Rosenheim Technical University of Applied Sciences
Faculty of Applied Sciences and Humanities
A project of the PRO-Aktjv University Teaching Team
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Rosenheim Technical University of Applied Sciences

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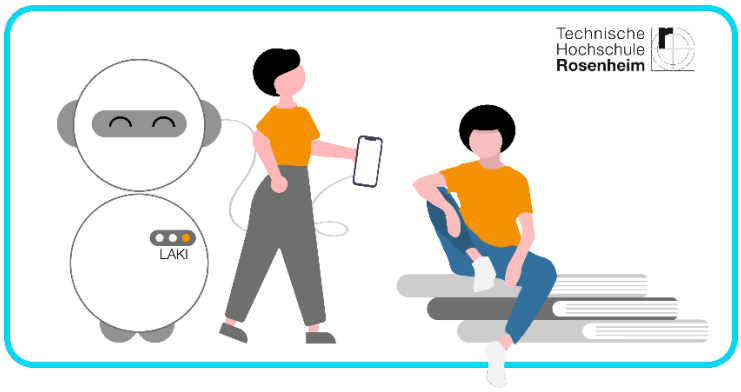

FANTASTIC

Feedback based on **An**alytics of **T**eaching **a**nd **St**udying meets **I**ndividual **C**oaching

E. Junker, B. Naumer, T. Schweser, S. Deschle-Prill, N. Kraus, J. Lackovic, C. Lux, A. Sanewski

The FANTASTIC project combines i) AI-generated feedback with ii) the pedagogy of learning and teaching and iii) pedagogical content knowledge as three essential support levels to improve students' learning behavior and thus their academic success in an innovative way.

The goal is to connect these levels in such a way that, on the one hand, as many students as possible are motivated to accept the AI-supported feedback, and on the other hand, they are accompanied in improving their learning behavior individually, both in terms of content and methodology.

If this succeeds, students not only experience self-efficacy, but also benefit long-term from the acquired ability of self-regulated learning, which is becoming increasingly important in the rapidly changing modern workplace.

The following pages show two examples of feedback emails that students received in the course *Physics for Industrial Engineering* received. The two-semester course includes two emails per semester: Email 1 and 3 without prediction, Email 2 with an AI prediction for the midterm exam (first semester material) and Email 4 with an AI prediction for the final exam (material from both semesters). The following examples are from Email No. 4 (from June 11) as final preparation for the exam on July 15, 2025 and contain:

- AI-based prediction of potential exam success with feedback/learning tips
- Learning traces overview with individual feedback
- Tips for final exam preparation
- Additional general information

Hi John Doe,

I have analyzed your learning traces again and compiled the following information for you:

- **Prediction** for the exam with **feedback**
- **Learning traces overview** with individual **feedback** and, where possible, a **comparison** to last semester
- Tips for **final exam preparation**
- General **information**

Prediction

Group B: Good Foundation

Based on your collected data, you fall into Group B. What does this mean? Most students with similar data have passed the exam in the past. This is an encouraging starting position. But attention: Make sure you don't become one of the few exceptions!
My recommendation: Use your solid foundation and continue working strategically. Deepen your understanding and test yourself, for example, with the Deepening Quizzes and new practice problems, such as those from the Learning Objectives Check. Final sprint!

Contextualization of my prediction – please note:

- My prediction is a probability, not a guarantee of your exam result and not a grade.
- My algorithm has learned patterns from data of previous students and calculated your probability of passing based on this. Accordingly, you are assigned to one of the groups A-E.
- My algorithm does not use all the data displayed below, and furthermore, data that is not shown here also flows into the calculation.
- **Important:** You still have approximately 1 month until the exam. Your engagement and your final preparation will determine your result – your success is still in your hands!

How to proceed?

- Use the feedback from this and my last 3 emails (from November 19, December 13, April 30) to prepare for your exam!
- Reflect on your learning behavior based on the feedback. Have you changed anything since then? If yes, what? Has it paid off? Do you (possibly need to) make adjustments (again)?
- When reviewing individual chapters, orient yourself to the learning objectives and the new Learning Objectives Check.

