Making learning more adaptive, transparent, and motivating with AI



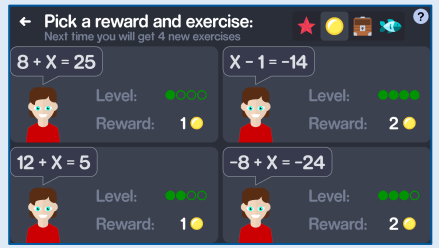
Jeroen Ooge

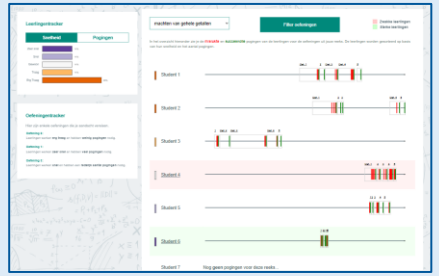
jeroenooge.be

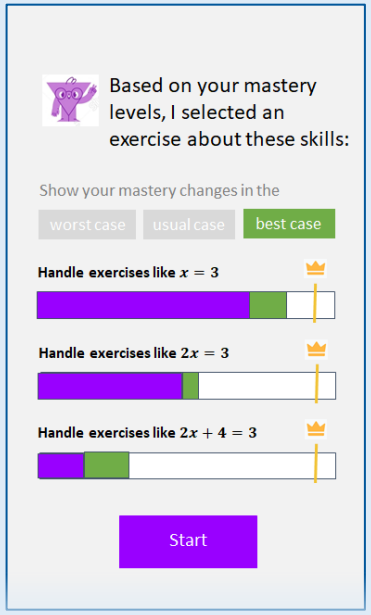
Universiteit Utrecht

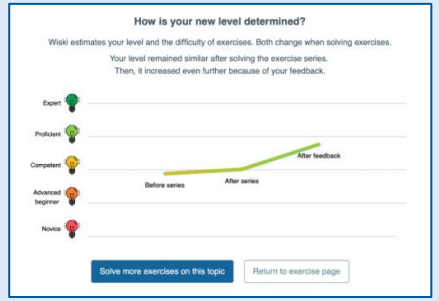


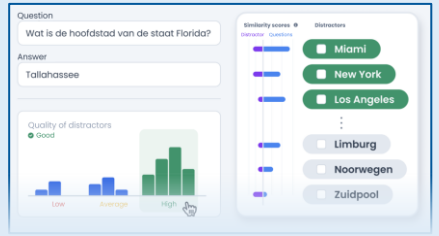


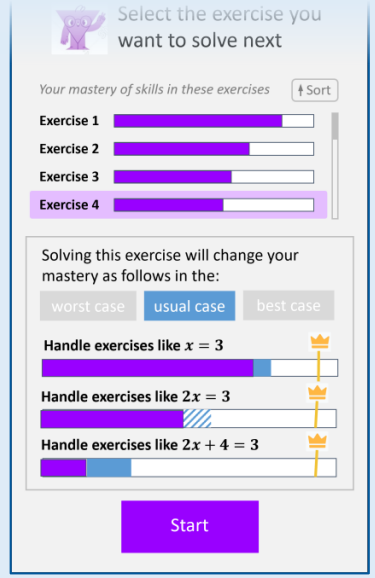


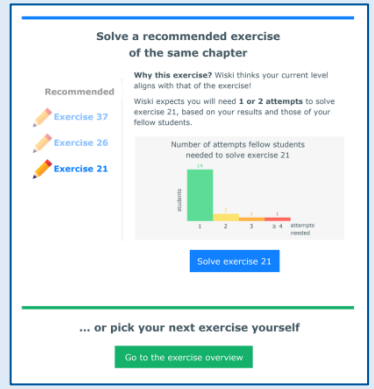


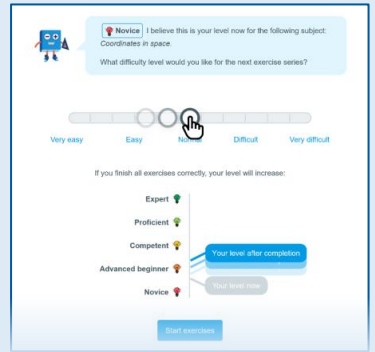












My life in 1 slide

I really like improving education and motivating students



Universiteit Utrecht

Assistant professor
in computer science
Nov 2023-now

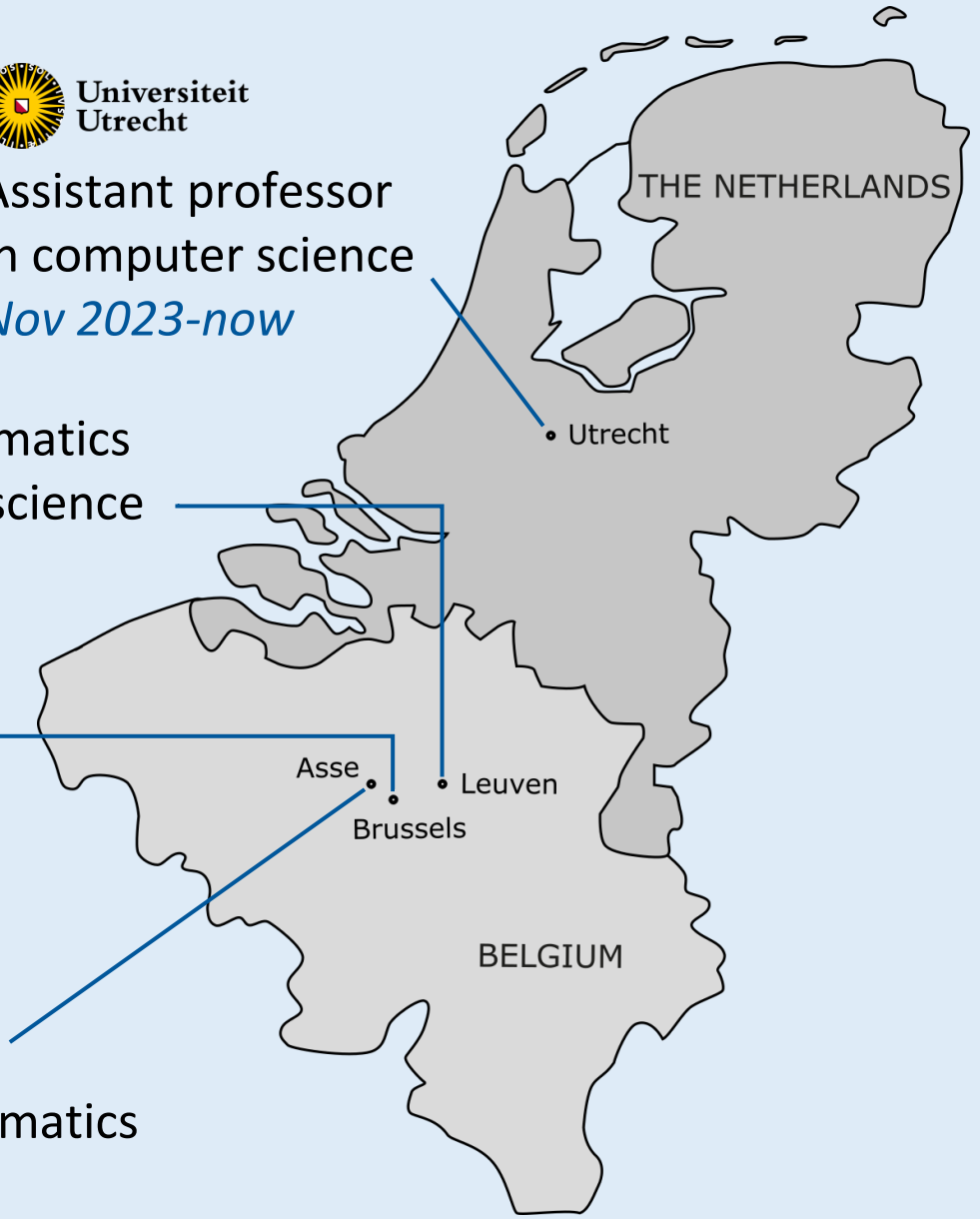
KU LEUVEN

MSc applied informatics
PhD in computer science
2017-2023

VUB VRIJE UNIVERSITEIT BRUSSEL

MSc fundamental
mathematics
2012-2017

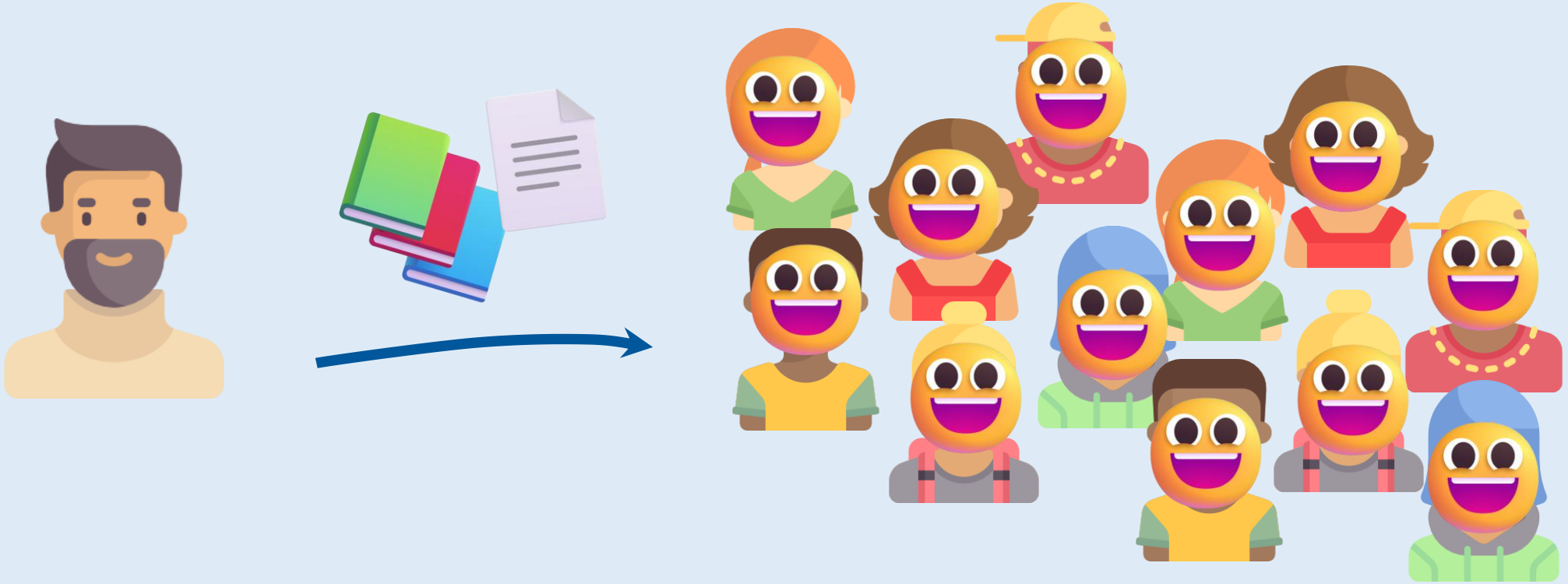
Secondary school
economics-mathematics
2006-2012



What learning typically looks like



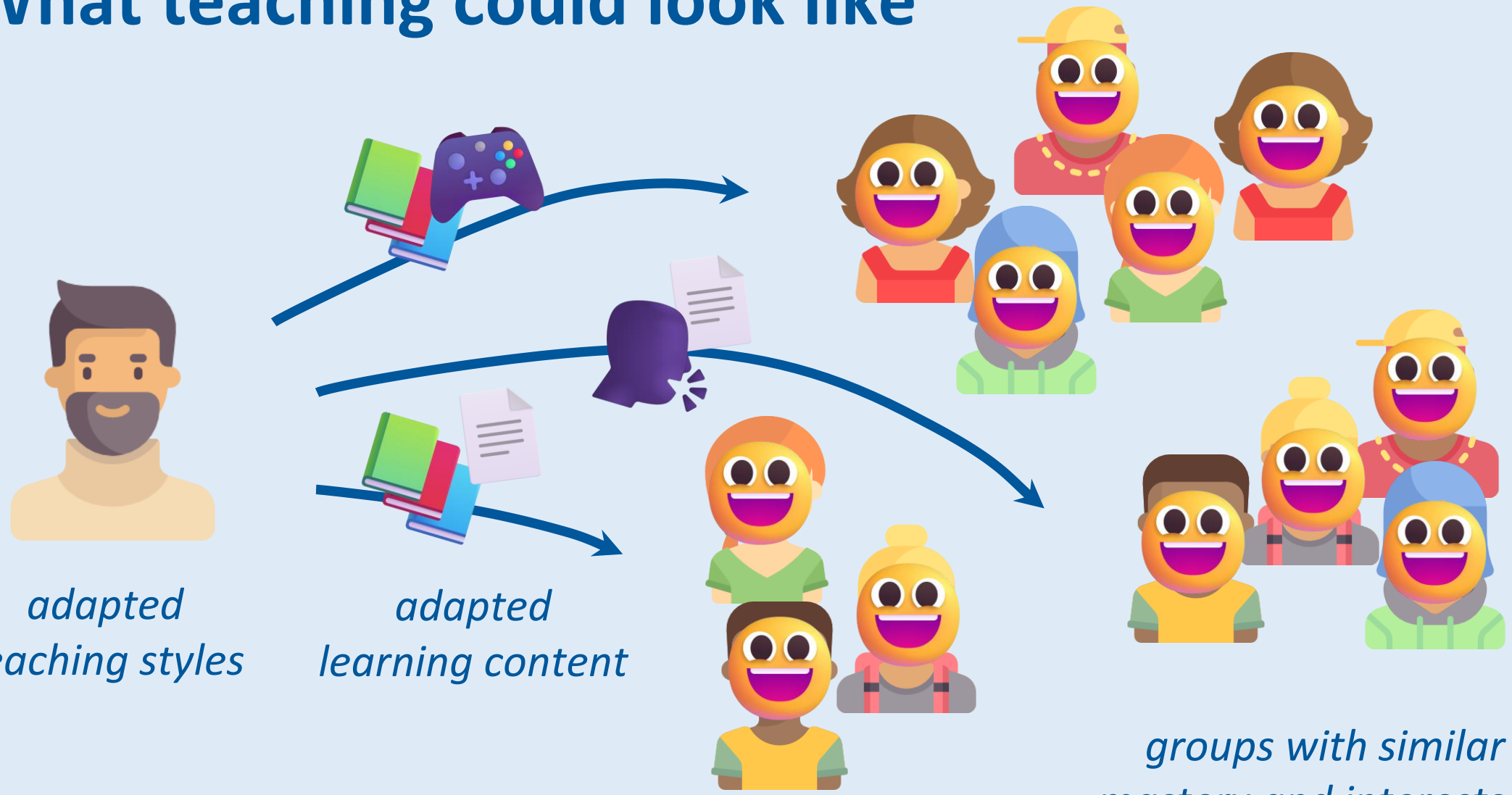
What teachers might expect



Reality



What teaching could look like



adapted teaching styles

adapted learning content

groups with similar mastery and interests

I do a lot of things as a professor



Researching AI in education

Teaching information science courses

Supervising student projects

Mentoring other researchers

Presenting at conferences/schools/…

Travelling to other countries

Collecting money for research projects

Assessing the work of other researchers

How can AI be used in education?

AI for teachers

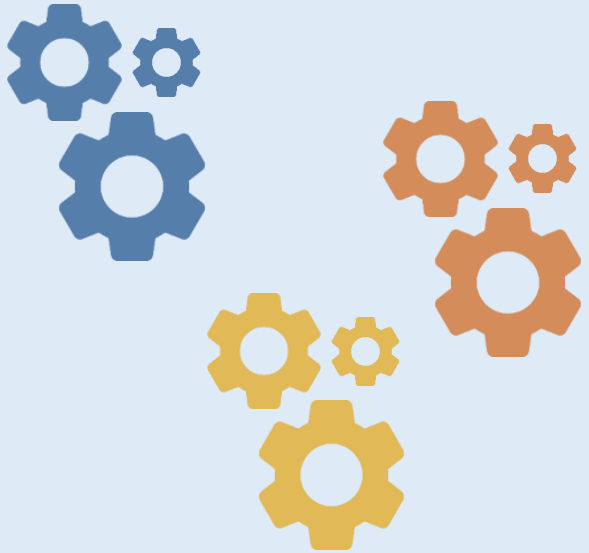
Teaching-aid
Teaching quality
Pedagogical agents
Training of teachers
Personalised teaching
Improving teaching



AI for students

Dropout prediction
Assessment
Cognitive diagnosis
Achievements
Grading
Reading ability
Creativity
Engagement
Feedback
Argumentation



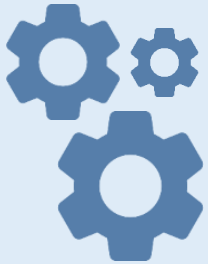


"**Artificial Intelligence**"
= algorithms with specific tasks

Mostafa Zafari, Jalal Safari Bazargani, Abolghasem Sadeghi-Niaraki, and Soo-Mi Choi. 2022. Artificial Intelligence Applications in K-12 Education: A Systematic Literature Review. *IEEE Access* 10: 61905–61921. https://doi.org/10.1109/ACCESS.2022.3179356



Available exercises

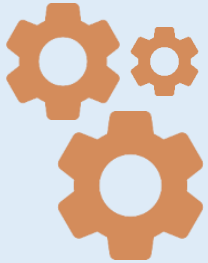




Recommended exercise



Learner profile

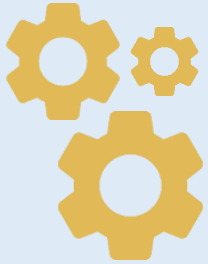


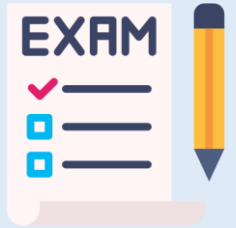


Predicted progress/risk



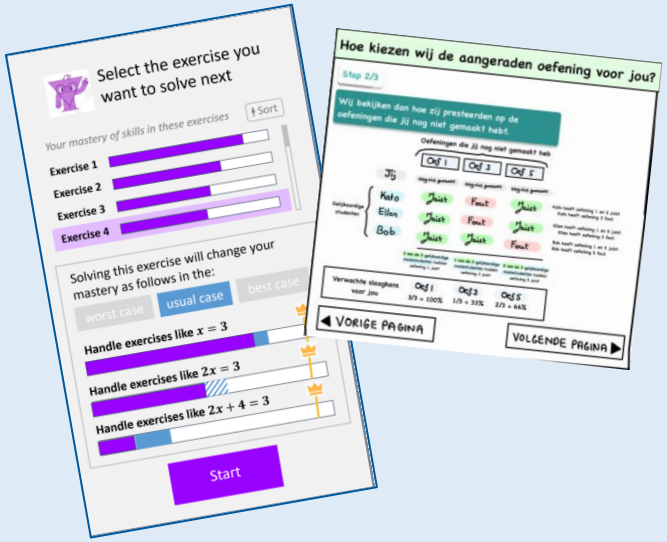
Textual prompt



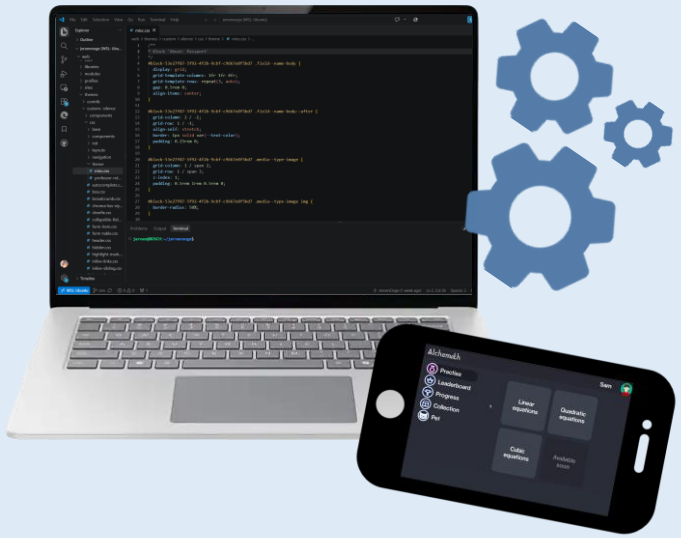


Exam question

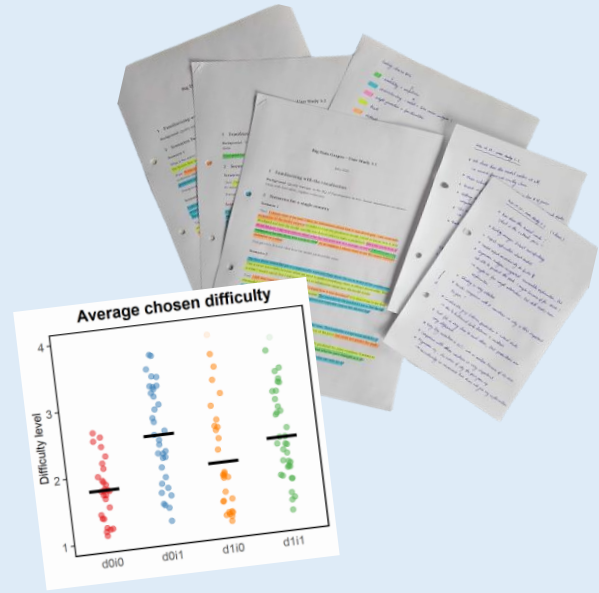
What does my research look like?



Designing
Create mock-ups together with students/teachers

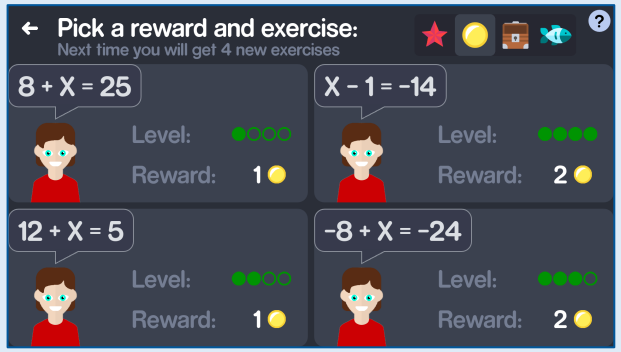


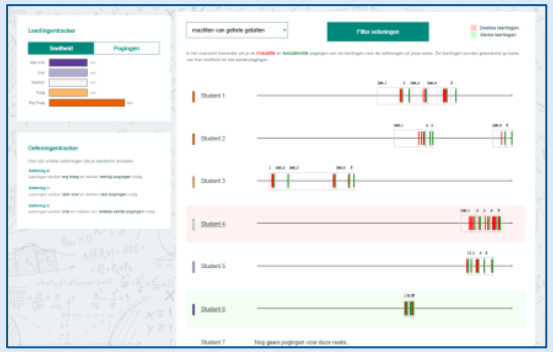
Programming
Build designs into real websites/apps

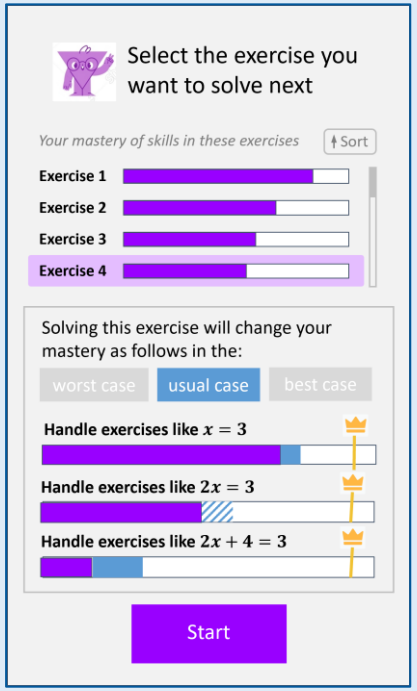


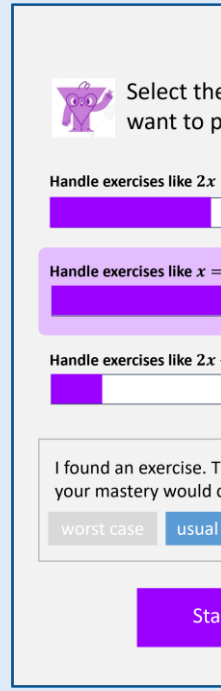
Evaluating
Study the effects on students/teachers

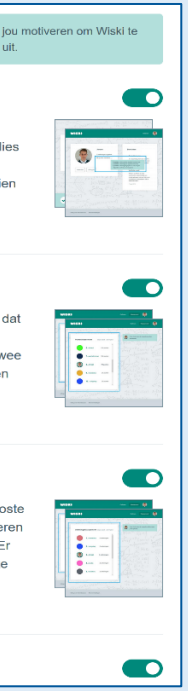


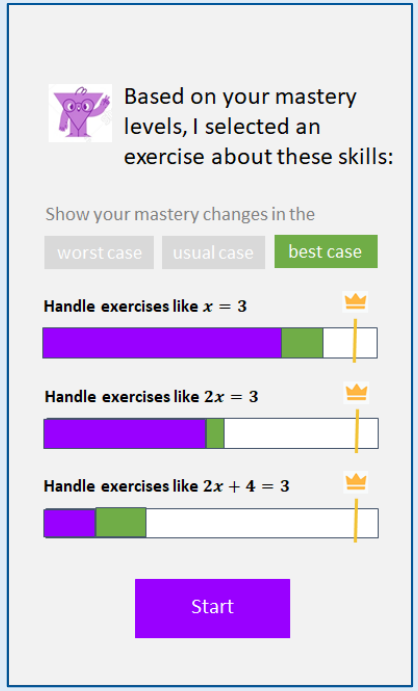




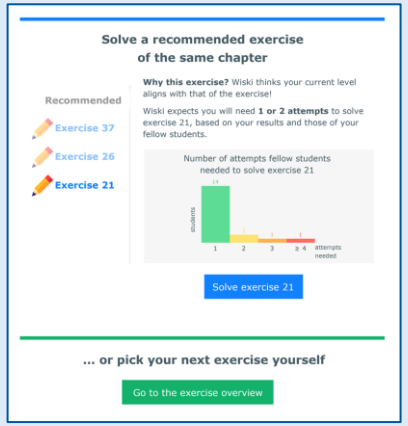


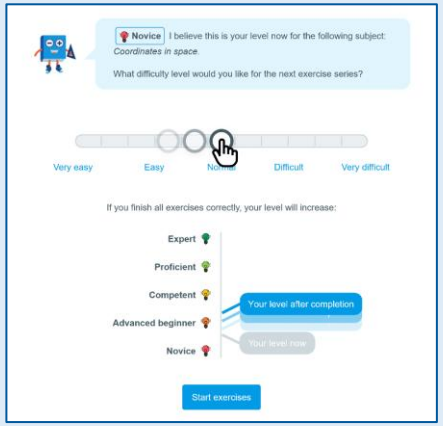


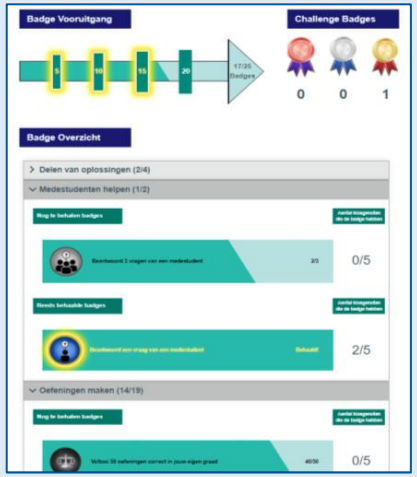


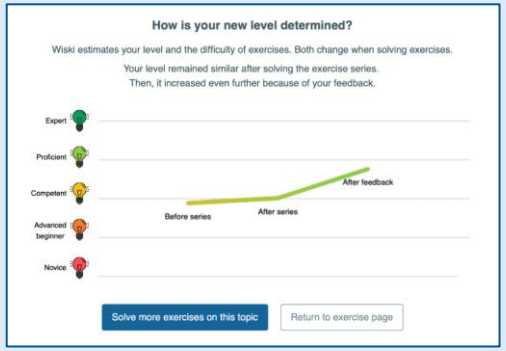


I do a lot of studies on AI in education









What is my research focused on?

1

Adaptation

2

Transparency

3

Motivation

What is my research focused on?

1 Adaptation

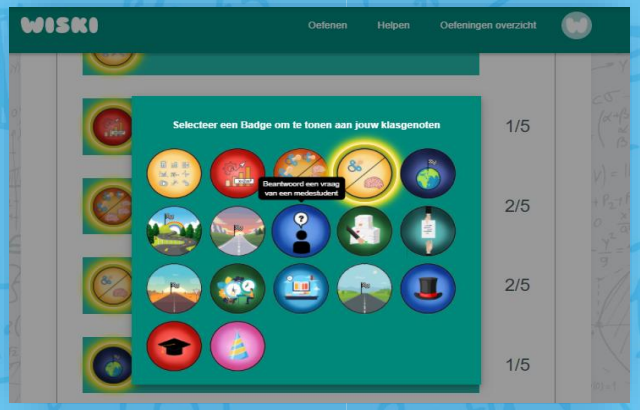
2 Transparency

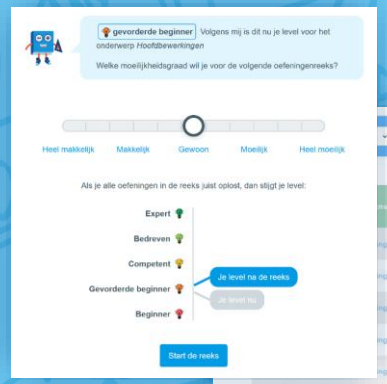
3 Motiva

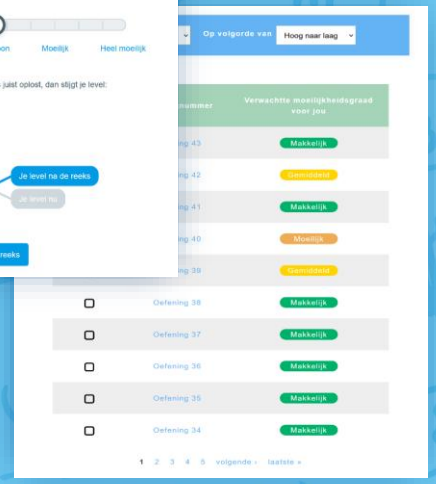
About fake whiskey
and spying dashboards



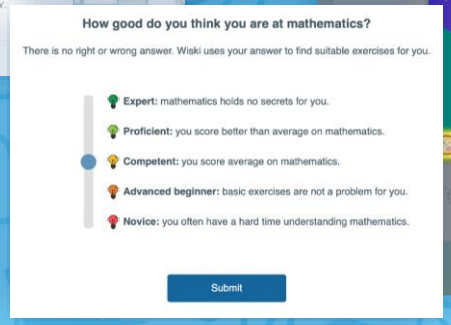


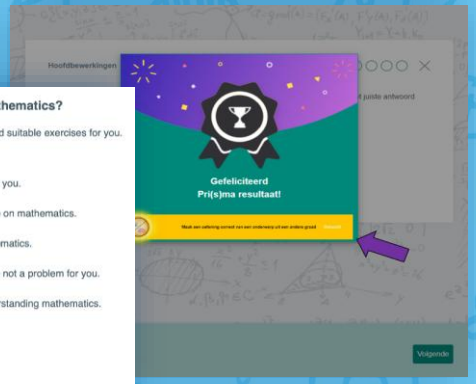


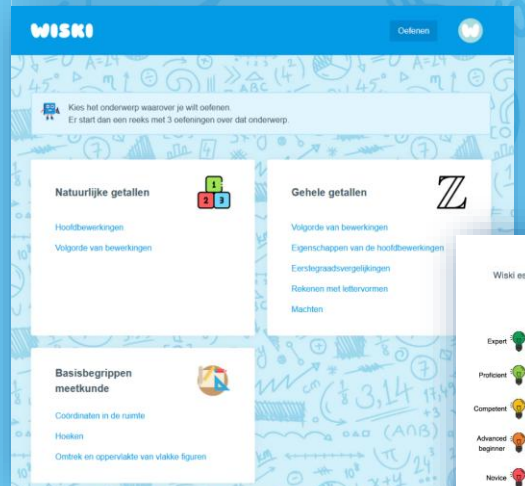


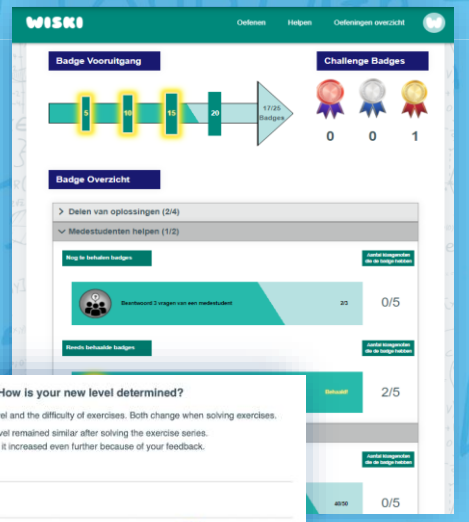














WISKI

personalised maths practice with AI

Volgorde van bewerkingen

$6 \cdot (-12) + 36 \cdot 2 = \ldots$ Bereken en tik de juiste oplossing aan.

- (•) 0
- ( ) -144
- ( ) 72
- ( ) 144

Correct

Top-π!

Overslaan Volgende



expert



competent

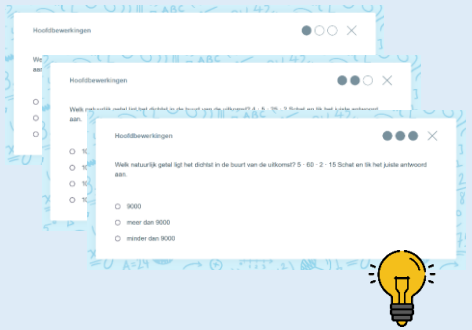


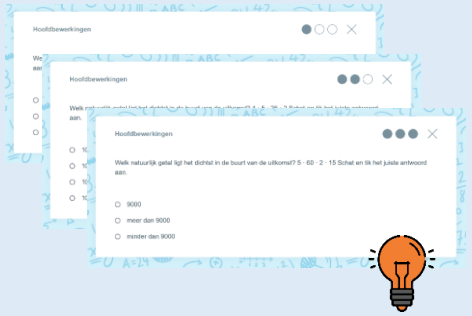
beginner



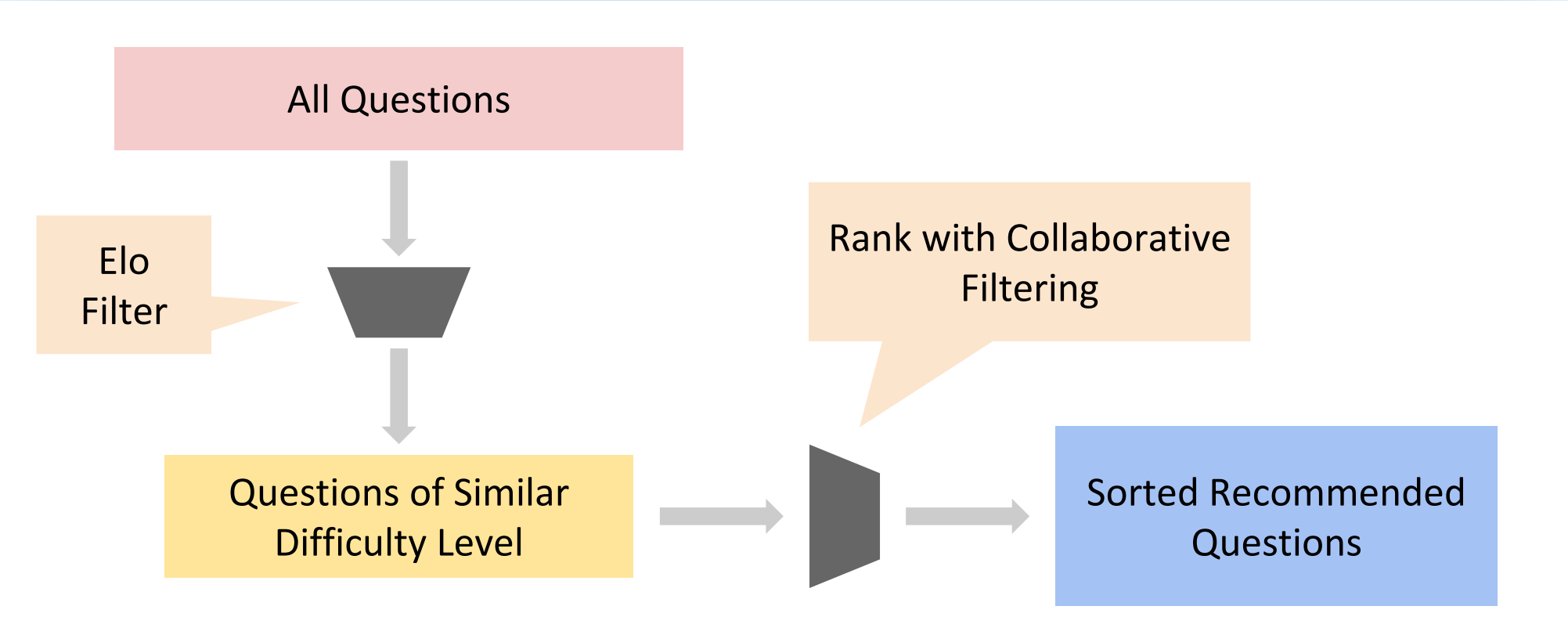
Recommender system





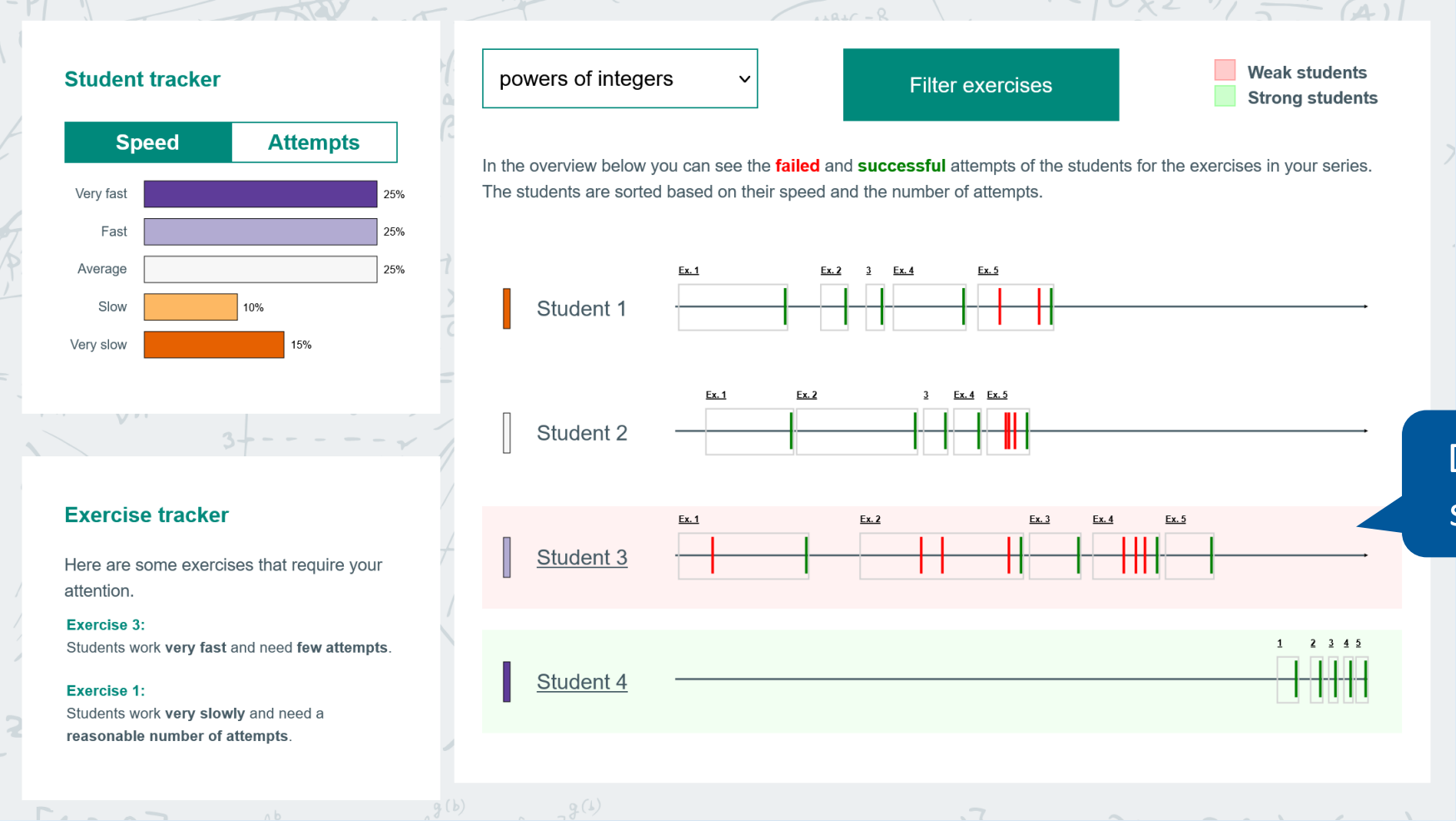


Recommending exercises



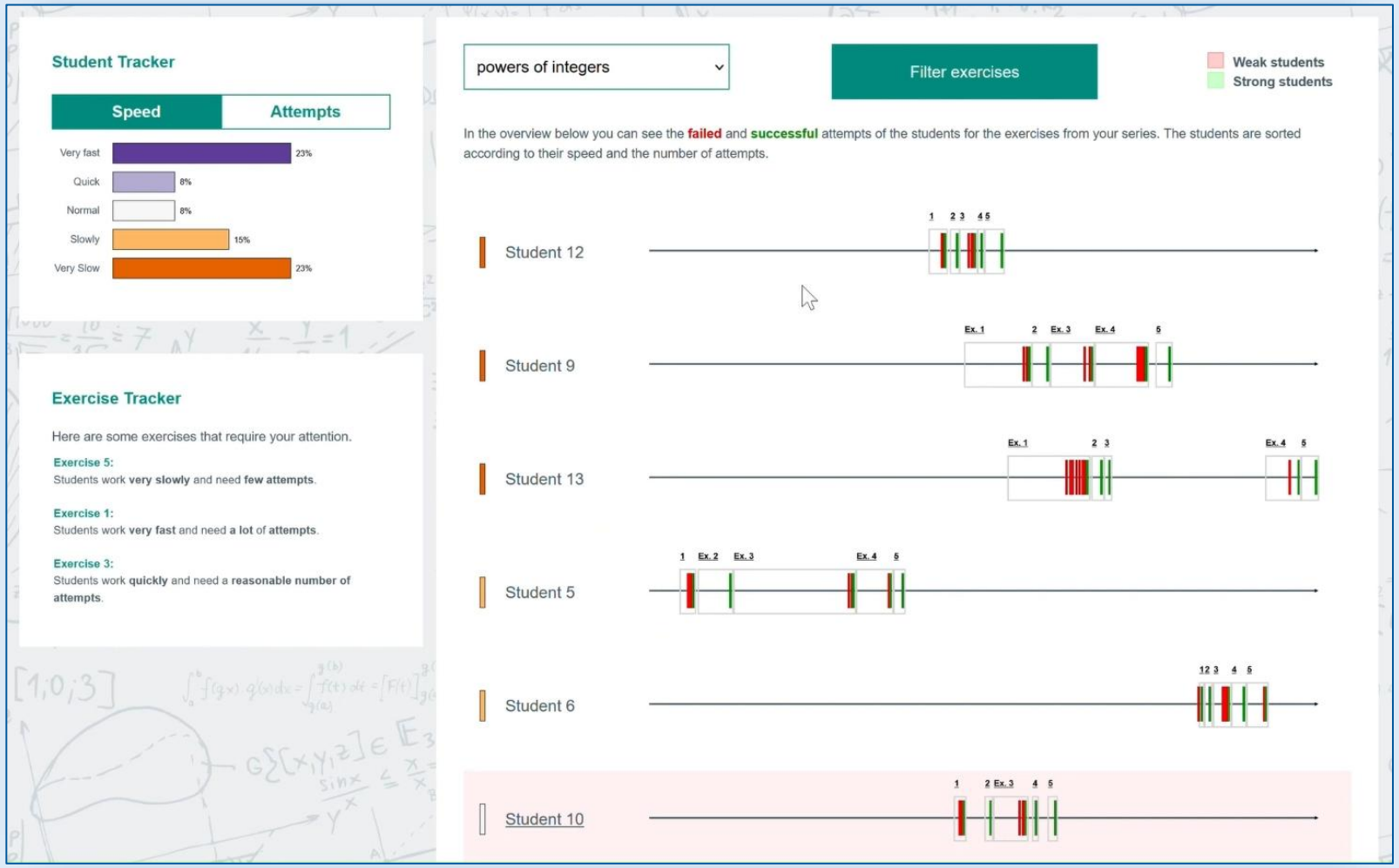
Jeroen Ooge*, Shotallo Kato*, and Katrien Verbert. 2022. Explaining Recommendations in E-Learning: Effects on Adolescents' Trust. In *27th International Conference on Intelligent User Interfaces* (IUI '22), 93–105. https://doi.org/10.1145/3490099.3511140

Monitoring dashboard for teachers



Jeroen Ooge*, Anissa Faik* & Katrien Verbert. Detect, Explain, Act: How Teachers Trust and Use an Explainable Real-Time Monitoring Dashboard to Detect Student Outliers in Class. In *Proceedings of the 16th Learning Analytics and Knowledge Conference*, April 2026, https://doi.org/10.1145/3785022.3785087

Monitoring dashboard for teachers



Jeroen Ooge*, Anissa Faik* & Katrien Verbert. Detect, Explain, Act: How Teachers Trust and Use an Explainable Real-Time Monitoring Dashboard to Detect Student Outliers in Class. In *Proceedings of the 16th Learning Analytics and Knowledge Conference*, April 2026, https://doi.org/10.1145/3785022.3785087


TIME FOR
QUESTIONS

What is my research focused on?

1 Adaptation

2 Transparency

3 Motiva

About fake whiskey and spying dashboards



What is my research focused on?

1 Adaptation

2 Transparency

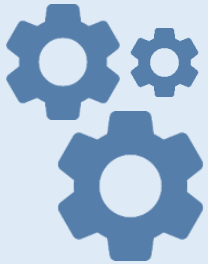
3 Motivation

About explaining and controlling AI decisions





Available exercises

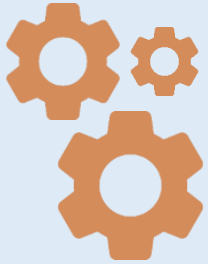




Recommended exercise



Learner profile

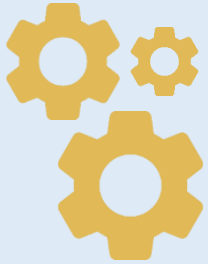


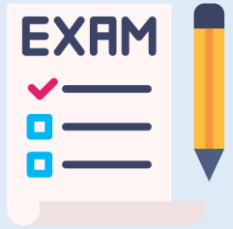


Predicted progress/risk



Textual prompt





Exam question



AI



Available exercises

Recommended exercise



AI

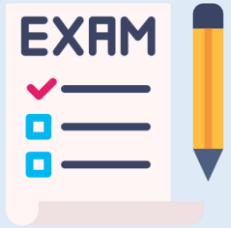


Learner profile

Predicted progress/risk

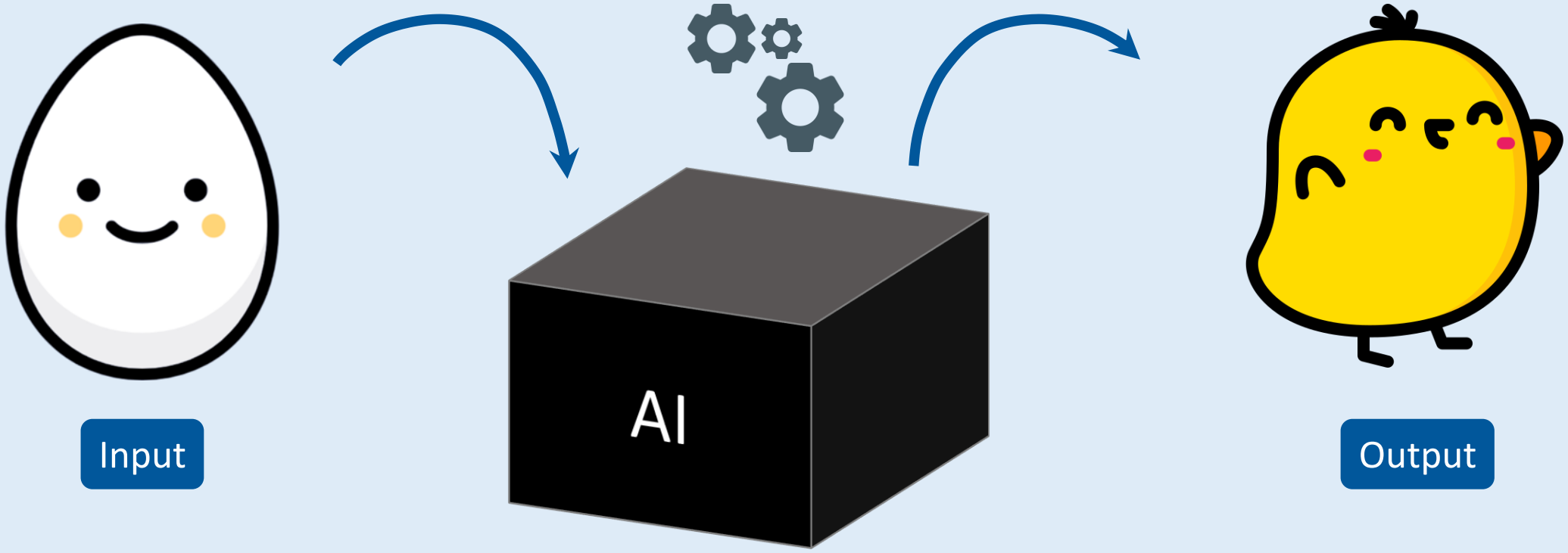


AI



Textual prompt

Exam question

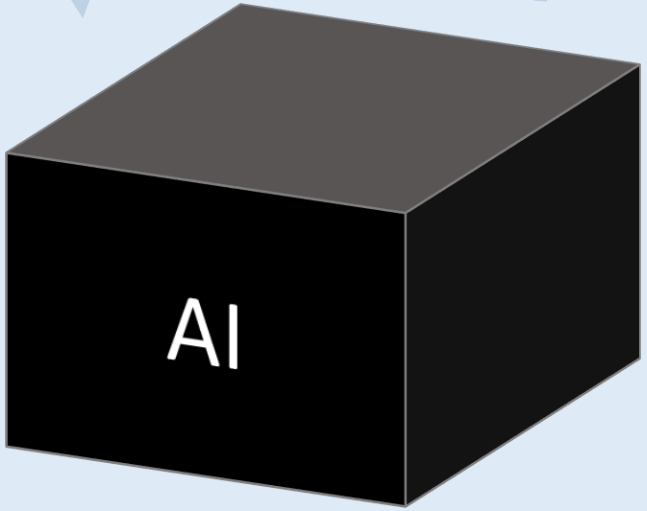

AI
Input
Output

We need to “**explain**” these AI black boxes!

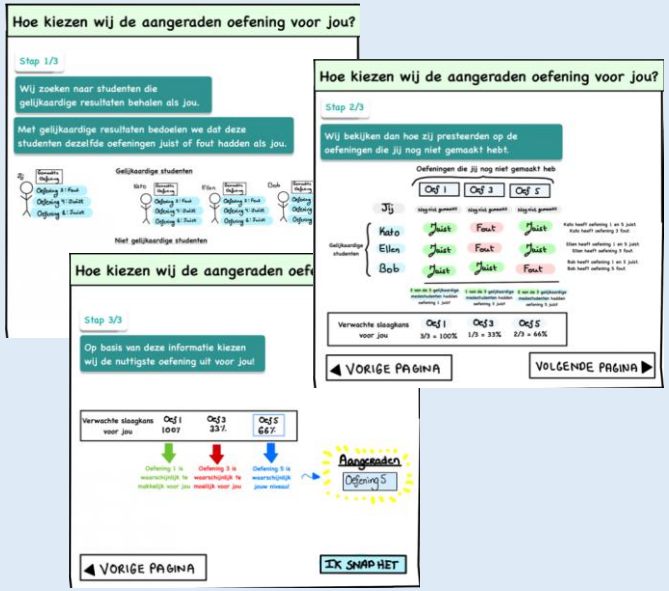
We should be able to “**control**” AI!



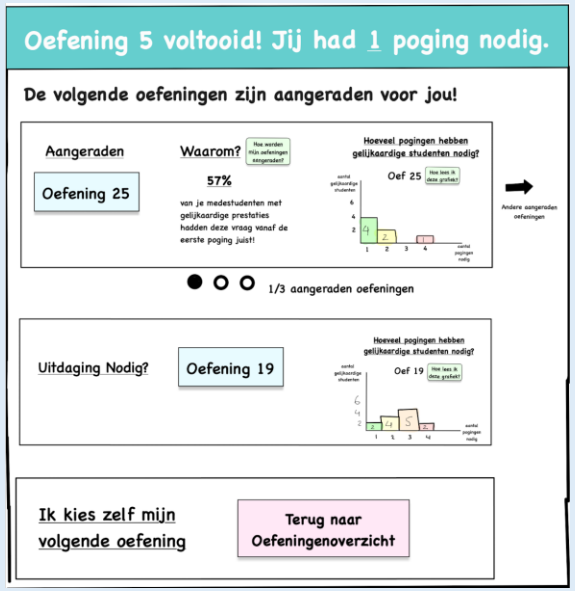
Input



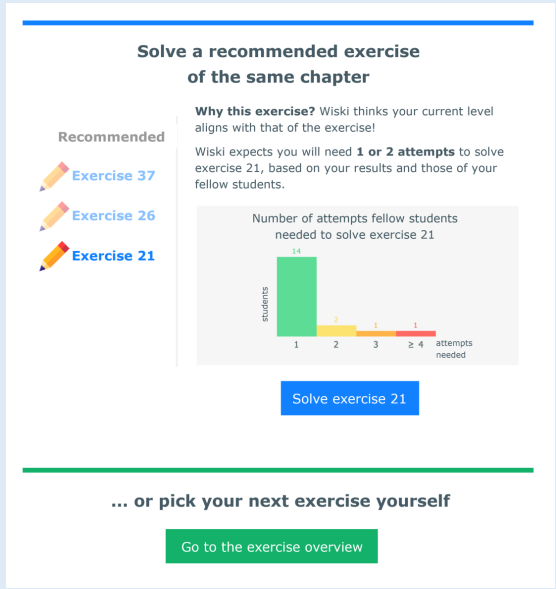
Designing step by step with students



Tutorial for full transparency

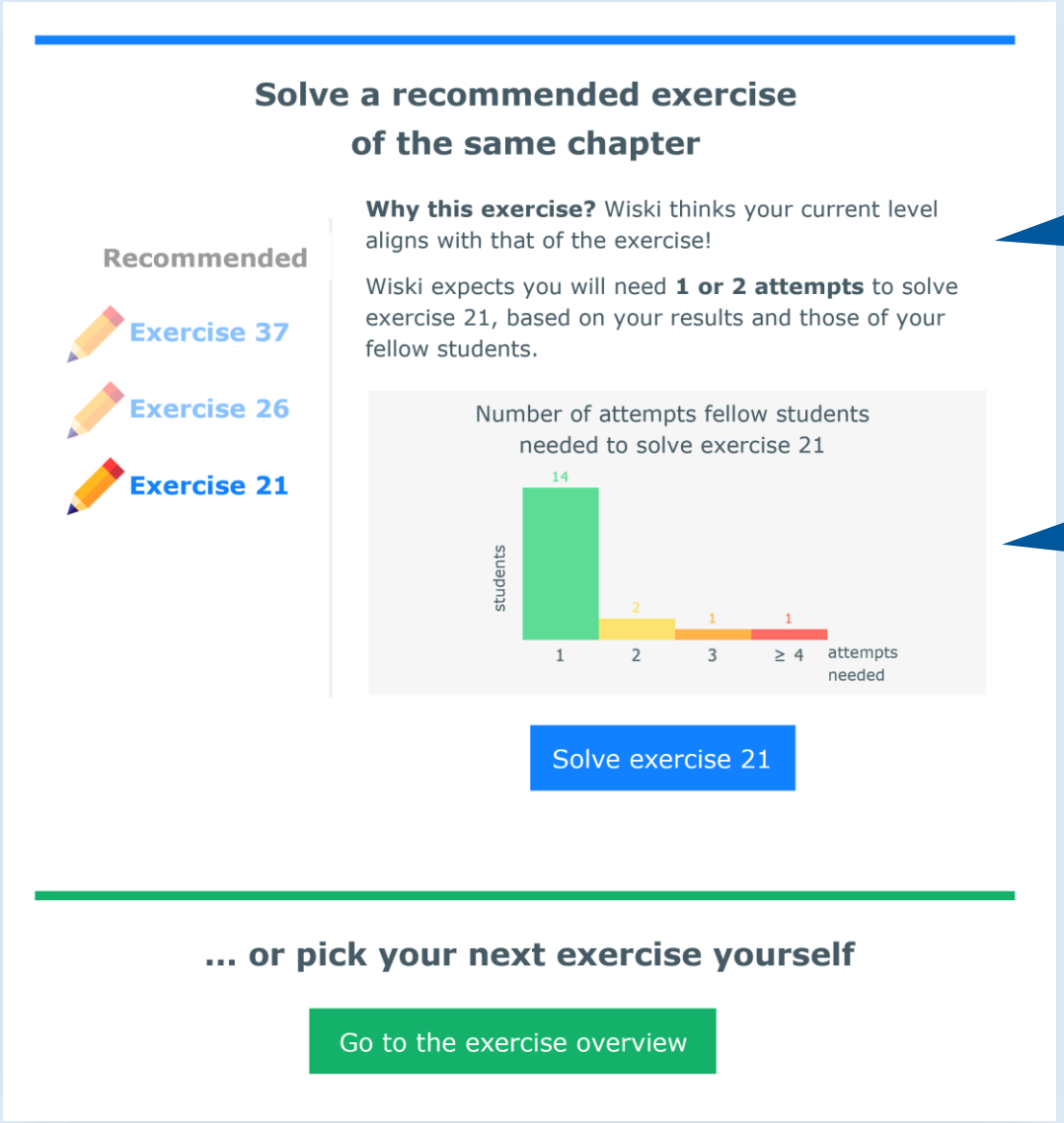


Single-screen explanation



Final explanation

Jeroen Ooge*, Shotallo Kato*, and Katrien Verbert. 2022. Explaining Recommendations in E-Learning: Effects on Adolescents' Trust. In *27th International Conference on Intelligent User Interfaces* (IUI '22), 93–105. https://doi.org/10.1145/3490099.3511140



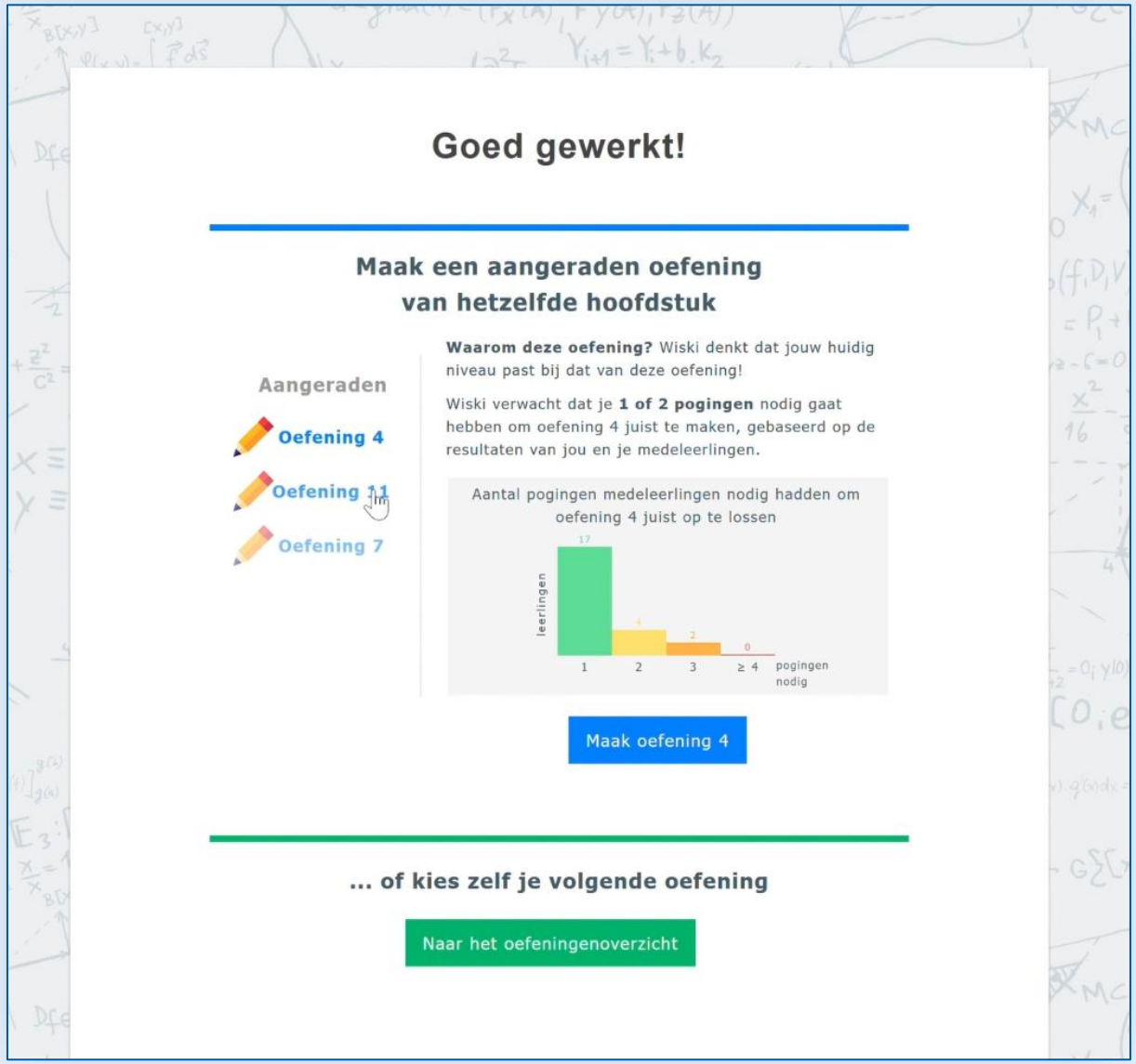
Textual explanation

Visual explanation

Explanation: *why* do you get a specific recommendation?

Control: choose next exercises

Jeroen Ooge*, Shotallo Kato*, and Katrien Verbert. 2022. Explaining Recommendations in E-Learning: Effects on Adolescents' Trust. In *27th International Conference on Intelligent User Interfaces* (IUI '22), 93–105. https://doi.org/10.1145/3490099.3511140



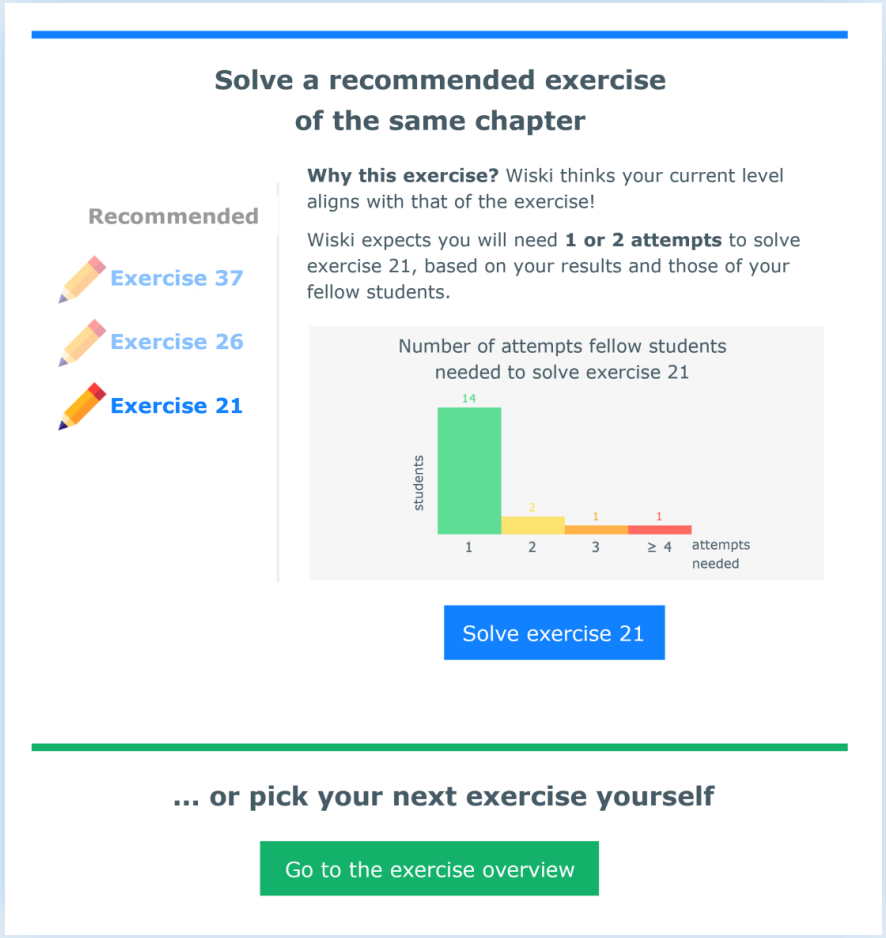
Programming the explanation and control on Wiski

Explanation: *why* do you get a specific recommendation?

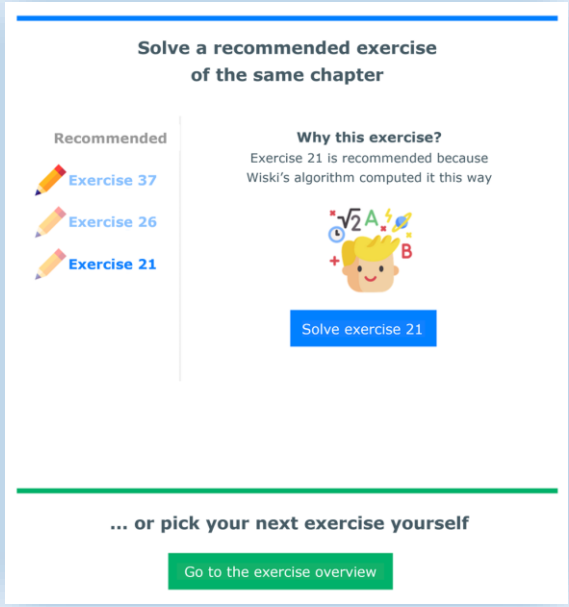
Control: choose next exercises

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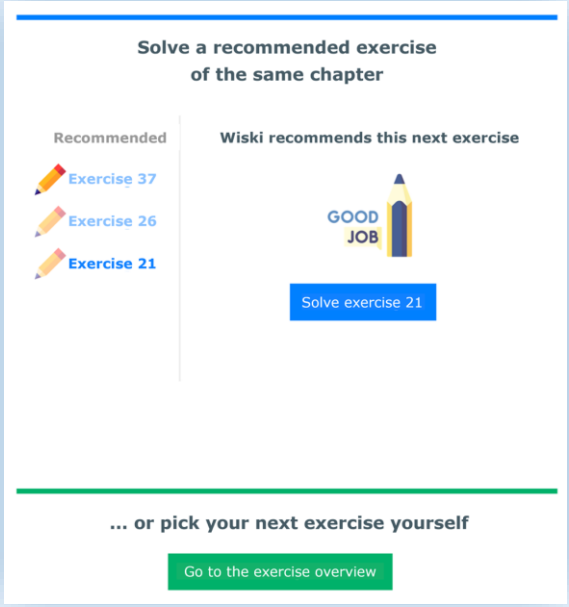
Evaluating how explanations affect students' trust in Wiski



Real explanation

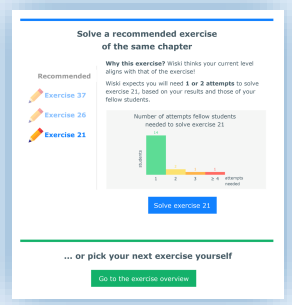


Placebo explanation

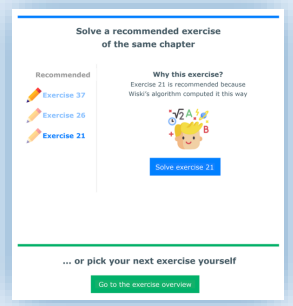


No explanation

Jeroen Ooge*, Shotallo Kato*, and Katrien Verbert. 2022. Explaining Recommendations in E-Learning: Effects on Adolescents' Trust. In *27th International Conference on Intelligent User Interfaces* (IUI '22), 93–105. https://doi.org/10.1145/3490099.3511140



