TEACHING JAVA IN FORCED CONDITIONS
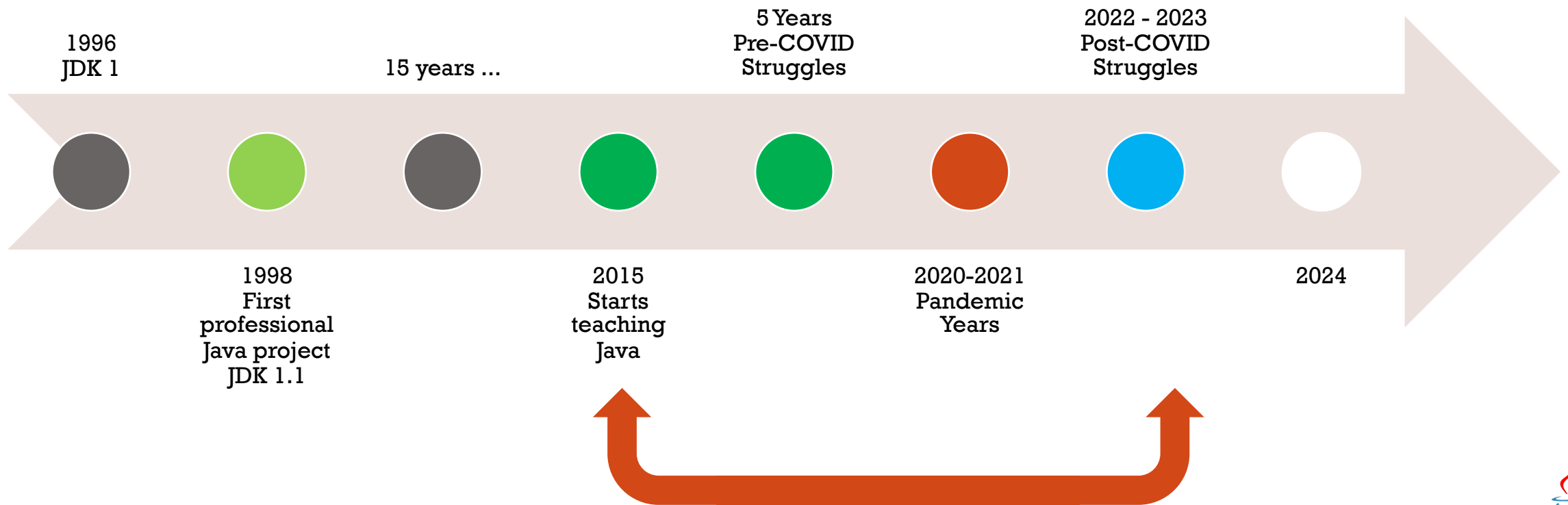
Emil Doychev

University of Plovdiv
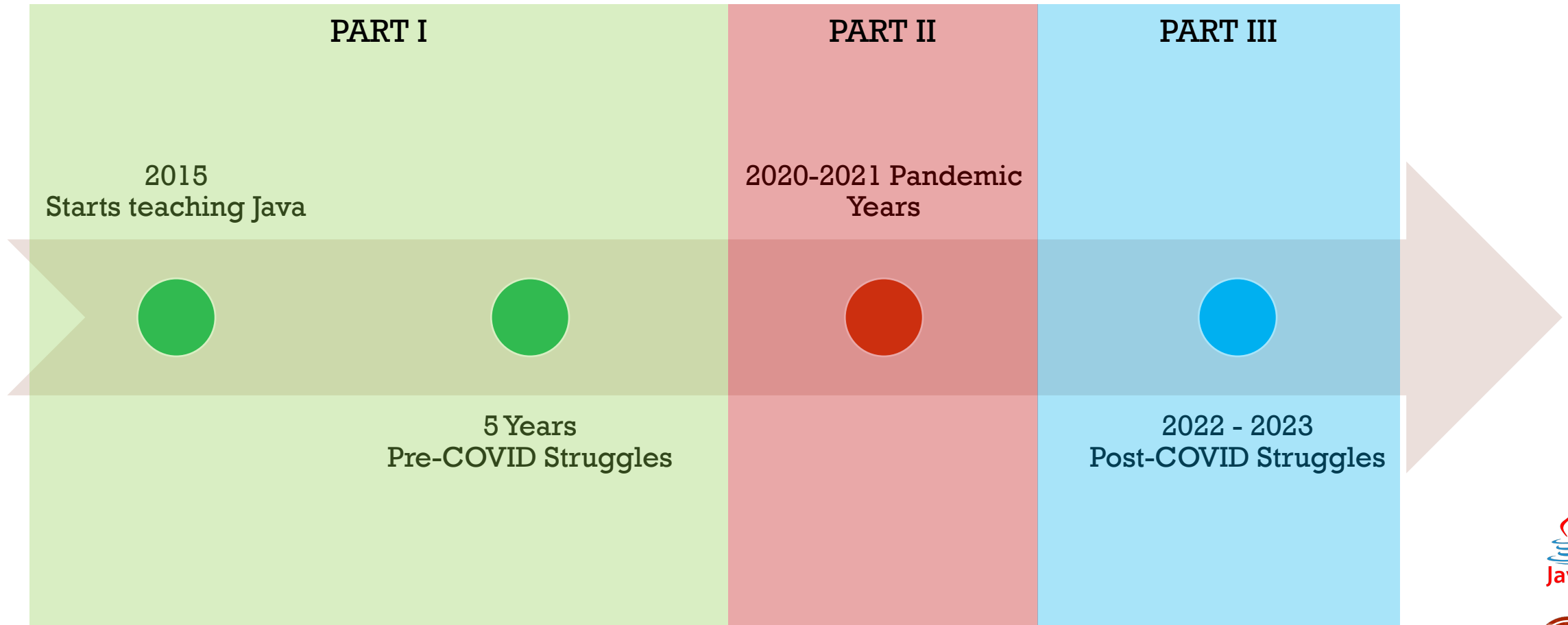
Bulgaria

Java

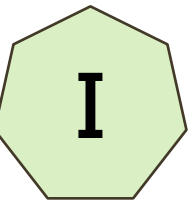# IT'S A KIND OF A STORY

1996
JDK 1

15 years …

5 Years
Pre-COVID
Struggles

2022 - 2023
Post-COVID
Struggles

1998
First
professional
Java project
JDK 1.1

2015
Starts
teaching
Java

2020-2021
Pandemic
Years

2024

IT'S A KIND OF A STORY

PART I	PART II	PART III

2015
Starts teaching Java

2020-2021 Pandemic Years

5 Years Pre-COVID Struggles

2022 - 2023 Post-COVID Struggles
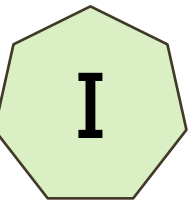
PART I
# PRE-COVID STRUGGLES

