



How to Reveal Students' Conceptions of Programming and Designing Digital Games

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Which specific conceptions of functionality, programming, and design of digital games do students have?

Which computing-related phenomena can be identified in their conceptions?

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Students' Conceptions

Game attributes	<ul style="list-style-type: none"> In a game, there are protected areas. There are games that have a beginning and an end. Depending on the type of game, a certain view or camera setting must be programmed. The more realistic a game looks, the more code is needed. Open maps are programmed similar to the globe. Digital games depend on the internet connection. Game developers collect data from all players, observe them regularly and, manipulate the individual game events.
Game execution	<ul style="list-style-type: none"> Some games continue to run even after the game is closed. A game hangs because of hardware problems, programming errors or the entire game has not been tested before. Mobile games often do not have a "real" ending, because they do not have an "overarching goal". When certain actions are performed, further actions are performed automatically. Calculations are performed in the game. Bugs allow "forbidden" or "atypical" actions.
Programming & Program code	<ul style="list-style-type: none"> If you can keep playing a game, the programming has to be very long. Hackers use bugs and can modify the game's code. Various program codes are required for different game modes. The program code of games is protected by the developers. In a game, all conceivable possibilities must be programmed.
Data & Storage	<ul style="list-style-type: none"> Important information (profile data, victories, etc.) is stored on the computer and/or servers. Each time the game starts, a specific savegame with profile data is loaded. The game or computer monitors essential data in the game and has/knows all information.
Objects	<ul style="list-style-type: none"> Objects have specific properties that distinguish between them and can be labeled individually. Data changes as soon as certain objects meet. Objects must receive information from the game or other objects in order to act (in)directly.

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Pilot Study

Instrument:

Semi-structured interviews with 4 different techniques

Evaluation:

Qualitative content analysis

Sample:

9 students (4 female, 5 male, 15/16 years old, w/ & w/o CS class)

Average interview running time:

57 min

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Techniques

(1) Brainstorming:

- What do you associate with digital games?
- What do you associate with game programming?
- To activate students' thoughts and prior knowledge

(2) Sorting:

- Sort these popular games by one self-defined category.
- Explain similarities and differences regarding to programming of the sorted groups.

(3) Structural Mapping:

- Choose a specific game scene.
- Write relevant objects regarding the scene on cards.
- Explain the relationships in the game and the programming.

(4) Miracle Question:

- Imagine, you meet an expert for game design who really knows everything about every single game. You can ask her any question you like. Which questions would you ask?
- To survey different aspects of digital games that the students are interested in, and several game situations they have experienced.

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Evaluation

- The **Brainstorming** technique helped to reveal students' **general thoughts about digital games and game programming**.
- Most of the conceptions were found in the answers by using the techniques **Sorting** and **Miracle Question**.
- The **Miracle Question** revealed furthermore several **computing-related phenomena** the students are interested in.
- The **Structural Mapping Technique** produced **long descriptions of game situations** but very few conceptions of functionality, programming, and design of digital games. Nonetheless, the answers will be used for extraction of **common and specific game scenes** (e.g. to select items and bring together) for the final interview guideline.

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Final Guide Line

- Brainstorming**
- Sorting**
- Specific Game Scenes**
The students will be asked to explain how the given and self-chosen game scenes could be programmed.
- Miracle Question**