Evaluating how explanations affect students' trust in Wiski



Real vs no explanation

trust increased ✓

trust unchanged

trust decreased

Placebo vs no explanation

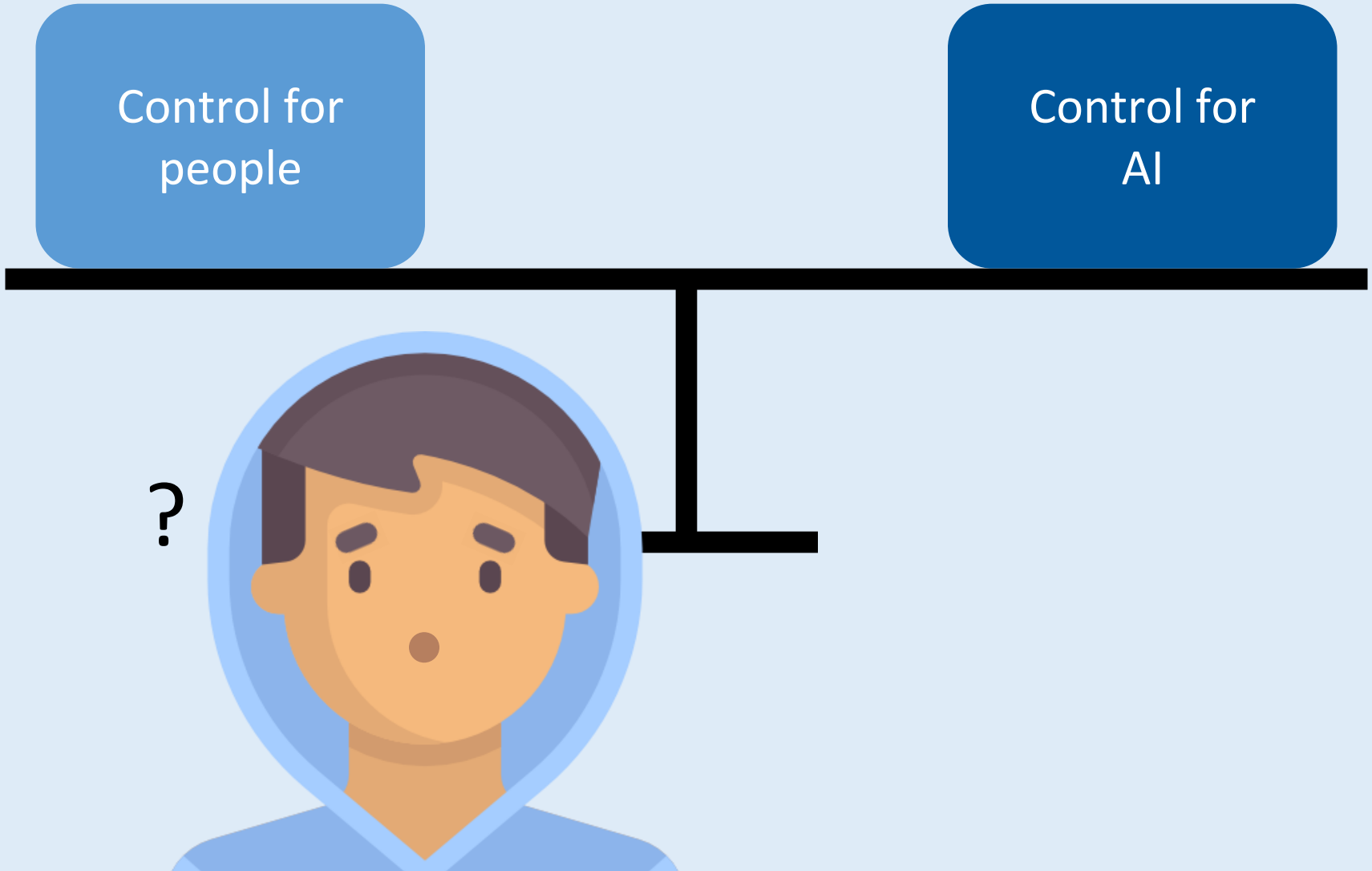
trust increased

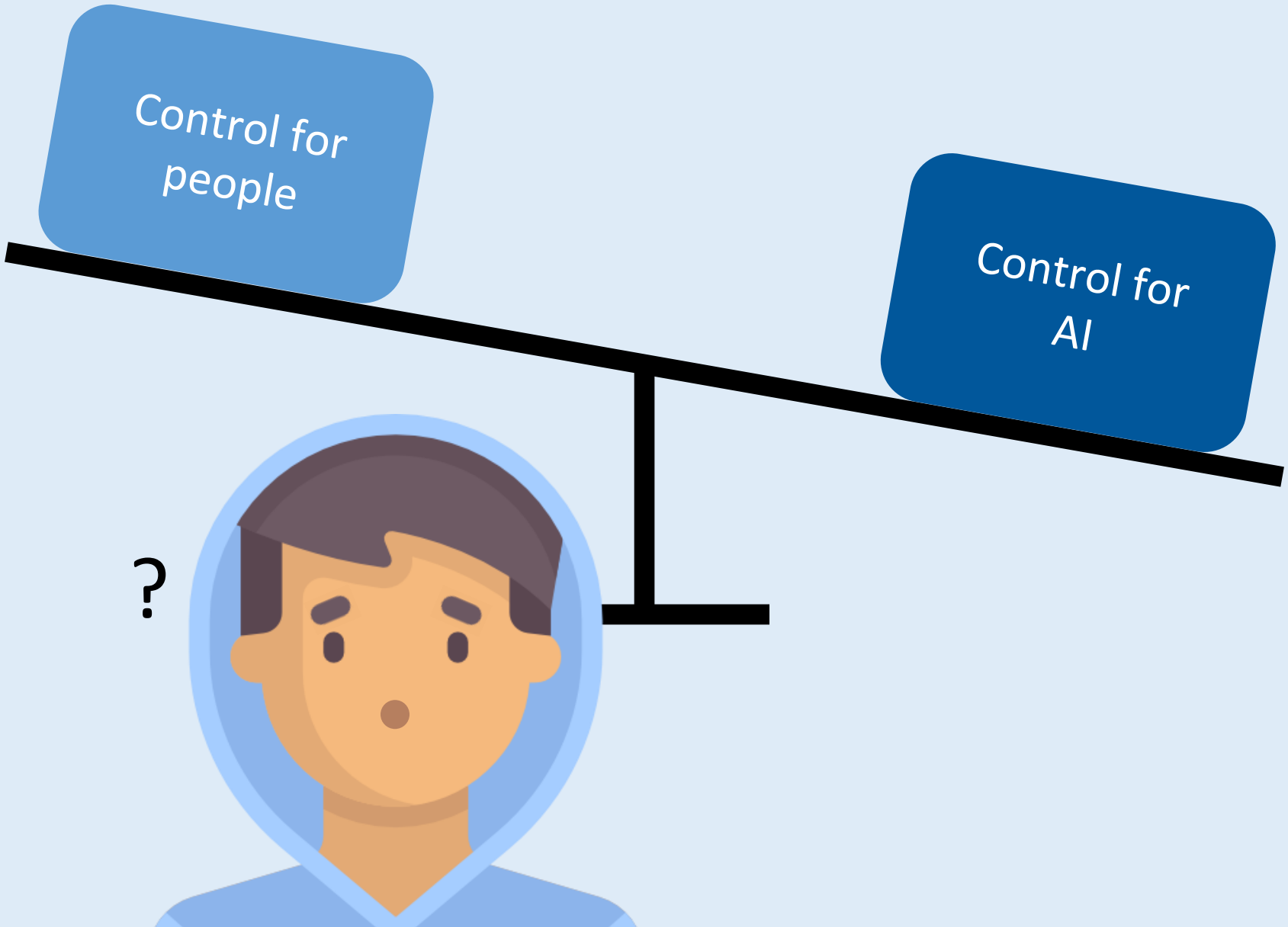
trust unchanged ✓

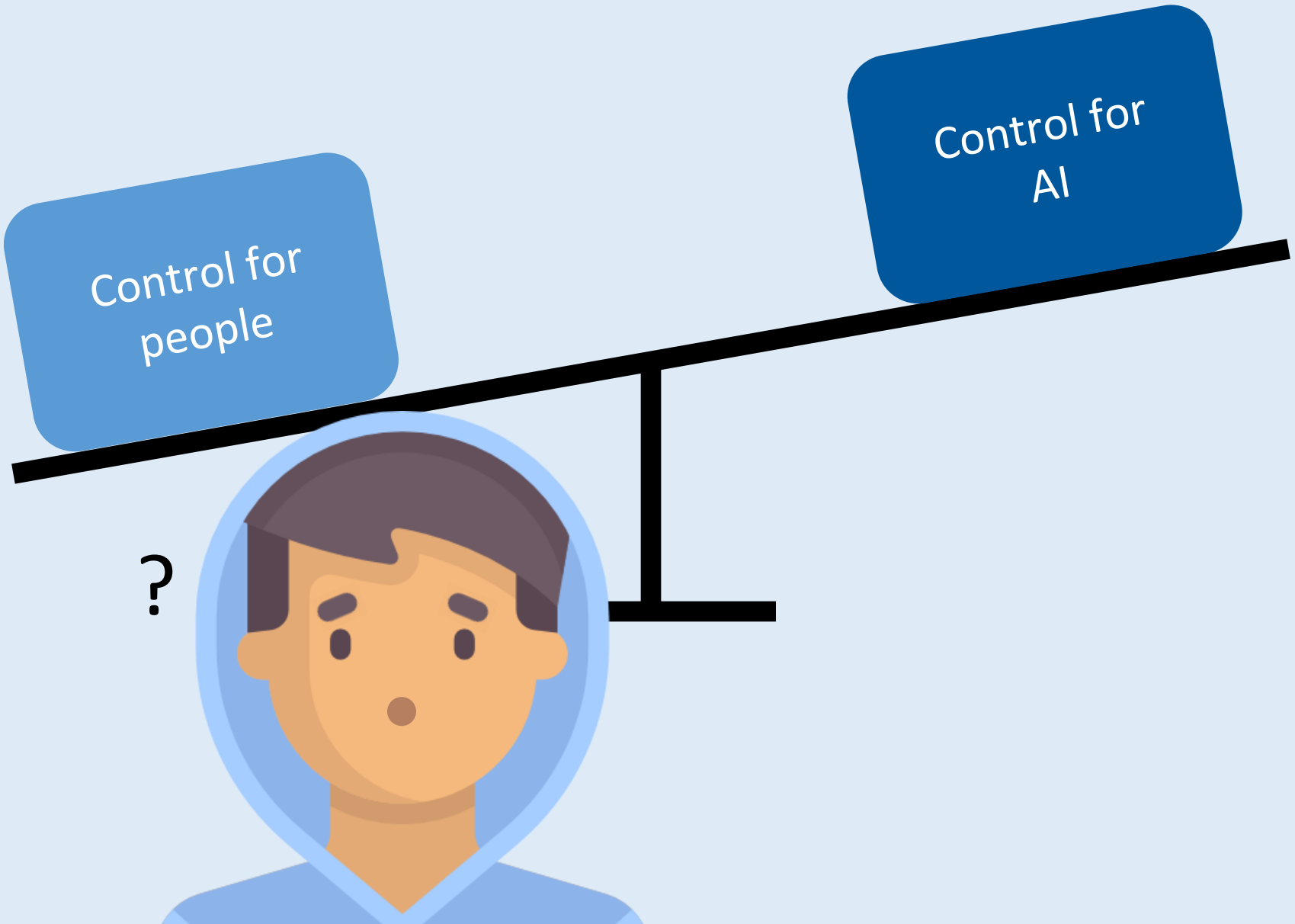
trust decreased

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TIME FOR
QUESTIONS


Control for people
Control for AI
?

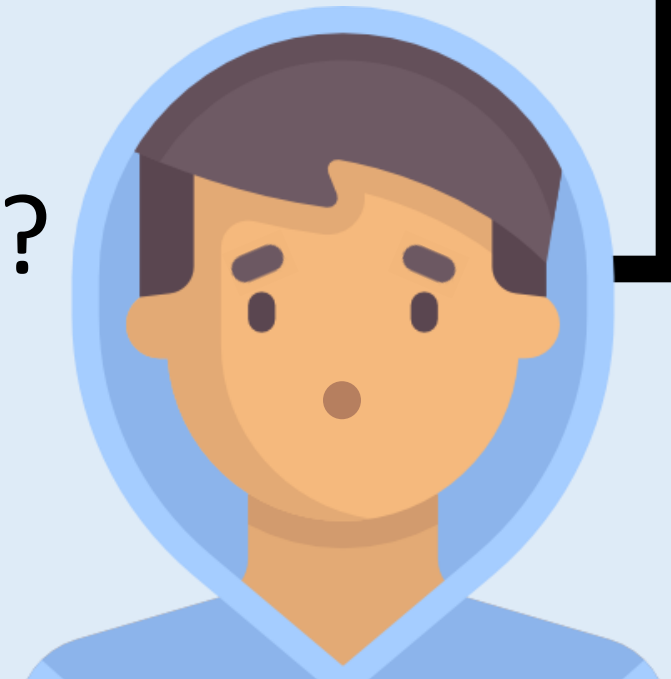

Control for people
Control for AI
?

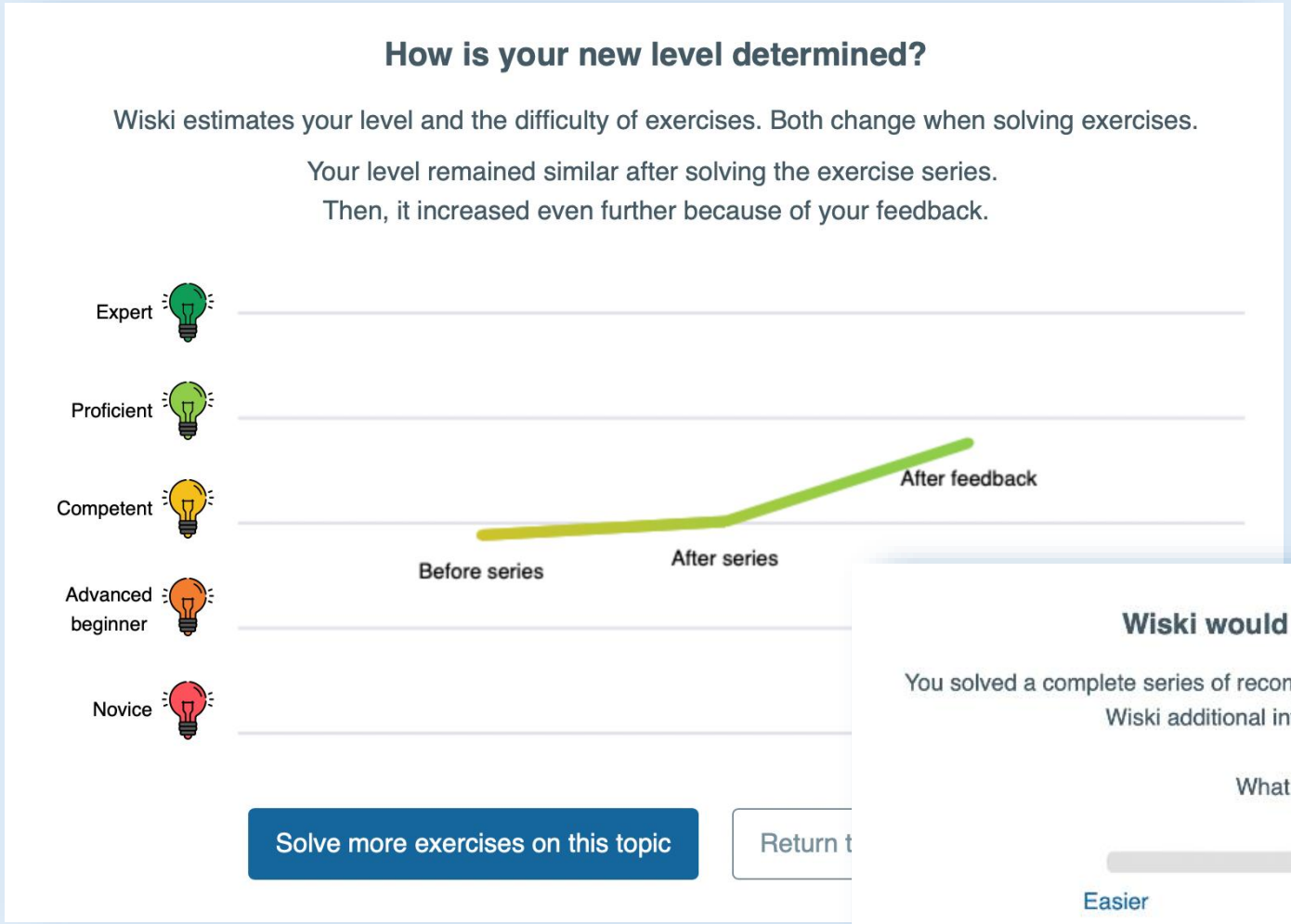

Control for people
Control for AI
?

Control for people

Control for AI

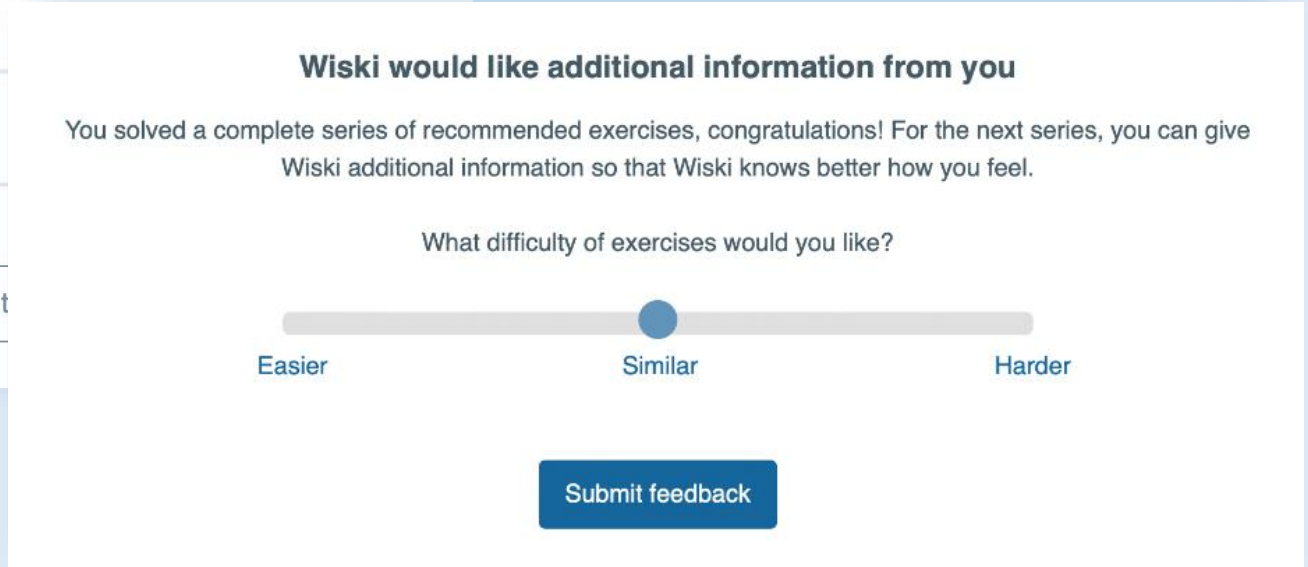
both?



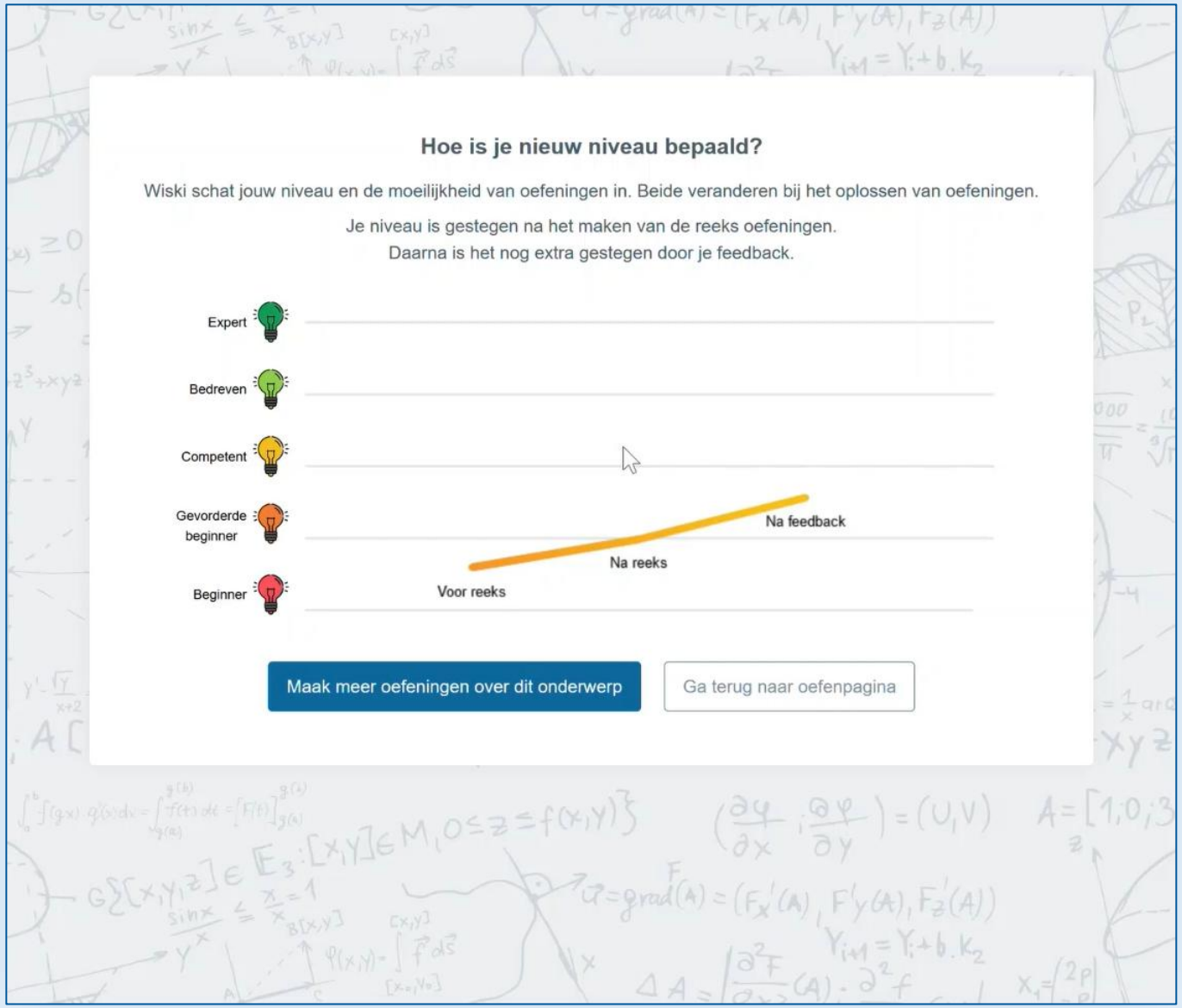


Explanation: impact of control

Control: steer mastery level



Jeroen Ooge, Leen Dereu, and Katrien Verbert. 2023. Steering Recommendations and Visualising Its Impact: Effects on Adolescents' Trust in E-Learning Platforms. In *Proceedings of the 28th International Conference on Intelligent User Interfaces* (IUI '23), 156–170. https://doi.org/10.1145/3581641.3584046



Explanation: impact of control

Control: steer mastery level

Jeroen Ooge, Leen Dereu, and Katrien Verbert. 2023. Steering Recommendations and Visualising Its Impact: Effects on Adolescents' Trust in E-Learning Platforms. In *Proceedings of the 28th International Conference on Intelligent User Interfaces* (IUI '23), 156–170. https://doi.org/10.1145/3581641.3584046


TIME FOR
QUESTIONS

What is my research focused on?