Java

I

2015 - 2019

THE COURSE

- First year students, spec. Informatics, third trimester

- Lectures based on prof. Bothe slides

- 10 weeks in April - June

- ~ 90 students

- 3 hours of lectures per week

- 3 hours of exercises per week
  - in groups of ~ 20 students
  - 2 assistants

- Final exam
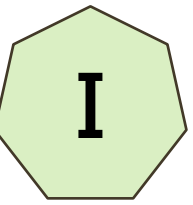 - 3 possible dates within the academic year

THE EXPERIENCE

- Low interest in the discipline

- Low lecture attendance (maybe around 20%)

- Low success rate (?)
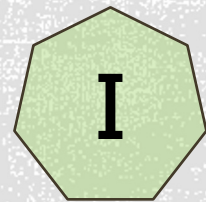
What should I consider as success?
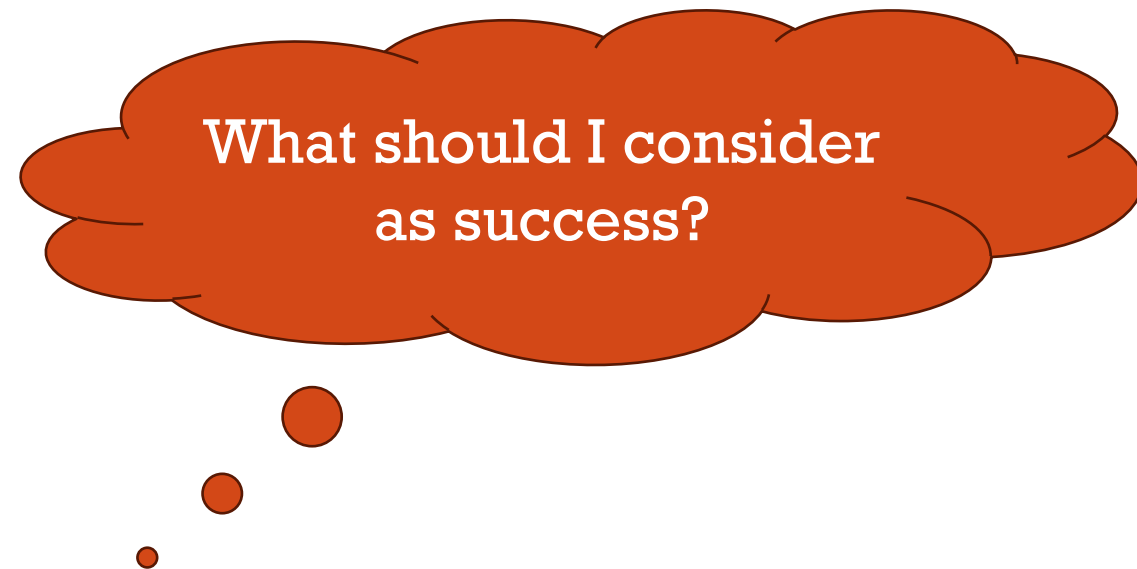
WHAT IS A SUCCESS?

- Student's point of view
  - Gathering knowledge in a new discipline
  - Passing the exam
  - Passing the exam with a high grade
  - Mix of the above

- Teacher's (my) point of view
  - The students gain as much knowledge in my discipline as possible
  - All students pass the exam
  - Most of the students pass the exam with a high grade
  - …?

AND THE FIGHT BEGAN

I

Goal: increasing the success rate

ALTERING THE COURSE

- Lectures:
  - Include live coding examples
  - Quick quiz (like 5-7 mins.) at the beginning of each lecture about the major topic of the previous one with bonus points

- Exercises
  - Two tests during the trimester with grading
  - Some homework assignments with grading

