14 Years Experience of e-Assessment Systems

Prof. D-r Marjan Gusev
University Sts Cyril and Methodius
Faculty of Computer Science & Engineering
Skopje, Macedonia

14 Years Experience of e-Assessment Systems

Prof. D-r Marjan Gusev
University Sts Cyril and Methodius
Faculty of Computer Science & Engineering
Skopje, Macedonia

15 Years Experience of e-Assessment Systems

Prof. D-r Marjan Gusev
University Sts Cyril and Methodius
Faculty of Computer Science & Engineering
Skopje, Macedonia

Rationale

- SE development of E-Assessment systems
- Implementations in e-Education, e-Learning
- Experience

Agenda

- **Overview**
- Motivation
- SE project managing
- Ongoing fight
- System description
- Experience
- Conclusion

Motivation

- Started in 1999
- Big number of students on exams 100-200
- Exam sessions each month (10 times per year)
- Some professors were given 6-7 courses per semester
- Small mathematics: each month approx. 1000 exams…

Solution

- Develop an e-Testing system
- Main objective: to help teachers realize exams!

- Several “side effects”:
- Increased efficiency, efficacy
- e-Learning

4 generations SE developments

- It was never treated as software engineering project
- Why? – started as hobby and voluntary work
- Continued as a project of one designer and those diploma, MSc and PhD seminar projects, later thesis

Version v.1.0 - 1999

- Three students working on small client-server application
- MS Access
- The first exam trial failed in sept 1999 !!!
- 20 students in lab, each test with 30 questions, each question with 5 choices, 3.000 simultaneous queries to database, MS Access saturated…

Version v.1.4 - 2000

- Solved a lot of problems
- Still a lot of issues were open
- We planned a new version

Version 2.0 - 2001

- Web application
- 3 layer architecture
- One SW programmer and SW one designer
- MS SQL, IIS, ASP.NET
- No bottlenecks
- Upgraded and migrated all database questions
- Opened new frontiers for innovative ideas

Version 2.2 – 2002

- Stable solution
- Solved all open questions
- “In use” until now - Thanks to Goce Armenski
- Small upgrades on-going

- New ideas also realized by seminar and diploma works: - Interactive Response Learning System, and Mobile technologies, etc.

Version 3.0 - 2006

- Web service oriented
- Interoperability – special award at 2006 CAE conference, Loughborough UT

- Exchange with Moodle and other systems
- Exchange of knowledge database with other universities

Version 4.0 – 2009

- Cloud solution ideas 2009
- Elasticity, scalability solved in 2012
- BEST paper award at IEEE EDUCON Berlin 2013
- Still programming in progress to allow stable solution

Agenda

- Overview
- Motivation
- SE project managing
- **Ongoing fight**
- System description
- Experience
- Conclusion

Ongoing fight with Cheating

- Students were very **innovative** with various cheating methods
- In 2002-3 there was an award for a student who will find a breakthrough channel for cheating
- We survived and hopefully win ☺ - at least we think so!

First generations

- Developing a different test for each student, but with equal complexity
- Each student answers different questions!
- NO chance to see from other computer…

Prevent memorizing

- Random position of answer choices
- Even if there a same question for two students – the answer choices are randomly positioned
- No chance to cheat with this question with answer B or C

Prevent guessing

- Negative grading of wrong answers
- Evaluate minus half of score if answer is wrong

Prevent external files search

- Allowed only from lab
- Stopped copy paste actions (Ctrl C, Ctrl V)
- Stopped Internet access on exam
- Stopped USB and other remote external files

- Still there are extensive txt files with answers
- We have even published textbooks and tutorials with answers

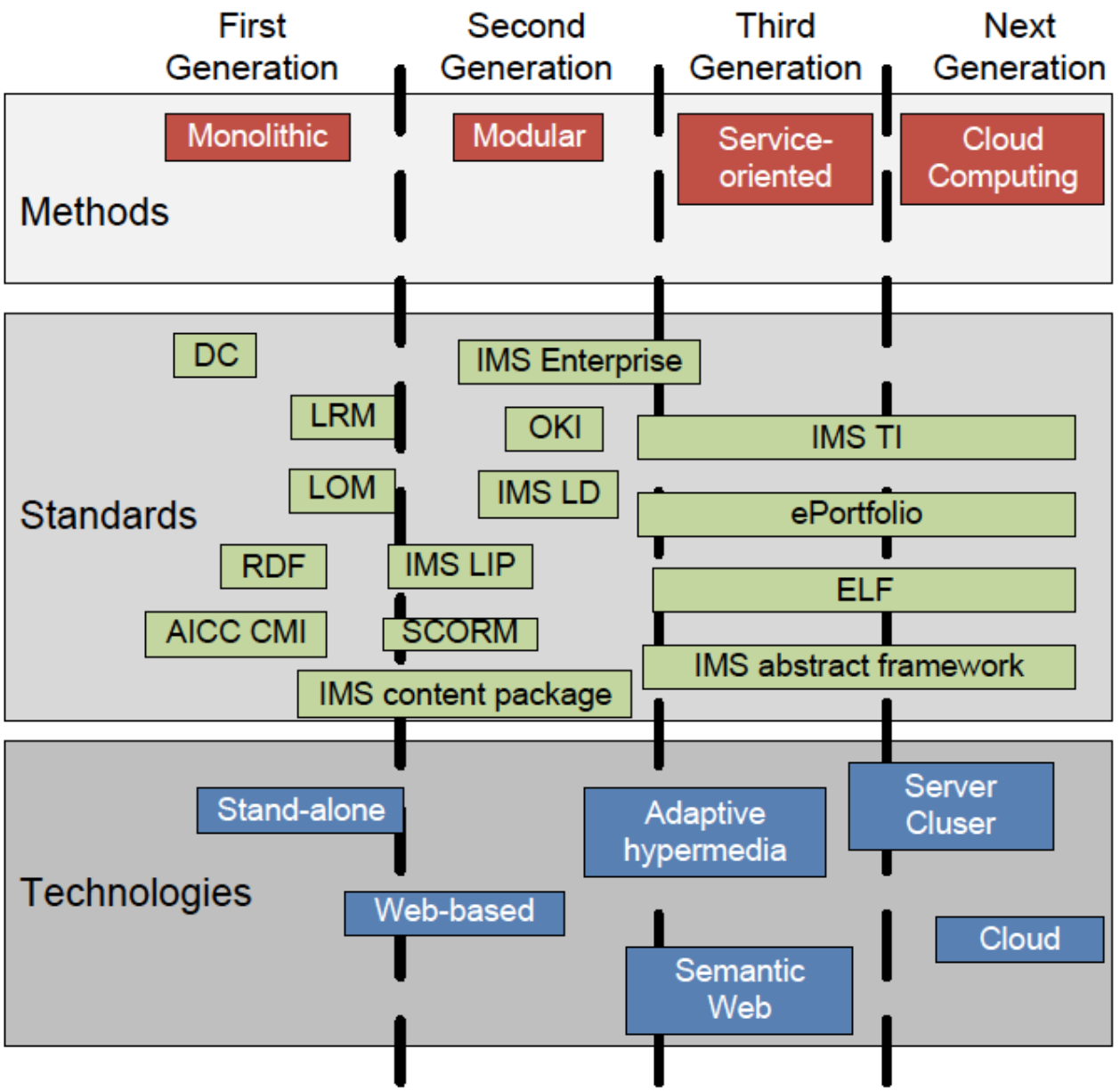
Innovative ways

- Using PrtScr
- Using Bluetooth connections
- Smart phones
- Body Tattoos or papers
- Many others

