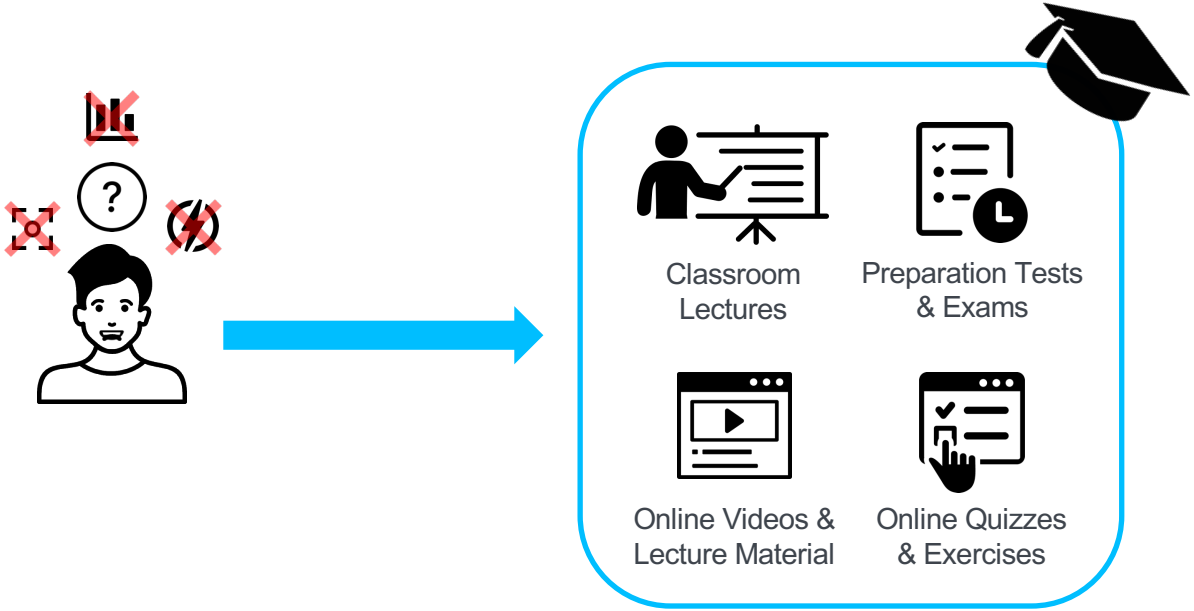
University of Stuttgart
Institute of Software Engineering (ISTE),
Software Quality and Architecture Group (SQA)

An Intelligent Tutoring System Concept for a Gamified e-Learning Platform for Higher Computer Science Education

Niklas Meißner, Sandro Speth, Uwe Breitenbücher

Motivation

Problem Description and Goal



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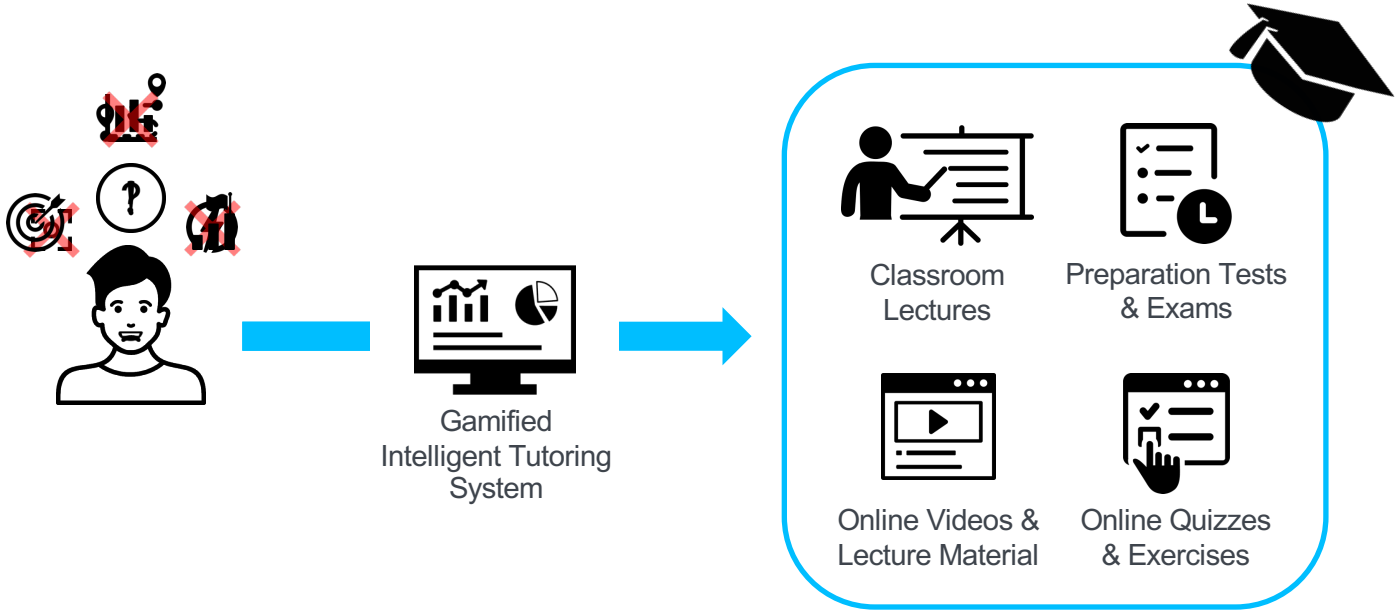
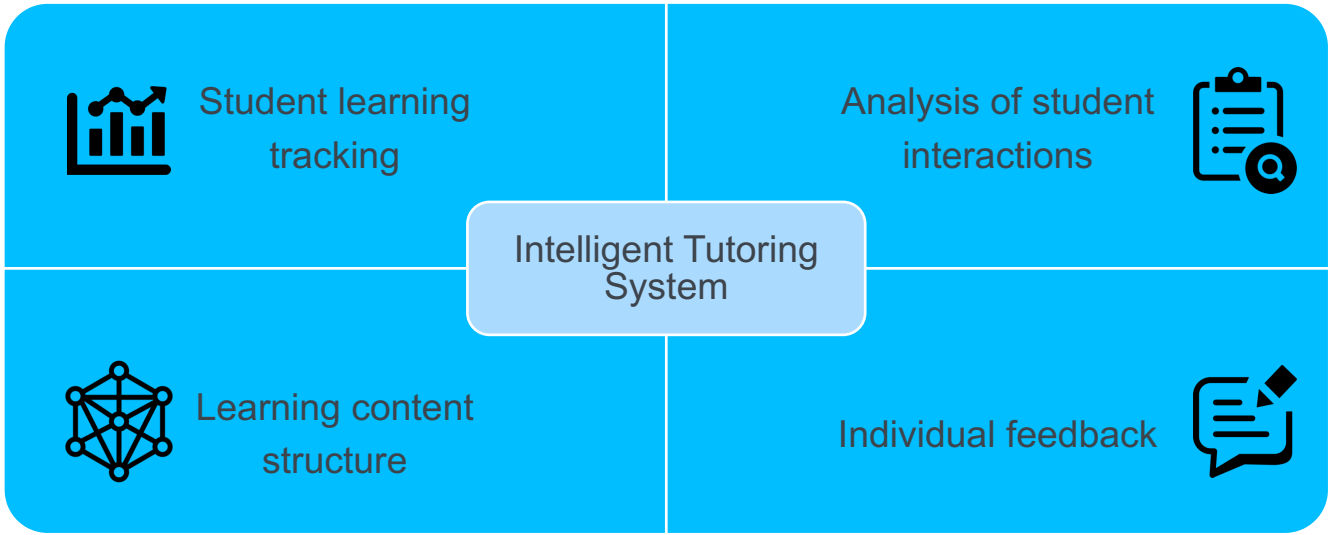


Motivation

Intelligent Tutoring Goals



Foundation

Interactive Training Remote Education Experience (IT-REX) [1]

GROWTH
Track progress

FITNESS
Repeat content

STRENGTH
Compete with others

HEALTH
Watch lectures

POWER
Compare to others

[1] Sandro Speth et al. – „*IT-REX — A Vision for a Gamified e-Learning Platform for the First Semesters of Computer Science Courses* “ (2022)

Related Work

Tools

Unstructured Content

Plugins for student statistics

Focus on repetition

Complicated to use

Not possible to publish own content

Only for high school education

Structured Content

Not motivating to keep up learning

No feedback on students' performance

Related Work

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Plugins for student statistics

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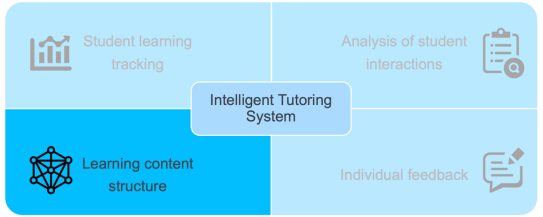
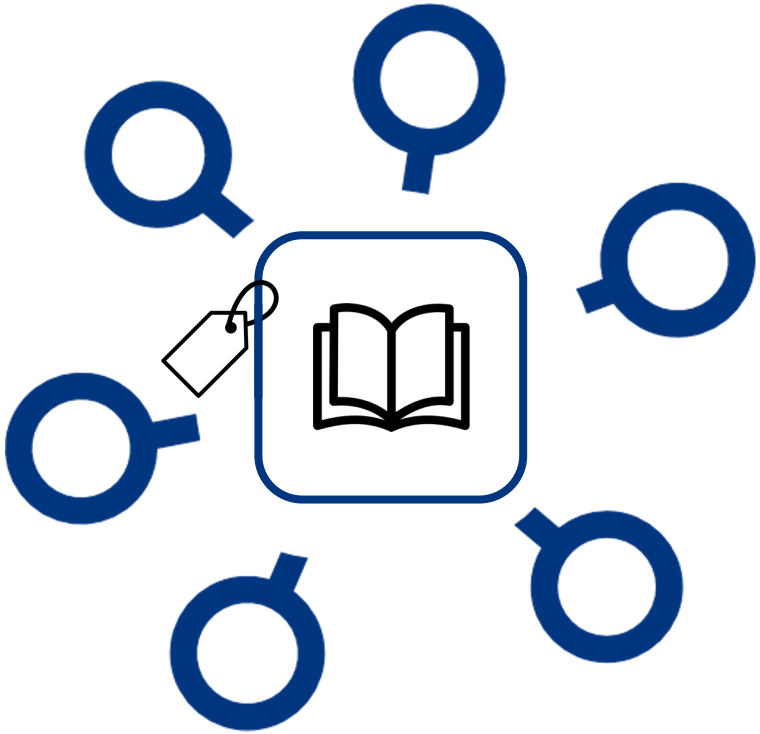
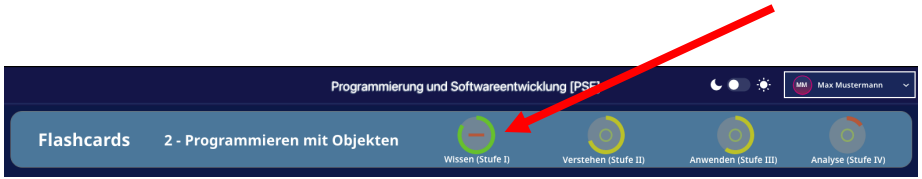
Preparation of Course Material

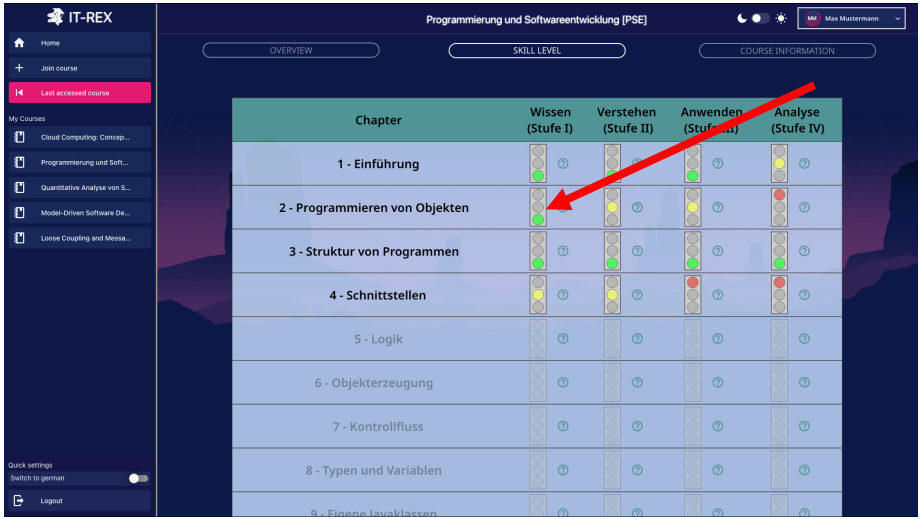
Tagging

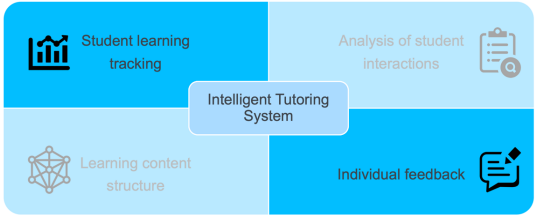




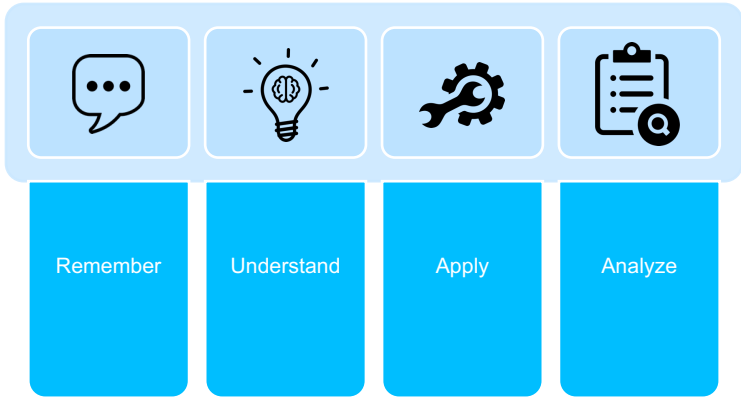
Skill Levels



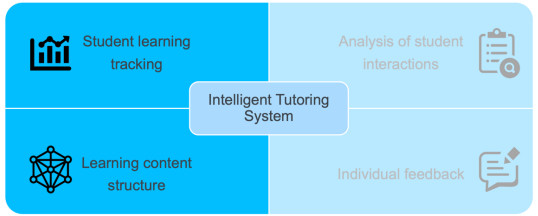


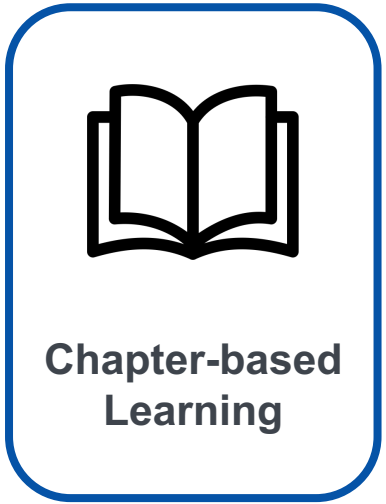


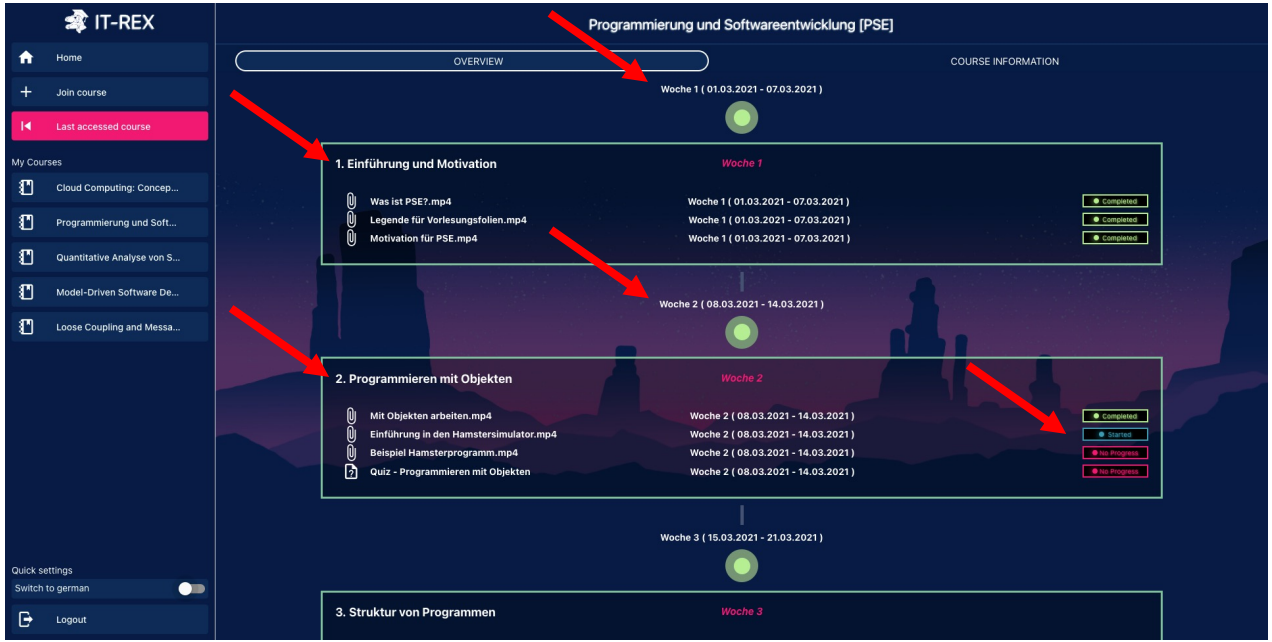
Bloom's Taxonomy



Learning Strategies
Chapter-based Learning







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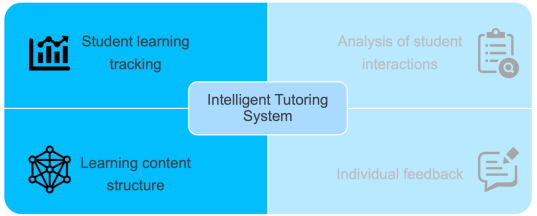


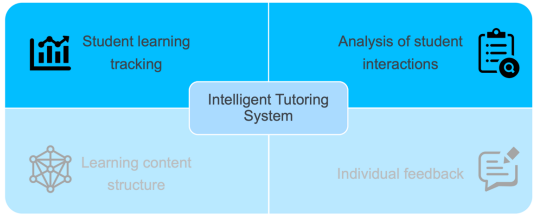
Chapter-based Learning
Quiz Results

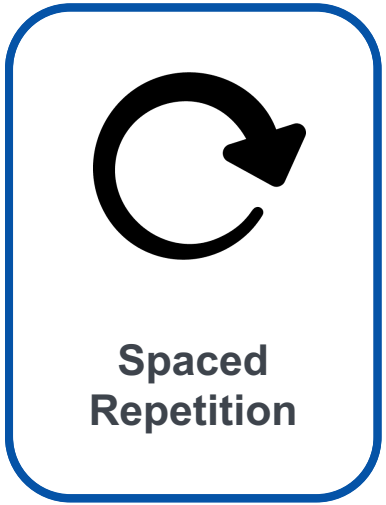
Case 1 – 0%-25%:
Head back to the foundations / basics of this chapter

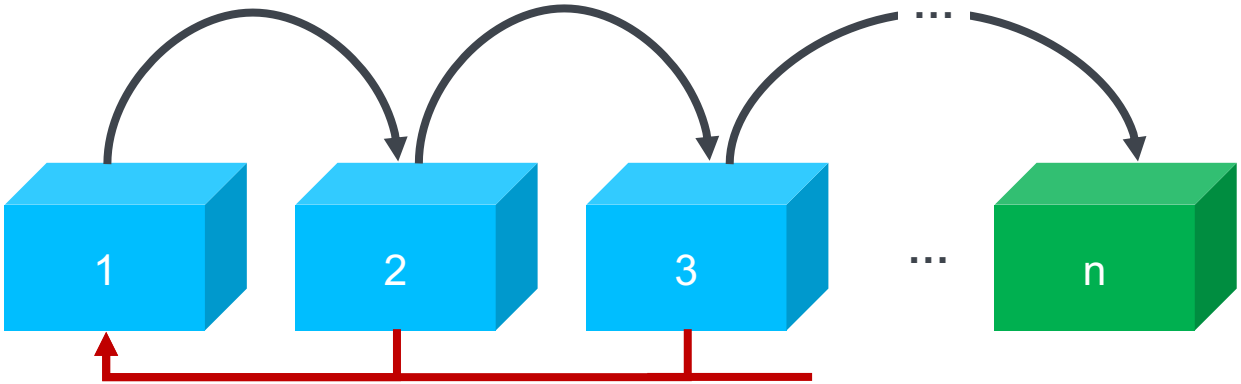
Case 2 – 26%-75%:
Review this course's materials and / or bonus material

Case 3 – 76%-100%:
Head to the next chapter

Learning Strategies
Spaced Repetition







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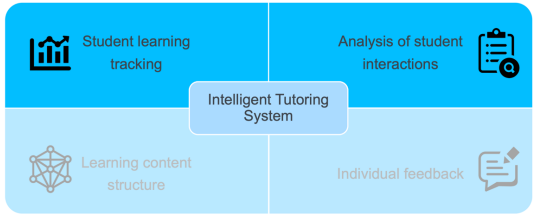
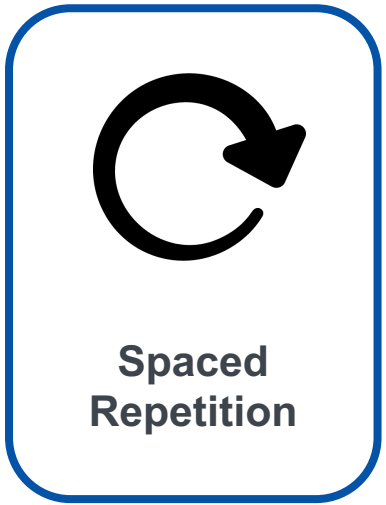
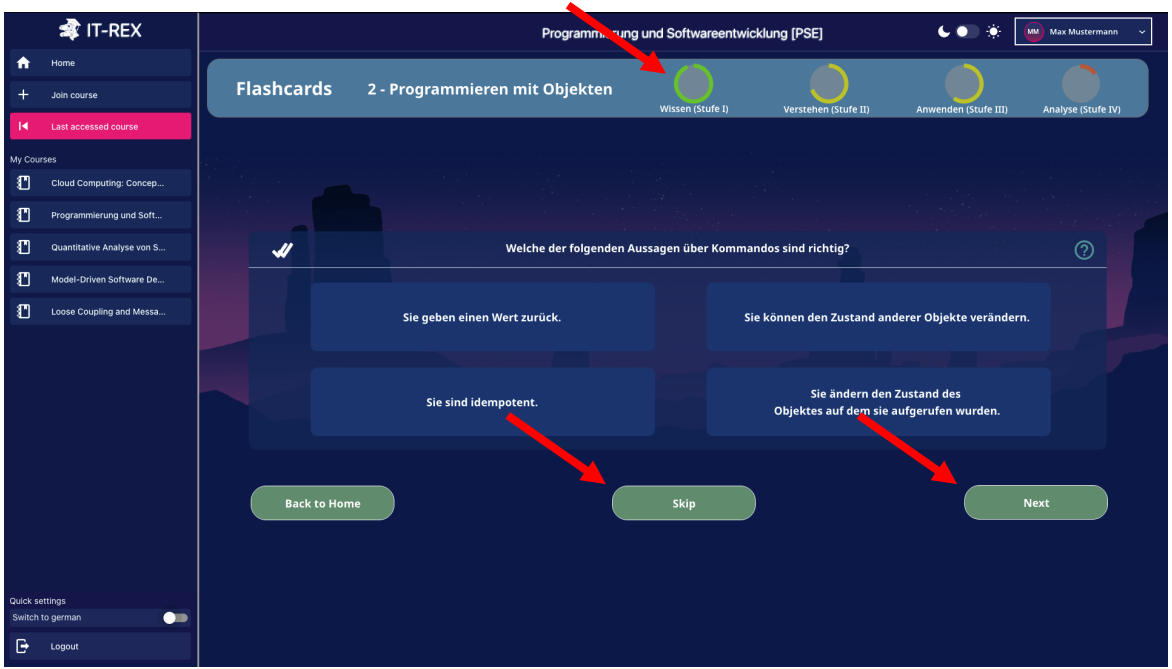
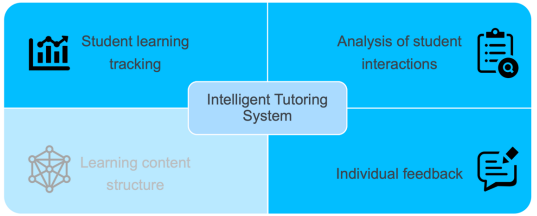
Spaced Repetition

