University of Maribor

Faculty of Electrical Engineering
and Computer Science

The impact of multiple quiz application on student's learning progress – a case study in System Convergence and Integration Domain

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Introduction

- THE PURPOSE OF THE STUDY - to investigate the factors, influencing the student's success during the course **System convergence and integration** (1st Cycle Bologna Study Programme)

- PARAMETERS OF THE STUDY – includes several years of observation and knowledge **evaluation in various stages of the study process** including several tests, quizzes and more frequent lab overviews.

Objectives of the course and learning outcomes

- To understand the importance of integration and system convergence
- To get familiar with integration methods
- To learn modern technologies, tools and semantics for integration

- understand information system convergence and its implications on society
- design and implement integration of information systems on different levels
  - data-level,
  - application-level,
  - process-level, and
  - presentation-level,
- design and implement integration processes
- manage integration projects.

Initial motivation

- Investigation of factors, influencing student's **motivation** as well as **success**

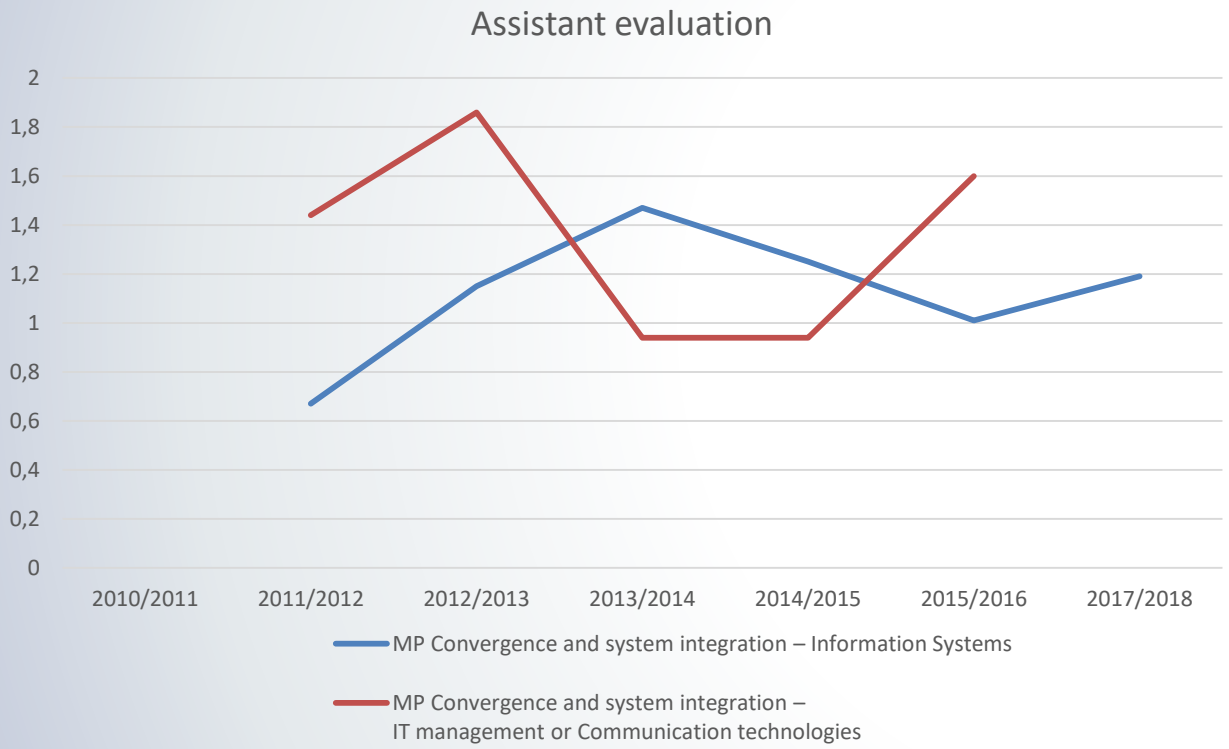
A CASE STUDY:
- Course: **System convergence and integration**
- 1st bologna level
- focus on web and xml technologies
- an obligatory subject in 3d year

