

# Gamification In Software Engineering Education

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# Gamification

- Gamification is the use of game mechanics, dynamics, and frameworks to promote desired behavior.
- Gamification techniques are intended to leverage people's natural desires for socializing, learning, mastery, competition, achievement, etc.
- The term "gamification" first appeared in 2008, but gained widespread usage in 2010.



# Introduction

- Games are an innovative educational tool for actively engaging the learners and improving their motivation [1].
- Educational games are used with most success in preschool education, where most of the learning process is game-based.
- Beyond schools and universities, video games applied to corporate training are already a reality in corporate companies.



[1] S. Kim, K. Song, B. Lockee, J. Burton, "Gamification in Learning and Education," Advances in Game-Based Learning, ISBN 978-3- 319-47282-9, Springer International Publishing, 2018.

# Aim Of The Study

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- Software engineering is a complex subject.
- Rapid growth in SE leads to the increasing necessity to teach students using the latest.
- The authors believed that gamification can be applied to teach software engineering.
- Objective:
  - To implement a collaborative agile team-based approach
  - Include engineering games to teach certain topics as part of the software engineering course.

# Collaborative Role Playing Game

- Students will form teams (5-6 students) and each student will play the role of a position that is similar to the positions available in software companies.
- Every member of the team has a main and secondary role.
- The teams distribute their roles and responsibilities for the project by using a Gantt time chart.
- The teams have to write all software requirements – including functional and non-functional.

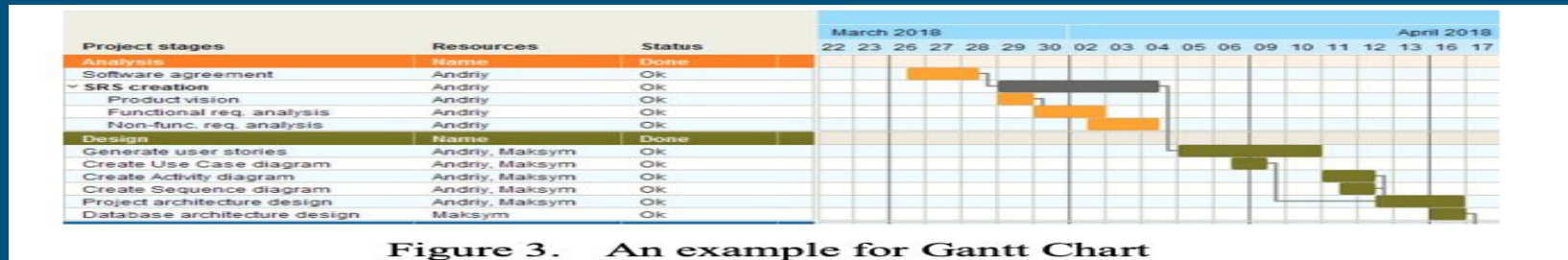


Figure 3. An example for Gantt Chart

# Collaborative Role Playing Game Cont.

- Teams are given the opportunity to play the role of Scrum or Kanban team for project management.
  - <https://v637g.app.goo.gl/B7Xz>

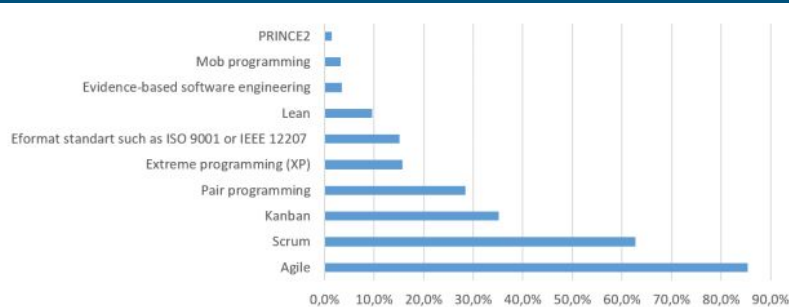


Figure 1. StackOverflow Developer Survey Results in 2018 about software methodologies

TABLE I. KANBAN VS SCRUM METHODOLOGIES

Scrum	Kanban
The time limited iterations are obligatory.	Time limited iterations are optional.
The team promises to finish a work process in every iteration.	Work process finalization in every iteration is not obligatory.
Tempo is used as a metric for planning and improving the process.	Time for completion is used as a metric for planning and improving the process.
It is imperative that multifunctional teams are present.	Multifunctional teams are optional. Specialized teams are permitted.
Work needs to be separated in small parts in order to be finished within	There are no constraints on the size of tasks and their length.
It is necessary to use a chart for the remaining work (Burndown chart).	A work chart is not needed.
Indirectly limiting the incomplete tasks (for a sprint).	Directly limiting the incomplete tasks (during work flow).
Rating and prioritizing tasks is obligatory.	Rating and prioritizing tasks is not obligatory.
Three roles are mandatory - Product owner, Scrum master and team.	There are no mandatory roles.

# Collaborative Role Playing Game Cont.

- Each team had to write user stories based on the specification using Jira.
- Confluence was used for project documentation.
- **“MoSCoW”** method was used for prioritizing the requirements of the project.
  - Must have, should have, could have, won't have

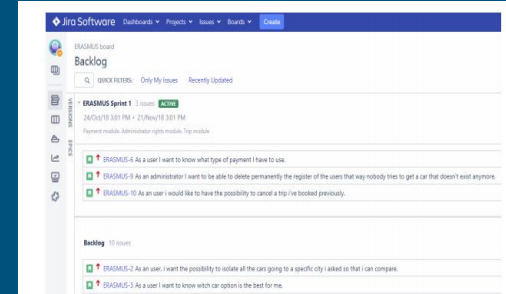
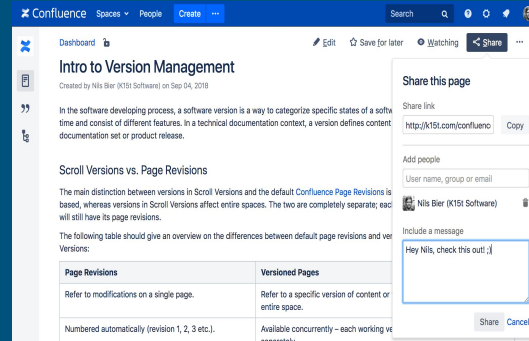
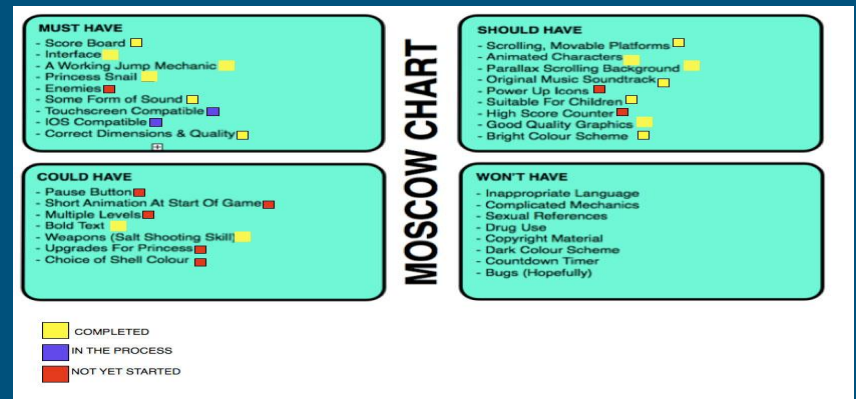


Figure 4. Jira Software used by students from the University of Ruse





# Poker Planning

- Poker planning, also known as Scrum Poker, is a technique for rating efforts based on consensus.
- The grading of the tasks is achieved by playing Poker Planning.
- Helps bypass the psychological effect anchoring bias, which occurs during voting by voice.
  - Can lead to incorrect grading and prioritizing tasks.
- <https://v637g.app.goo.gl/M5Jo>

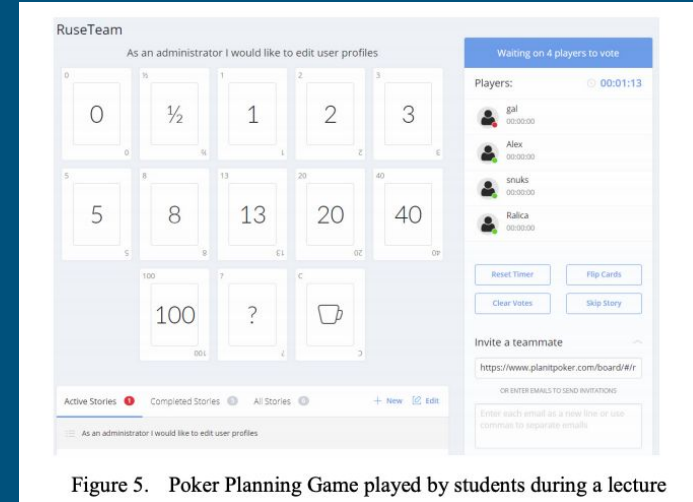


Figure 5. Poker Planning Game played by students during a lecture

# CodeCombat Game

- Various gamification techniques can also be applied during the code implementation phase.
- A game geared towards teaching students to code is CodeCombat.
  - Simple coding environment, disguised as a game.
  - Objective is to teach students the basics of coding mainly JavaScript and Python.
  - The game has a dedicated classroom mode, which allows to track the whole class' overall progress.

- <https://www.youtube.com/watch?v=uIrhNndjZfA>

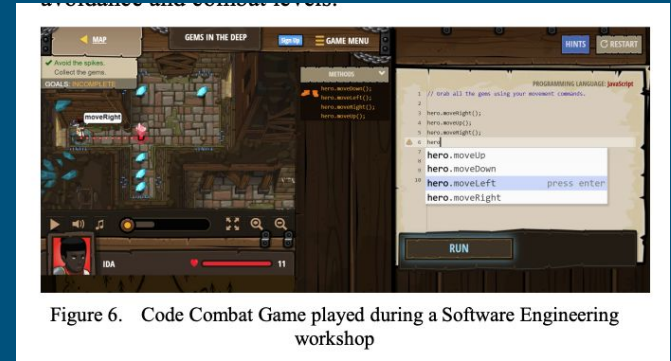


Figure 6. Code Combat Game played during a Software Engineering workshop

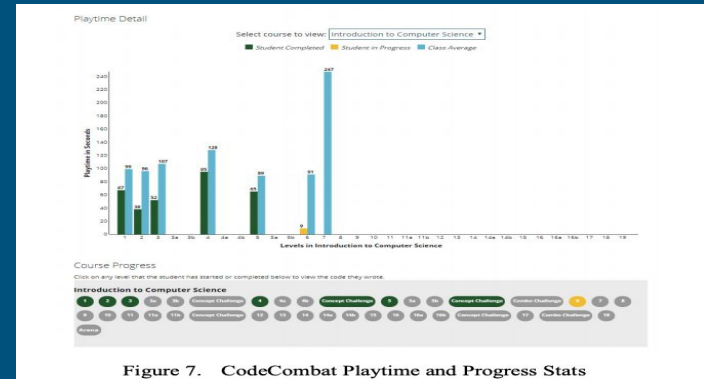
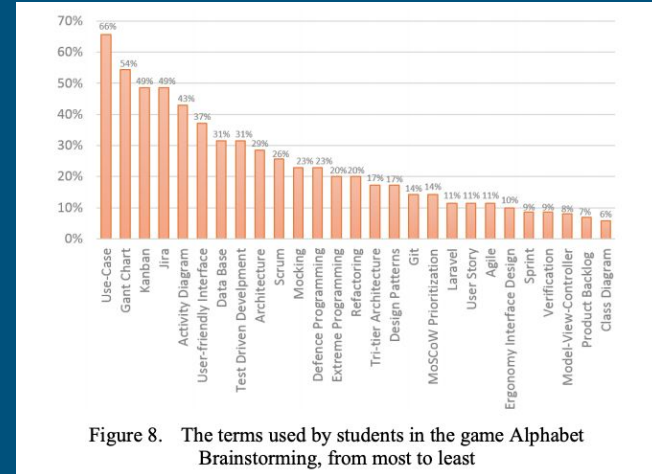


Figure 7. CodeCombat Playtime and Progress Stats

# Alphabet Brainstorming

- A game which helps students generate connections between ideas and key words beginning with the letters from the alphabet.
- Every student was given a sheet of paper with alphabet.
- The goal was to determine at least one term with every letter of the alphabet.
- The game is a great approach for reviewing the students' knowledge on the subject at the end of the semester.



# Kahoot Game

- An innovative method for actively engaging the students during class.
- Kahoot was used as a quiz game at the end of a lecture.
- The idea was to find out excellent students who had paid attention in class and quickly revise the course material.
- After every question, the interactive board in the lecture room visualized the results in a player rank ladder with the students' points.
- <https://www.youtube.com/watch?v=P9Fm6cBe6HA>

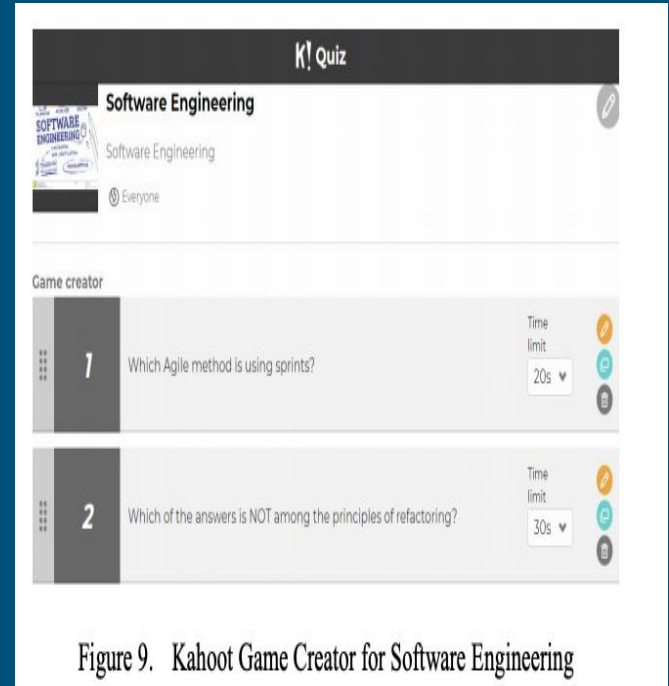


Figure 9. Kahoot Game Creator for Software Engineering

# The Millionaire Game

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- Used to review the course material at the end of the semester.
- Questions with different degree of difficulty were formed.
- Two helpline option were available:
  - Audience poll - Vote by lifting their hand
  - Phone a friend - Call anyone including professor

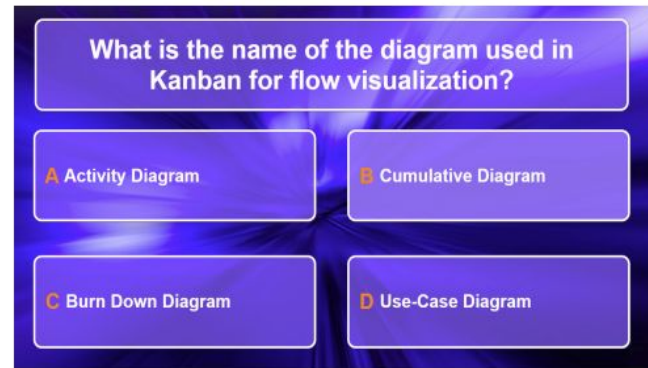


Figure 10. The Millionaire Game (Software Engineering Edition)

# Results

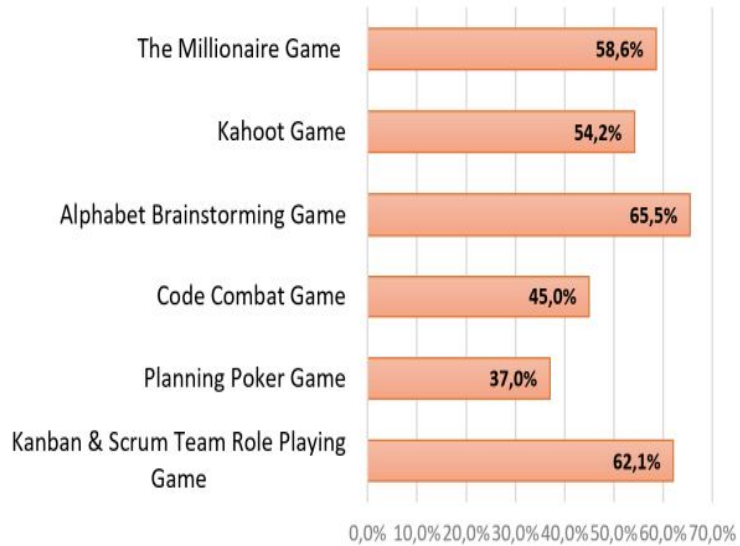


Figure 11. Survey Results - Software Engineering Games Evaluation

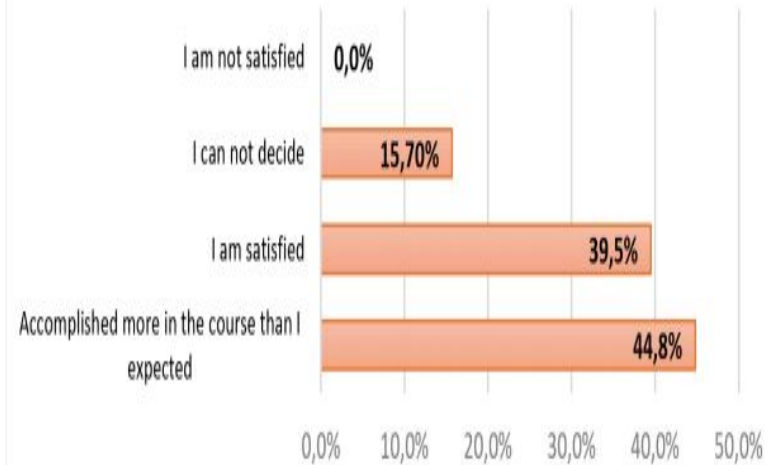


Figure 12. Survey Results

# Limitations (personal opinion)

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- Only allowed to use Confluence and Jira software tools for documentation and team management.
  - **Solution:** Do not limit to use of a particular software. Allow team to choose based on project requirements.
- In order to replicate a game like scenario the students quiz score was shown to the entire class while taking the quiz.
  - Not all students will be comfortable having his/her quiz scores displayed.
  - **Solution:** Suggestion would be to not display the scores or create new design.

# My Questions?

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- Define gamification and briefly explain its role in towards world?
- Define the term scrum and kanban and also provide three differences?
- Briefly explain the poker planning and alphabet brainstorming game and also mention how these games were used in the SE class?



Your Questions ?

Thank You !