Learning traces overview

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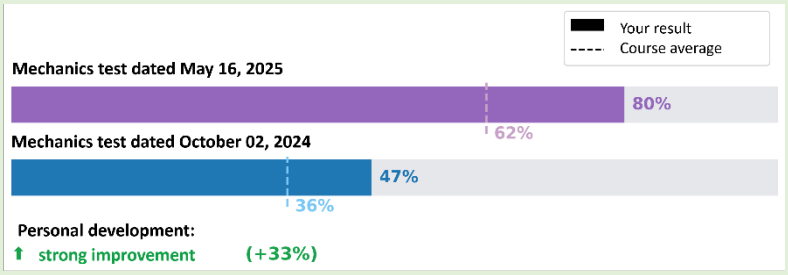
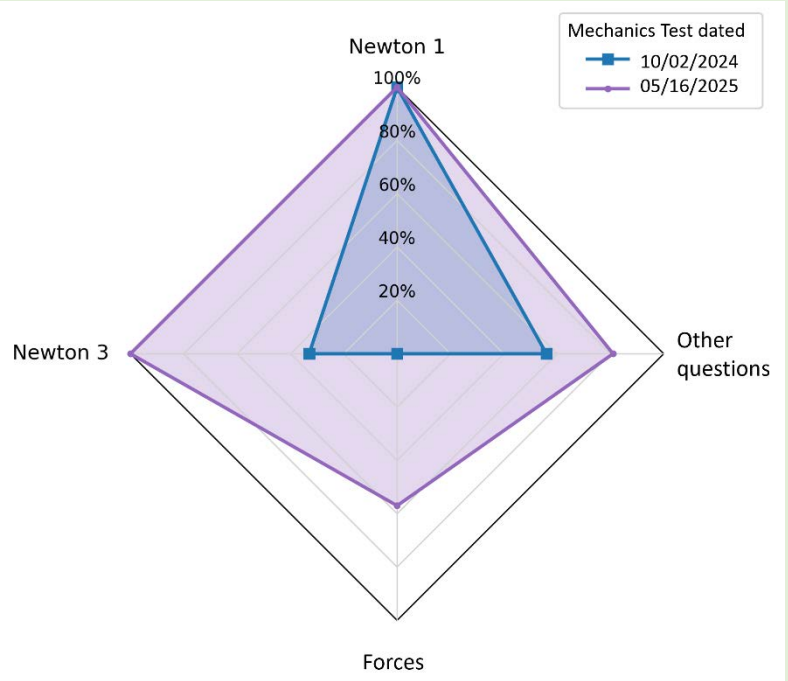
Below you see the results of your completed tests:



Current result (May 16, 2025): 24 out of 30 points (80%); solid understanding of mechanics concepts. To become even more confident, you should review the topics again.

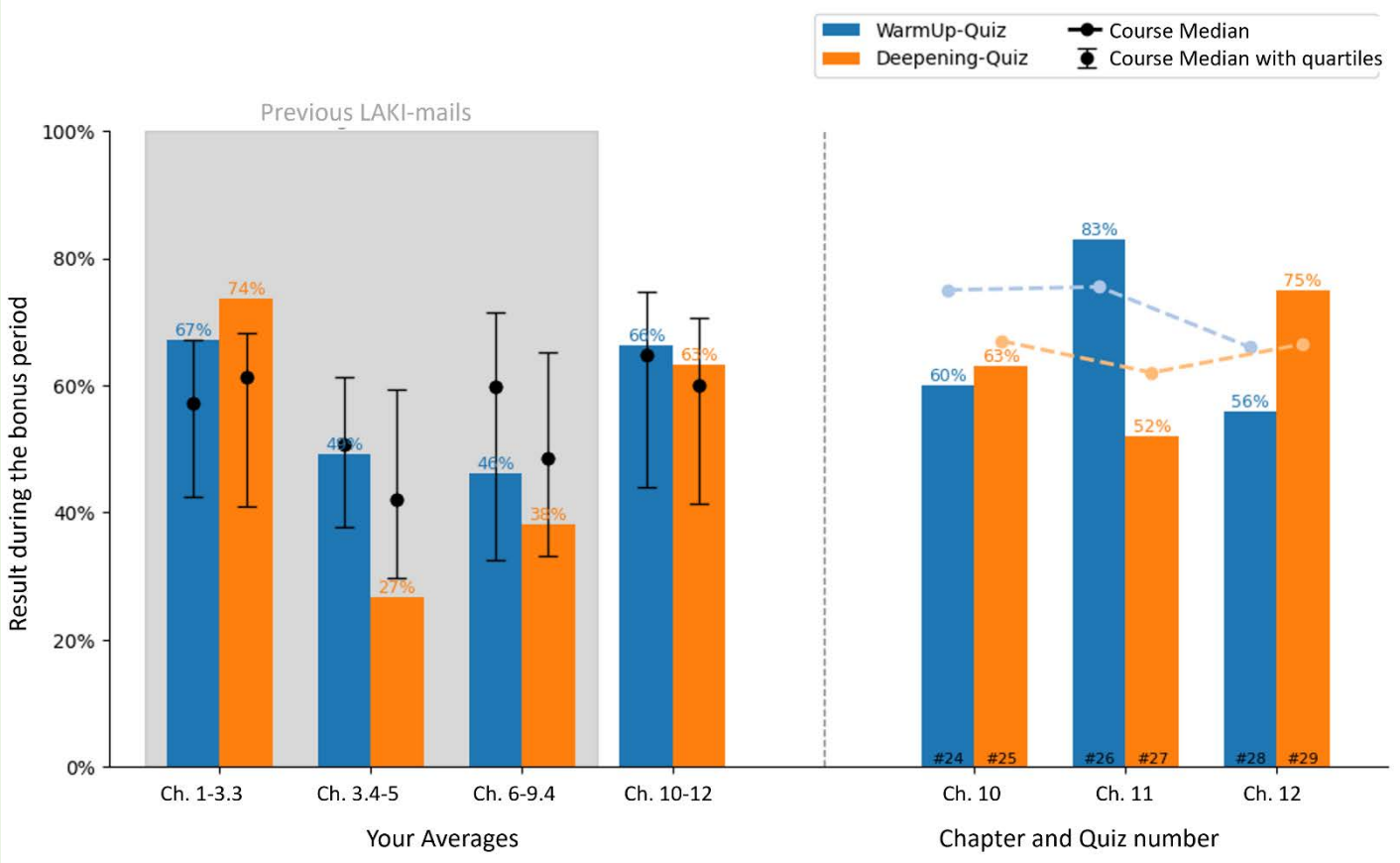
Personal Development: Excellent progress compared to the pretest. Maintain your successful strategies and keep it up!