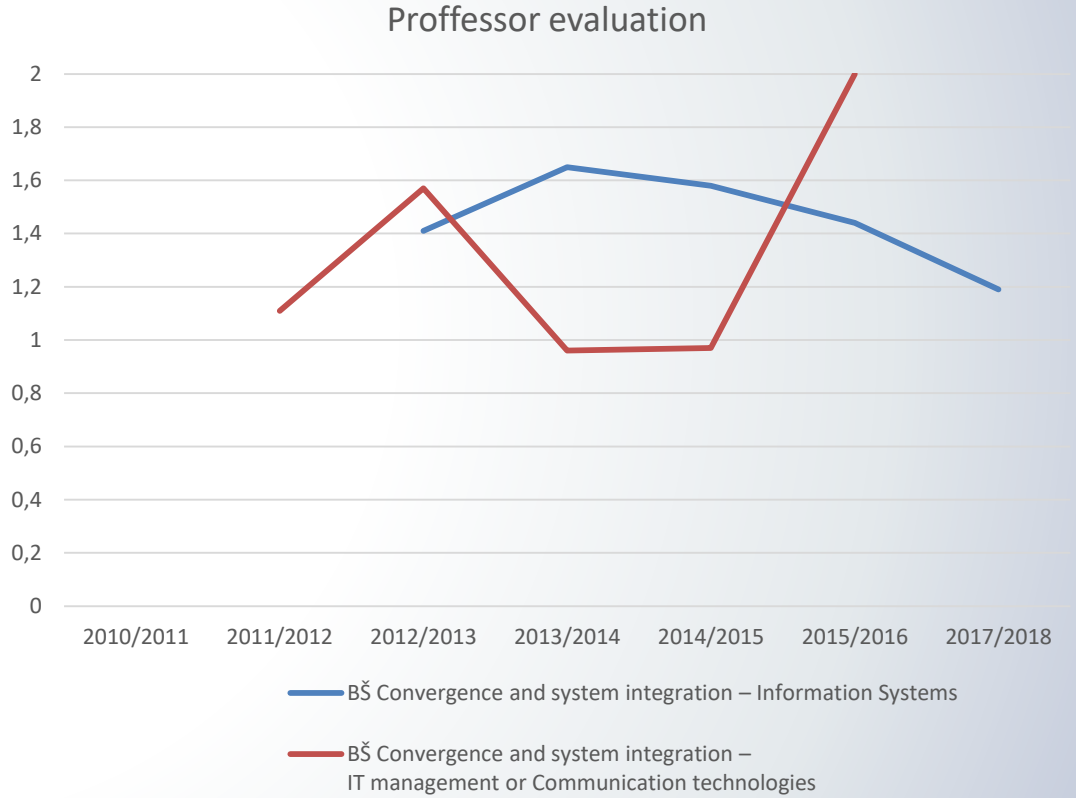
TIMELINE:
- aprox. 10 years of experience
- 3 years of focused observations

APPROACH:
- Quizzes in various stages of semester
- Systematic lab overviews
- Mid-term exam
- Final exam
- Presentations
- Documentation of student's progress on a week-to-week basis

Students' survey results

	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018
Assistant	1,54	1,34	1,15	1,33	1,3	1,4	1,02	1,4	1,52
Professor	1,43	1,03	1,25	1,58	1,47	1,5	1,28	1,4	1,42





ALARM #1 – The evaluations in „Information system" program for the evaluated subject are mainly dropping!

Student‘s grades through years

	2009/ 2010	2012/ 2013	2014/ 2015	2016/ 2017	2017/ 2018	2018/ 2019
Number of enrolled students	60	60	23	19	27	27
Number of successful students	53 (88%)	46 (76%)	18 (78%)	16 (84%)	25 (92,5%)	15 (55,5%)
Average grade	67%	83%	64%	52%	68%	66%

ALARM #1 – The evaluations in „Information system“ program are mainly dropping!

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ALARM #2 – The students‘ grades are dropping/remaining on a low level!

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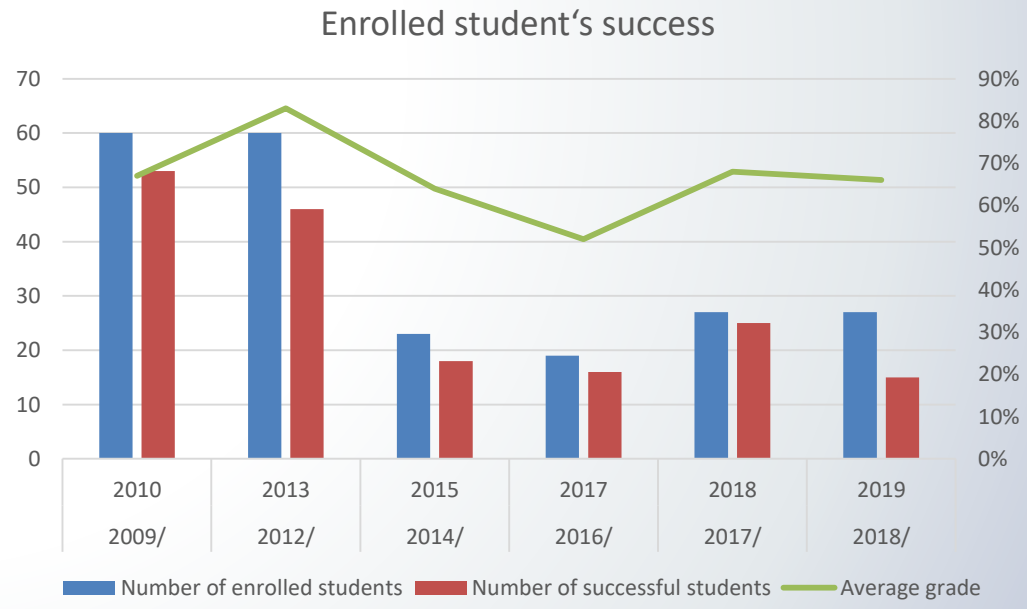
ALARM #3 – Dissatisfied/unmotivated students do not finish their studies or finish them with a lower grade!