- Exam
  - Requires achieved results from exercises' assignments and tests
  - Added bonus for 80% attendance on lectures
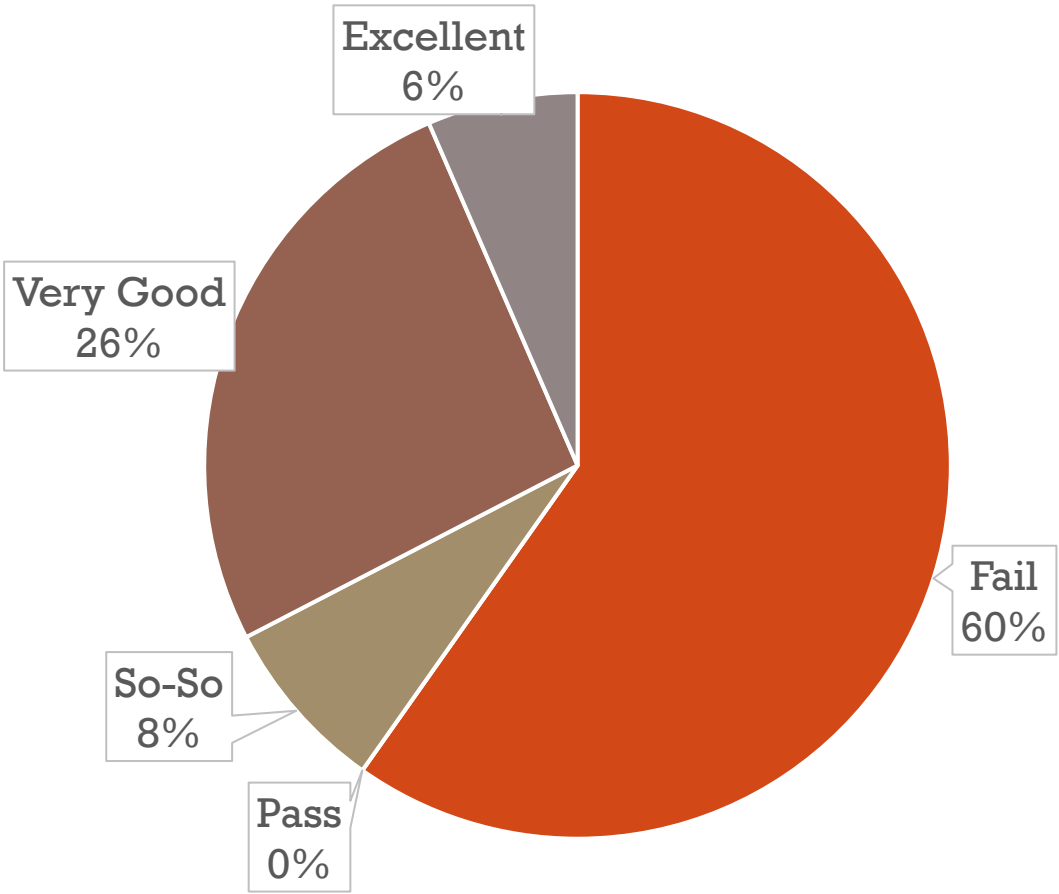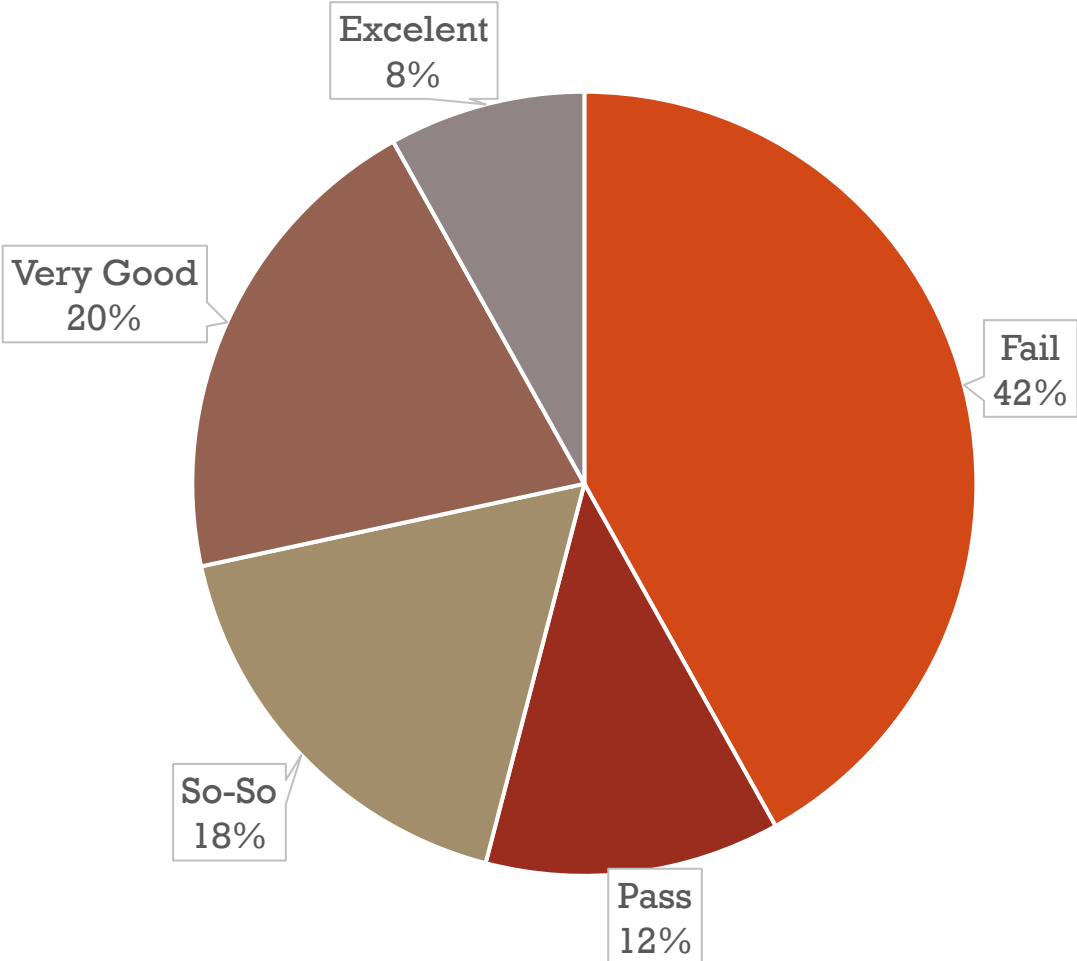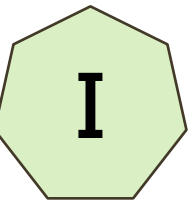 - Additional bonus for 100% attendance on lectures
  - E-test
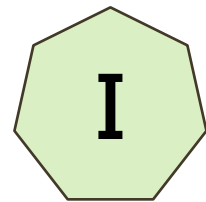
THE EFFORT

факултетен ном	Присъствие на лекции									%	Точки от лекции									Общо	Оценки от упражнения			Задачи (поправка)	Оценка от тест (редовен)			Оценка редовен	Оценка от тест (поправка)			Оценка поправка
	05.04	12.04	19.04	26.04	10.05	17.05	24.05	31.05	07.06		12.04	19.04	26.04	10.05	17.05	23.05	31.05	07.06	Доп.		I	II	Крайна		Точки	Общо точки	Оценка		Точки	Общо точки	Оценка	
17012610	1	1	0	0	0	0	0	0	0	22	1								0	1	6.00	6.00	6		18	19	3	4	20	21	4	5
17012610	0	0	0	0	0	0	0	0	0	0										0												
17012610	0	0	0	0	0	0	0	0	0	0										0	3.00	3.00	3		24	24	4	3				
17012610	1	1	0	0	0	0	0	1	1	44	1						0	0	0	1	6.00	5.00	6		12	12	2	2	22	23	4	5
17012610	0	0	0	0	0	0	0	0	0	0										0	2.00	3.00	2									
17012610	1	1	1	1	1	1	1	1	1	100	1	0	0	0	0	1	0	0	1	3	4.00	5.00	5		21	24	4	5				
17012610	0	0	1	0	0	0	0	0	0	11		0								0	6.00	3.00	4		23	23	4	4				
17012610	0	1	1	0	0	0	0	0	0	22	0	0								0	6.00	3.00	4		14	14	2	2	22	22	4	4
17012610	1	1	0	0	0	0	0	0	0	33	0	1								1	6.00	6.00	6		14	14	2	2	30	31	6	6
17012610	1	1	1	1	1	1	1	1	1	100	1	1	0	0	0	0	1	1	1	5	6.00	6.00	6		21	26	5	6				
17012610	0	0	1	0	0	0	0	0	0	11		0								0	5.00	3.50	4									
17012610	0	1	1	1	1	1	0	0	0	89	1	1	1	1	1	0	0	0	0	5	6.00	4.00	6		32	37	6	6				
17012610	1	0	1	1	1	1	1	1	1	89	0	1	0	1	1	1	0	0	0	3	3.00	4.00	4		9	9	2	2	20	23	4	4
17012610	0	0	1	0	0	0	0	0	0	11		0								0												
17012610	1	1	1	1	0	1	1	1	1	89	1	1	0	1	0		0	0	0	3	5.00	4.00	5		13	13	2	2	32	35	6	6
17012610	1	1	1	1	1	1	0	1	1	78	1	0	0	0		0	1		0	2	3.00	4.00	4		9	9	2	2	20	22	4	4
17012610	1	1	0	1	1	1	1	1	1	89	0		0	1	1	0	0	0	0	2	5.00	4.00	5		21	23	4	5				
17012610	1	1	1	0	1	1	1	0	1	78	0	0		0	0	0	0	0	0	0	6.00	4.00	5		23	23	4	5				
17012610	1	1	1	1	1	1	1	1	1	100	1	0	0	1	0	1	0	0	1	4	4.00	5.00	5		21	25	4	5				
17012610	0	0	1	1	0	0	0	0	0	22	0	0								0	3.00	3.00	3		20	20	3	3				
17012610	1	1	1	0	1	1	1	1	1	78	1	0	0	1	0	0	0	0	0	2	3.00	3.00	3		13	13	2	2	26	28	5	4
17012610	1	1	1	1	1	1	1	1	1	100	1	0	0	0	0	1	0	1	1	4	4.00	5.00	5		13	13	2	2	16	21	4	5
17012610	1	1	1	1	1	1	1	1	1	100	0	1	1	0	0	1	0	1	1	5	6.00	6.00	6		21	26	5	6				
17012610	0	0								11									0	0	3.00	4.00	4		11	11	2	2	18	18	3	3