Sub-areas: The radar chart shows your partial results and illustrates your strengths and weaknesses - if you have completed two tests, you can also track your development. Use this visual representation to improve in a targeted way, for example, with Chapter 3 (lecture notes, practice problems) and the learning video on 3.3 Forces & Free Body Diagrams.

JiTTs in the Bonus Period

As you know, the quiz results do not necessarily reflect your current knowledge level. I recommend that you repeat the Deepening Quizzes in particular, as these are more challenging and test in-depth knowledge.



Quiz-feedback	WarmUp-Quiz	Deepening-Quiz
Current quizzes (Ch. 10-12):	3 of 3	3 of 3
	You completed all quizzes - great performance! Keep it up!	
Your current average:	in the upper mid-range	in the upper mid-range
Average development (Ch. 6-12):	Positive improvement. What did you change? Build on your successes and continue to deepen the core topics - you're on a good path!	Pleasing performance improvement on the more complex tasks. To achieve a solid understanding, you should continue to engage intensively with the content. Definitely keep at it!

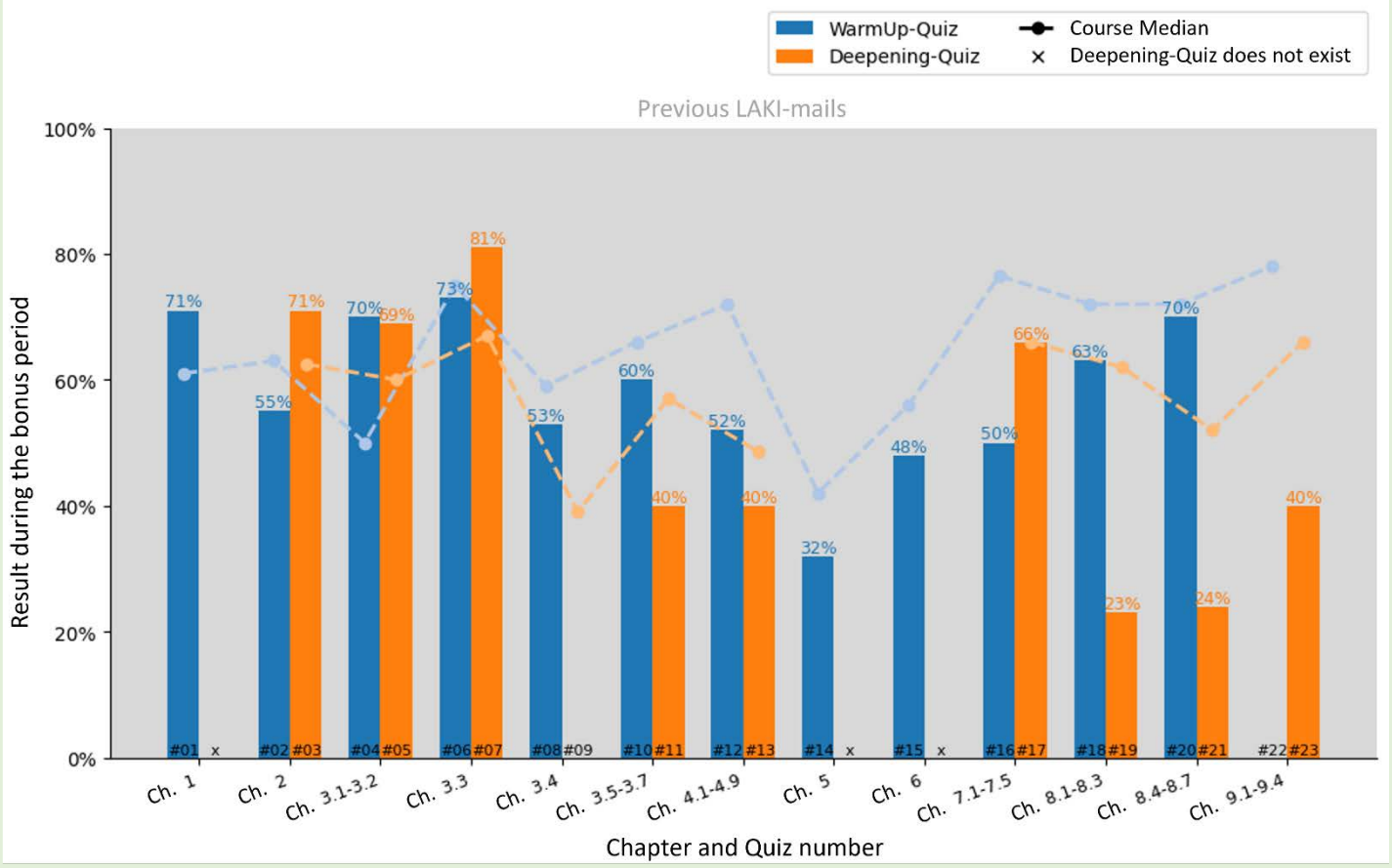
Chapter Feedback

Chapter 10 Kinetic Gas Theory	Significantly below average; you should practice more intensively, e.g., with these problems: Kuypers (2012): S. 245/12-1 &12-3 und Mills (2019): S. 264/14.5 & 14.13.
