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

Niklas Meißner, Sandro Speth, Uwe Breitenbücher

An Intelligent Tutoring System Concept for a Gamified e-Learning Platform for Higher Computer Science Education
Motivation
Problem Description and Goal

Classroom Lectures
Preparation Tests & Exams
Online Videos & Lecture Material
Online Quizzes & Exercises
Motivation

Intelligent Tutoring Goals

- Student learning tracking
- Analysis of student interactions
- Learning content structure
- Individual feedback

Intelligent Tutoring System
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

Related Work

Tools

<table>
<thead>
<tr>
<th>Unstructured Content</th>
<th>Plugins for student statistics</th>
<th>Structured Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complicated to use</td>
<td>Focus on repetition</td>
<td>Not motivating to keep up learning</td>
</tr>
<tr>
<td></td>
<td>Not possible to publish own content</td>
<td>No feedback on students' performance</td>
</tr>
</tbody>
</table>

Learning Management Systems

- ILIAS
- moodle

Intelligent Tutoring Systems

- CARNEGIE LEARNING

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24/02/2023
Related Work

Tools

Learning Management Systems
- Ilias
- Moodle

Intelligent Tutoring Systems
- Carnegie Learning

Unstructured Content
- Complicated to use

Structured Content
- Not possible to publish own content
- Not motivating to keep up learning

Plugins for student statistics
- Focus on repetition
- Only for high school education
- No feedback on students' performance
Preparation of Course Material
Tagging
Skill Levels

Bloom's Taxonomy

Remember
Understand
Apply
Analyze

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Learning Strategies
Chapter-based Learning

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Learning Strategies
Chapter-based Learning

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

Spaced Repetition

1 2 3 ...

n

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Learning Strategies
Spaced Repetition

Spaced Repetition
Scoring System

Course

Chapter

Remember 0-100
Understand 0-100
Apply 0-100
Analyze 0-100
Scoring System
Calculation of Hidden Score

Number of repetitions
Frequent repetitions (Intervals)
Number of hints needed
Time needed
Number of corrections

0-100
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

You have reached 62.5% of 100%
5 of 8 questions are completely right

You answered 62.5% of the questions correctly.
Before you try again this quiz, you should review contents of chapter 4 again to improve your next turn.

- Repeat the video on „Arten von Schnittstellen“
- Repeat the video on „Javadoc“
Outlook – IT-REX

Gamification

IT-REX

Intelligent Tutoring

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Outlook – Gamify-IT

Which Java Class implements an ordered collection that supports duplicates?

- Set
- List
- MultiSet
- Map

Hey

I'm having big trouble with this code. Can you help me finding all bugs?

Finish

I think I found the bug. Is the code running?

Sadly not.

With

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Conclusion

Skill Levels

Tagging

Learning Strategies

Scoring System

Feedback Strategy

- Verification
- Correct Response
- Try Again
- Topic Contingent
- Response Contingent
Thank you!

Niklas Meißner

e-mail  niklas.meissner@iste.uni-stuttgart.de
phone  +49 (0) 711 685-60845
www.  iste.uni-stuttgart.de/sqa/team/Meissner

University of Stuttgart
Institute of Software Engineering,
Software Quality and Architecture Group
Universitätsstraße 38,
70569 Stuttgart
Room 1.252
BACKUP SLIDES
Related Work

- MATHia [1]
- ActiveMath [2]
- Adaptive Web-Based ITS [3]
- Generalized Intelligent Framework for Tutoring (GIFT) [4]