PROJEKT readySTEMgo – PRIPRAVENOSŤ ABSOLVENTOV SŠ PRE ŠTÚDIUM NA VŠ

Doc. PaedDr. Peter Hockicko, PhD.
prodekan pre vzdelávanie EF UNIZA
READYSTEMGO

EARLY IDENTIFICATION OF STEM READINESS AND TARGETED ACADEMIC INTERVENTIONS

Co-funded by the Erasmus+ Programme of the European Union

Erasmus+ Strategic partnership 2014-1-BE02-KA200-000462

Kick-off session, November 19th 2014
Presentation of the project

- secondary education
- STEM education at university

| incoming students |

early identification of those that are at high risk of dropout

targeted academic interventions
the dropout rate in University of Zilina (UNIZA) (2013/2014, 2014/15):

- Faculty of Electrical Engineering: dropout/enrolled = 134/412 = 32.5 %, 134/310 = 43 %
- Faculty of Civil Engineering: dropout/enrolled = 116/246 = 47.2 %, 62/126 = 45.6 %
- Faculty of Mechanical Engineering: dropout/enrolled = 167/340 = 49.1 %, 118/256 = 46.1 %
the dropout rate in KU LUUVEN (2009 - 2013):

- KU Leuven: the cohort 2009-2010
  - 18% of the students stopped during the first year
  - 32% of the students stopped after the first year
  - 5% stopped during the second year
  - 35% stopped after the second year
  - And so on..
Sample (LASSI (Learning and Study Strategies Inventory))

- 815 filled in questionnaires
- 22% female students | 78% male students

<table>
<thead>
<tr>
<th>Study programme</th>
<th>N</th>
<th>%</th>
<th>% Male</th>
<th>% Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inžinierstvo elektrotechnické - Electrical Engineering</td>
<td>199</td>
<td>24%</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>Inžinierstvo stavebné - Civil Engineering</td>
<td>97</td>
<td>12%</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>Security Engineering</td>
<td>126</td>
<td>16%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Vedy - Sciences</td>
<td>260</td>
<td>32%</td>
<td>88%</td>
<td>12%</td>
</tr>
<tr>
<td>Iné</td>
<td>133</td>
<td>16%</td>
<td>59%</td>
<td>41%</td>
</tr>
</tbody>
</table>
What type of secondary school did you attend?

<table>
<thead>
<tr>
<th>Type of school</th>
<th>Electrical engineering</th>
<th>Civil engineering</th>
<th>Security engineering</th>
<th>Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gymnázium</td>
<td>33%</td>
<td>30%</td>
<td>36%</td>
<td>52%</td>
</tr>
<tr>
<td>Stredná odborná škola elektrotechnická</td>
<td>53%</td>
<td>3%</td>
<td>13%</td>
<td>24%</td>
</tr>
<tr>
<td>Stredná odborná škola stavebná</td>
<td>1%</td>
<td>55%</td>
<td>14%</td>
<td>4%</td>
</tr>
<tr>
<td>Stredná odborná škola strojnícka</td>
<td>3%</td>
<td>0%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Iné</td>
<td>12%</td>
<td>12%</td>
<td>34%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Mathematics – School leaving exam

<table>
<thead>
<tr>
<th>Study programme</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Exam not taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inžinierstvo elektrotechnické - Electrical Engineering</td>
<td>8%</td>
<td>10%</td>
<td>6%</td>
<td>3%</td>
<td>73%</td>
</tr>
<tr>
<td>Inžinierstvo stavebné - Civil Engineering</td>
<td>7%</td>
<td>9%</td>
<td>8%</td>
<td>1%</td>
<td>75%</td>
</tr>
<tr>
<td>Security Engineering</td>
<td>4%</td>
<td>9%</td>
<td>11%</td>
<td></td>
<td>76%</td>
</tr>
<tr>
<td>Vedy - Sciences</td>
<td>23%</td>
<td>17%</td>
<td>12%</td>
<td>5%</td>
<td>43%</td>
</tr>
<tr>
<td>Iné</td>
<td>5%</td>
<td>8%</td>
<td>5%</td>
<td>2%</td>
<td>80%</td>
</tr>
<tr>
<td>TOTAL</td>
<td><strong>11%</strong></td>
<td><strong>12%</strong></td>
<td><strong>9%</strong></td>
<td><strong>3%</strong></td>
<td><strong>66%</strong></td>
</tr>
</tbody>
</table>
# Physics – School leaving exam

<table>
<thead>
<tr>
<th>Study programme</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Exam not taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inžinierstvo elektrotechnické - Electrical Engineering</td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
<td>2%</td>
<td>88%</td>
</tr>
<tr>
<td>Inžinierstvo stavebné - Civil Engineering</td>
<td>4%</td>
<td>7%</td>
<td>1%</td>
<td>0%</td>
<td>88%</td>
</tr>
<tr>
<td>Security Engineering</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
<td>94%</td>
</tr>
<tr>
<td>Vedy - Sciences</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>0%</td>
<td>95%</td>
</tr>
<tr>
<td>Iné</td>
<td>0%</td>
<td>2%</td>
<td>1%</td>
<td>0%</td>
<td>98%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>93%</td>
</tr>
</tbody>
</table>
Study aids and amount of effort in secondary school

How hard did you have to study for your study results in secondary school?

- Nevyšnaloží/a som žiadne úsilie - Not hard at all (N=40)
- Nie usilovne - Not hard (N=135)
- Priemerne - on average (N=342)
- Usilovne - Hard (N=151)
- Velmi usilovne - Very hard (N=28)

Score study aids

- Very weak
- Weak
- Average
- Good
- Very good
FCI test (pre-test)

Boxplot Gain of Pre-test results:

UniZA
(FCE – Faculty of Civil Engineering,
FEE – Faculty of Electrical Engineering,
FOE – Faculty of Operation and Economies of Transport and Communications,
Tampere VS - vocational school,
US – Upper secondary)

TARGETED ACADEMIC INTERVENTIONS =>

1. Motivation
   - Task: Choose any motion of a ball for the following analysis.
   - Diagrams of a ball in motion (left), graph showing motion analysis (right).

2. Analysis using Tracker
   - Diagrams of data analysis software Tracker.
   - Graph showing data analysis.

3. Mathematical description
   - Diagrams of mathematical concepts and calculations.

4. Analysis of students' conceptions
   - Diagrams showing student response rates pre and post intervention.

Conclusion
- Analysis by Tracker and PhET Sites: Development and increasing of conception.

Graphs showing response rates:
- Pre-test: Control group vs. Experimental group.
- Post-test: Control group vs. Experimental group.

Q11
- Comparison of response rates pre and post intervention for different groups.
- Bar charts and pie charts showing percentage changes.

Table: Pre-test and Post-test data (N, M, SD, Min, Max, D, p-value) for control and experimental groups.
BEST POSTER AWARD

THIS CERTIFICATE IS PRESENTED TO

Peter Hackicka

FOR THE FIRST POSTER

Exploring of Students’ Knowledge Using the Concept Inventory Test at Technical University

8TH WORLD CONFERENCE ON EDUCATIONAL SCIENCES

04-06 FEBRUARY 2016

AIDA HOTEL CONFERENCE CENTER

MADRID, SPAIN
References: