A Scalable, Modular Architecture Enabling Digital Teacher-Defined Mobile Escape Rooms

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Introduction

However, existing escape room implementations are often designed around particular learning goals and can be difficult to adapt or reuse across contexts. The development of such environments typically requires significant effort in terms of design, content creation, and technical implementation (Fotaris and Mastoras, 2019).

To address this issue, we present DIETER, a modular digital escape room framework that enables educators to create their own escape room experiences. The system combines a mobile master application with independently developed mini-games and supports external non-digital tasks for hybrid learning scenarios.

DIETER provides a flexible and scalable framework that gives teachers more control over the design and configuration of digital educational escape rooms.

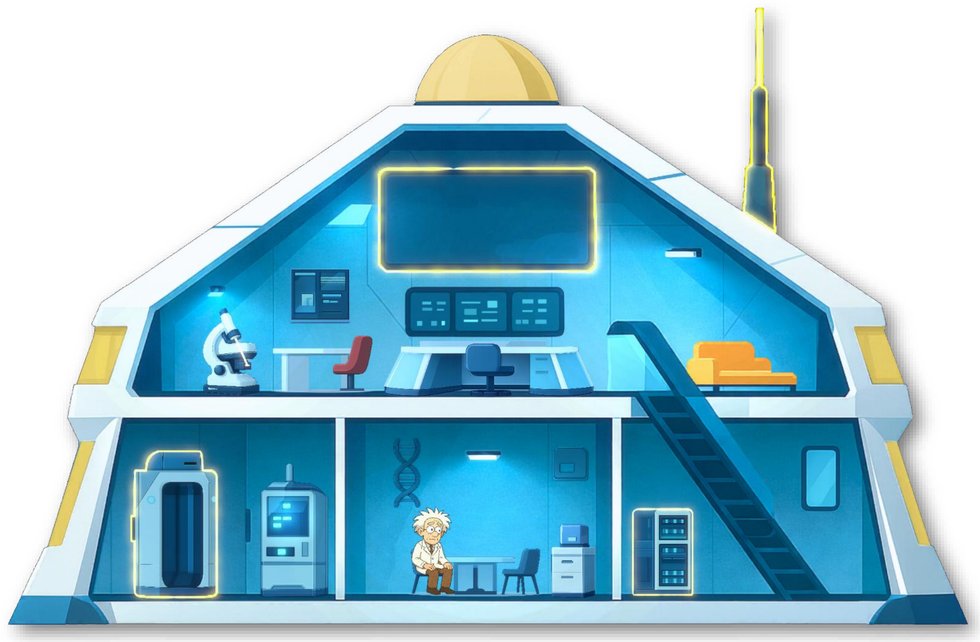


Figure 1: The master app's game selection screen used by students to access the mini-games by clicking the highlighted objects.

Framework Design

- **Modular Mini-Games**
  Independently developed mini-games that can be combined into different digital escape room sequences.
- **Mobile Master Application**
  A central mobile application that lets teachers define escape room experiences and guides students through the escape room.
- **Expandable Server-Based Game Library**
  A central server stores mini-games and their metadata, creating an expandable library that can be updated over time.
- **Game Uploader Software**
  A dedicated software tool supports the packaging and upload of mini-games together with relevant metadata, such as descriptions, technical settings, and time constraints.