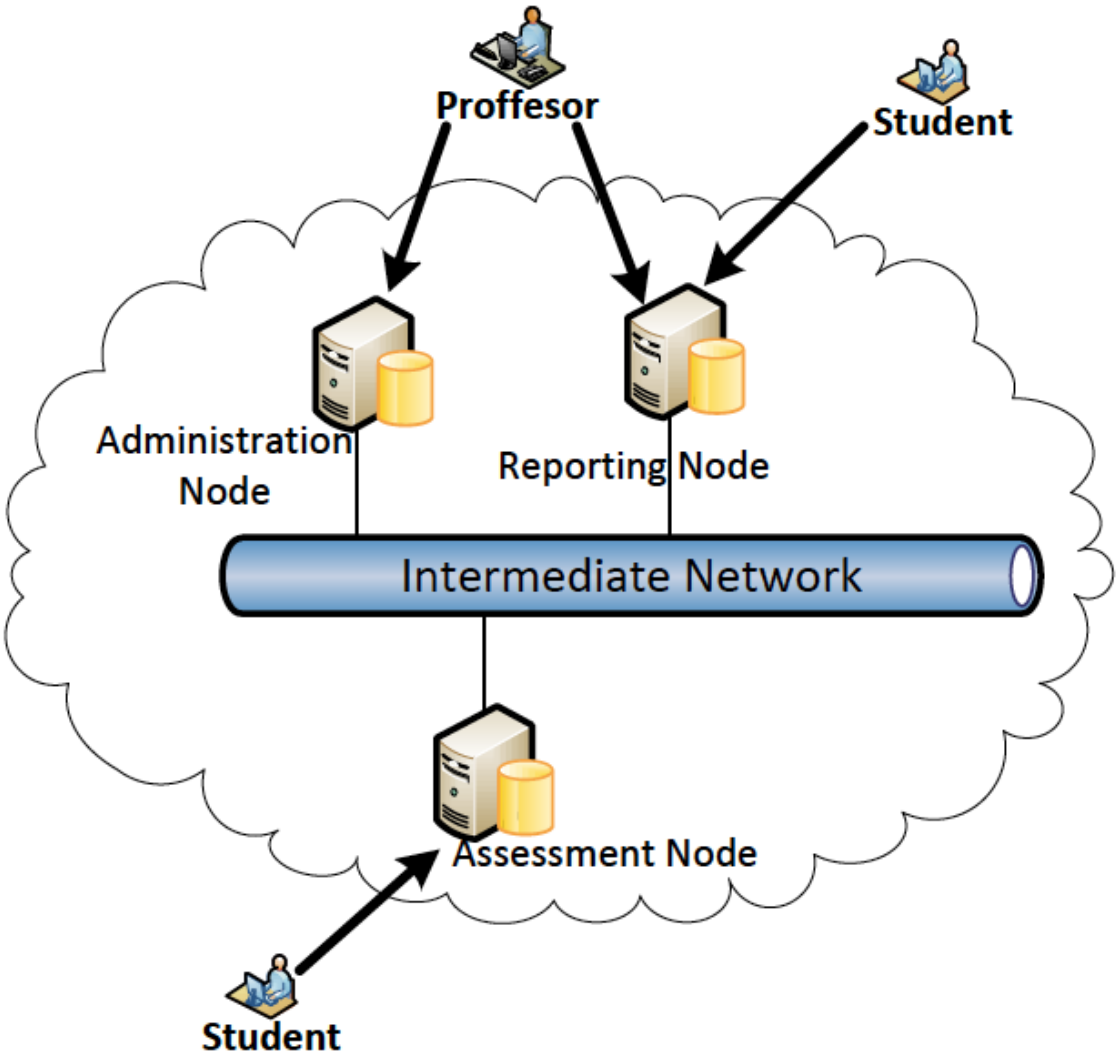
Agenda

- Overview
- Motivation
- SE project managing
- Ongoing fight
- **System description**
- Experience
- Conclusion

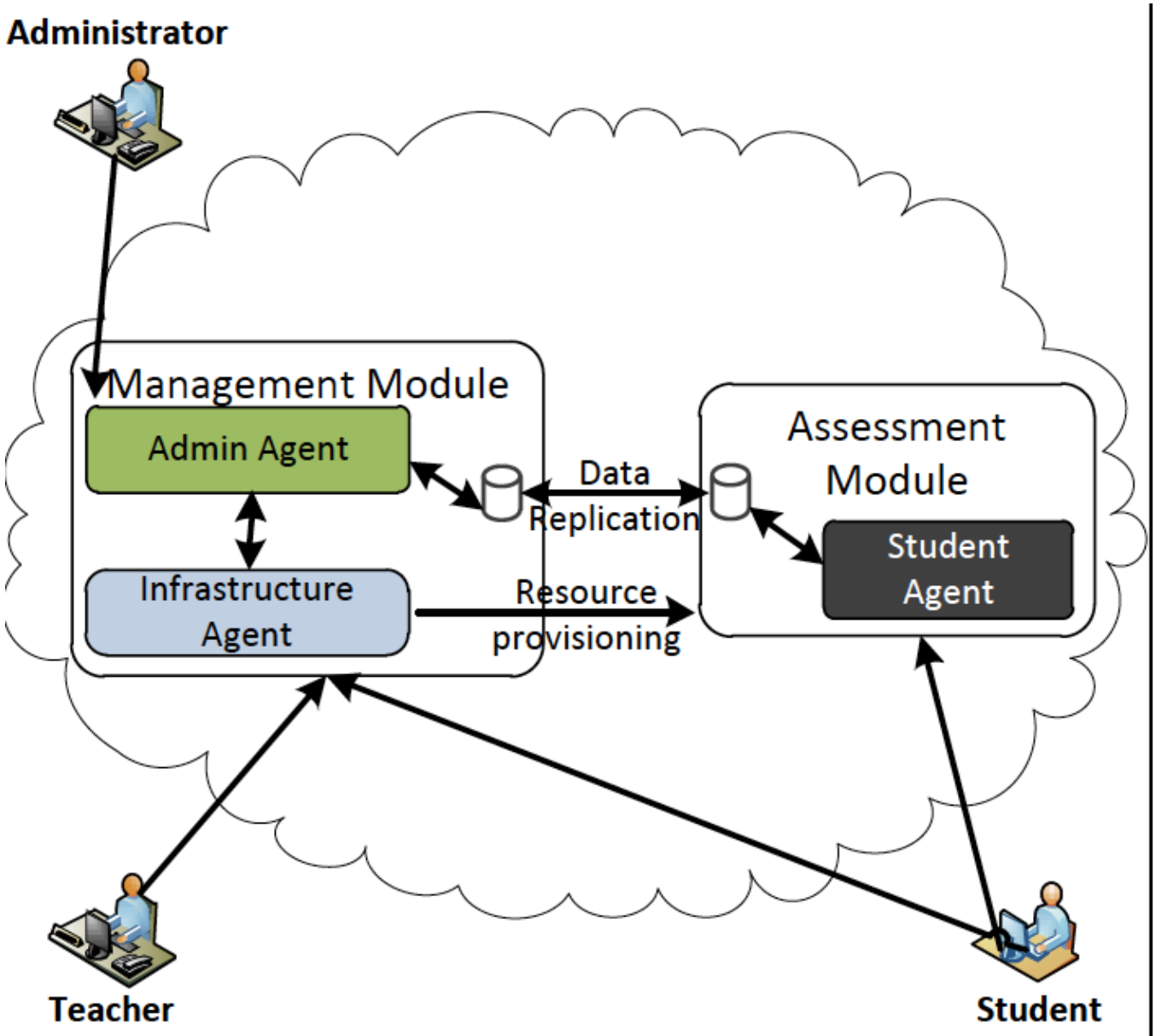
Evolution of e-Assessment



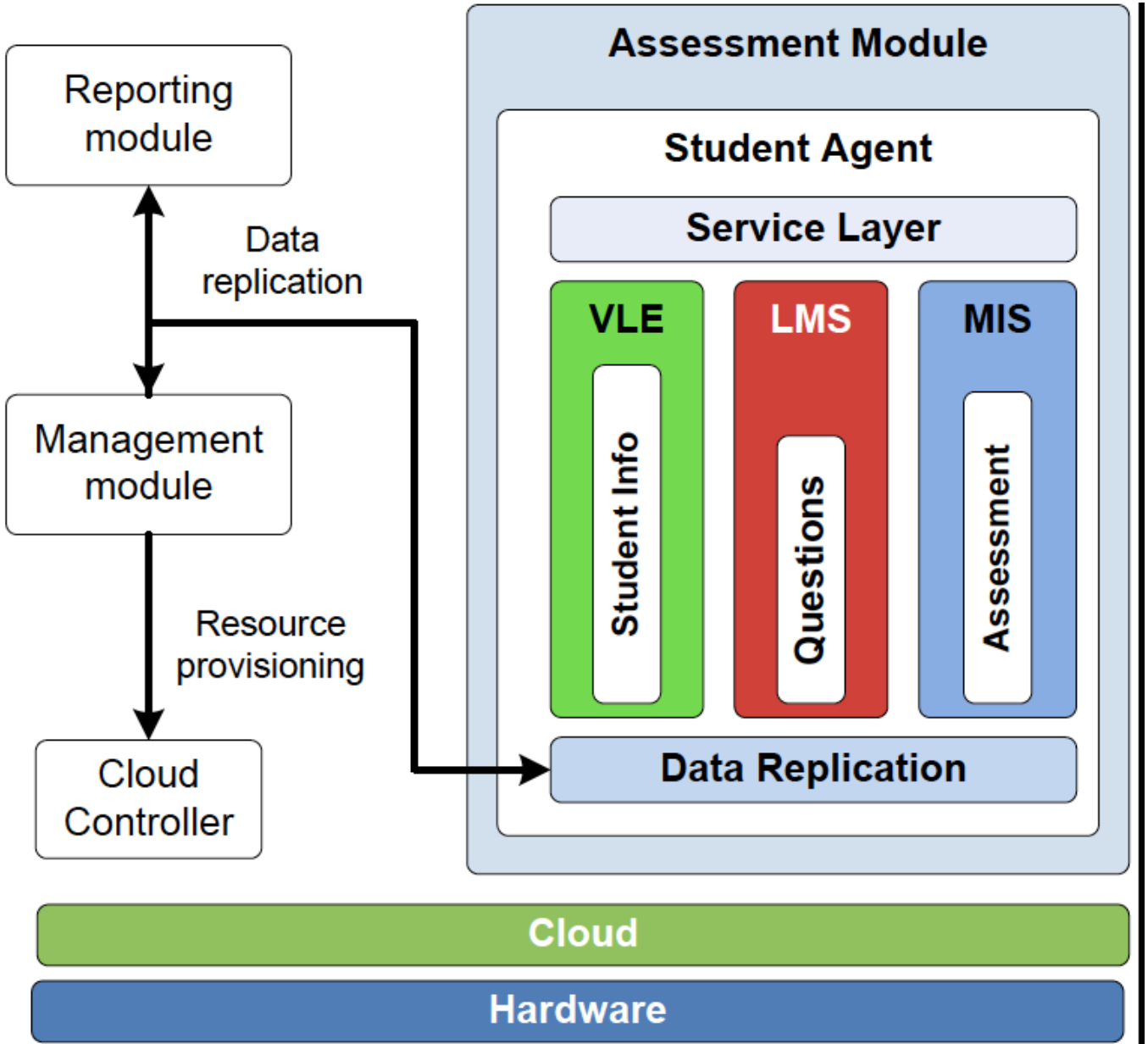
Architecture of cloud solution



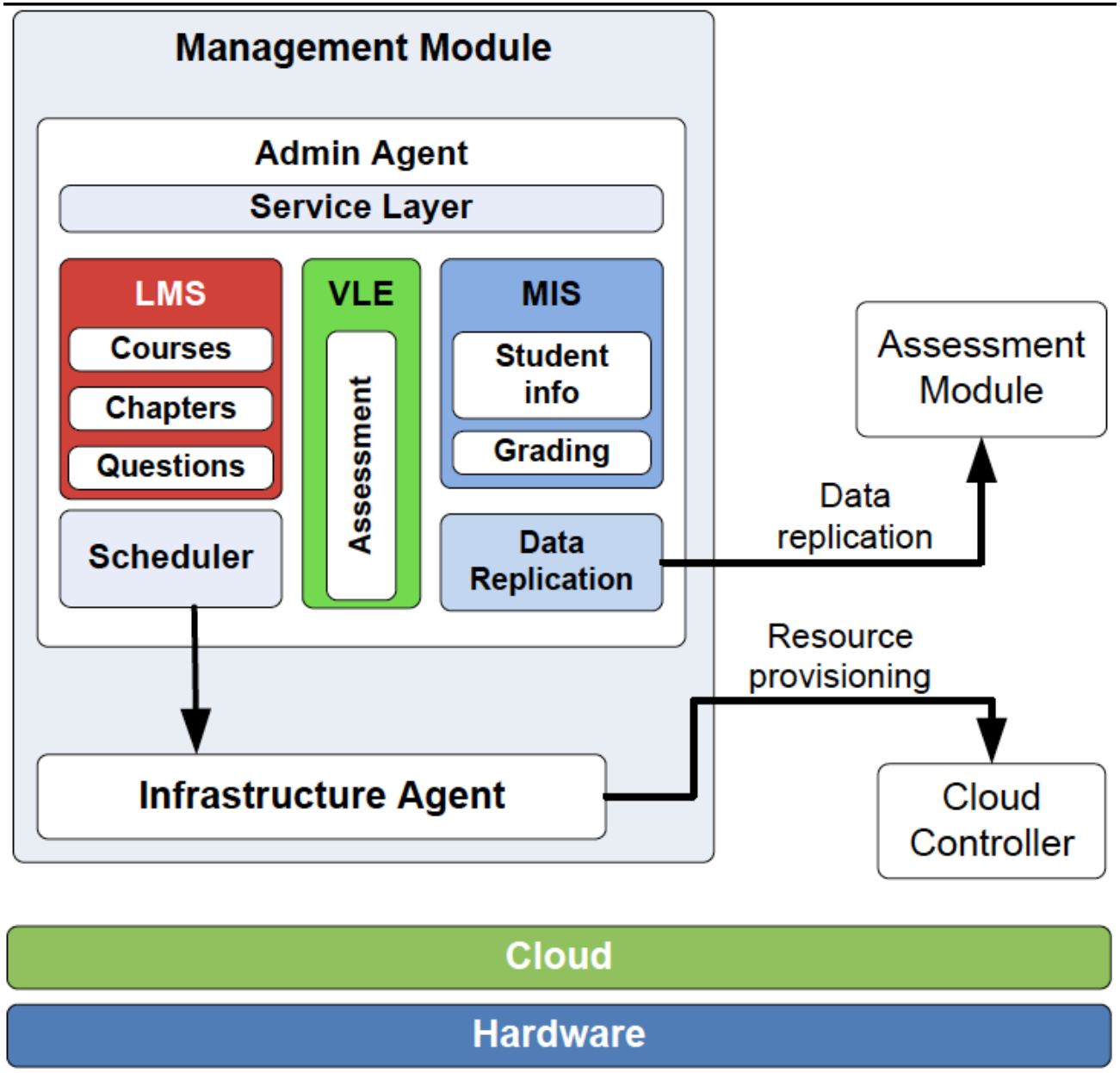
Modules in cloud solution