Chapter 11 Heat	Quiz #26 upper mid-range; Quiz #27: lowest quartile. Warm-Up Quiz significantly better than Deepening Quiz; i.e., you lack a deeper understanding of the topic to apply your knowledge flexibly.
Chapter 12 Applications of Thermodynamics	Quiz #28: lowest quartile; Quiz #29 upper mid-range.

Note: When working in **study groups**, the result is a group performance; your own performance may potentially be worse. If you used **AI tools** such as ChatGPT, Claude, etc. to complete the JiTTs, honestly check your own understanding of the content – did you **really** understand the concepts? Good results can be deceptive here. Keep in mind that these tools will not be available to you during the exam.

You can find the exact references at the end of this email in the P.P.S.

Here is an **overview of your previous quiz results** from the bonus period again, so you can prepare for the exam in a targeted way:



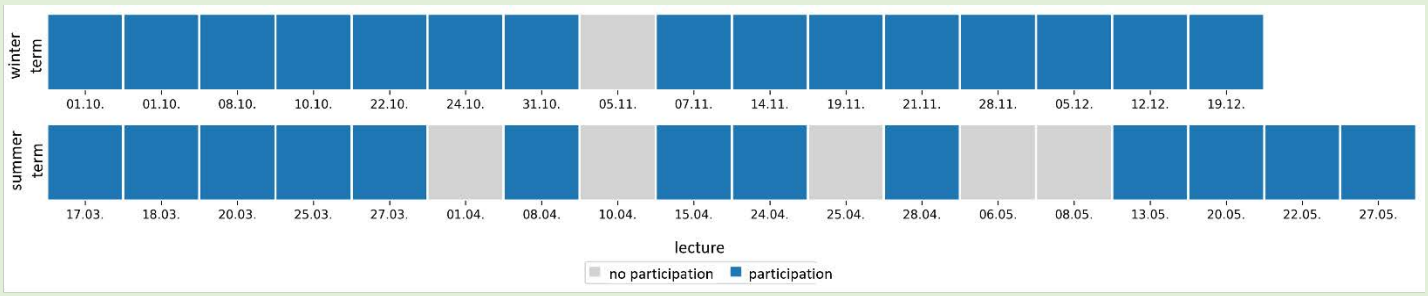
Attendance in Class

since October 1, 2024

‘Lectures‘:

Past experience has shown that attendance and, especially, **active participation** in class significantly increase learning success in physics.

Your attendance:

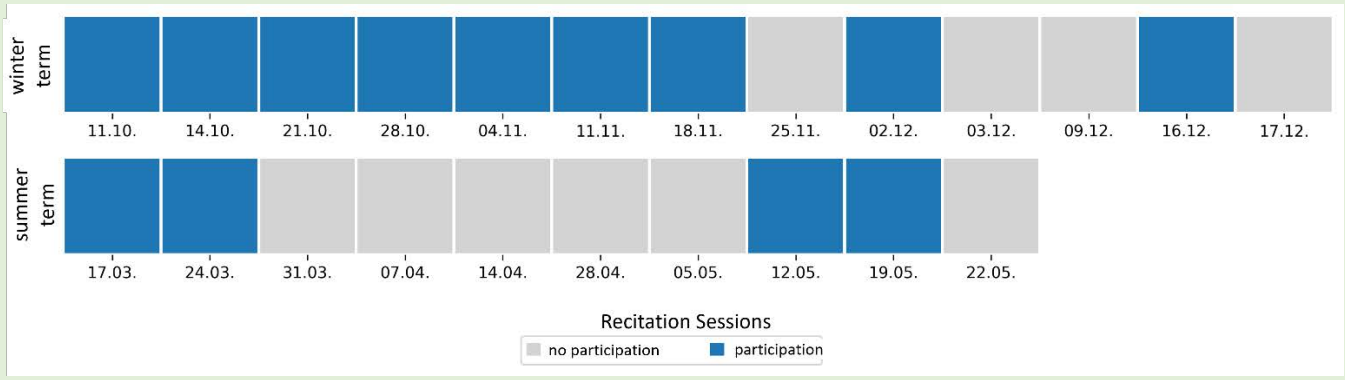


With 28 out of 34, frequently; you experienced many topics directly, which is a good foundation for your learning success. Specifically address the missed topics to leave no gaps.