Java

Excellent
6%

Very Good
26%

Fail
60%

So-So
8%

Pass
0%

THE RESULTS

I

11

Excelent
8%

Very Good
20%

So-So
18%

Pass
12%

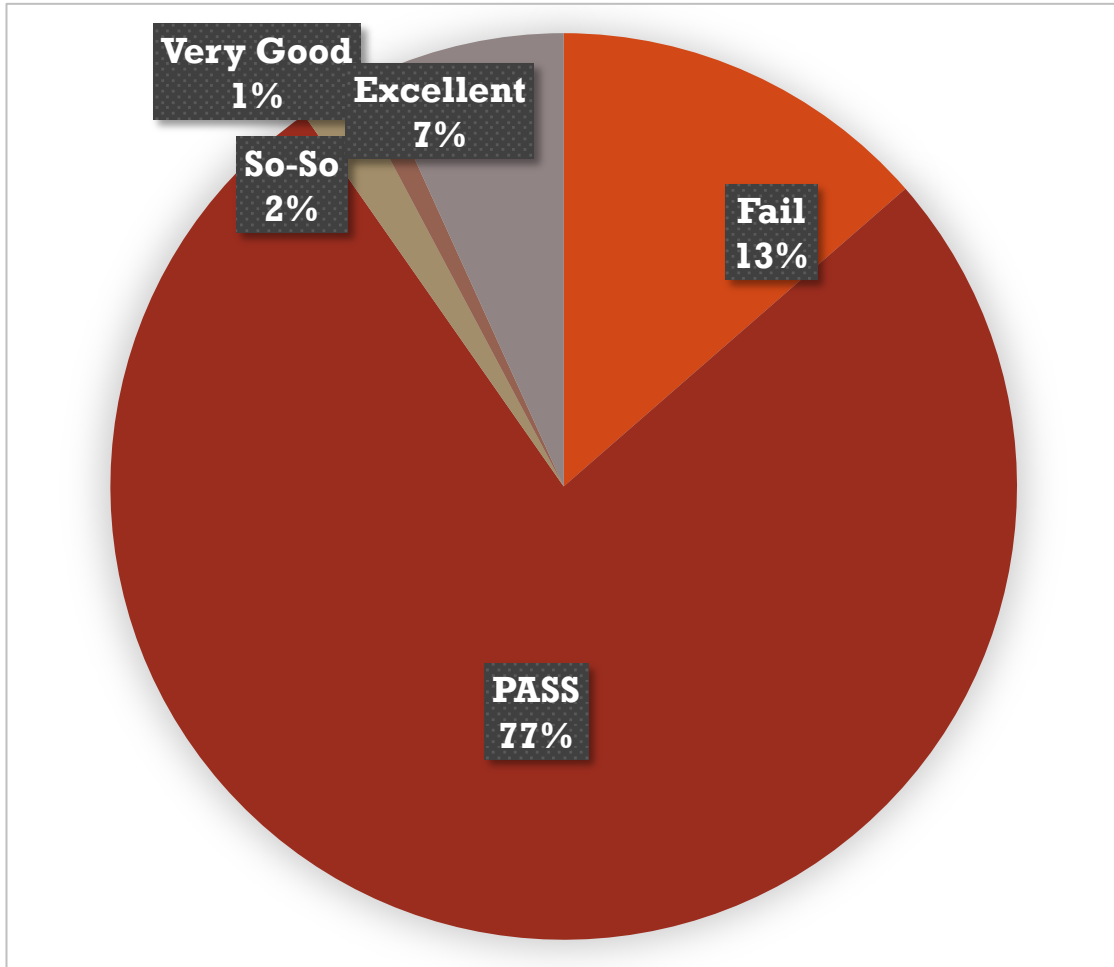Fail
42%

MORE RESULTS

I

12

SOMETHING STUPID

- A new concept (just the highlights):
  - Focus the efforts to students that want to learn Java
  - Let the rest pass the exam
    - and give them the chance to find their motivation in some other discipline of the IT field in the next years
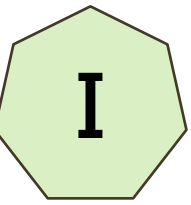
> ⚠ Warning from prof. Stoyanov:
>
> Education is a forced process…

Very Good 1%

Excellent 7%

So-So 2%

Fail 13%

PASS 77%

THE RESULTS
MY FAILURE

I

14

THE CONCLUSIONS

- I ruined a year

- Whatever I do (despite me) there always will be minimum constant percent of excellent students (6-8%)

- Education is a forced process (… by prof. Stoyanov)

- The majority of students do not share my passion – Java.
  - It is not that they have no interest in programming at all
  - A lot of diploma theses are done in garbage languages like PHP or in the direct competitor - .Net

RECONSIDERING THE SUCCESS (MY POV)

- ~~Most of the students pass the exam with a high grade~~

- Get students to be more passionate about Java

CHANGE OF THE GOAL

Fire the spark
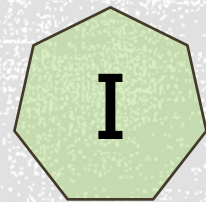
PART II
PANDEMIC YEARS
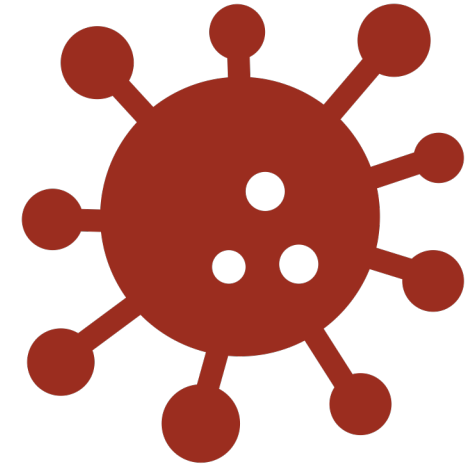
2020 - 2021

ADDED CHALLENGES

- Organizational challenges, specific to our university and faculty
  - Lack of institutional e-mail accounts for the students
  - Lack of unification of the used e-platforms in the university (from self-developed, like DeLC, to occasional non-properly maintained Moodle installations)
- Mostly one-way communication (teachers to students)
- Students that do not have a computer at home
- Internet connection stability during the live meetings
- The missing eyes

Java

HOW TO COPE WITH THE SITUATION?