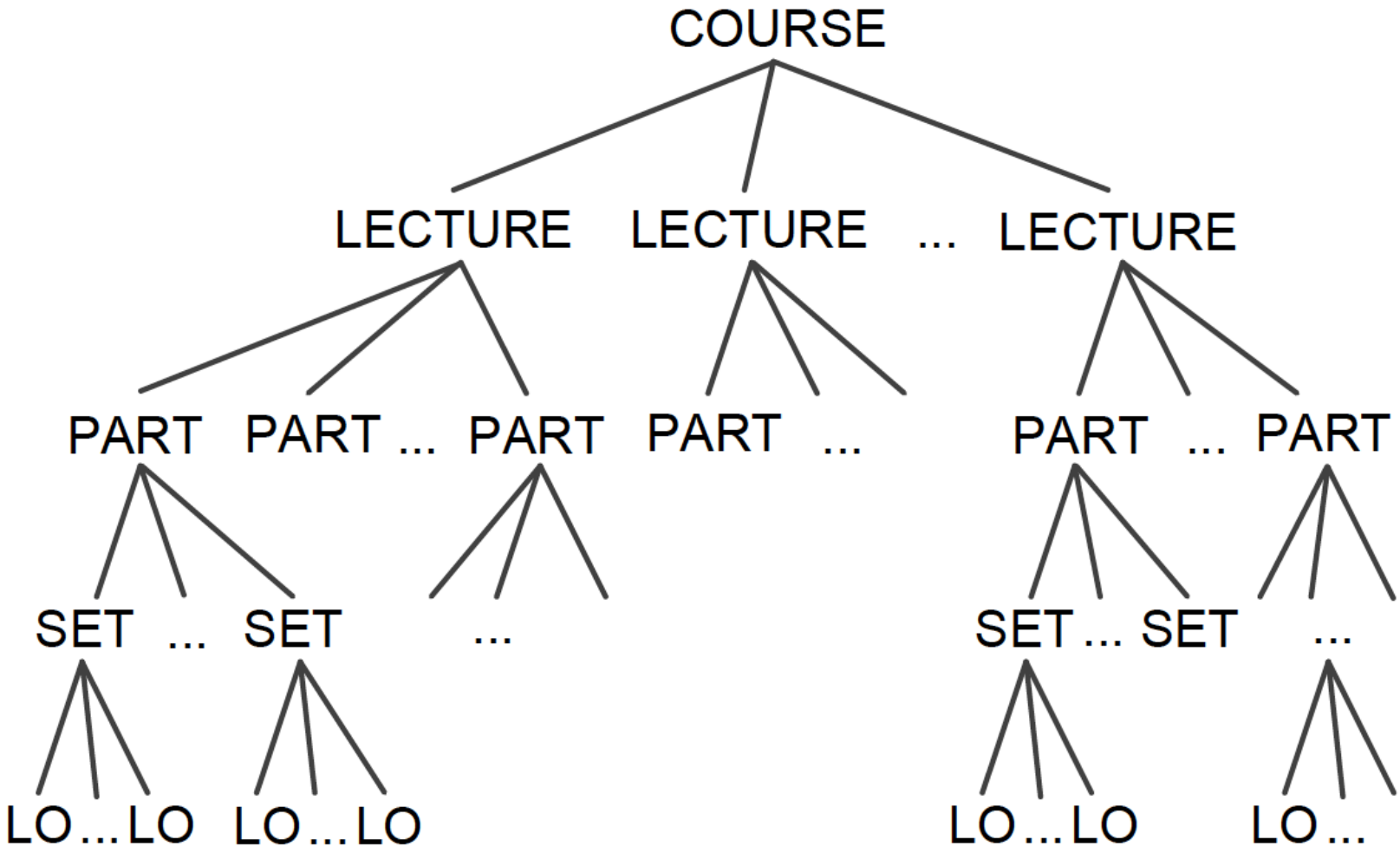
Assessment module



Management module



Knowledge database



Implemented questions

- Multiple Choice Questions
- Single input answers – number or word..

