Creation of a Serious Game For Teaching Code Review

Presenter: Barış Ardıç

Barış Ardıç  İrem Yurdakul  Eray Tüzün
Outline

I. Serious Games

II. Code Review Process

III. Workflow of the study

IV. Learning Objectives

V. Game Flow

VI. Preliminary Experiment

VII. Future Directions
Serious Games

- A game with a different main purpose than entertainment.
- A concept similar to gamification.
- Game elements are parts of the core functionality.
- Aim is to provide a platform that introduces code review while allowing students to practice.
Code Review Process

• A manual inspection of source code by developers other than the author.

• Frequently used practice in software development

• Improves code quality if done right.

• Often not addressed in software engineering curriculums.
Workflow of the Study

Phase 0: Prototyping
1) Review literature on Code Review related educational games
2) Determine the learning objectives
3) Create a prototype in order to realize the learning objectives

Phase I: Preliminary Experimentation
4) Create the quiz and pre&post surveys for preliminary evaluation
5) Organize a preliminary experiment for feedback
6) Conduct interviews with the participants for additional feedback

Phase II: Feedback and Overhauling
7) Analyse preliminary experiment and interview data
8) Decide on improvements for the game and companions
9) Overhaul the game regarding the decided improvements

Phase III: Main experimentation
10) First round of the main experiment on CS319
11) Fix minor problems occurred in the first round
12) Second round of the main experiment on CS453
13) Investigate the results&outcomes of the main experiment
Learning Objectives

• Main objectives are rows A and C.

• B consists of game concepts.

• Objectives are realised by game concepts.
Learning Objectives

• Review Related Parameters:
  o Review size
  o Time spent on review

• Process Related Parameters:
  o Review workflow
  o Actors and responsibilities
Learning Objectives

- Finding smells improve code quality.
- Defect classification\[4\] helps communication.
- Code standards help provide evolvability.

Game Flow

PS: If a line of code is missing you should select the nearest encapsulating object structure, e.g. the nearest curly brackets, for example if a return statement is missing inside an "IF" statement you should select the whole if statement. The reason of the defect for such cases should be "Data and resource manipulation."
Defect Selection

The drop-down menu represents the defect classification taxonomy.
Validation Strategy

• Not a straightforward process.

• Lack of validation is prevalent in the field.

• We came up with a strategy inspired by social sciences.

• Created an experiment for measuring differences after playing.

• Test -> Play -> Test
Preliminary Experiment Setting

- Pre-Survey: Overall and CR experience
- Pre-Quiz: CR knowledge and programming
- Gameplay: 5 levels
- Post-Quiz: Same as Pre-Quiz
- Post-Survey: Feedback and familiarity
- Interviews: Rate quiz questions

### Table I

<table>
<thead>
<tr>
<th>Phases of Experiment</th>
<th>Min. Duration</th>
<th>Max. Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Survey</td>
<td>5 min.</td>
<td>8 min.</td>
</tr>
<tr>
<td>Pre-Quiz</td>
<td>19 min.</td>
<td>34 min.</td>
</tr>
<tr>
<td>Play Session</td>
<td>35 min.</td>
<td>61 min.</td>
</tr>
<tr>
<td>Post Quiz</td>
<td>7 min.</td>
<td>13 min.</td>
</tr>
<tr>
<td>Post Survey</td>
<td>5 min.</td>
<td>20 min.</td>
</tr>
</tbody>
</table>
Feedback From Participants

• Detected some bugs and inconsistencies.
• Improved the game content.
• Added feature requests like:
  o Multiple reason support
  o Tutorial
• Adjusted the experiment duration
  by omitting or adding quiz questions based on interviews.
Later Phases

• Enhanced the game according to the preliminary feedback
• Utilized in game as a lab assignment in Bilkent University
• Followed the same experiment format.
• The lab had 132 participants and was received positively.
• Journal paper with the improved game and main experiment statistics and is in review.
Future Directions

• We intend to add collaborative gameplay for knowledge transfer and team building.

• An additional game mode from the authors perspective.

• Code base can be extended for other SE processes.

• More experiments are on their way as well.
Thank You for Listening

Video Demo

Github Page

Full Paper