Recitation Sessions:

Upper-level students advise you to attend the recitations because there is constant exchange, topics are examined from different perspectives, and you engage with the content more intensively and sustainably.

Your attendance:



With 13 out of 23, spotty; without regular practice, it is difficult to master the complex content from the lectures. Have you compensated for this in other ways?

Your Activity in Moodle

from April 21 to May 30, 2025

How active were you in Moodle? The gauge chart shows your activity. Ask yourself: Does this match what you want to achieve? Additional materials are available if needed. Use them where appropriate.

Final Exam Preparation

You're on the home stretch! To keep the goal in sight during the final stretch, I have compiled some tips and links here.

Steps

IMPORTANT: NEVER start calculating right away!

Read the problem → Make a sketch (possibly before-after sketch) → read again → adjust sketch → ideas for solution approach, fundamental principles (conservation laws, force/pressure/torque equilibrium) → read the problem again → calculate

Study Techniques

On the respective pages, you will find all learning objectives in the Learning Objectives Check as a good overview, a quiz on using the calculator, and a quiz for practicing algebraic manipulations.

Problems & Solutions

In Section 16 of Moodle, you will find numerous additional problems for practice, an overview of the approach to solving problems, or in Section 17, solutions to Pitka.

Learning Videos
Here you can find the learning videos (explanatory videos and practice problems) of the PRO-Aktjv team, the Physik TH Rosenheim YouTube channel, and the videos by Prof. Kohl from HS Koblenz: https://www.physik-online.com/.

Study Techniques & Self-Management
Here you will find a checklist and tips for exam preparation, a presentation and a website on learning strategies, and contact information for exam coaching, e.g., for test anxiety.

Physics Recitations
Attend the physics recitations on Mondays regularly in the final weeks! You can ask your questions there (even for older problems). Attend the **practice exam** on Thermodynamics/Fluids on Fri, June 13, 8-11 a.m.

General information:

- Do you still have questions about **learning physics**? Elmar Junker – elmar.junker@th-rosenheim.de
- Would you like individual coaching?
- Would you like to contact the **LAKI-Coaches**? fantastic-coaching@dummy.de
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Are you familiar with the **Netzwerk Beratung** (Counseling Network)? Here you will find an overview of diverse support services, e.g., the Academic Advising Center and exam coaching (i.e., help with exam preparation or test anxiety).

„A goal without a plan is just a wish." – Antoine de Saint-Exupéry

In this spirit, I wish you continued success in the coming weeks, a good final phase of preparation, and a successful exam – give it your all now so it turns out well!

Yours, *Laki*

P.S.: For participating in the survey about my email in Moodle, you will receive one bonus point!

P.P.S.: References:
Pitka, Rudolf. *Physik: der Grundkurs.* 3rd edition. Harri Deutsch Verlag, 2005.
Kuypers, Friedhelm. *Physik für Ingenieure und Naturwissenschaftler: Band 1-Mechanik und Thermodynamik.* 3rd edition. John Wiley & Sons, 2012.
Kersten, Peter, Paul A. Tipler, and Gene Mosca. Tipler *Physik: für Studierende der Naturwissenschaften und Technik.* 9th edition. Berlin, Heidelberg: Springer Berlin Heidelberg, 2024.
Mills, David. *Arbeitsbuch zu Tipler/Mosca, Physik: Alle Aufgaben und Fragen mit Lösungen zur 8. Auflage.* Springer-Verlag, 2019.

Hi Jane Doe,

I have analyzed your learning traces again and compiled the following information for you:

- **Prediction** for the exam with **feedback**
- **Learning traces overview** with individual **feedback** and, where possible, a **comparison** to last semester
- Tips for **final exam preparation**
- General **information**

Prediction

Group D: Increased Risk

Based on your collected data, you fall into Group D. What does this mean? Most students with comparable data have not passed the exam in the past, but there were also exceptions. This means your engagement can make the crucial difference.
Many of the data shown here are probably no surprise to you. And you may even be considering postponing the exam. But this is not an option! The past has shown that this tends to lead to even larger gaps. Therefore, use the final sprint, definitely take the exam to see where you really stand.
My recommendation: Intensify your preparation and analyze your results, e.g., from the JiTTs, to build on your strengths and close gaps. Now is the time to adjust your learning strategy. Definitely keep at it; it can be done!

Contextualization of my prediction – please note:

- My prediction is a probability, not a guarantee of your exam result and not a grade.
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- **Important:** You still have approximately 1 month until the exam. Your engagement and your final preparation will determine your result – your success is still in your hands!

How to proceed?