- No essays, text which requires additional expertise by human…

- Idea – have immediate results…

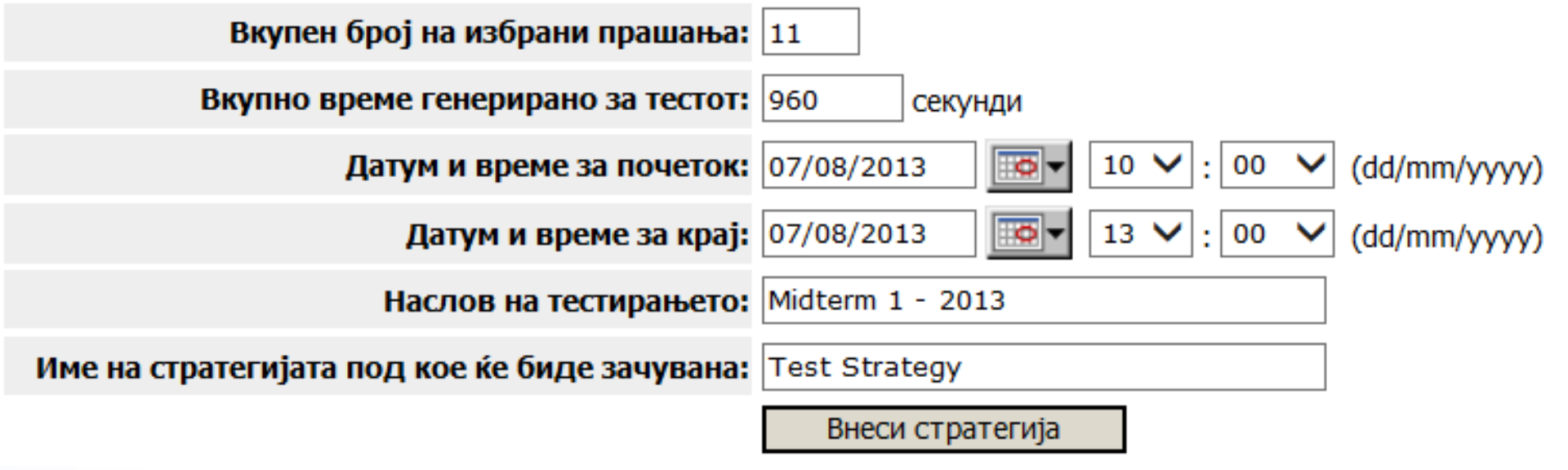
Test Strategy

- Select knowledge items (LO)
- Select number of questions from each LO

2.Системски параметри		0	0	0	60
Перформанси во однос на време		0	0	0	60
Фреквенција - периода	1	5	5	3	120
Задачи за сооднос на перформанси	0	7	7	4	60
Задачи за подобрување на перформанси	0	4	4	3	60
Задачи за време за извршување	2	7	7	4	60
Број на инструкции	0	7	7	5	60
Задачи за побрза машина	3	6	6	2	60
Перформанси во однос на CPI		0	0	0	60
Задачи за побрз компјутер во однос на CPI	2	8	8	4	120
Задачи за перформанси со класи на инструкции	1	5	5	3	120
Задачи за CPI	1	5	5	3	120
Задачи за CPI 2	0	3	3	3	60
Задачи за број на инструкции 2	0	5	5	3	120
Број на инструкции 3	1	5	5	3	60

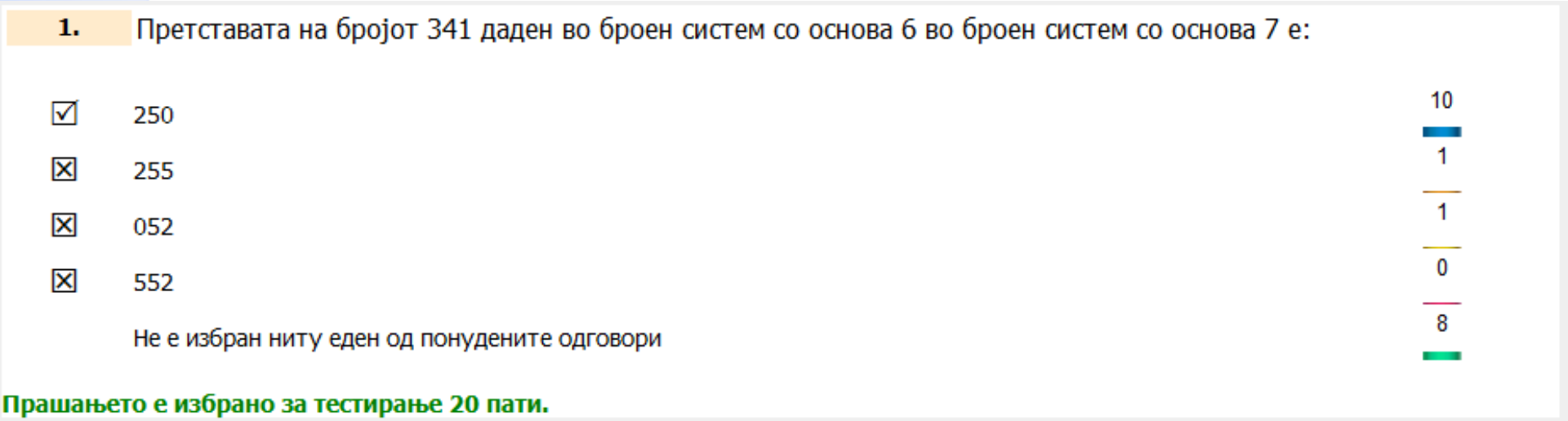
Test generation

- Total number of questions
- Time constraints
- Time schedule



Analysis

- Statistics about each question
- Gives hints to improve or upgrade
- Gives idea what has been learned…
- Gives idea to improve the learning/teaching processes



Immediate answers

- Students satisfied
- No waiting
- No extra hours

for teachers

Прашање 12. Кај броевите со подвижна запирка (IEEE 754), бројот се формира како:

Точен одговор е:		Вие одговоривте:	
T	Експонент, мантиса, знак	T	Експонент, мантиса, знак
T	Експонент, знак, мантиса	T	Експонент, знак, мантиса
T	Мантиса, знак, експонент	T	Мантиса, знак, експонент
T	Мантиса, експонент, знак	T	Мантиса, експонент, знак
R	Знак, експонент, мантиса	R	Знак, експонент, мантиса
T	Знак, мантиса, експонент	T	Знак, мантиса, експонент

Освоивте 2,00 поени од можни 2 поени.

Прашање 13. За мемориски адреси се користат:

Точен одговор е:		Вие одговоривте:	
R	Природни броеви	T	Природни броеви
R	Unsigned Integer	T	Unsigned Integer
T	Броеви со фиксна запирка	T	Броеви со фиксна запирка
T	Броеви со подвижна запирка	T	Броеви со подвижна запирка
T	Стрингови	R	Стрингови

Освоивте -0,50 поени од можни 2 поени.

Прашање 14. При операција A-B, ако A<0, B>=0, тогаш пречекорување се појавува ако резултатот е:

Точен одговор е:		Вие одговоривте:	
T	>0	T	>0
T	<0	T	<0
R	>=0	T	>=0
T	<=0	T	<=0

Administration

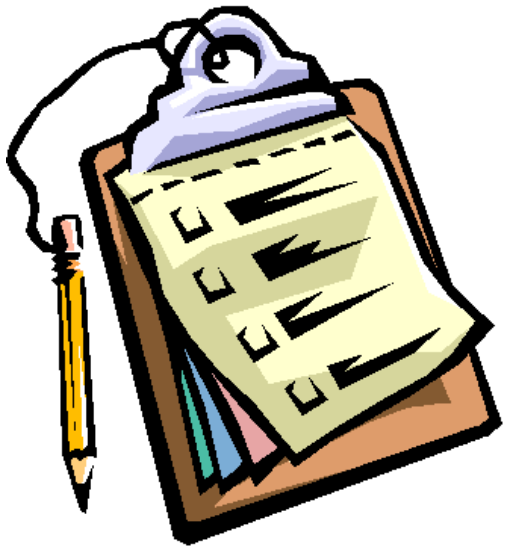
- Integration to Moodle LMS
- Integration to iKnow enrollment and grading university management system
- Integration to AAI system

Add-on values

- Online learning
- Self testing
- Less stress
- Increased overall success of students
- Used in business
- E-Surveys
- Personal Learning path

Open problems

- Persuade others to use the system
- Develop questions and update database – time consuming action…



What we have done so far

- We started something that we were not aware what will become
- We accepted the challenges
- We are satisfied of everything designed and implemented
- Contributed to development of knowledge based society

