

Working Group: Game Development for Computer Science Education

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1. BACKGROUND

Educators have long used digital games as platforms for teaching. Games tend to have several qualities that aren't typically found in homework: they situate problems within a compelling alternate reality that unfolds through intriguing narrative, they draw more upon a player's intrinsic motivations than extrinsic ones, they facilitate deliberate low intensity practice, and they emphasize a spirit of play instead of work.

At ITiCSE 2016, this working group convened to survey the landscape of existing digital games that have been used to teach and learn computer science concepts. Our group discovered that these games lacked explicitly defined learning goals and even less evaluation of whether or not the games achieved these goals. As part of this process, we identified and played over 120 games that have been released or described in literature as means for learning computer science concepts. In our report, we classified how these games support the learning objectives outlined in the ACM/IEEE Computer Science Curricula 2013.

While we found more games than we expected, few games explicitly stated their learning goals and even fewer were evaluated for their capacity to meet these goals. Most of the games we surveyed fell into two categories: short-lived proof-of-concept projects built by academics or closed-source games built by professional developers. Gathering adequate learning data is challenging in either situation. Our original intent for the second year of our working group was to prepare a comprehensive framework for collecting and analyzing learning data from computer science learning games.

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ITiCSE '17, July 3–5, 2017, Bologna, Italy.

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ACM ISBN 978-1-4503-4704-4/17/07..

DOI: <http://dx.doi.org/XXXX.XXXX>

Upon further discussion, however, we decided that a better next step is to validate the design and development guidelines that we put forth in our final report for ITiCSE 2016.

We extend this working group to a second year—with a mission to collaboratively develop a game with clearly defined learning objectives and define a methodology for evaluating its capacity to meet its goals.

2. OBJECTIVE

In this second year of the working group, we plan to collaboratively define a target learning area in computing education and design and develop a game for this learning area. We will define explicit and measurable learning goals and propose evaluation measures that can be followed and modified as desired by the general computing education community. The process of building a game as an international group of educators—and playtesting it with and releasing it to the computer science education community—is a necessary first step in forming a broader understanding of how these games might be used to facilitate learning.

To avoid the trap of creating polished but unevaluated games that have been published, the group will develop its game using the format of a game jam to take place during ITiCSE 2017. Prior to the conference, the group will decide on learning objectives and prototype game concepts. During the conference itself, the team will implement an alpha version of the game, recruiting conference attendees to play and give their feedback. After the conference, the release version of the game will be published online, with an additional goal of incorporating analytics to help educators understand their student-players' learning.

We intend for our game to be non-monolithic, with no pretense to serve as a standalone learning resource. Rather, we intend for it to have challenges or levels that are episodic in nature and will be embeddable as supplementary exercises distributed throughout a larger course. We will seek input from fellow computer science educators by incorporating them early in the development process through playtesting.