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- Reflect on your learning behavior based on the feedback. Have you changed anything since then? If yes, what? Has it paid off? Do you (possibly need to) make adjustments (again)?
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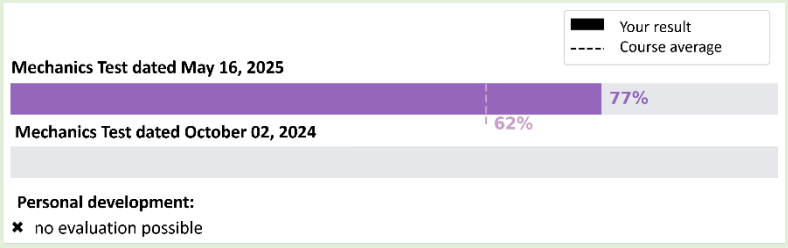

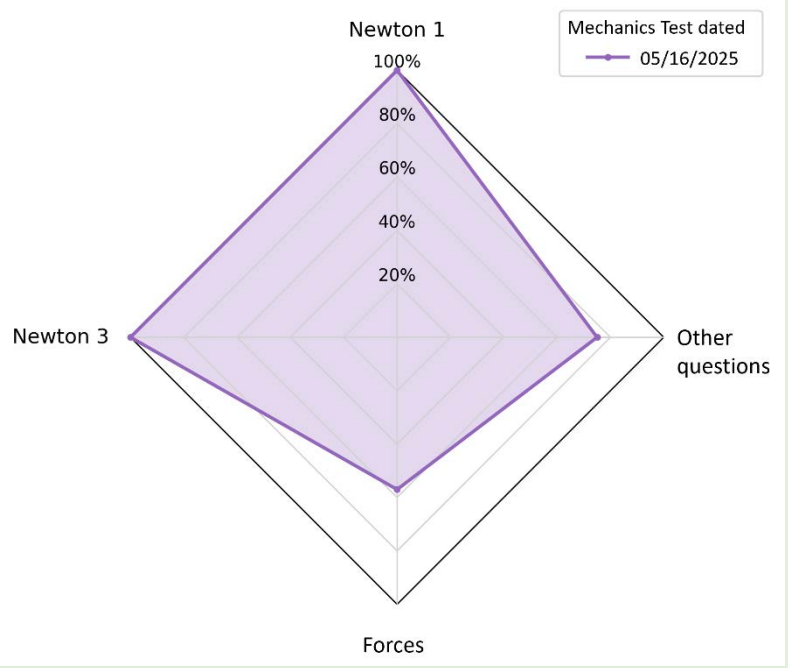

Current result (May 16, 2025): 23 out of 30 points (77%); solid understanding of mechanics concepts. To become even more confident, you should review the topics again.

Sub-areas: The radar chart shows your partial results and illustrates your strengths and weaknesses - if you have completed two tests, you can also track your development. Use this visual representation to improve in a targeted way, for example, with Chapter 3 (lecture notes, practice problems) and the learning video on 3.3 Forces & Free Body Diagrams.

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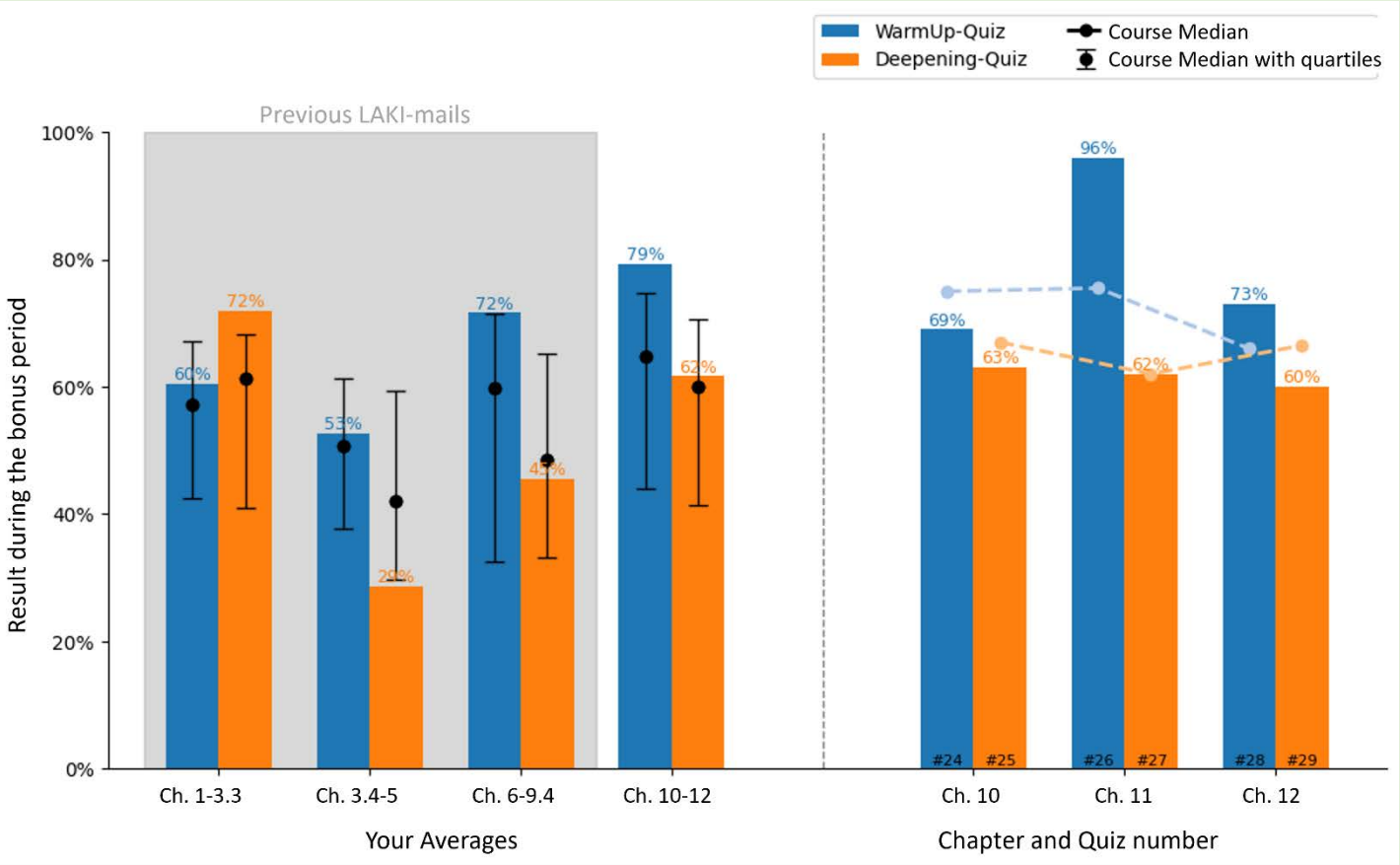