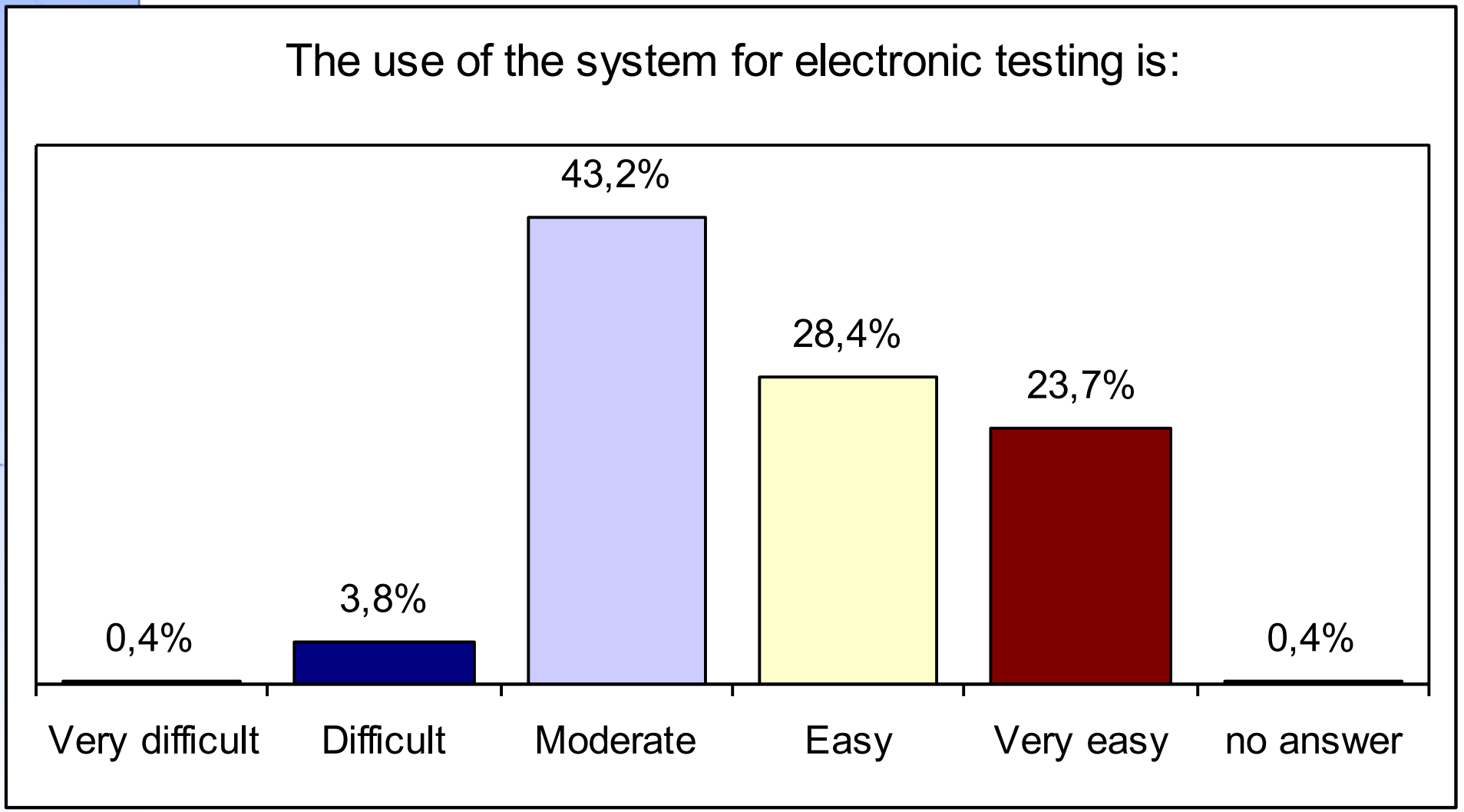
Statistics

- Average test – 30-40 questions
- Big numbers of students – 1st year 600, 2nd 500
- 9132 students and 110 teachers registered
- 74 courses realized
- 27027 questions and 107116 offered answers
- >90% Multiple choice questions
- 63255 tests and 1.585.126 questions processed
- 51 courses using the online learning
- Avg. 81 parts and 900 LO per course

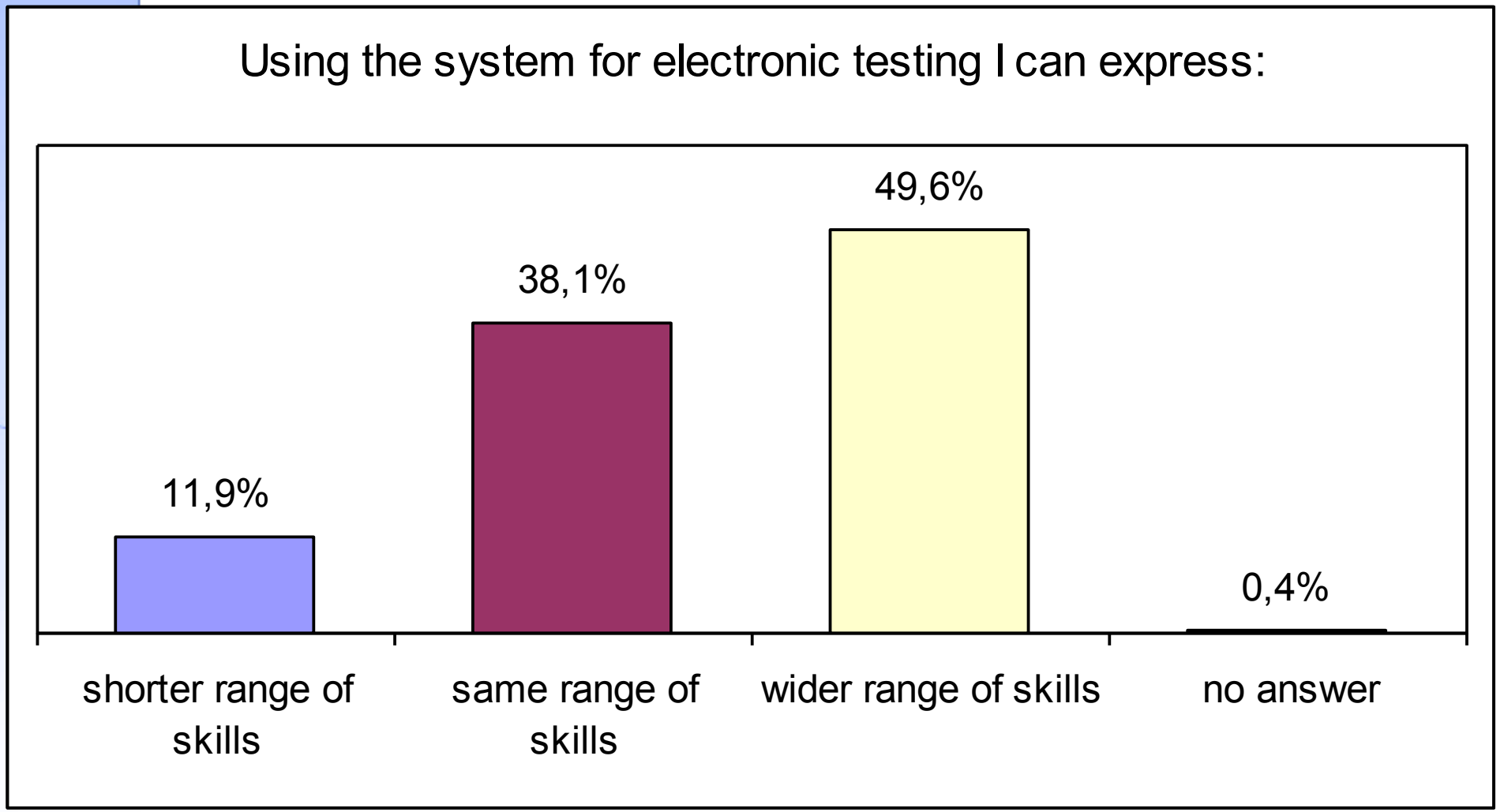
Realized MSc and PhD …

- Goce Armenski – MSc e-Testing (2003)
- Goce Armenski – PhD Service Oriented Architecture in e-Testing (2010)
- Mile Jovanov – MSc Automated generation of questions based on ontologies (2009)
- Velimir Graorkoski – MSc Model of adaptive e-Learning (2010)
- Mile Jovanov – PhD candidate – Collaborative Ontology Building (exp.2013)
- … other seminar and diploma works…

