Developing a Game Production Pipeline for University Educators

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Abstract

In this paper, we describe the initial process of developing what we call the Game Production Pipeline (GPP), an effort to assist and guide educators in making educational games within higher education. Noting the need to push the boundaries of engaging virtual learning principles in the wake of the pandemic, the GPP seeks to address the epistemic gap between game design, virtual education, and game production. We set out to investigate educator wants, needs, and challenges in this area. We also created a probing survey to collect juxtaposing feedback on the GPP from commercial game developers. We found that educators were more concerned with implementation than design, and that developers had notes on time and production management, and epistemic clashes in making educational games.

Keywords: Online learning; virtual learning; educational games; serious games; game production; game design

1. Introduction

The present paper reports on the work so far of a project called the Game Production Pipeline (GPP). The GPP is an initiative that seeks to create a point-of-access to support and expertise for making games for education and other utility purposes at Aalto University. The project is a response to an increase in inquiries about the use of games for educational purposes, especially in virtual educational contexts, alongside an increased interest in self-service game production. The aim is to offer a design and practice focused track to educational game-making, while also constituting a training-ground for research on how educational games are made.

Figure 1. Visualization of the Game Production Pipeline (GPP).

While a lot of scholarly attention is paid to the commercially successful game industry, a significant – and growing – amount of game work happens outside of it. This includes educational games, a segment that has been heavily researched in its efficacy as instructional learning tools, but less investigated from a design and production point of view. The benefits of better understanding how educational games are made are twofold. Firstly, informed practices can help focus and scale educational game-making into context-appropriate budgets and time frame constraints. Secondly, understanding practice is key to removing design expertise bottlenecks and improving the quality and purposefulness of educational game-making. We take both perspectives into consideration when developing our case.

2. Background and context

Recent global challenges and fast-paced technological development call for rethinking and transforming virtual education. Starting in early 2020, the pandemic has forced universities to do remote work and remote learning. Simultaneously, in 2022, universities are calling their students and faculty back to campus for face-to-face learning. We argue for the need to design engaging learning experiences in this complex, hybrid situation. We identified this as a strategic focus point for our educational development actions and launched Aalto Online Learning — Online Hybrid Lab in 2021. The launch was done after running a piloting phase from 2016 to 2020 that covered the whole university and resulted in around 250 production-

quality courses employing educational games, augmented and virtual reality environments, online textbooks, and videos. Our goal with this new lab is to design selected production pipelines (360° environments, MOOCs, and VR) to support creating those experiences and contents needed accordingly, and locally. Perspectives on educational games in this context are twofold; the issue of using and teaching with educational games, and the practical scaffolding of making games for and in education (Prensky 2008).

Using games in education is a growing point of interest across all academic disciplines and plenty of research has been conducted in this area, not least about games' educational efficacy during the covid-19 pandemic (Kriz 2020; Oe et al 2020; Nieto-Escamez & Roldán-Tapia 2021). In contrast, research focused on game-making practices and game production within the educational context (for teaching, and in higher education) is less explored.

In this gap, we see the need to explore game production which takes a scientifically informed, and game- and production-aware approach to this disconnect to further develop educational game-making in the university context. Additionally, we argue that local game production practices should be explored within higher education to safe-guard personalization and ownership of teaching by educators – in contrast to, for example, adopting or buying into wholesale existing course materials (Delaney-Klinger *et al* 2014).

3. Developing the game production pipeline

So far in the development of the GPP, we have taken three steps. The first was to perform a wants-and-needs review to better anticipate the optimal role for a GPP in our university setting. The second step was to outline an initial proposition for a production pipeline based on literature in conjunction with an assessment of the setting in terms of tools, educators' interest, and perceived challenges. In the third phase, the GPP outline was evaluated by game industry professionals to obtain practice-based expert feedback that would both inform the future of the GPP and provide insight about the comparison between the two settings.

3.1 Phase 1: Tools, skills, and implementation

The initial phase of developing the game production pipeline was focused on assessing challenges and possibilities connected to educational game production, asking: what are some potential issues that can and should be anticipated by the pipeline? What tools are available, what skills are needed, and how do educators make decisions that lead to game production? The purpose of this phase was to explore wants and needs among educators against these questions, and against existing research.

Previous research at the specific intersection of game production in higher education is limited. With notable exceptions (Ferreria da Rocha Neto *et al* 2018; Ahmed 2022) the literature is focused on artefact design, gameplay, and educational outcomes. The readings

were therefore focused on broad aspects of game production, as well as relevant production elements such as tools, processes, and expertise, to guide our work.

The GPP foundation was broadly developed based on insights from the fields of game production studies (Sotama & Švelch 2021; O'Donnell 2020) and game design praxiology (Kultima 2018; Garner 2014; Hagen 2010; van Roessel & van Mastrigt-Ide 2011). The practice and production perspective offered insight into the epistemic specifics of game-making, such as risk-assessment, talent acquisition, teamwork, the power of professional communities, and their histories (Tschang 2005; Kultima 2010; Kuittinen 2010; Burke & Kafai, 2014). Game design praxiology especially guided our decision to engage with the larger context of commercial game production for input on how to build the GPP (as described in phase 3). This is done based on the understanding that juxtaposing game-making settings offers an opportunity to highlight the interplay of context, production, and outputs.

Readings suggested that there is a significant epistemological gap between the understanding of games as educational tools, and games as developed for other contexts, such as entertainment, competition, or art (Berg Marklund 2015) For example, common game production processes are perceived as only partly beneficial to making games in educational contexts (Ferreria da Rocha Neto *et al* 2018, 474). Adding nuance to this point, it is unknown how specific design choices determine the level of success of games as instructional (Clark *et al* 2016, 108; Sailer & Homner 2019, 106). In other words, the consequences of making games in and for non-gaming contexts (especially educational contexts) are so far vague and potential benefits unclear. Here, the collaboration between game production expertise and topic expertise becomes particularly poignant to observe.