Quiz-feedback	WarmUp-Quiz	Deepening-Quiz
Current quizzes (Ch. 10-12):	3 of 3	3 of 3
	You completed all quizzes - great performance! Keep it up!	
Your current average:	in the upper quarter	in the upper mid-range
Average development (Ch. 6-12):	Positive improvement. What did you change? Build on your successes and continue to deepen the core topics - you're on a good path!	Pleasing performance improvement on the more complex tasks. To achieve a solid understanding, you should continue to engage intensively with the content. Definitely keep at it!

Chapter Feedback

Chapter 10 Kinetic Gas Theory	Quiz #24: lower mid-range; Quiz #25: lowest quarter.
Chapter 11 Heat	Great result in Quiz #26—keep it up! Quiz #27: lower mid-range. WarmUp quiz significantly better than Deepening-quiz; i.e., you lack a deeper understanding of the topic to be able to apply your knowledge flexibly.
Chapter 12 Applications of Thermodynamics	Quiz #28: upper mid-range; Quiz #29: lower mid-range.

Note: When working in **study groups**, the result is a group performance; your own performance may potentially be worse. If you used **AI tools** such as ChatGPT, Claude, etc. to complete the JiTTs, honestly check your own understanding of the content – did you **really** understand the concepts? Good results can be deceptive here. Keep in mind that these tools will not be available to you during the exam.

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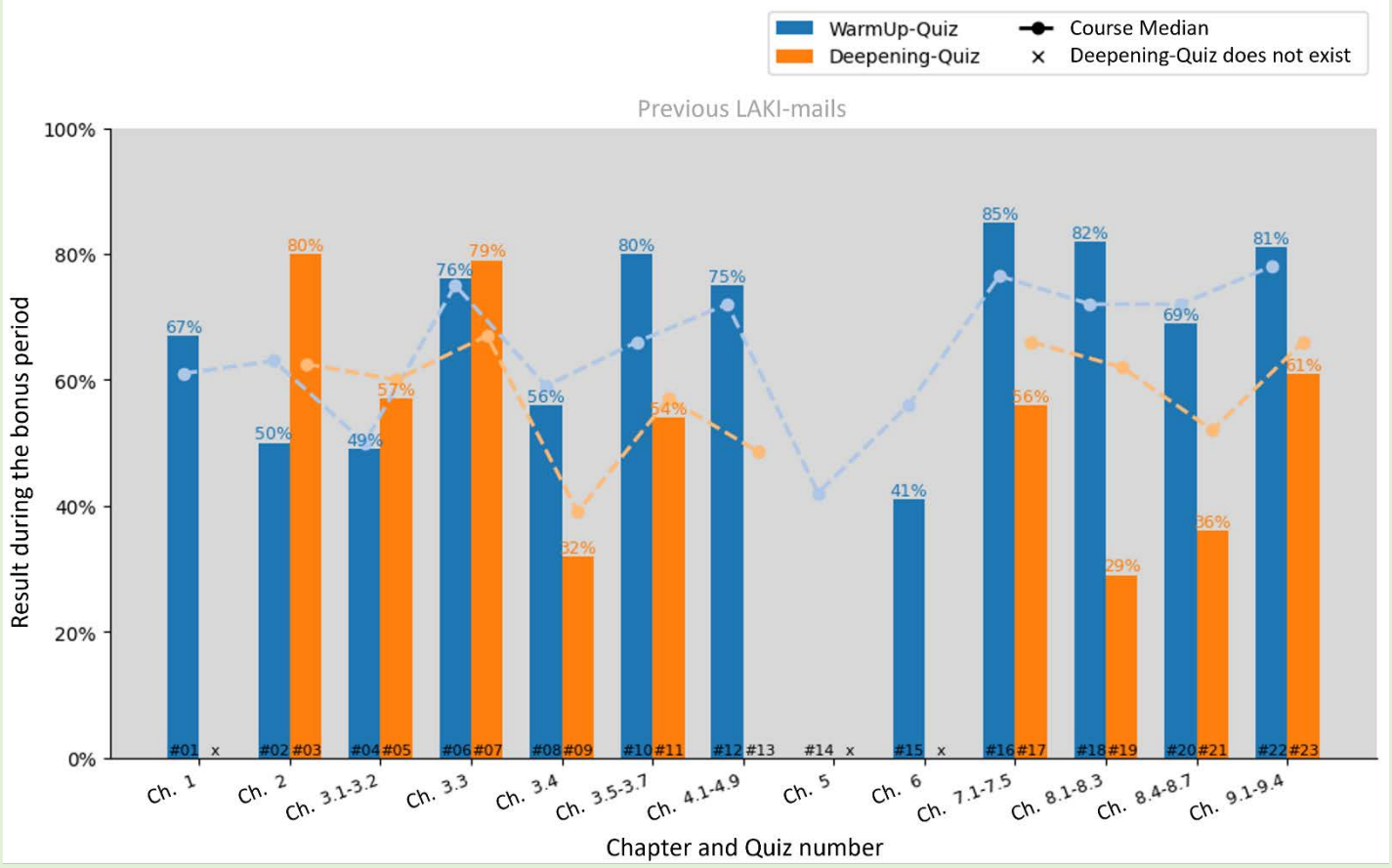

