JOBSTEM PROJECT - STEM career aspirations during primary schooling: A cohort-sequential longitudinal study of relations between achievement, self-competence beliefs, and career interests

Josip Burušić
IVO PILAR Institute of Social Sciences, Zagreb, Croatia
What is JOBSTEM Project?

- A four-year longitudinal study
- It aims to address the formation and dynamics of interests for STEM-related fields (Science, Technology, Engineering, Mathematics) during primary schooling
- Our research aims are based on insights from contemporary theories of academic achievement, self-competence beliefs, and vocational interests
1. To examine how students’ general and specific STEM career aspirations form and how they change over time

2. To examine how students’ school achievement and self-competence beliefs relate to students’ general and specific STEM vocational preferences and the dynamics of these relations during primary school

3. To examine how students’ general and specific STEM career aspirations are shaped by their families and gender
JOBSTEM Research Team

Brings together researchers from:

- **Croatia**
  - Institute of Social Sciences Ivo Pilar
  - University of Split, Faculty of Philosophy
  - University of Zagreb, Faculty of Electrical Engineering and Computing
  - University of Zagreb, Faculty of Teacher Education

- **France**
  - Université de Poitiers

- **Hungary**
  - Central European University

- **United States**
  - University of California Irvine
Methodological approach

Our study encompasses longitudinal, experimental, and qualitative methodological approaches:

- Cross-sequential design includes **three cohorts** of primary school students assessed through **three successive years**

- The first wave of measurement included a cohort of fourth grade students (*age 10*), a cohort of fifth graders (*age 11*), and a cohort of sixth graders (*age 12*)

- This way we covered a developmental period between ages 10 to 14

- To evaluate the effects of STEM intervention this study encompasses two-group pre- and post-test randomized experimental design

- Each STEM intervention in the experimental group is followed by focus group discussions with students
The longitudinal-sequential design of the study with a two-group pre- and post-test randomized experiment.
Participants

Random sampling of experimental and control schools after clusterization by urbanization level

Random sampling of classes within schools

Number of students in age cohorts

Total number of students

<table>
<thead>
<tr>
<th>Control schools</th>
<th>Experimental schools</th>
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<tbody>
<tr>
<td>N=8</td>
<td>N=8</td>
</tr>
<tr>
<td>4th grade classes N=2</td>
<td>4th grade classes N=2</td>
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<tr>
<td>5th grade classes N=2</td>
<td>5th grade classes N=2</td>
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<tr>
<td>6th grade classes N=2</td>
<td>6th grade classes N=2</td>
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<tr>
<td>Students N=320</td>
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<td>Students N=320</td>
<td>Students N=320</td>
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<tr>
<td>Students N=320</td>
<td>Students N=320</td>
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<tr>
<td>Total number of students N=960</td>
<td>Total number of students N=960</td>
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The three main objectives of the STEM intervention were:

- to increase the interest of elementary school pupils in STEM subjects
- to help students develop positive attitudes towards STEM
- to give students more information about possible future educational and career choices

The intervention took place twice for experimental group and encompassed 12 hours of workshops per student in total.

It consisted of science workshops in students’ schools and workshops and visits to STEM high-educational and scientific institutions in Zagreb.

Intervention outcome measures were carefully designed to provide data about the intervention’s possible effects on students’ interests, achievements, self-competence beliefs and career decisions.
JOBSTEM findings and implications for STEM teachers
Implications for teachers

Motivational beliefs in STEM

- Lower achievers in STEM show substantially lower interests for jobs in STEM area
- Teachers need to be educated on the crucial role of students’ motivational beliefs for STEM career choices
- Teachers can foster students’ achievement beliefs by building on students’ past experiences, interests, and aspirations
- School lessons should include discussions about the value of STEM disciplines in the society, but also students’ everyday activities and future
Implications for teachers

**Gender issues in STEM**

- Our findings suggest that Croatian primary school students slightly endorse the gender-stereotyped belief that STEM subjects are more suitable to boys than to girls.

- Boys and more successful students endorse this stereotype somewhat more.

- Teachers need to be aware of STEM stereotype endorsement in their classroom → This might help identifying children who are vulnerable to the negative consequences of these beliefs, such as stereotype-consistent behavior among female students.

- Boys also show more interest in STEM occupations than girls, with the biggest differences in the fields of Technology and Engineering → Teachers should encourage more girls to see STEM aspirations as desirable.
Implications for teachers

**Participation in out-of-school STEM activities**

- Students’ participation in out-of-school STEM learning contexts needs to be addressed more frequently in the classroom:
  - Informing students about STEM learning opportunities in their local area
  - Organizing school trips and visits
  - Discussing and encouraging students’ out-of-school STEM activities and habits during regular lessons
Implications for teachers

**Collaboration with parents**

- Croatian parents on average highly value achievement in the STEM school domains and the usefulness of STEM school subjects, however, *parental values are weakly related to their children’s importance values of STEM school subjects*

- Schools and teachers can support parents through educating them about the ways they can successfully communicate value of STEM to their children and about the role these values may play in their children’s educational choices

- Implementing utility-based STEM interventions in the school-level policies can be beneficial for both parents and students

- More emphasis should be put especially on work with families from disadvantaged backgrounds
Implications for teachers

Qualitative analysis of STEM intervention program

- Students reported decrease in their stereotypical beliefs about STEM experts through increase of the knowledge about STEM careers
- Students reported increase in their sense of self-efficacy and subjective value for STEM domains
- Very small interest among teachers for conducted activities
- Parents were overall interested in the intervention, but those who are themselves more familiar with STEM area expressed more interest
Implications for teachers

**Implications for future interventions**

- Students prefer activities that:
  - Are hands-on type of activities
  - Offer students the opportunity for autonomy and creative freedom
  - Include learning through play
  - Were perceived as more useful in everyday life
  - Emphasize cooperative learning among students
Thank you!

josip.burusic@pilar.hr

INSTITUTE OF SOCIAL SCIENCES IVO PILAR
CROATIAN
CENTER OF SCIENTIFIC EXCELLENCE
IN SCHOOL EFFECTIVENESS AND MANAGEMENT RESEARCH
Marulicev trg 19, HR - 10000 Zagreb, CROATIA

more info at
www.jobstem.eu