- Plan A – Leave "fire the spark" plan for better times
  - Toss the students last year's presentations
  - Provide them with some third-party resources as links
  - Have a pseudo exam
  - Use the "force majeure" situation as an excuse

- Plan B – turn the disaster into an oportunity
  - Explore new ways of communication and interaction
  - Try new approaches for presenting the concepts and matherial
  - Taste the mantra for fully distant/remote/whatever e-learning
  - … and all this, fully supported by otherwise restrictive authorities (gov. regulations, university, faculty, etc.)

Went for B

THE ORGANIZATION

II

- The tools
  - Google Classroom for anouncements, providing matherials, assignments, comunication
  - Google Meet for live meetings – lectures, exercises, additional activities
  - GitHub for assignments

- The activities
  - Lectures
  - Exercises
  - HW assignments
  - HW analyses
  - HW solutions
  - Additional seminars
  - Polls
  - Record everything and provide it as reference whenever needed

ALTERING THE COURSE: THE LECTURES

- **First lecture (fire the spark) – attractive, with a cinematic feel**
  - Examples of successful application of the language in a lot of domains
  - Focus on the popularity of the language in different indexes – Tiobe, salary, jobs...
  - Mixed with fun short movie clips about Java (from JavaZone by the Norwegian JUG)
  - Photos and videos from big Java conferences in Bulgaria and around the world (to show the community at scale)

Как бихте оценили уводната първа лекция?

90 responses

Positive feedback

81.1%

Unique

It was fesh, different, even fun ...

Very useful as an indroduction to the language and informational for the discipline's organization
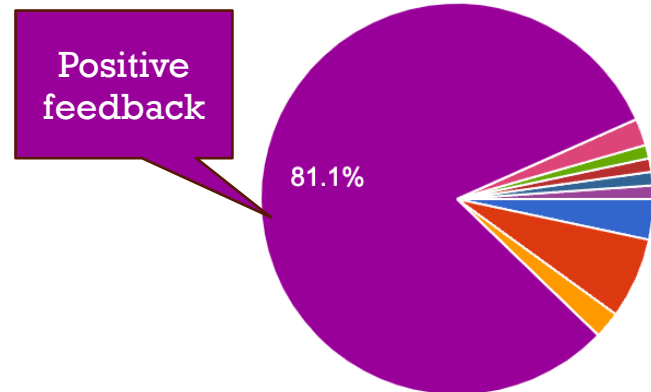
ALTERING THE COURSE: THE LECTURES

- There is time to scare the students - there is an advanced Java course in the second year
  - Now the goal is to "fire the spark"

- Remove some complex parts of the material, like:
  - Advanced OOP concepts
  - Generics
  - Threads
  - … even exceptions

Java

ALTERING THE COURSE: HW

- A programming language can be learnt with a lot of programming (by me)
  - Homework assigment each week – 10 HW in total
  - Non-traditional approach – assignments as fantasy stories
    - Unique stories
    - Up to 20 pages per assignment
  - 6-day deadline
  - Utilize Google Classroom for intensive discussions about the assigments
 - **80% of the final grade is formed by HWs**

ADDITIONAL ACTIVITIES (1/4)

- HW analysis
  - A recorded discussion between an assistant and me about the possible implementation strategies and an interpretation of the assignment's details. (up to 30 mins.)
  - Available to the students together with the assignment.
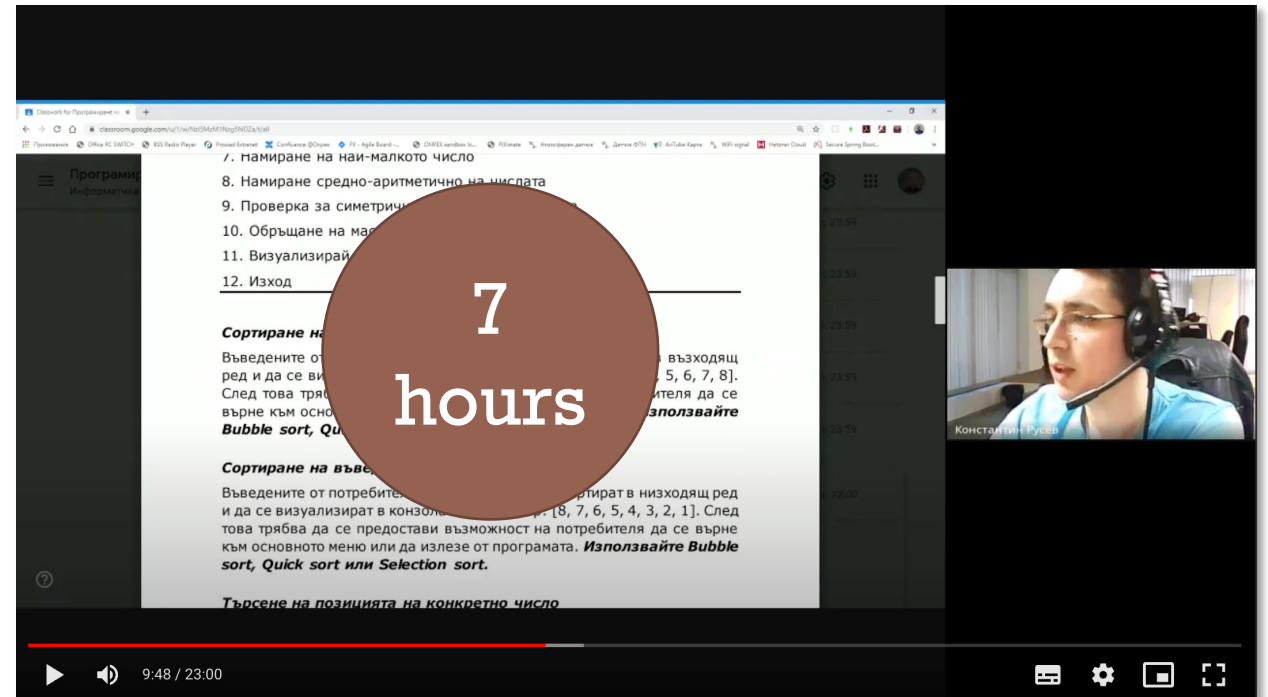
ADDITIONAL ACTIVITIES (2/4)

- HW solutions
  - A possible sollution, implemented in a live online meeting with me and an assistant. (up to 4 hours in late evenings)
  - The idea is while one of us codes the solution, the other one is to help by giving ideas or commenting the pros and cons.
  - The live online meeting is open for students to join and participate.
  - Held imediately after the assignment's dealine.
  - It is recorded and available to students together with the next assigment.