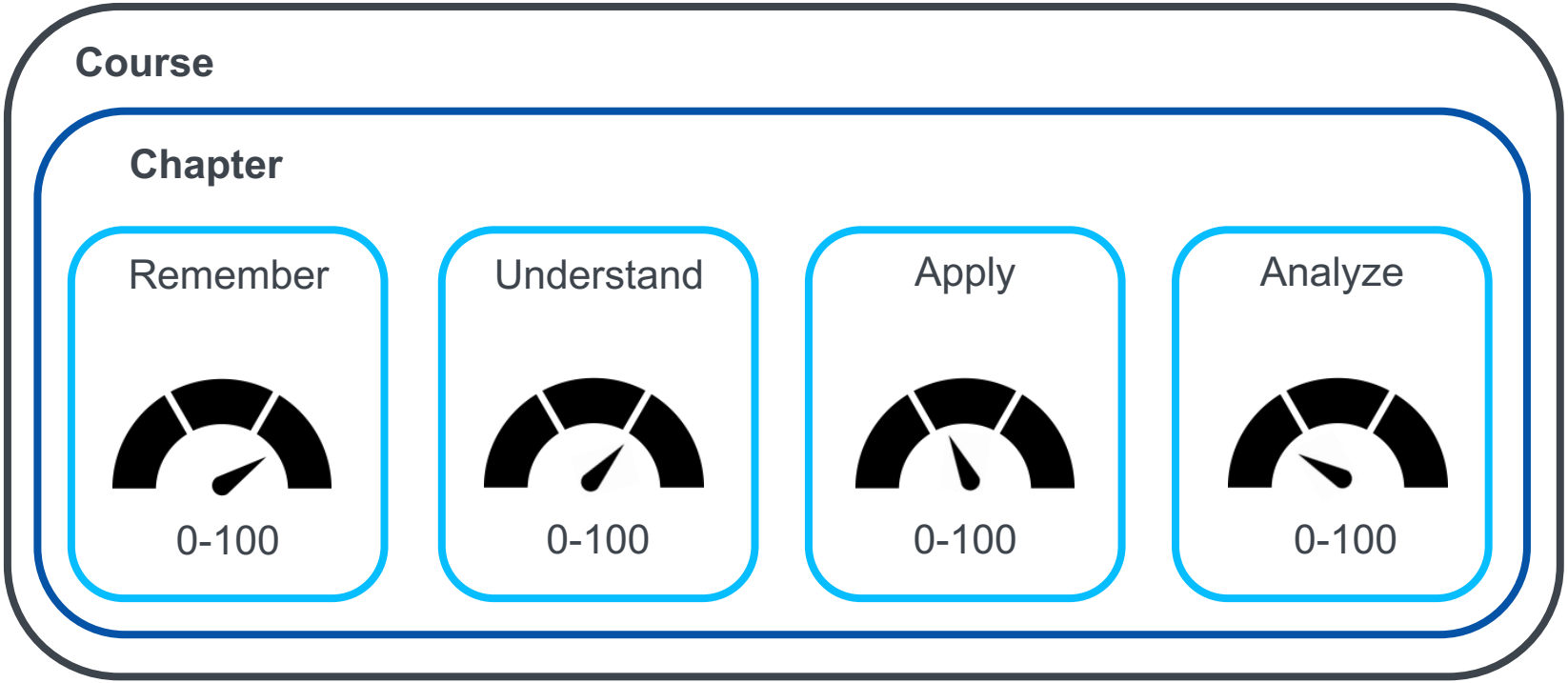






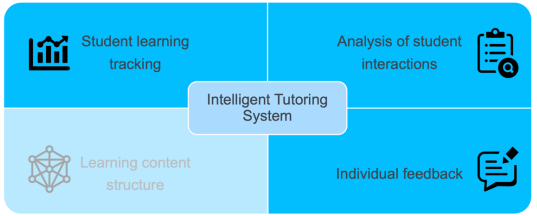
Scoring System

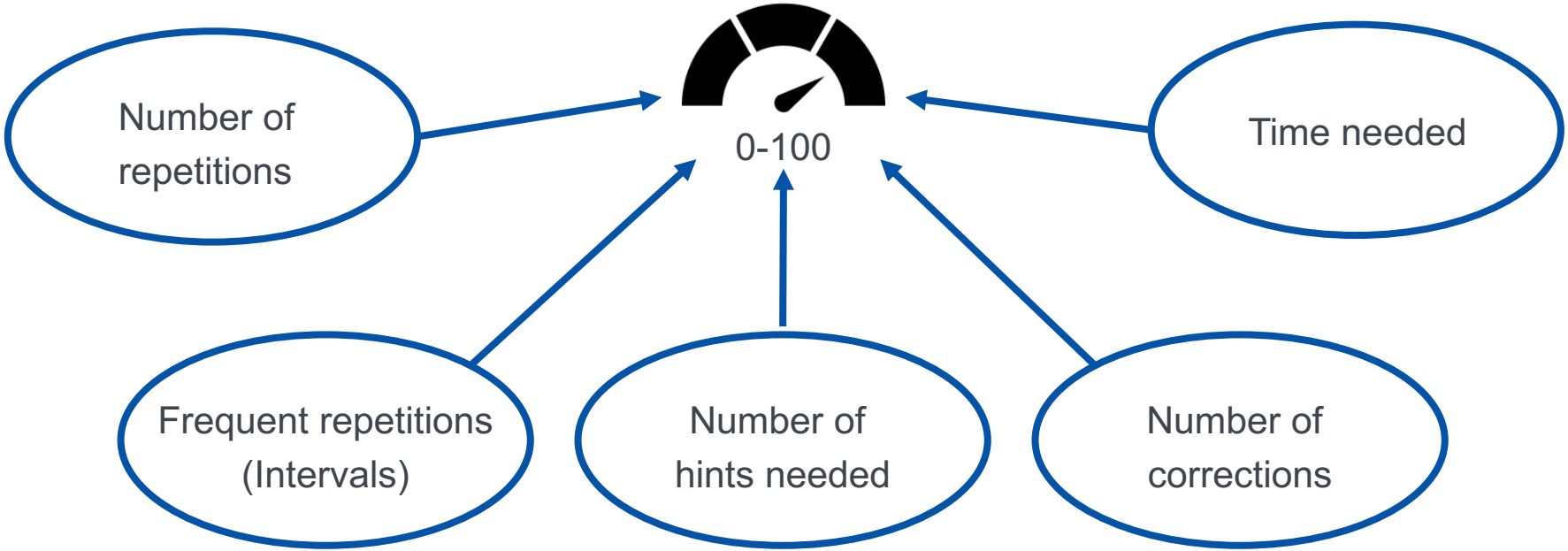




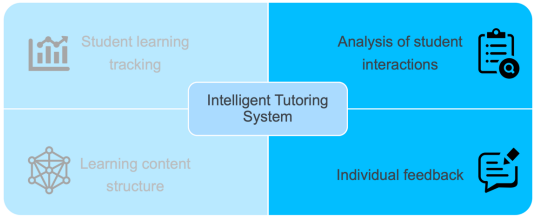
Scoring System

Calculation of Hidden Score





Feedback Strategy



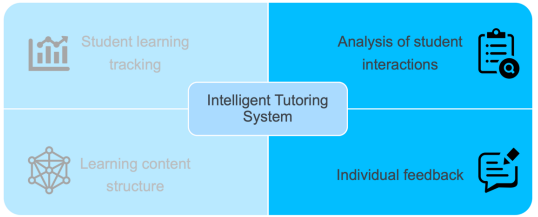
Levels of decision tree

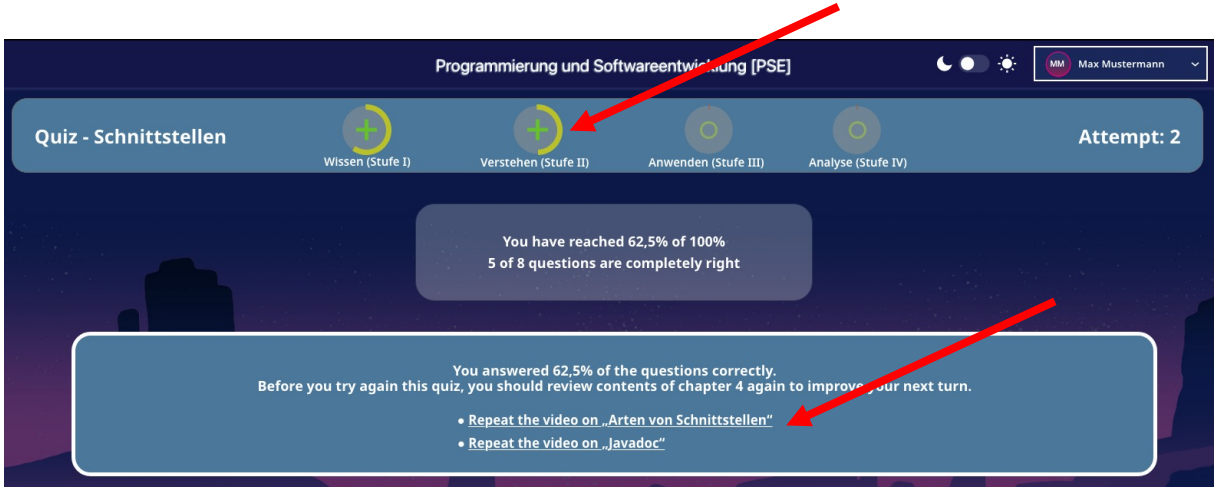
- Student Achievement
- Task Level
- Timing Of Feedback
- Prior Knowledge
- Amount Of Repetitions
- Hint Type