Present approach: **frequent evaluation approach**

- Evaluation is in form of online quizzes

- The approach has developed through 3-year time period with additional support of other examples
  - covering several supporting technologies for web services development (XML, XSD, DTD, XSLT, XPath, XQUERY, SOAP, REST, BPEL, SQL)

CHANGE #1
Introduction of more short-term evaluation

1. Week-to-week evaluation of labs
2. Several short quizzes
3. Final presentations (to motivate students to create a good result)

CHANGE #2
Introduction of start-quizzes to evaluate initial knowledge

- The students were given a quiz to evaluate their knowledge
- Initial QUIZ included 21 students:
  - Average grade – 47%
  - MIN grade – 30%
  - MAX grade – 70%

- Close-ended questions (encirclement)
  - Average - 57%
  - MIN - 30%
  - MAX - 90%
- Open-ended questions (answer questions, write code)
  - Average - 37%
  - MIN – 0%
  - MAX - 60%

The Quiz question examples

Using XSL transformations, access the attributes with the $ sign.
- Yes
- No

As part of the XSLT transformations we can store variables?
- Yes
- No

With help of the XPath expression we can check conditions only in case of numerical values (for example root/element[@id=X] the X has to be a numerical value)
- Yes
- No

Within the XML schemas, we can define only one global element, which must be the root of the XML document:
- Yes
- No

As part of XSLT transformations, we have the option of sorting data according to the selected parameter.
- Yes
- No

A type that is directly behind the definition of an element and is not specifically named is called:
- anonymous type
- simple tip
- internal type

The Quiz question examples

Are the errors in the next section of the code?

<select/> <option type="text"/>SLO <option type="text"/>CRO </select> (choose one or more answers)	Inappropriate completion of the 'option' Incorrect use of the 'type' attribute Inappropriate final label of 'select' Insufficient starting tag of 'select'e. No errors

Which of the following tags is not correct for the XML element?

- All tags are incorrect
- <1person>
- <h5>
- <People>

Is the next XML document valid?

<? xml version="1.0" encoding="UTF-8"?> <list> <person id=1> <name>Mojca</name> <address>Maribor</address> </person> </list>	Yes/No

Within the XSL transformations we access the variables using the character:

- @,
- $,
- &name

For provided XML document prepare a vocabulary (XML schema or DTD); include limitation over attribute “kratica” and “povprecje”:

```
<result>
  <subject id="013" abbreviation="MOS"/>
  <people no="2" average="9.5"/>
</result>
```

Compose an XML document, which will include a list of three employees in addition to parameters such as name, address, phone number and date of birth. All employees must have a unique identifier.

For given XML document we conduct XPath query:
employees/employee/personalData/*

```
<?xml version="1.0" encoding="UTF-8"?>
<employees>
<employee id="as_234" type="instructor 1. category">
 <personalData rd="31.12.1970" gender ="M">Marjan  </personalData>
 <contact>
 <phone>02 222 5555</phone>
 <mail>marjan@gmail.com</mail>
 </contact>
</employee>
< employee id="as_233" type ="instructor 2. category">
 <personalData rd="16.5.1980" gender="female">Marija
Zadravec</personalData>
 <contact>
 <phone>041 222 333</phone>
 <mail>marija@gmail.com</mail>
 </contact>
</employee>
</employees>
```

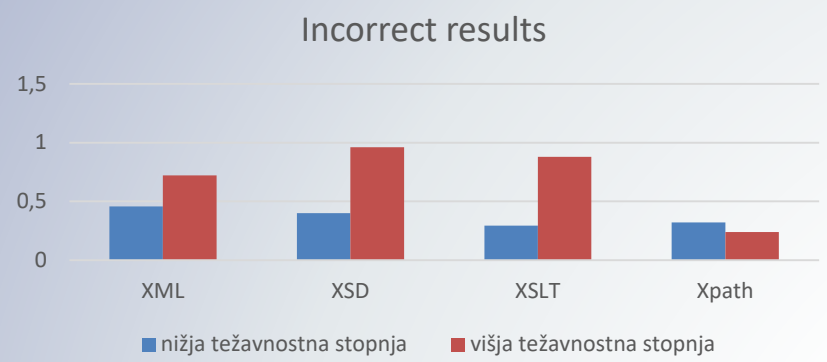
Create a transformation that will convert the original XML document to the target. Explain what type of transformation is involved.