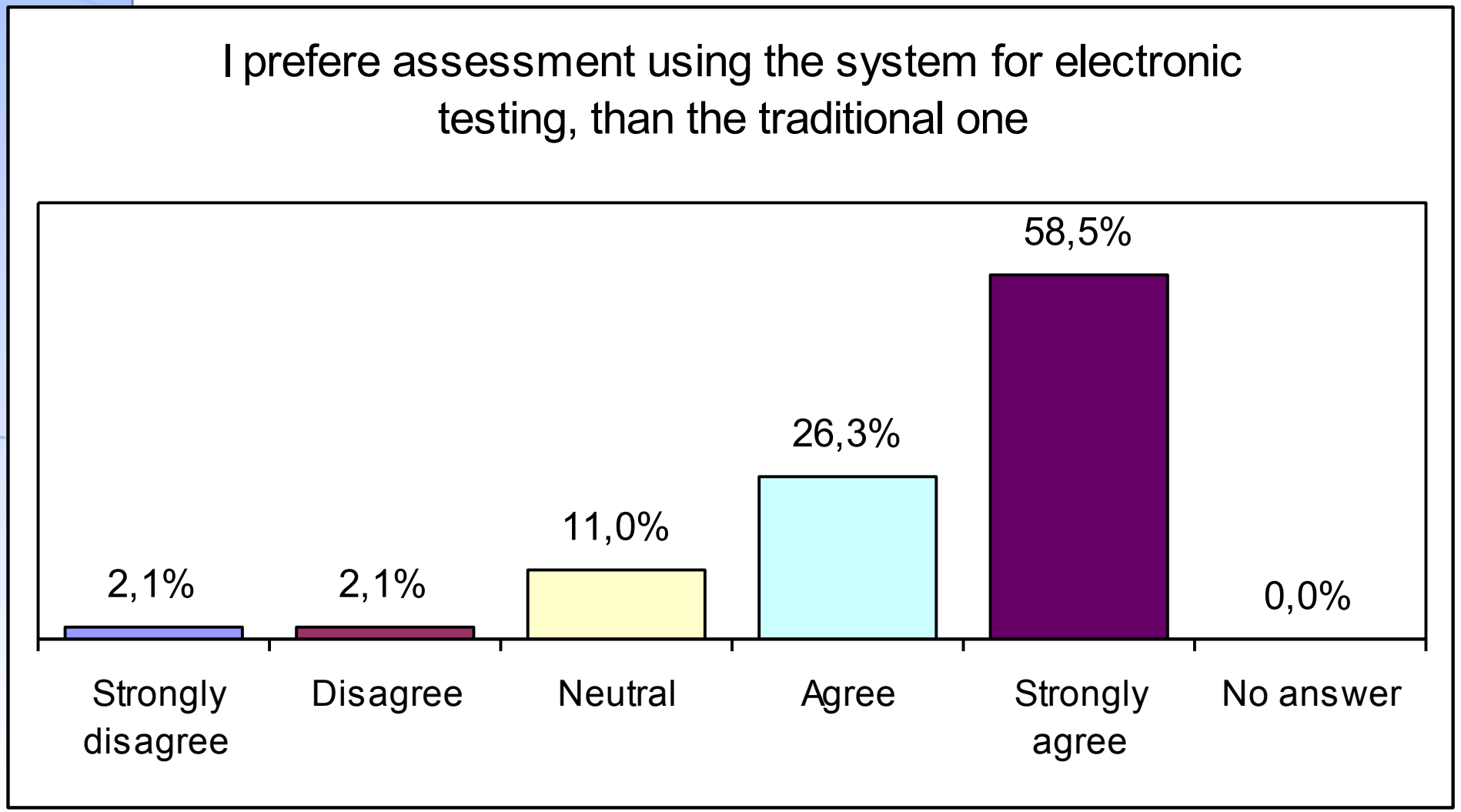
Student perspective 1/3



Student perspective 2/3



Student perspective 3/3



New ideas

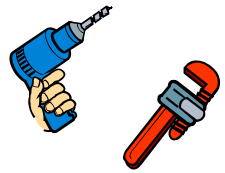
- Usage of interactive images…
- Applicable a lot for medical images…
- Based on experience that there a lot of internet sites with questions and answers.

Agenda

- Overview
- Motivation
- SE project managing
- Ongoing fight
- System description
- Experience
- **Conclusion**

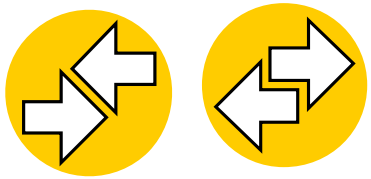
Online learning system

- Tools used specially for classical teaching and learning – not only for distance learning!
- Best known approach for learning – Aristotle as teacher of Alexander
- Teaching by asking questions – students all the time answer questions and find solutions to problems



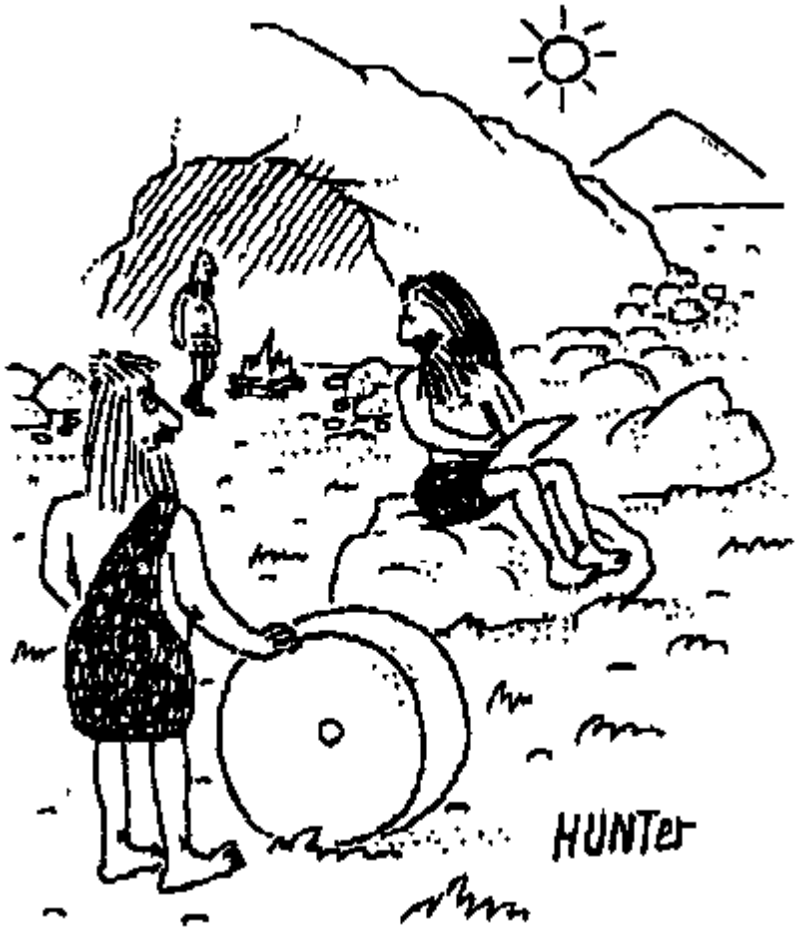
Interactive learning

- Learning through fun
- Common interaction: instructor/student
- Ability to “listen all students’ opinion”
- IRLS & Interactive learning system