Feedback types

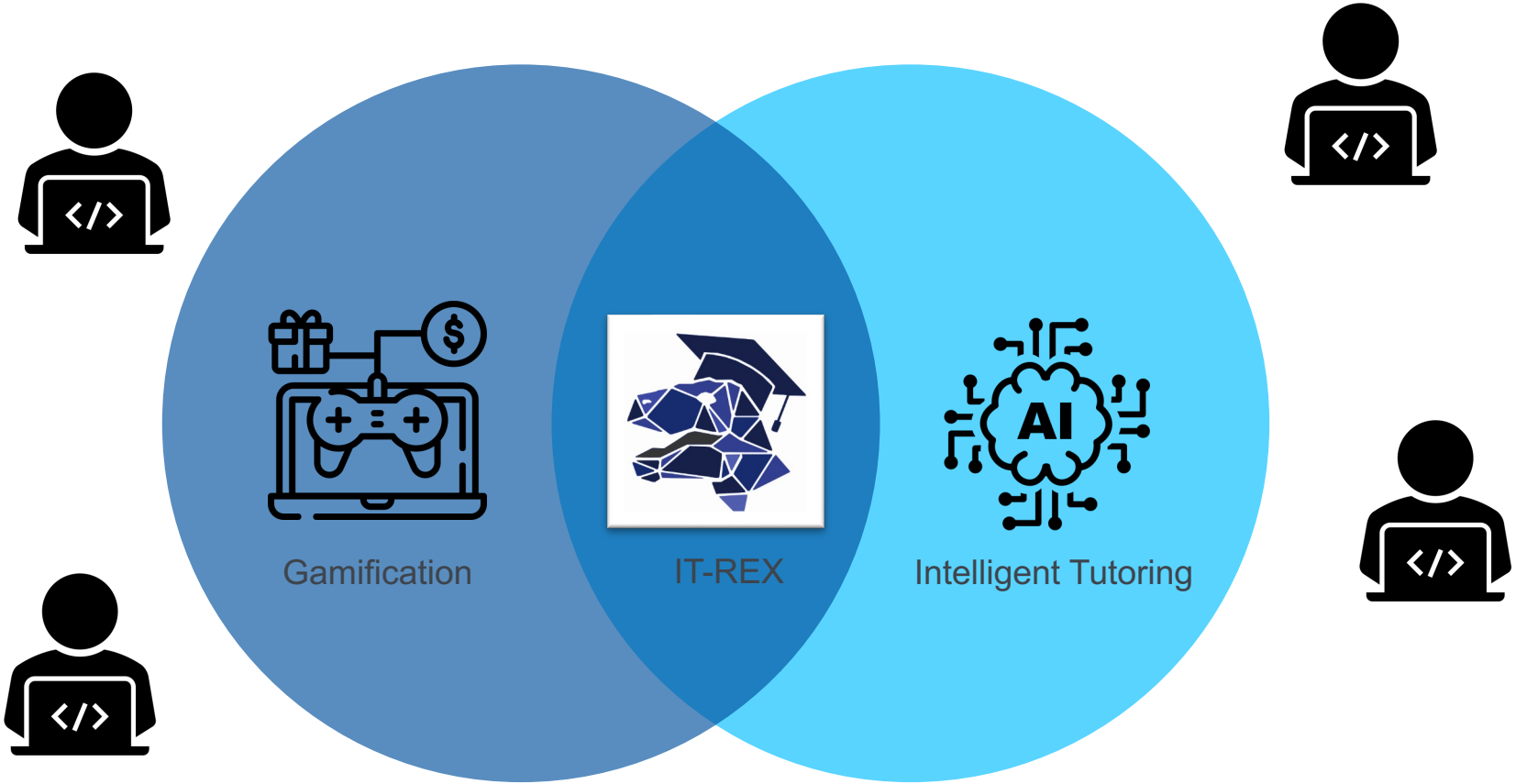
- Verification
- Correct Response
- Try Again
- Topic Contingent
- Response Contingent