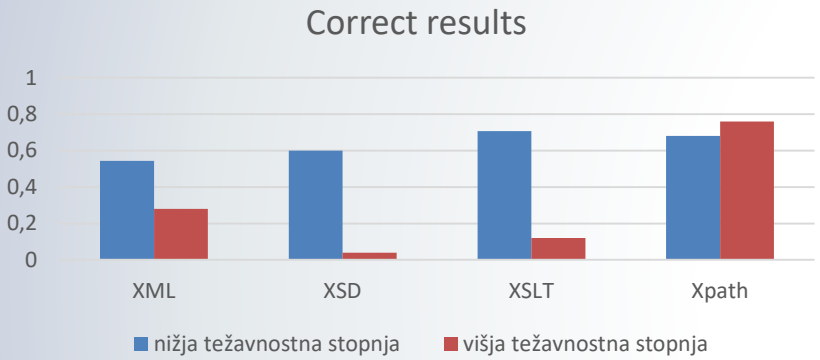
Original XML document

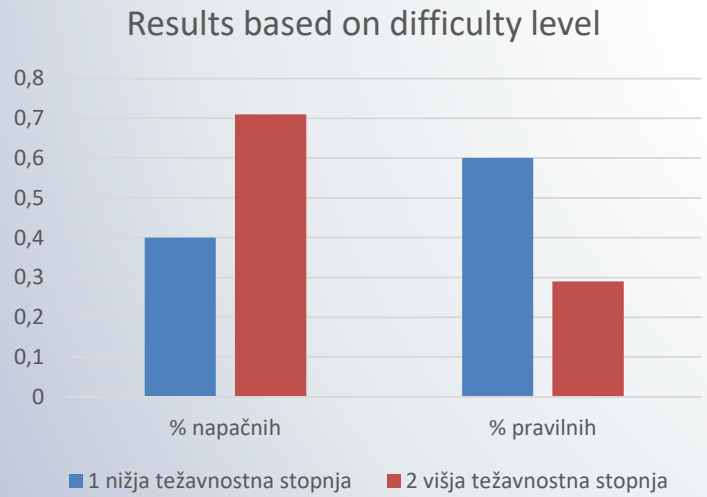
```
<listOfStudents>
    <student index="E23492304">
                <name>Mojca</name>
                <surname>Pokraculja</sur
name>
                <grade>9</grade>
  </student>
  <student index="E23492305">
                <name>Peter</name>
                <surname>Klepec</surna
me>
                <grade>10</grade>
  </student>
</listOfStudents>
```

Result document

```
<list>
<student index="E23492304"
grade="9"/>
<student index=" E23492305"
grade="10"/>
</list>
```



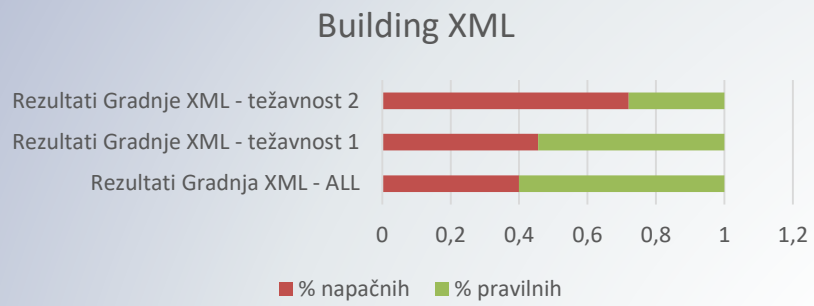


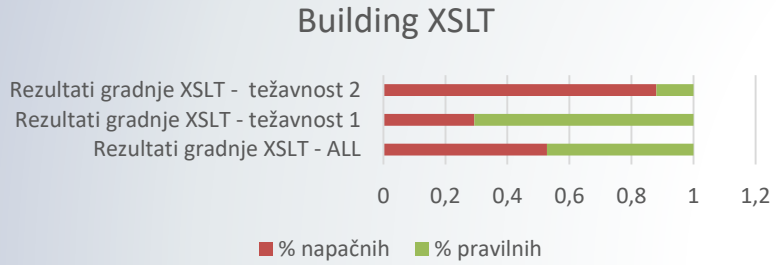


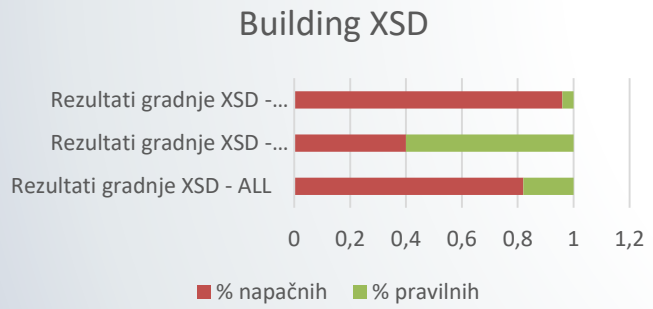
In-depth results evaluation!