27 hours
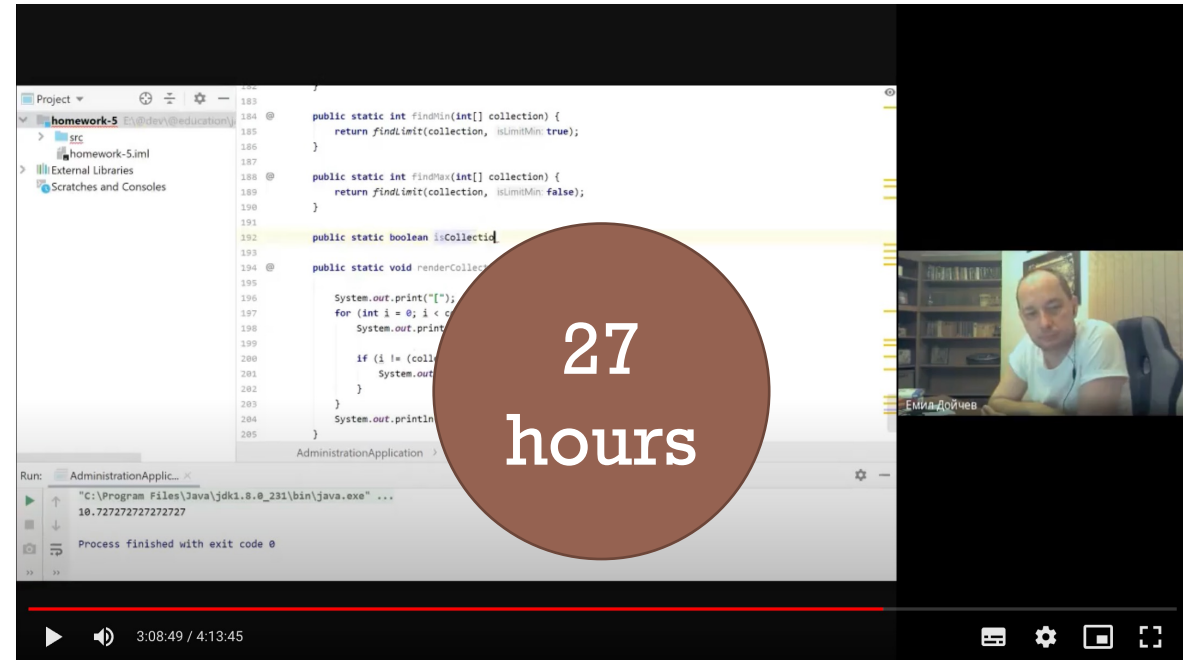
ADITIONAL ACTIVITIES (3/4)

- Personal review by us (the teaching staff) for each submited HW (~90 per week)
  - Careful with the wording (no negative feedback):
    - what is done good
    - what could be imrpoved with ideas

прилагат останалите критерии.

Константин Русев 15 May 2020

1. Много добро именуване на методи и променливи от смислова гледна точка.

2. Имам леки забележки около форматирането на кода, табулации и празни редове. Използвайте функционалността на средата за разработка за автоматично форматиране на кода.

3. Адмирации за използването на константи.

4. Можеше да използвате метода nextInt() наличен в класа Scanner и така няма да се налага да парсвате символен низ към int стойност (https://github.com/Anton-Georgiev/homework-Java/blob/master/homework-week5-arrays/src/inf/informatics/Main.java#L12)

5. Имам забележки относно именуването на някои методи.
Например, методите: option_1(), option_2().
Хубаво е методите да носят в името си това което правят, например sortAscending(), sortDescending() и т.н.
Сами по себе си тези option_1() и option_2() не говорят достатъчно какво точно правят.
Също така, конвенцията за именуване е camelCase, а не snake_case.

6. Методът за търсене на елемент от масива реализира линейно търсене, а в условието изрично е указано да се използва двоично търсене.
Тук не сте спазили напълно изискванията и ще трябва да Ви лишим от точките за това условие.

Много добро представяне!

ADITIONAL ACTIVITIES (4/4)

- Additional seminars on IT topics (outside Java)
  - Introduction to Git
  - Clean code and refactoring
  - Teamwork
  - QA
  - Looking for IT jobs
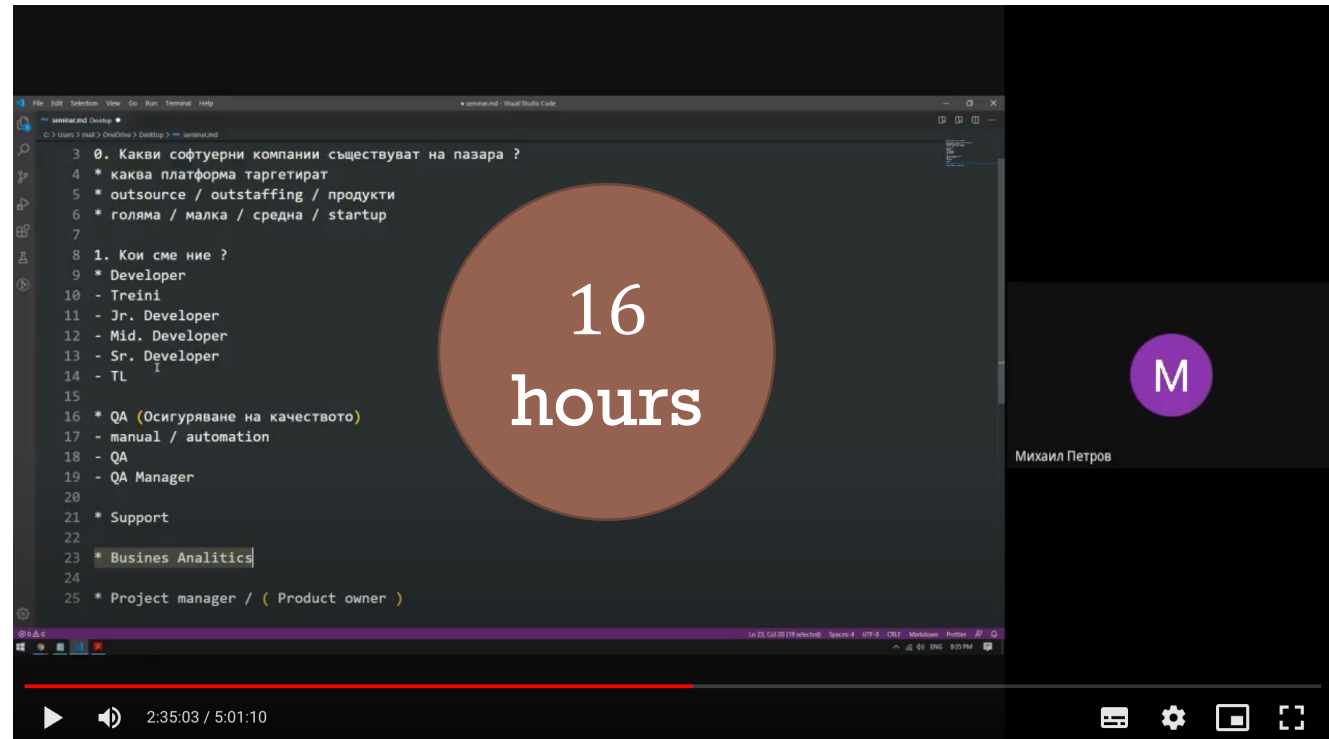
COMPENSATING THE "MISSING EYES"