Feedback Strategy





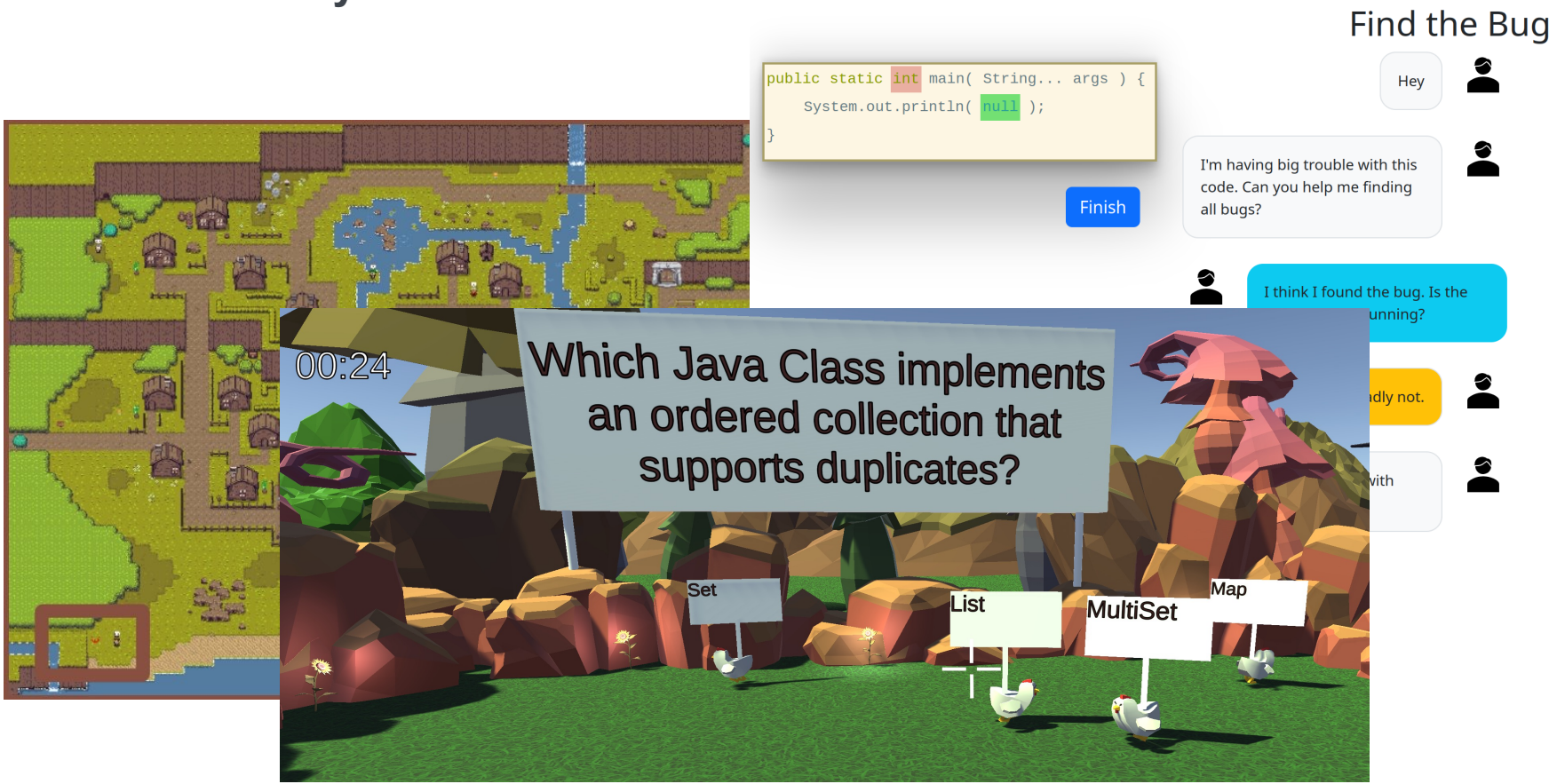
Outlook – IT-REX



Outlook – Gamify-IT

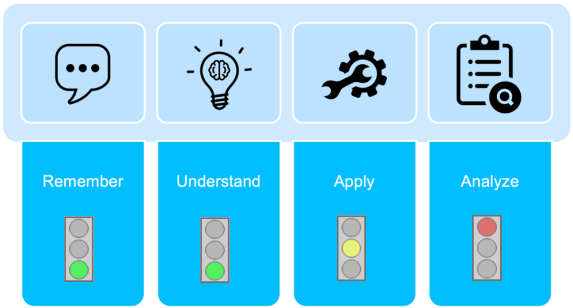
YouTube

Code



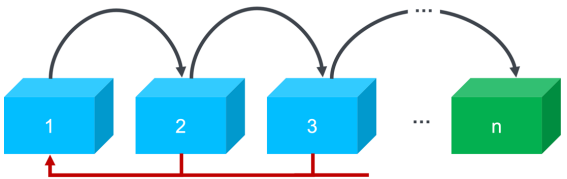
Conclusion

Skill Levels

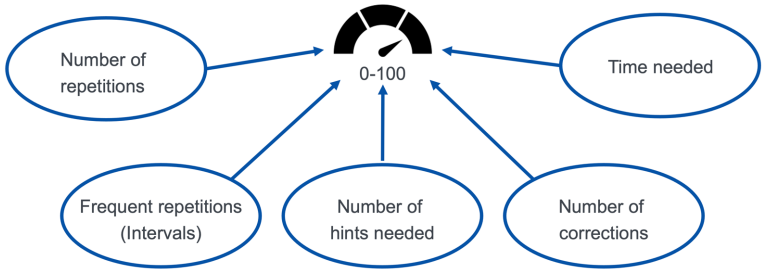


Tagging

Learning Strategies



Scoring System



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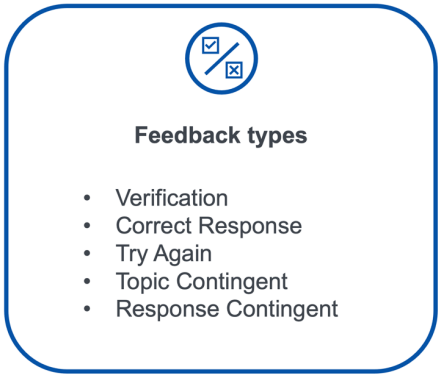

Feedback types

- Verification
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- Try Again
- Topic Contingent
- Response Contingent

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Thank you!