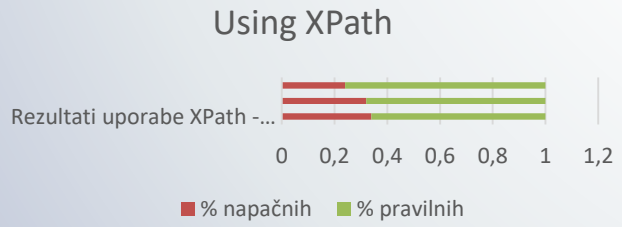
Understanding student‘s strengths and weaknesses

Analysis of the answers by fields









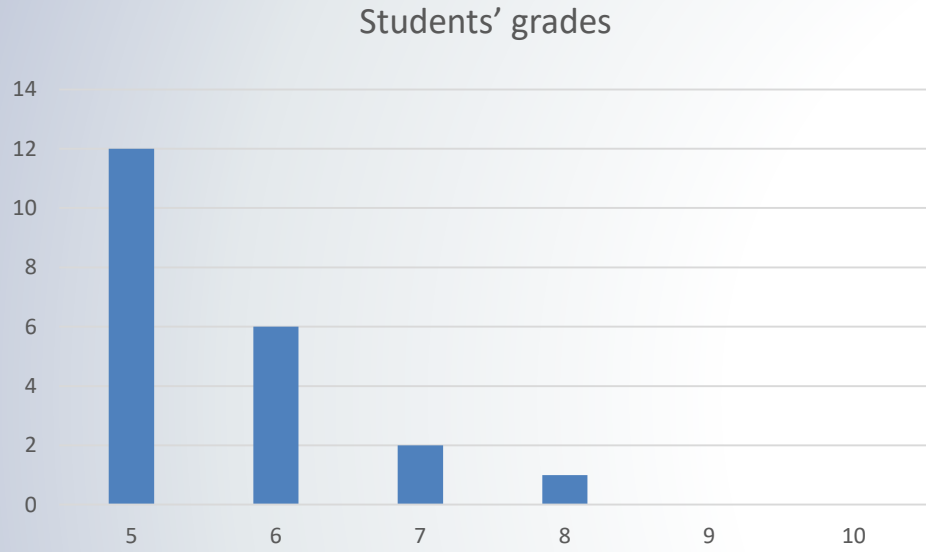
Identifying student‘s knowledge

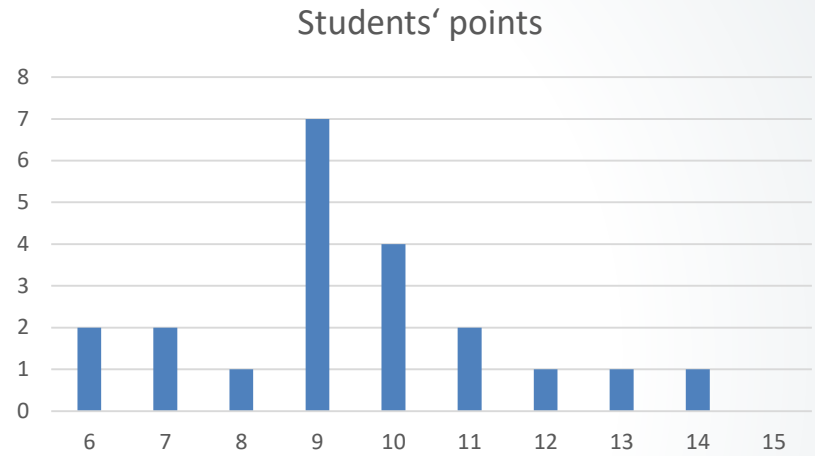
- What they already know
  - Construction of basic XML documents
  - Knowledge of XSLT syntax, XPath

What they do not know

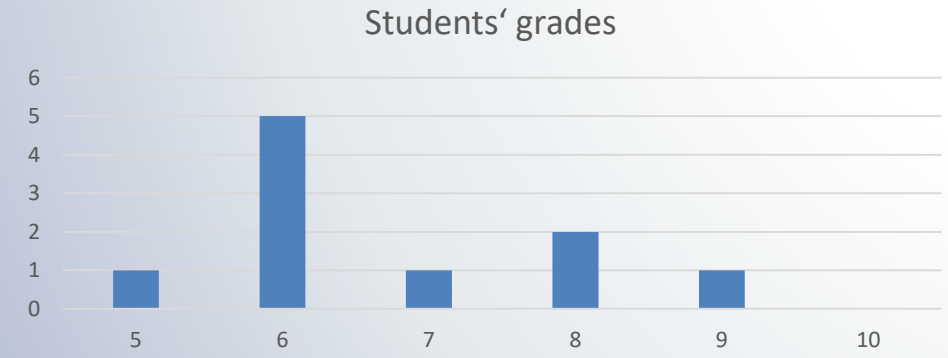
- Knowledge of the construction rules and the specifics of XML documents
- Building XML Schemas
- Building XSLT Transformations
- Understanding XPath queries