1 Adaptation

2 Transparency

3 Motivation

About explaining and controlling AI decisions



What is my research focused on?

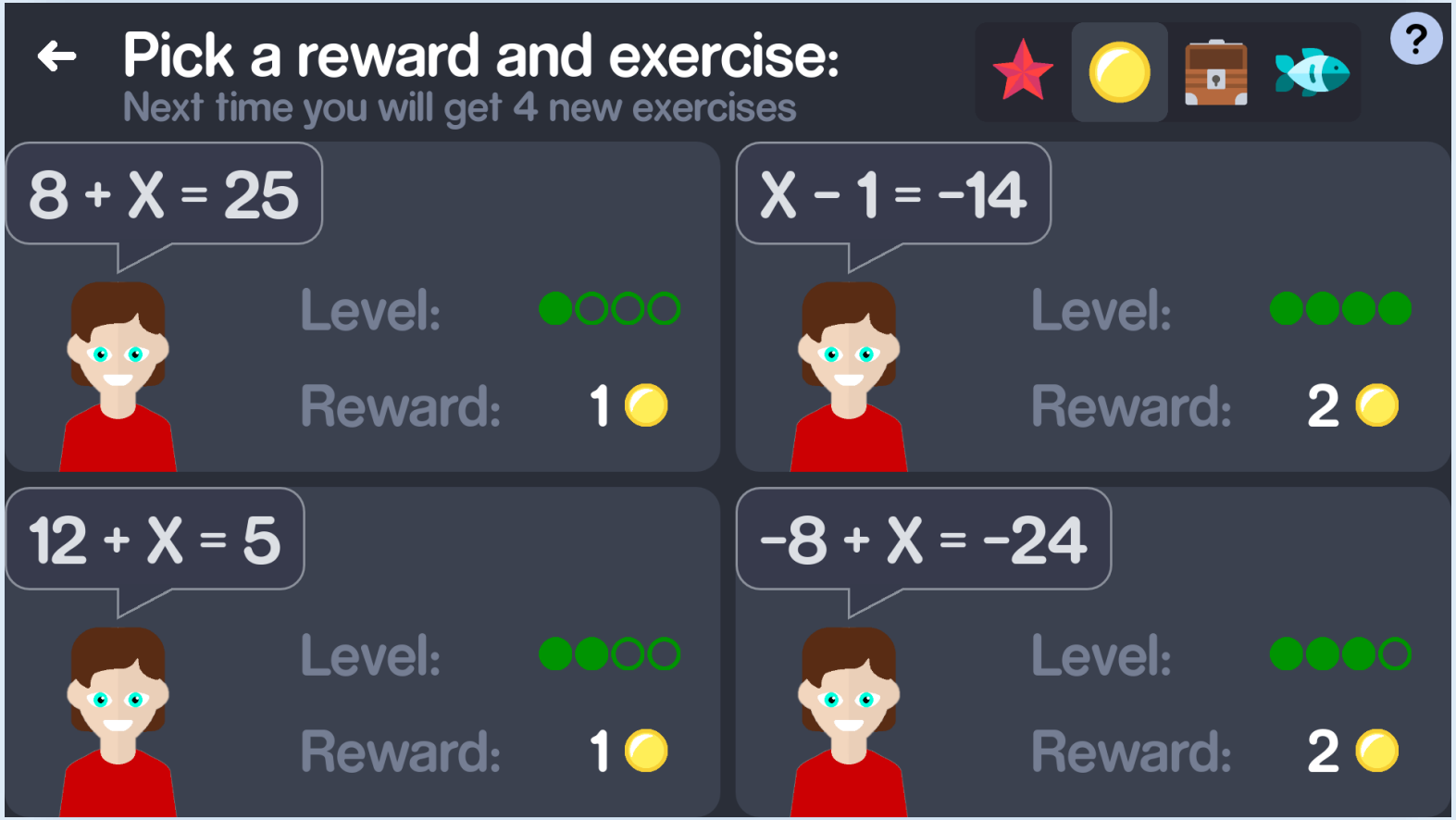
1 Adaptation

2 Transparency

3 Motivation



About fun gamification



Difficulty for the learner

Reward for a correct answer

Transparency: difficulty labels

Control: choose next exercise while being nudged

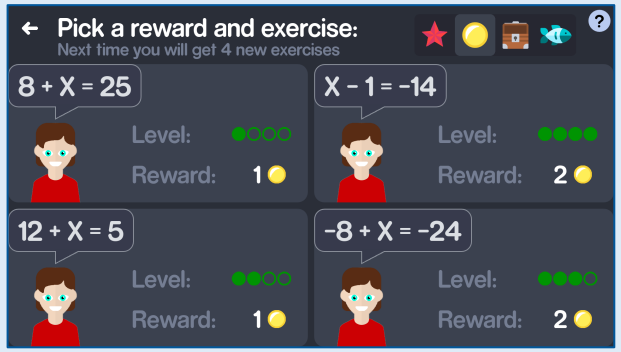
Jeroen Ooge*, Joran De Braekeleer*, and Katrien Verbert. 2024. Nudging Adolescents Towards Recommended Maths Exercises with Gameful Rewards. In: Artificial Intelligence in Education. AIED 2024. Lecture Notes in Computer Science, vol 14830. Springer, Cham. https://jeroenooge.be/alchemath

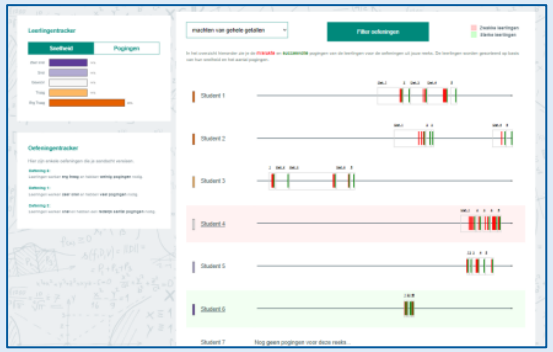


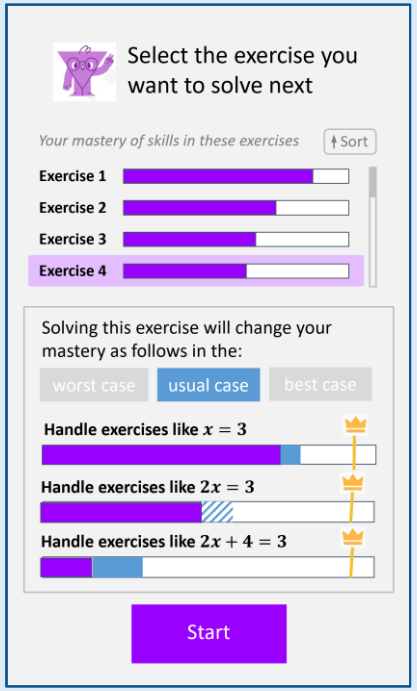
Jeroen Ooge*, Joran De Braekeleer*, and Katrien Verbert. 2024. Nudging Adolescents Towards Recommended Maths Exercises with Gameful Rewards. In: Artificial Intelligence in Education. AIED 2024. Lecture Notes in Computer Science, vol 14830. Springer, Cham. https://jeroenooge.be/alchemath

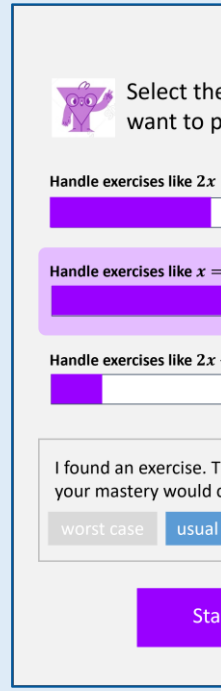

TIME FOR
QUESTIONS

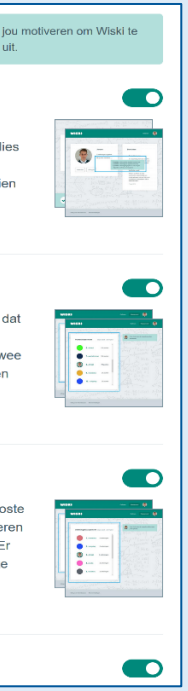


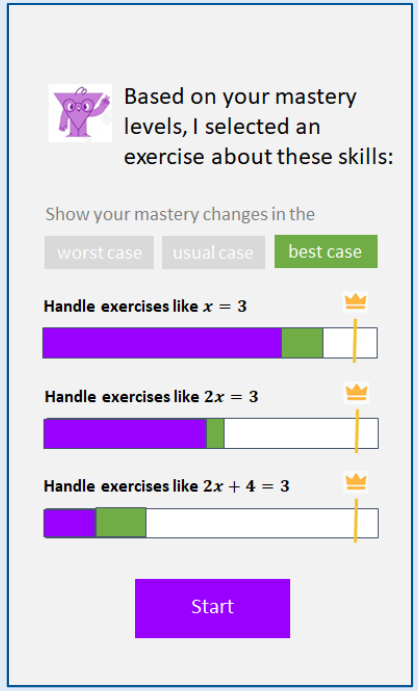




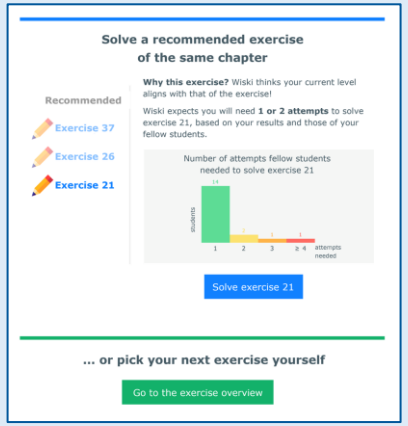


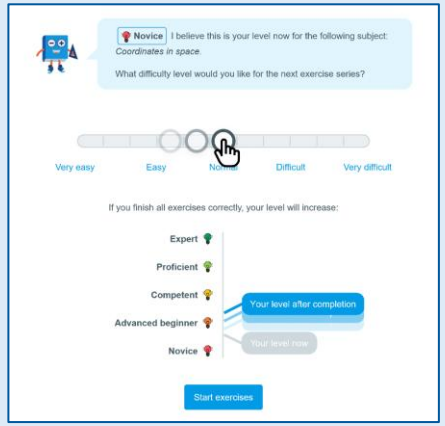


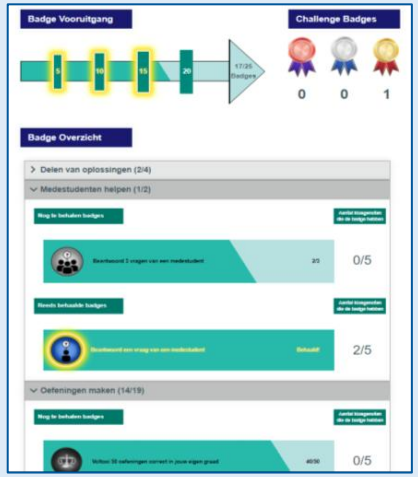


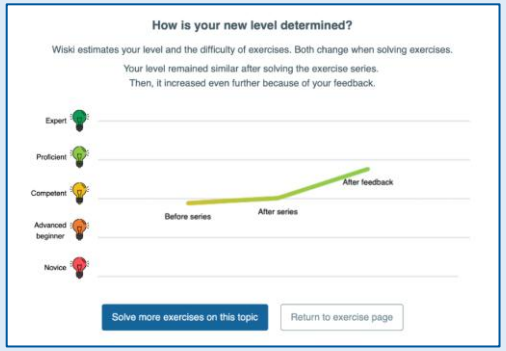


Making learning more **adaptive**, **transparent**, and **motivating** with AI









Check out **jeroenooge.be** to learn more about my work!