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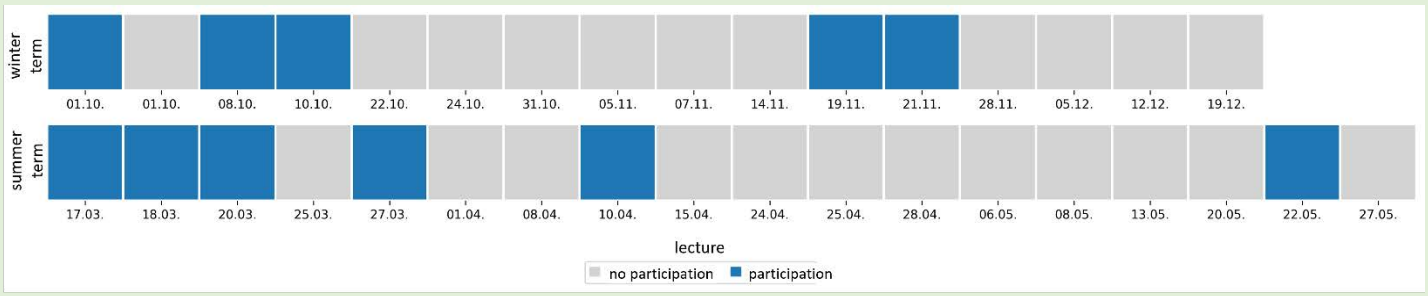

With 11 out of 34, very low; this can significantly impact your understanding of the course content and your learning success. I strongly recommend that you address any knowledge gaps.

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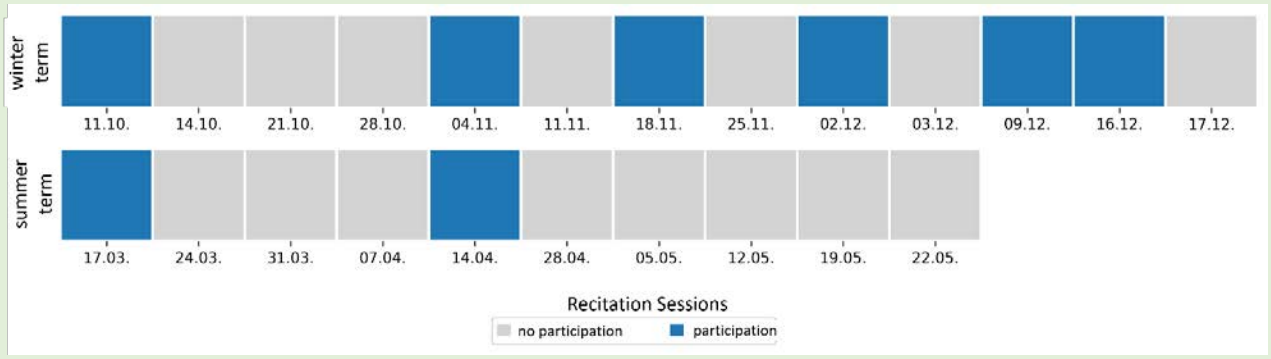

With 8 out of 23, low; without regular practice, it is difficult to master the complex content from the lectures. Have you compensated for this in other ways?

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