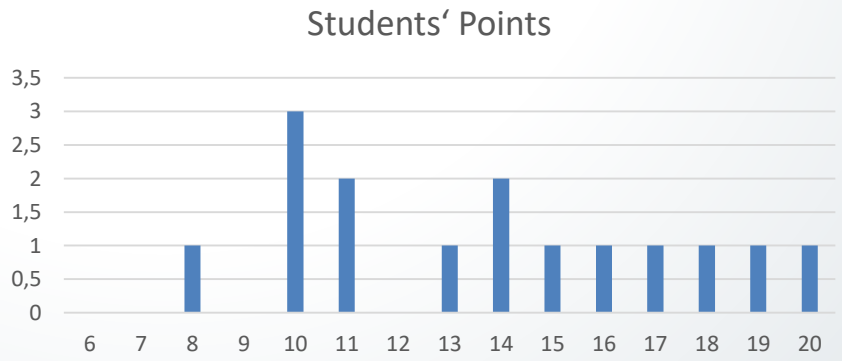
CHANGE #3
Investing more effort in problematic areas





Pre-test
2018/2019





Post-test
2018/2019

Analysis of pre and post test results (2018/2019)

	Simple	Complex	SUM
Pre test	57%	37%	47%
Post test	80%	59%	64%

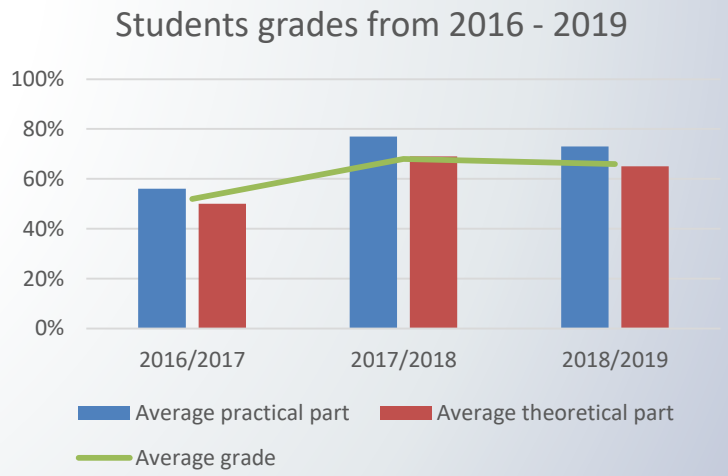
ALARM #3 – The students‘ motivation remains low!

- 23% of improvement regarding simpler tasks
- 22% of improvement regarding more complex tasks
- ONLY 17% general improvement in 15 weeks!

CHANGE #4
Motivation for web service development for desired field

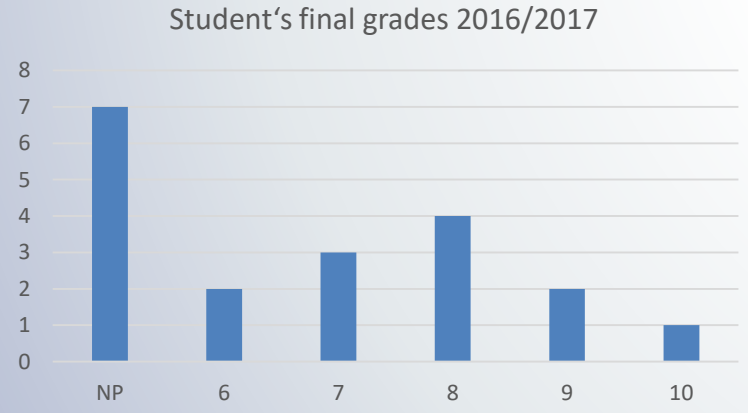
- Students pick their own applications
- Encouraged to choose fun-oriented projects
- Leaded exercises as example…
- Accepted solution that are extensions of existing solutions

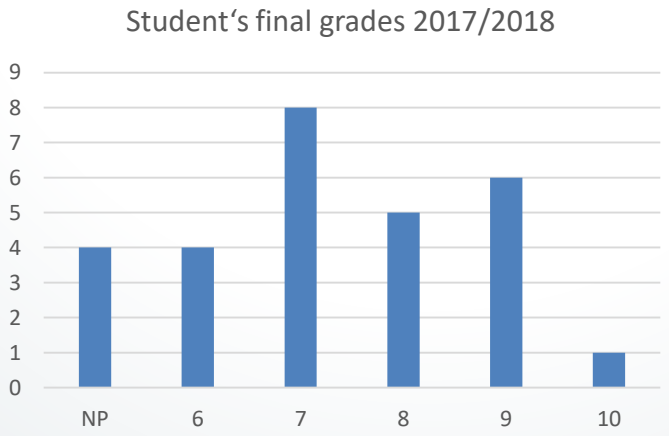
The Study year	# students	Average grade	Average practical part	Average theoretical part
2016/2017	19	52%	56%	50%
2017/2018	27	68%	77%	69%
2018/2019	27	66%	73%	65%