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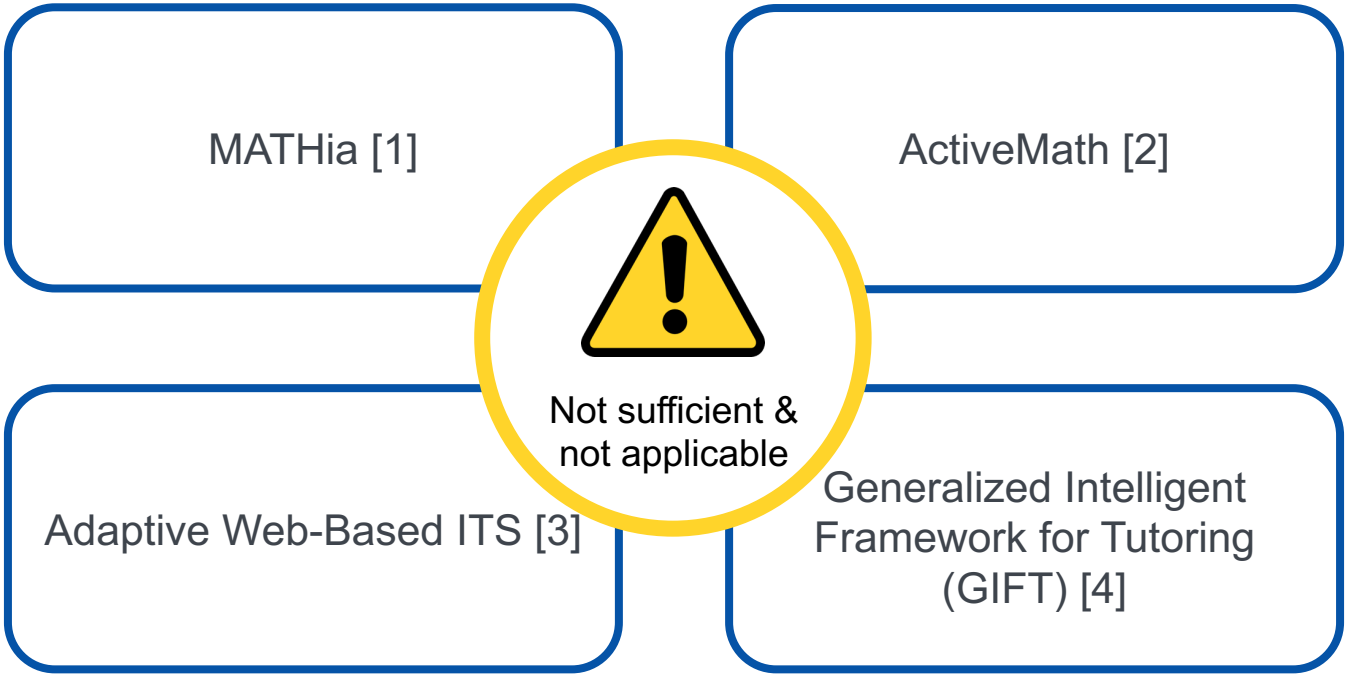
BACKUP SLIDES

Related Work



[1] Carnegie Learning – „*MATHia*“ (2021)
[2] Erica Melis, Jörg Siekmann – „*ActiveMath: An Intelligent Tutoring System for Mathematics*“ (2004)
[3] Kunyanuth Kularbphettonga et al. – „*Developing an Adaptive Web-Based Intelligent Tutoring System using Mastery Learning Technique*“ (2014)
[4] Robert Sottilare, Heather Holden – „*Motivations for a Generalized Intelligent Framework for Tutoring (GIFT) for Authoring, Instruction and Analysis*“ (2013)