish.
- 46% male, 54% female.
- Different years of teaching experience (25% < 10 years, 75% > 10 years).

# METHOD – RESEARCH TOOL

- Online questionnaire
- Groups of items:
  - teaching in informal learning environments
  - using high tech equipment
  - (and 21st century skills)
- 4-point Likert scale – Totally agree, agree, disagree, totally disagree.
- Open ended question about their perceived role in the Fablab/MakerSpace



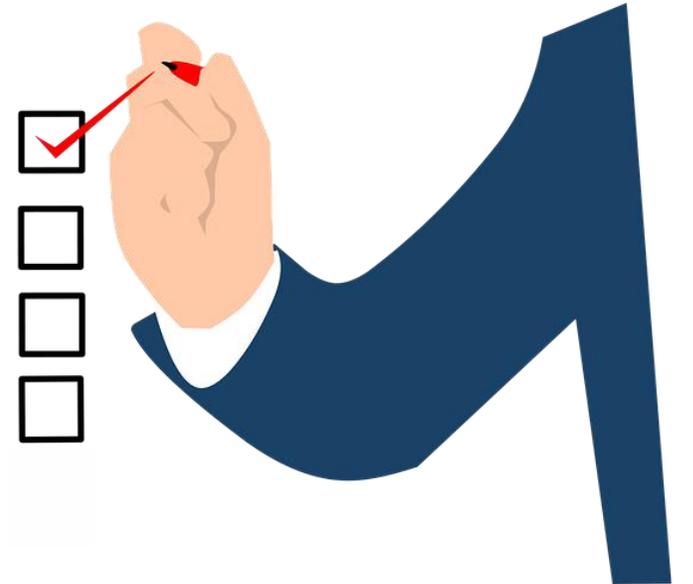
# METHOD – RESEARCH TOOL – SAMPLE ITEMS

## Self-efficacy for teaching in informal learning environments

12 items

I have confidence in how to...

- stimulate students' learning in *out-of-school* learning environments
- follow up a visit to a Fablab/Makerspace
- ...



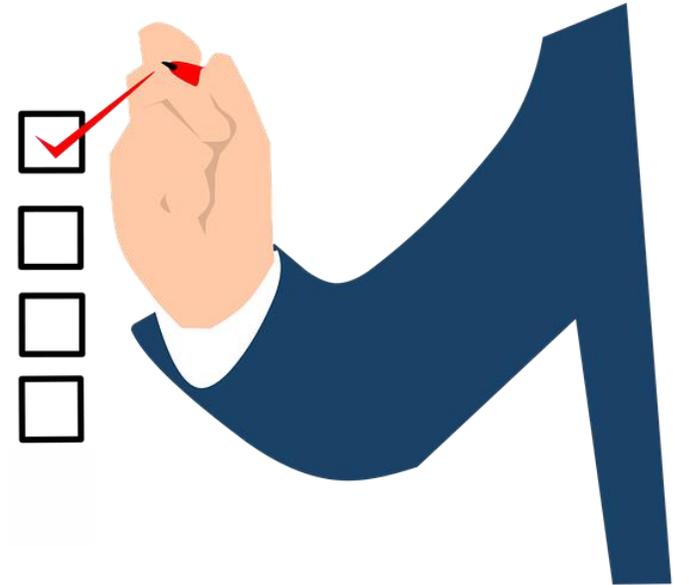
# METHOD – RESEARCH TOOL – SAMPLE ITEMS

## Self-efficacy for using high tech equipment

12 items

I have confidence in how to...

- use technological equipment such as laser cutters
- use robotics in teaching
- ...



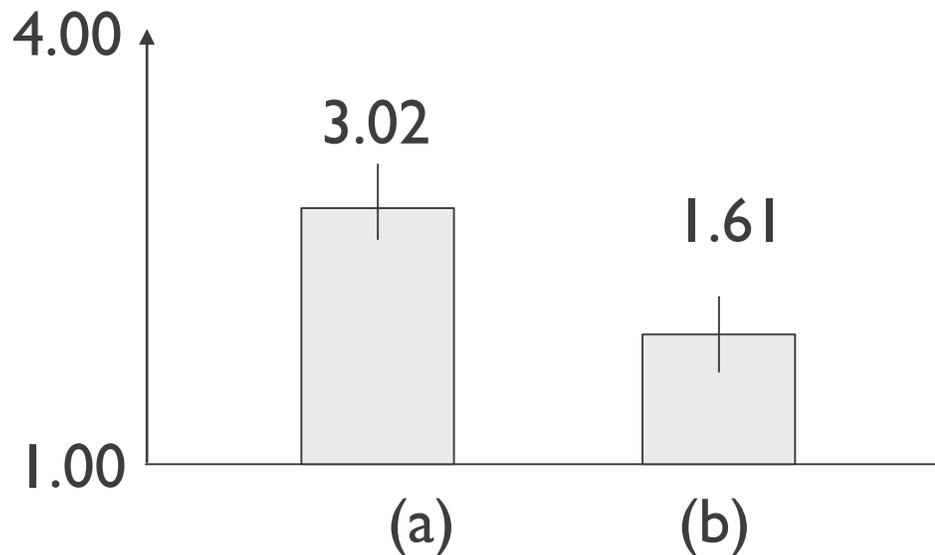
# METHOD - ANALYSIS

- RQ 1: Descriptive statistics – correlations between self-efficacy measures, mean scores, SD.
- RQ 2: Linear regression analyses – relationship between teachers' nationality, gender and teaching experience and self-efficacy measures.
- RQ 3: Content analysis – coding of open ended question.



# RESULTS - RQ1

- **RQ1** : How self-effective do teachers feel in
  - (a) teaching in informal learning environments and
  - (b) using technological equipment?



- Teachers feel moderately confident about their own ability to teach in Fablabs and makerspaces
- They feel ineffective about their own ability to use the technological equipment in Fablabs and makerspaces

# RESULTS - RQ2

- **RQ2** : How do teachers differ with regard to their self efficacy in
  - (a) teaching in informal learning environments and
  - (b) using technological equipment?

(a) **No effects** of teacher characteristics (i.e. **country, sex, and teaching experience**) on **self-efficacy in teaching in informal learning environments**.

(b) For self-efficacy in technology use:

- Belgian teachers reported higher self-efficacy than Swedish teachers.
- Male teachers reported higher self-efficacy than female teachers in Belgium.
- No differences between males and females in Sweden.

# RESULTS - RQ3

- **RQ3** : How do teachers identify their own role in these learning environments?

**We identified 4 main roles :**

- **Unknown**, maybe because they are not familiar with these kind of learning environments (n=97)
- **Active role 'practical'**, support students with practical issues (n=67)
- **Active role 'learn'**, support the learning of the students (n=15)
- **Passive role**, wanting to be an observer, or make sure students behave (n=7)

# RESULTS - RQ3

- **RQ3** : How do teachers identify their own role in these learning environments?
  - **Active role ‘practical’**, support students with practical issues.
    - >> Highly related to self-efficacy for using equipment
  - **Active role ‘learn’**, support the learning of the students.
    - >> Related to self-efficacy for teaching in these spaces

# DISCUSSION

- Using high tech informal learning environments is still quite a new phenomenon.
- Teachers feel not so prepared to teach in such environments.
- Teachers need support and professional development, especially in using the technological equipment themselves.
- Furthermore, their role in these kinds of learning environments needs to be further explored and developed
- Active roles are connected to more self-efficacy and might foster better student learning in Fablabs and MakerSpaces
- More studies to be conducted (in other countries as well).





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**THANK YOU**