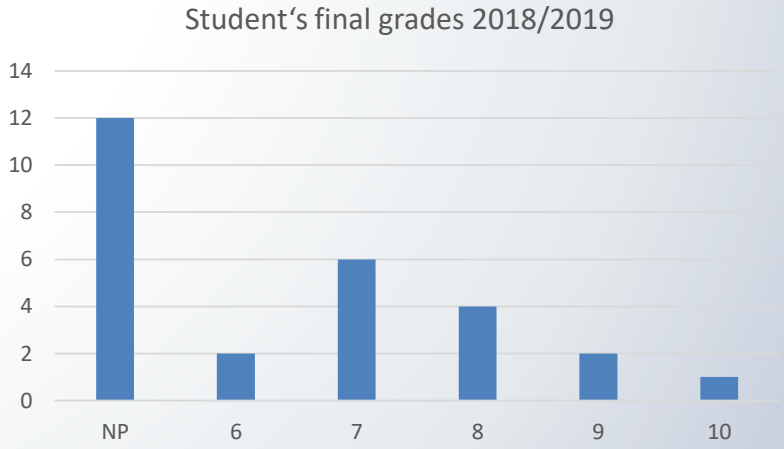


CONCLUSION

- Through introduction of democracy students are only slightly more motivated to finish their projects and more responsible towards achieving a good result
- Based on their work, project positions are opened (PKP projects)
- Despite all the efforts, motivation to get a higher grade remains low!



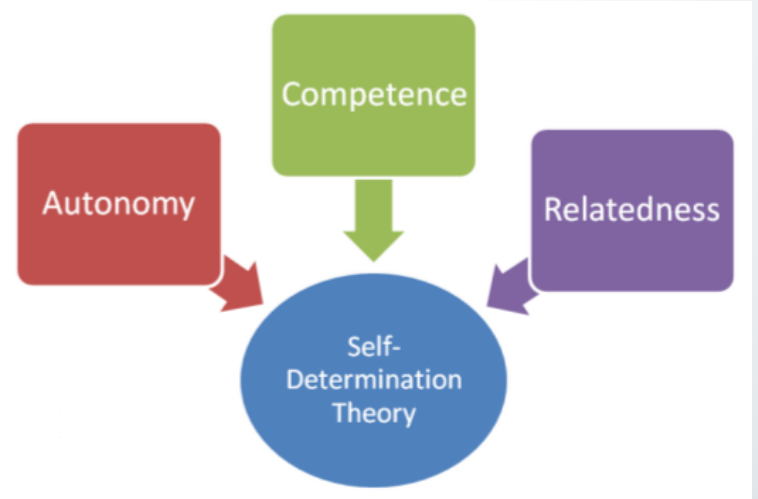




Future work

Addressing the identified problems:

1. Address the low motivation of students to achieve a higher grade
2. How to help non-motivated students and still support better students
3. Understanding the motivation factors of „modern“ students through **self-determination theory**
4. Find **modern** approaches



What are innovative/modern approaches?

- What are valuable approaches is still in discussions:
  - Unclear in what scenario a certain approach represents most benefits;
  - How affective **different factors** interact with **cognitive factors** to produce learning.

Engagement in the classroom is an indicator of students' positive academic functioning and serves as the mechanism through which students make academic **progress**, as a consistent predictor of academic success [Patall et all, 2019].

The problem of students' engagement/focus

- Multidimensional construct that includes:
  - behavioral (e.g., effort attention and participation),
  - emotional (e.g., interest, enjoyment, and other positive emotions),
  - cognitive components (e.g., regulation of the learning process)

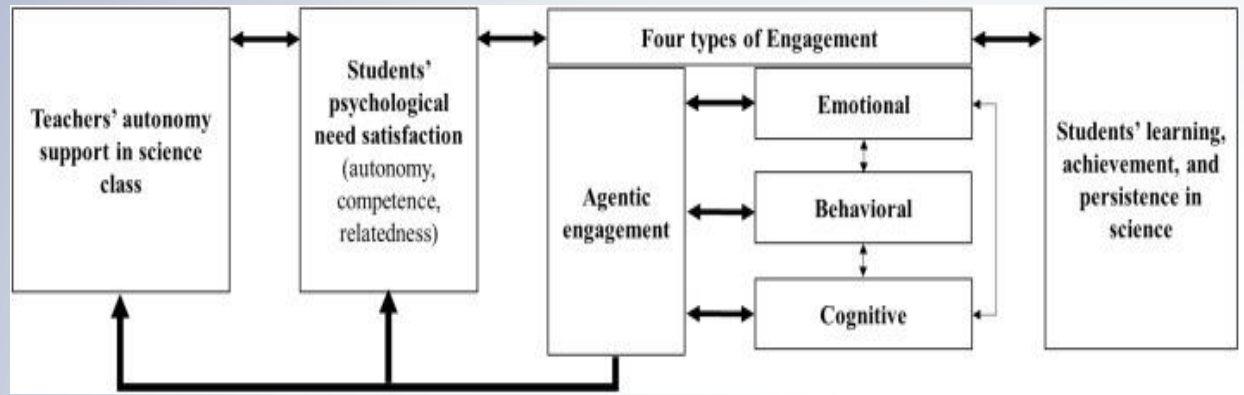
[(Fredricks, Blumenfeld, and Paris, 2004; Sinatra et al., 2015)]

