Comparing learning outcomes in traditional and gamified lecture formats

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The Future of Education Conference

Course characteristics			Conclusions
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1 Course characteristics

2 The current solution

3 New solution

4 Conclusions

Course characteristics		
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Number of student	S	

- 1 st term Informatics part-time studies 60 people
- 2 nd term Informatics full-time studies 230 people
- 3 2nd term Automatics, Cybernetics and Robotics 120 people
- 4 2nd term Biomedical Engineering 60 people
- **⑤** 2nd Electronics and Telecommunications 220 people

Total: 690 people Lecture: 15 h

Analyzed term: 58 students of 1st term Informatics part-time studies. The whole course contains two blocks:

- Electronics (totally 50%): 25% lecture and 25% laboratory
- Metrology (totally 50%): 25% lecture and 25% laboratory

There is passing threshold for whole course: more than 50% of all points.

The current solution	Conclusions
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2 The current solution

3 New solution



	The current solution	
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Verification of leas	rning outcomes	

- 1 end-semester colloquium, min. 2 weeks after the last lecture
- est: 20 "All or nothing" questions on Moodle (only marking the correct combination results in awarding a point) factual knowledge
- 3 time: 15 minutes

No passing threshold for the test.

	The current solution	
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Results		



2022/2023 2023/2024

	New solution	Conclusions
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1 Course characteristics

2 The current solution

3 New solution



		New solution	
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Verification of le	arning outcomes		

Goals:

- mobilizing students to study regularly
- introducing practical, computational tasks related to literature and the work of an engineer
- introduction of the possibility of choosing the path of completion
- introducing an interesting background
- arousing emotions by choosing a more difficult/easier test and actually feeding the cat Gabrys

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		New solution	

Verification of learning outcomes



		New solution	
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Verification of lea	arning outcomes		



he current solution

New solution

Verification of learning outcomes

	Care Phase - one of two options			one of two options
	Feeding phase		The task is easier - getting a voucher	A more difficult task - completing the mission
Subject	Max number of cans	Number of cans to move to the care phase	Max number of vouchers	Max number of vouchers
Error Theory	3	2	1	3
Multimetrs	3	2	1	4
Oscilloscopes	3	2	1	3
Time, frequency and phase measurements	2	1	1	2
DC/AC voltages	2	1	1	2
AC/DC Converters	3	2	1	4
RLC and non- electrical measurements	3	2	1	3

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		New solution	
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Verification of l	earning outcomes		

Game construction:

- cans: max. 19
- tasks: max. 7
- missions: max. 21

The result in % is scalled to 25% of whole course.

The maximum number of points is 40. Therefore, solving only the canned tasks gives less than 50% of 25% of whole course. It is recommended to do tasks or missions.

Number of people who chose gamification: 56 (97% of 58 people).

		New solution	
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Verification of lea	rning outcomes		

New types of tasks

- read an industry article and answer the questions reading comprehension skills
- analyze the catalog note and calculate the ability to find information and use it

Limited time to do the homework with deadlines.

Analysis of the effe	ects of the conducted	gamification	
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		New solution	

• factual knowledge questions – "All or nothing" questions

Multiple choice question - you must marked exactly the right answer(s).
Example:
Wild boars feed on
 a. people b. electronic equipment c. apples d. plant shoots e. insects
 a. people b. electronic equipment c. apples d. plant shoots

		New solution	
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Analysis of the effec	ts of the conducted	gamification	

• factual knowledge questions – "Missing Words" questions

In this type of question, you select a matching word fr	om a drop-down list.	
Example:		
The whale shark is a species of cartilaginous	fish, the largest	representative of sharks,
easily recognizable by its specific coloration. It is also	the 🗢 k	nown fish. The largest
reliably measured individual of this species was 18.8 r	n long. The body weig	ht of the whale shark
reaches 13.6 t (unconfirmed rumors speak of individu	als even 20 m long, we	eighing over 30 tons). In
many areas, however, the maximum recorded length of	loes not exceed 10-12	m. Despite its impressive
size and menacing-sounding name, the whale shark is	a gentle fish and does	not pose a threat to
humans. It is one of three known sharks that feed on	¢	. The other two are the
basking shark and the megamouth shark. The whale s	nark lives to be over 7	0 years old. It is
commercially fished, and its meat commands high price	es.	

		New solution	
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Analysis of the effec	ts of the conducted	gamification	

 factual knowledge questions – "Drag and drop onto text" questions

In this type of question, you have to grab the string that you want to put in a given gap, move it there and drop it.			
Example:			
Long before patented first in 1879 and then a year later in 1880 and began			
commercializing his incandescent light bulb, British inventors were demonstrating that electric light			
was possible with the arc lamp. In 1835, the first constant electric light was demonstrated, and for the			
next 40 years, around the world worked on the incandescent lamp, tinkering with the			
(the part of the bulb that produces light when heated by an electrical current) and the			
bulb's atmosphere (whether air is vacuumed out of the bulb or it is filled with an inert gas to prevent			
the filament from oxidizing and burning out). These early bulbs had extremely short lifespans, were too			
expensive to produce or used too much energy.			
Max Planck Thomas Edison Albert Einstein Johannes Gutenberg			
traders scientists politicians journalists			
dog fang air filament ceramic rod			

			New solution ○○●○	
Ana	lysis of the effec	cts of the conducted	l gamification	
	Construction of task: • factual knowled	s ge questions – "Matchinş	g" questions	
	Match categories to objec	ts		
	colour	Drag answer here	bottle	
	plant	Drag answer here	bamboo	
	vehicle	Drag answer here	jar	
			red	
			hat	

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Analysis of the eff	ects of the conducted	gamification	

- calculation questions using the appropriate formulas
 - questions related to acquired skills
 - questions related to logical thinking

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Comparison of	achieved results		

If there was pass threshold: above 50%:

• 48 people would passed gamification (82,76% of 56)

In previous years:

- 25 people would passed (45,45% of 55) (2023/2024)
- 32 people would passed (66,67% of 48) (2022/2023)

		New solution	
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Comparison of a	chieved results		

Basing on on factual knowledge questions



		New solution	
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Comparison of achie	eved results		

Basing on on non-factual knowledge questions (reading comprehension)



		New solution		
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Comparison of achieved results				

Basing on on non-factual knowledge questions (application of know-ledge)



			Conclusions
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Course characteristics

2 The current solution

3 New solution



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Conclusions		

- The introduction of gamification significantly increased student engagement and participation. 97% of students chose this form of credit.
- Compared to traditional lecture assessment (based on theoretical questions only), gamification improved performance in nearly all topics, even though students had access to all resources.
- The structure of tasks -— especially those requiring reading comprehension, practical application, and information analysis -— promoted deeper learning and development of future-ready competencies.

		Conclusions
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Conclusions		

- The results confirm that gamified methods, despite being more time-consuming to develop, offer measurable educational benefits.
- This was the first implementation of the gamified lecture. The results are based on approx. 60 students, but further analysis will cover the entire cohort of nearly 630 students, providing a broader base for conclusions.