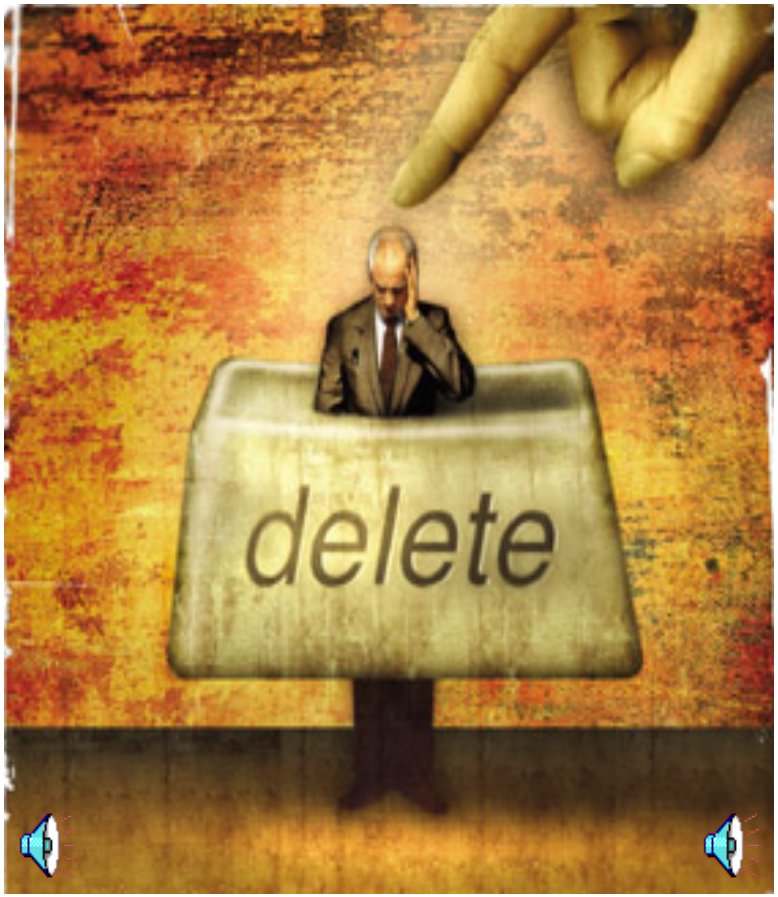


Evolution

- Stone age
- Iron age
- ...
- Industrial age
- **Information Technologies**
- **Knowledge based society**



Work in Knowledge Society

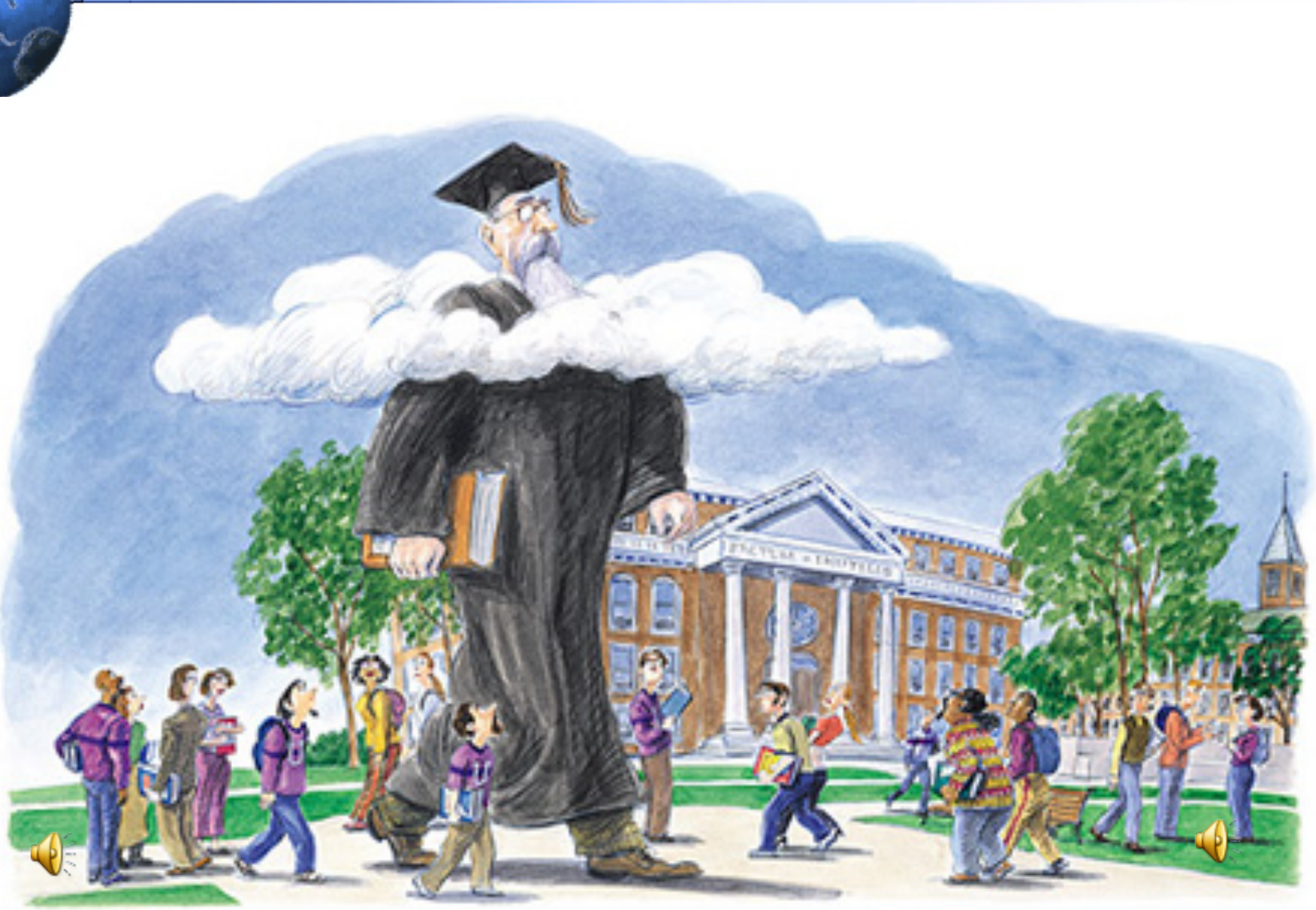


What do the students think?

Overload

Difficulties in memorizing & remembering

Students and professors



Knowledge Society