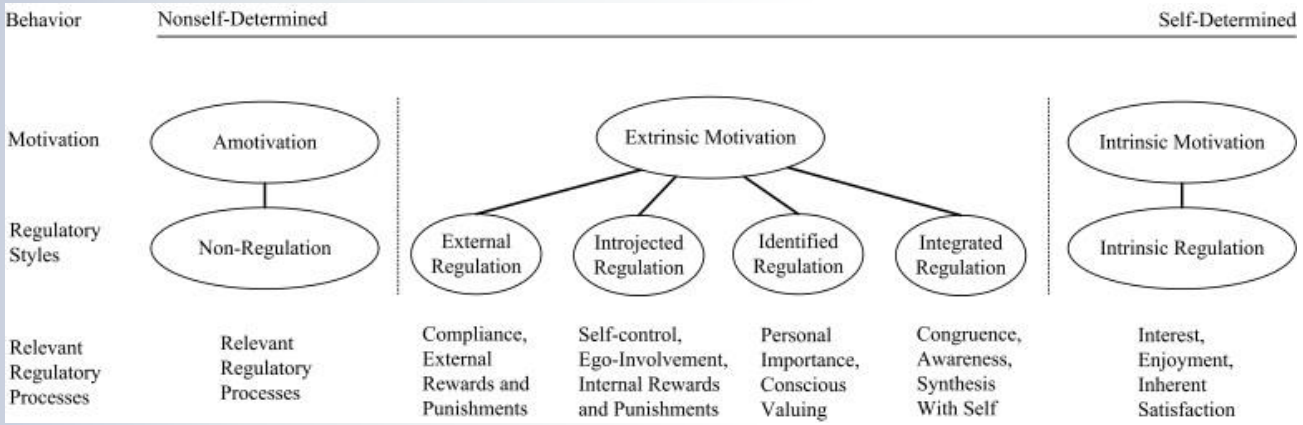
- Main reasons for dropping out of higher education
  - erroneous educational choice (an identity commitment)
  - lack of motivation

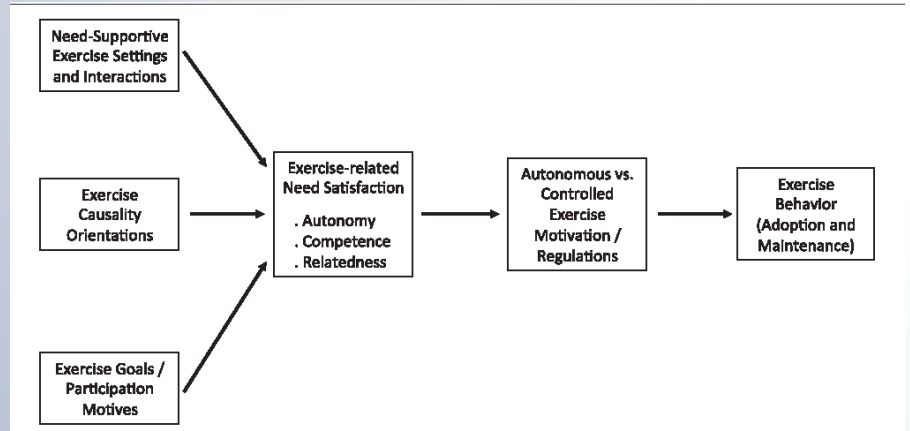
[Meens et all, 2018]

Results indicate that **motivation is associated with academic achievement**, whereas identity is not

What is the problem with IT students?







al SDT process model for exercise behavior. Adapted from the general health process model (Ref Ryan et al., E

Present work

Testing the students motivation based existing data and familiar approaches

Future work

Testing the students motivation based existing „motivation oriented“ theory models

Future work

- Introducing modern learning/teaching approaches
  - Flipped based learning
  - Project based learning
  - Problem based learning
  - Gamification
  - Simulations
  - Etc.

Didakt.UM

https://didakt.um.si/

- A project, started at the UM
- Period: 1. 4. 2017–30. 9. 2020
- Introduction of modern ICT supported learning/teaching approaches

Thank you for listening!

Questions?

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