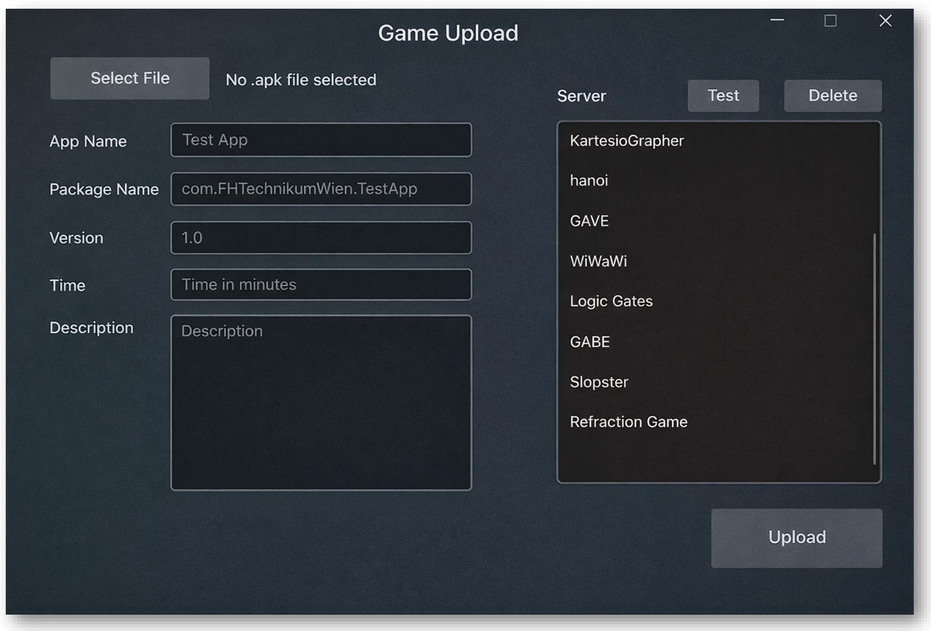


Figure 2: Software tool used to upload and manage mini-games

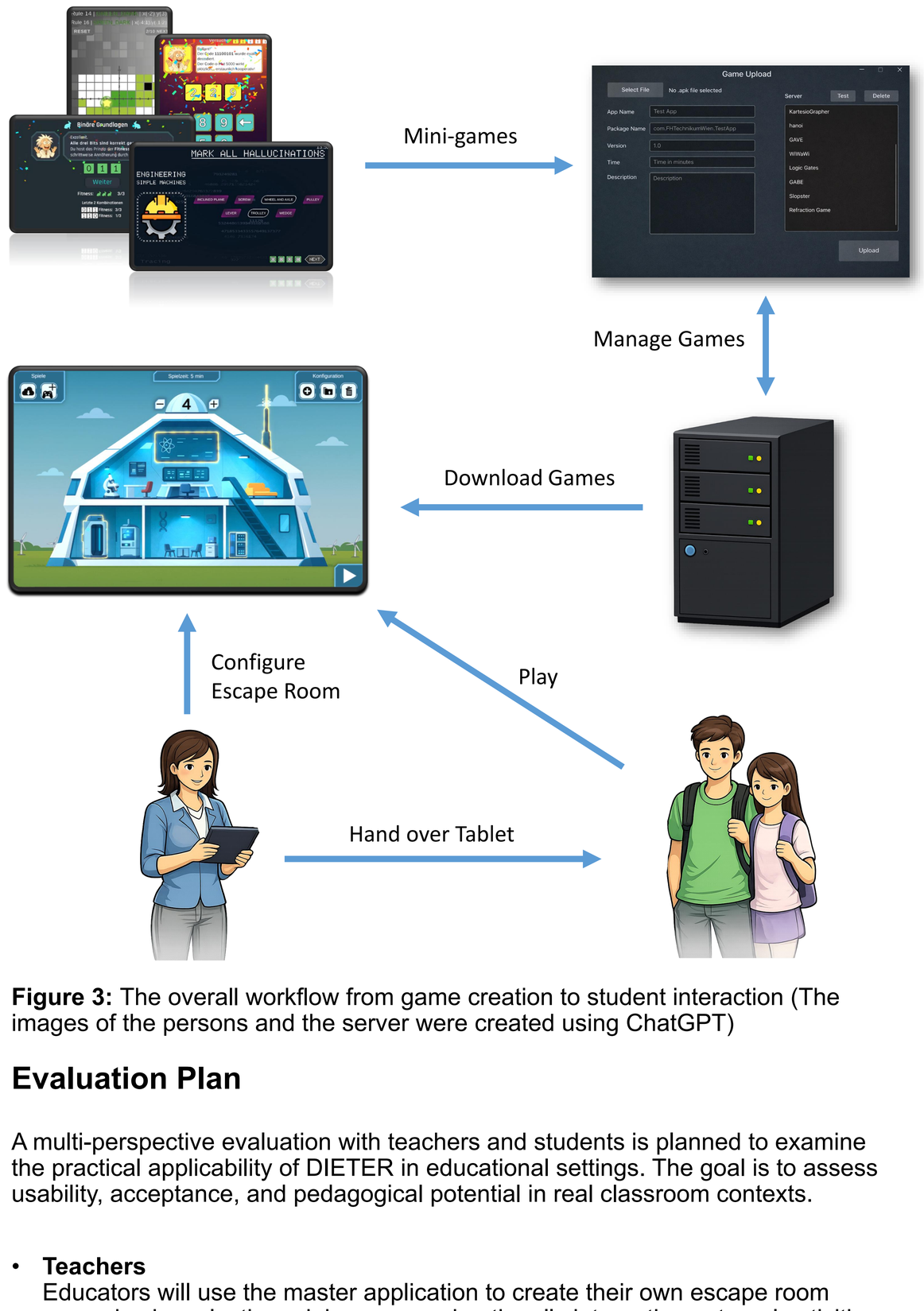


Figure 3: The overall workflow from game creation to student interaction (The images of the persons and the server were created using ChatGPT)

Evaluation Plan

A multi-perspective evaluation with teachers and students is planned to examine the practical applicability of DIETER in educational settings. The goal is to assess usability, acceptance, and pedagogical potential in real classroom contexts.

- **Teachers**
  Educators will use the master application to create their own escape room scenarios by selecting mini-games and optionally integrating external activities. Their experience will be examined through interviews and questionnaires, focusing on usability, usefulness, and ease of configuration.
- **Students**
  Data will be collected through observations, short questionnaires, and feedback sessions to evaluate engagement, perceived learning, and overall user experience in a classroom setting.

Conclusion

DIETER enables teachers to combine modular mini-games and external activities into flexible digital escape room sequences. This supports adaptable learning scenarios for different STEM topics, classroom contexts, and learning goals while reducing the effort required to create new escape rooms from scratch.

Current limitations include the still limited size of the mini-game library and the need to validate usability for instructors without a technical background. Future work will therefore focus on expanding the library, improving instructor usability, and evaluating the pedagogical impact in real classroom settings.

Future work will focus on expanding the mini-game library, improving usability for instructors, and evaluating the pedagogical impact of DIETER in real classroom settings.

References

Fotaris, P. and Mastoras, T. (2019) 'Escape rooms for learning: A systematic review', Proceedings of the European Conference on Games-based Learning, 2019-October, pp. 235–243. doi: 10.34190/GBL.19.179.

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