Step-by-step Solution of Applied Engineering Problems in Mathematics Courses Using STACK

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Introduction

- It is customary in engineering schools to incorporate mathematical knowledge and skills into engineering education.
- Solving practical problems in a mathematics course with first-year

Questions Development

hen pla	nning the d	evelopment of	the new quarter of Tal	linn, it is neces
o do this	s, you can in	stall traffic lig	hts on demand, automa	atic traffic light:
he avera	age time it t downtime i	akes for a car in a traffic jam	to travel along each str or at traffic lights.	eet is shown in
	Underpass	Automatic traffic light	Underpass Traffic lights on demand	Maximum travel time
treet 1	2	-1	-4	-4
treet 2	6	1	4	60
treet 3	6	-1	4	48
ow mar	y traffic ligh	nts or underpa	sses do you need to bu	ild?
olution:				

	one-room ap	two-room ap	three-room ap	Total time spent	
Wallpaper	8	12	16	528	
Glass	60	75	85	3100	
Painting	20	35	50	1580	
How many o Solution:	ne-, two- and three	e-room apartme	ents are there in t	he house?	

students allows them to clarify their ideas about the techniques and methods of solving problems that are necessary in their professional activities as an engineer.

- To implement the concept of practice-oriented problems, teachers of the TTK UAS and the Simon Kuznets Kharkiv National Economic University developed a set of step-by-step tasks. Each assignment translates several mathematical concepts into real practice, helping students understand the impact of these topics on their future work.
- On the other hand, a detailed approach allows the authors to control the educational actions of students in the process of studying the course material: to prompt students to effective decisions, to fix their attention on certain points of the material that students usually do not notice or misunderstand.
- STACK questions are used to ask a variety of questions while honing skills and the ability to provide quick feedback at every step.
- First-year students of Tallinn University, specializing in mathematics teacher, took part in the peer review. They gave their own idea of the concept by answering the questionnaire.



Question 2

Peer Review

Q1. How satisfied are you with the step-by-step structure of the tasks?

- Not at all satisfied
- Not so satisfied
- Somewhat satisfied
- Very satisfied
- Extremely satisfied

Q2. How satisfied are you with the design of the tasks?

- Not at all satisfied
- Not so satisfied
- Somewhat satisfied
- Very satisfied
- Extremely satisfied

Q3. How difficult/easy did you find it to follow the given solution steps?

- Very difficult
- Somewhat difficult
- Neither difficult nor easy
- Somewhat easy
- Very easy

Q4. How did you handle filling in the gaps with answers?

- Very difficult
- Somewhat difficult
- Neither difficult nor easy
- Somewhat easy

Satisfaction with step-by-step structure of the tasks

Not at all satisfied
 Not so satisfied
 Somewhat satisfied
 Extremely satisfied



Question 3

Question 1



Question 5



Satisfaction with design of the tasks Not at all satisfied Very satisfied Extremely satisfied



Question 4



Question 6



Question 7

Very easy

Q5. What did you like about the tasks? Please describe at least 2 things Q6. What did you dislike about the tasks? Please describe at least 2 things Q7. What could be done differently?





Future Plans

- Create short instructions about the STACK questions inputs syntax
- Think about how to make a student's work only computer-based (built-in online calculator, sketchpad)
- Develop a clearer design of questions according to the possibilities of STACK

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