- Provide options for receiving feedback from the students

- A lot of **anonymous** surveys
  - Do you have a computer at home?
  - How do you like this or that lecture/exercise/etc.?
  - What do you think could be improved?

- A Google form for free text feedback
  - Anonymous
  - **Always available** in the Google Classroom
  - Multiple submissions

- A comprehensive anonymous survey at the end of the course

HOW WAS IT?

- Hard for the students

We do not have time for the other disciplines…

HARD FOR US

95 h in records

258 m/h

~ 4 times more effort

67 m/h

45 h in class

IT WAS FUN

- The majority of the feedback was positive

- The students were happy with the different style and the personal attention they got with the reviews

- Despite the hard assignments they liked the concept with the stories more than the classical clear definition of a HW.

I am so satisfied. I learnt a lot of things thanks to the assignments and the reviews.
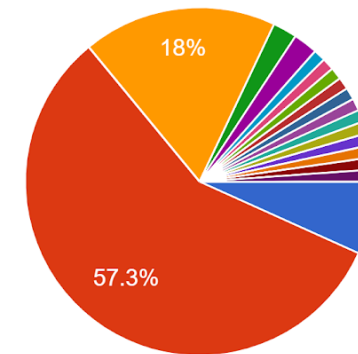
I learnt so many things.

My knowledge was enriched. You helped me gain more interest in programming.

WAS THE SPARK FIRED?

- How do you feel about the Java programming language?
  - 57% - I would not mind to work with it
  - 18% - I love Java

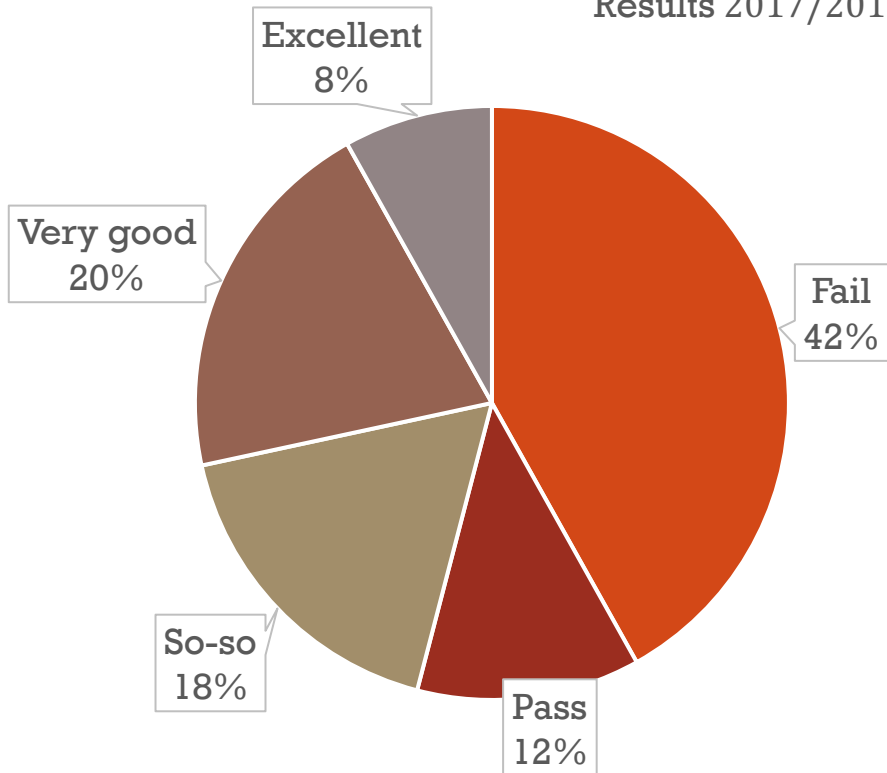So at least 75% with positive feelings + some more in free answers.

Какво е отношението Ви към езикът за програмиране Java?
89 responses

33

WHAT THE RESULTS SAY?

Results 2017/2018

Excellent 8%
Very good 20%
So-so 18%
Pass 12%
Fail 42%

Обобщени резултати "Програмиране на Java"
След редовния изпит, Информатика, I курс, редовно, 2019/2020