Studies also showed that the landscape for digital game-making tools is changing rapidly as a response to games becoming a mainstream conceptual and communicational tool (Kerr 2017; Consalvo 2021; Neil 2012; Young 2021). Game-making is now in a democratizing process wherein tools have become low-cost, low-code, and low-threshold, allowing a multiplicity of users, including educators, to gain access (Burke & Kafai, 2014; Toftedahl & Engström 2019). Based on this, and in conjunction with previous work by Aalto Online Learning (Kultima *et al* 2020), the self-service aspect of the pipeline was outlined around common, accessible tools, including *Construct 3*, *Unity*, *Ren'Py*, *Twine* and *Game Maker*.

To gauge the sentiments on educational game production of educators who are experienced in virtual learning tools and environments, the GPP was presented to educators within Unite! European University alliance in October of 2021. Based on the feedback from the session we were surprised to learn that the educators' main concerns were focused on implementation (see also Ahmad 2022); that is, production seemed to be less of an issue than embedding and contextualising games in teaching. As it stands, the pipeline expressly does not take an active part in the implementation of games for reasons that will be discussed below.

3.2 Phase 2: Sketching the pipeline

Informed by phase one, the next step in the GPP project was to outline the pipeline details in a document to clarify its underpinnings and purpose. The contents of the pipeline sketch were as follows: 1) Overview - *aims.* 2. Pipeline content - *what the GPP offers*. 3.Production examples - *what outputs might look like.* 4. Future development of the pipeline - *improving the GPP.*

The overview specified the aims of the pipeline; to assist in expectation management, to help in forming the idea and vision for the game, to connect with developers needed for the production, to put the production in motion with realistic scoping, and to end up with a polished product with appropriate visibility.

The proposed pipeline contents were **workshops** to increase awareness and knowledge about the GPP and educational games among educators, ideation, and wants-and-needs **assessment**, **selecting** a production path, **acquiring** tools and licenses, guidance in **working with a production team**, and guidance on **publishing and archiving**. The GPP was then further explained using existing game examples. The GPP outline also had a track for collecting feedback to improve the pipeline.

Importantly, the pipeline does not purport to help educators in *implementing* games into their teaching. This stance was taken based on previous research suggesting that the educational context is a make-or-break factor for the success of the game artifact as an educational tool (Berg Marklund 2015, 235; Ahmad 2022, 2), and not something the GPP can reasonably provide.

3.3 Phase 3: Drawing on commercial game production expertise

Nine (9) actors from the game industry were then invited to comment on the pipeline outline based on their experience as game-making professionals (roles: production, game design, quality assessment, art direction, and game direction). We presented them with the draft of the pipeline document and a set of prompting questions. The questions were posed and answered in the form of a survey presented alongside the pipeline document.

The queries were divided into four subsections, aligning with the GPP outline (see above), asking developers to give their *response* to the given outline and to *reflect* on it using their own relevant experiences. The pipeline draft was designed purposefully brief and somewhat naïve to prompt the developers' critical comments. The resulting data is a set of statements that, from the perspective of developers, highlight perceived strengths and weaknesses in the GPP and provide additional insights on challenges and best practices for game production.

Significant challenges identified by the developers were: Resource management - *the pipeline does not contain steps that adequately assess resource availability and use.* Client-developer interactions - *the pipeline does not account for pitching, scope adjustment,*

milestones, and testing in a balanced manner. Timeframes - *the pipeline overestimates the time needed to make educational games.* Production linearity - *the pipeline is unrealistic about project progression.* While we anticipated most of these comments, we were surprised how in line they were with each other.

Furthermore, some developers suggested and highlighted areas of improvement for the pipeline (not in the original outline): Prototyping - *step to visualize and concretize the game idea before production.* Detailed production trajectory - *more detailed breakdown of production.* Developer substance competence - *breakdown of developer and educator skill sets and interplays.* To this last point, the difficulty and time consumption of finding appropriate and available talent, was specifically mentioned.

4. Discussion

Developing the GPP has clarified what key production-points the pipeline should address. Juxtaposing the readings and educators' responses with the game industry professionals' we find that educators appear to find the prospect of implementing and using games in teaching more challenging than making them. Game industry professionals found that the pipeline document at large reflects a balanced and feasible plan in all parts except where developer expertise and educator expertise must interplay. In this area, both found significant challenges, which also aligns with previous research in this field. Game developers offered some practical advice for how to solve this, including tighter timeframes, and extensive prototyping. Measured against the aims of the GPP, the issue of talent is a possible future bottleneck that needs addressing as the competition for game design expertise is fierce, which speaks to the continued exploration of self-service game development.

5. Conclusions

This exploratory and charting preamble to the GPP venture tells us that with conscious GPP design the impact can be two-fold; 1) it places educator perspectives and the university setting at the forefront of educational game development, and 2) offers the possibility to continue studying how educational game-making happens as well as the subsequent implications for the product and its implementation. Furthermore, we note that a fruitful step towards implementing such pipelines is to engage the expertise and experience of commercial game-making. Crucially, this is not to fall in line with normative practices but to take advantage of the significant specificities in design challenges for education compared to other production contexts.

Going forward, the GPP will be tested in internal educational game development projects and iterated upon. It will also be supplemented by ideation and training workshops targeted at educators, as well as further benchmarking, and assessment.

Acknowledgements

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