Escape Games in Physics Education
Students’ Attitudes and Flow Experience

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The escape game has been developed in an iterative process following the EscapED framework [1] which suggests a 6-level approach:

- **User type**
- **Time**
- **Difficulty**
- **Mode**
- **Scale**

**Participants**
- Learning objectives
- Solo/multi-disciplinary
- Soft skills
- Problem solving

**Objectives**
- Escape mode
- Mystery mode
- Narrative design
- Stand alone

**Theme**
- Puzzles design
- Reflect objectives
- Instructions
- Manual

**Puzzles**
- Location/ space design
- Physical props
- Technical props
- Actors

**Equipment**
- Testing
- Reflection
- Evaluate learning objectives
- Adjust
- Re-set

**Evaluation**

**Research Questions**
- How does students’ escape game experience change over time?
- Does this educational escape game foster a mental state of flow?
- How do students describe their (learning) experience?

**First Results**

**Game experience before, during & after the escape game**

<table>
<thead>
<tr>
<th></th>
<th>positive</th>
<th>immersion</th>
<th>flow</th>
<th>competence</th>
<th>challenge</th>
<th>tension</th>
<th>negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>completely agree</td>
<td>0.5</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>agree</td>
<td>0.5</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
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<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>disagree</td>
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<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
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</tr>
</tbody>
</table>

**Sub-dimensions of game experience after the escape game, Pearson’s r**

- **positive affect**
- **Immersion**
- **Flow**
- **Competence**
- **Challenge**
- **Tension**
- **Negative affect**

**Sub-categories**

- **positive affect**
- **Immersion**
- **Flow**
- **Competence**
- **Challenge**
- **Tension**
- **Negative affect**

**Summary**
- Escape games can provide fun and engaging activities for students
- Iterative design to balance challenge and competence experience
- Immersion and flow experience are correlated, but independent of physics interest, self-concept & other game experience dimensions
- Successful game even with little storytelling / immersive atmosphere

**Literature**


Theoretical Background & Methods

- **Mental state of flow**: characterized by intense and focused concentration, distortion of temporal experience, and an intrinsically rewarding experience [2]
- **Game-based learning**: refers to a type of games characterized by specific learning goals. Learners practice new skills and acquire new knowledge in a playful way while being absorbing in an enjoyable game without noticing time passing [3]
- **Fostering flow in educational games**: engaging activities, defined goals & progress indicators, immediate & clear feedback, balance perceived challenge & perceived skills [3]

**Game Experience Questionnaire**: assesses the multi-facet nature of game experience [4] before, during and after the game (14/43 5-level items, completely disagree - completely agree)

- **Positive affect**: e.g. “I enjoyed it”
- **Immersion**
  - e.g. “I was interested in the story”
- **Flow**
  - e.g. “I felt completely absorbed”
- **Competence**
  - e.g. “I felt successful”
- **Challenge**
  - e.g. “I thought it was hard”
- **Tension**
  - e.g. “I felt frustrated”
- **Negative affect**
  - e.g. “I felt bored”

**Interviews**: four focus groups (4-5 students) with discussion guide about game experience