Excellent 12,5%
Very good 12,5%
So-so 17,5%
Pass 17,5%
Fail 40%
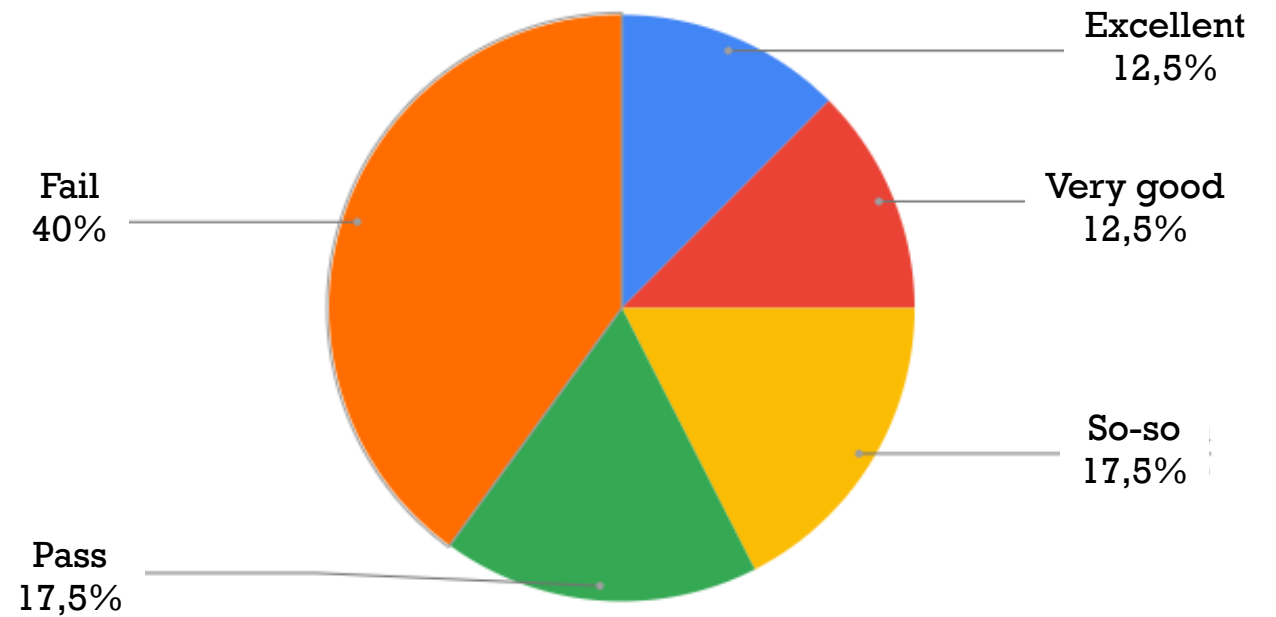
PART III
# POST-COVID STRUGGLES

2020 - 2021

WHAT WE KEPT?

- Google Classroom for providing materials, lectures, assignments

- The anonymous feedback form

- Some of the polls

- The first lecture (fire the spark) – attractive with cinematic feel - proper lighting and sound

- Moved from GitHub to self-hosted GitLab (in attempt to lower the plagiarism)

- 15 HWs instead of 10 (because of switching from trimesters to semesters)

- The HWs reviews, but they are now simplified (in attempt to decrease the teacher staff overload)

- Put more hints in the assignments (in attempt to decrease the complexity)

AN UNEXPECTED SIDE EFFECT

- In an attempt to provide an option for passing students that can't "code", we added an alternative grade scheme:
  - With no homework
  - With 100% attendance on lectures and exercises
  - And just 20% of the final exam (e-test)
  - => a student can get a "Pass" grade.

- This increased the attendance on lectures and exercises significantly

- My surprise – only one student chose that scheme for the final grade.

- The second surprise … on the next slide

THE RESULT

- The "Excellent" and "Very good" grades are close to 60% – twice more than 2017/18

- Failed are almost half less

Count of Редовен изпит/Оценка

Pass 9,1%
Fail 23,4%
So-so 7,8%
Excellent 28,6%
Very good 31,2%
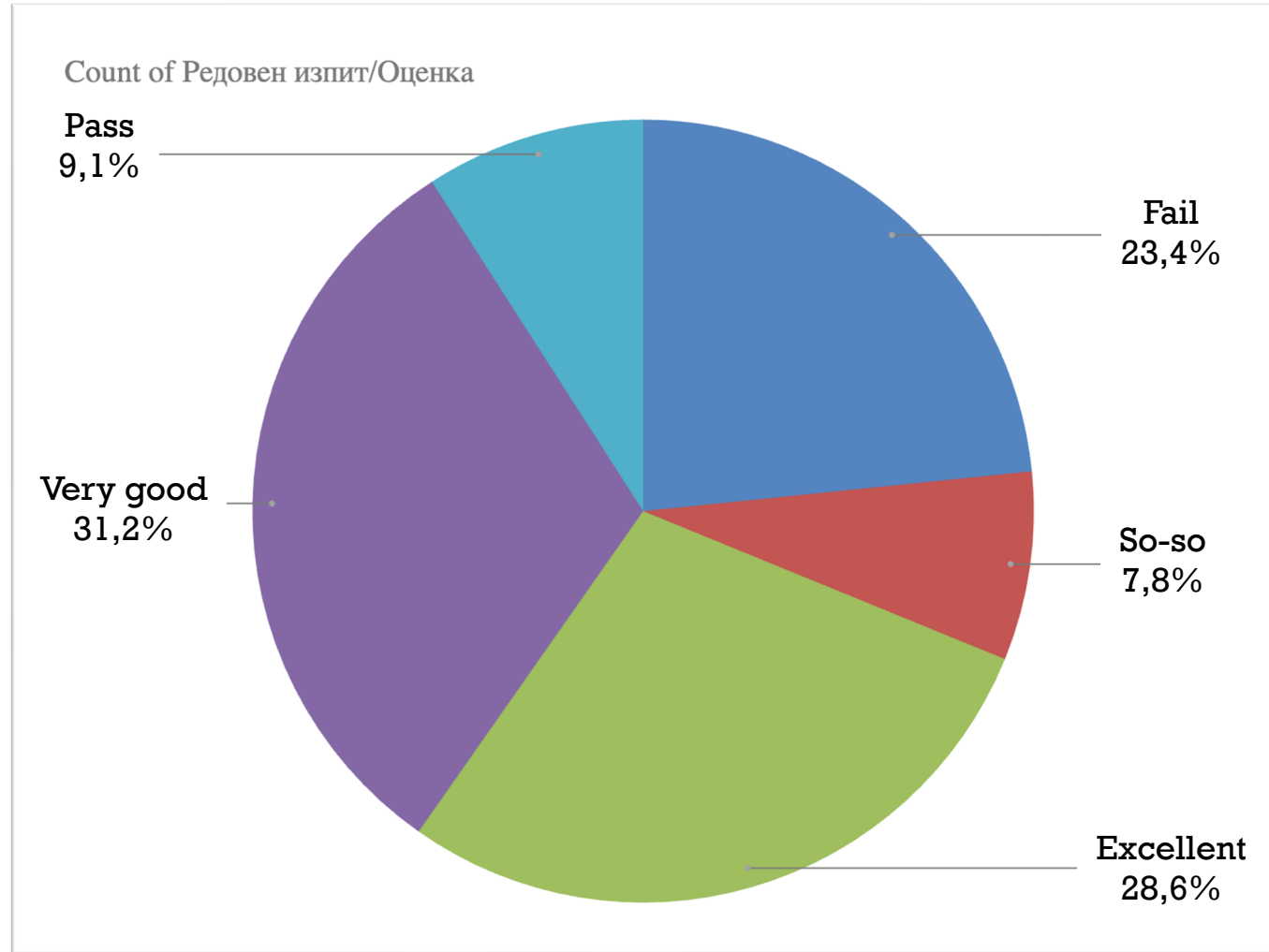
FINAL CONCLUSIONS

- Education is a forced process (… by prof. Stoyanov)

- The attendance on lectures and exercises increases the success rate (I know it should be expected)