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ASSESSING SKILLS TRANSFER FROM COMPUTER GAMING TO ACADEMIC LEARNING: AN EXPERIMENTAL DESIGN

Björn Sjödén[1], & Michael Trotter[2]
[1]*School of Education, Halmstad University (Sweden)*
[2]*Department of Psychology, Umeå University (Sweden)*

Abstract

The relationship between computer games and academic learning has been a topic for research and debate over decades. Here, we present an updated, theory-driven experimental design for assessing how specific skills that players train in commercial computer games may transfer and be subsequently applied to study-relevant tasks in a school context. As theoretical starting points, we posit that i) skills transfer from such seemingly disparate domains as gaming and studying can be better understood on the metacognitive level of self-regulation of one's progress towards a goal, and ii) what drives learning in both domains can be understood in terms of their "core mechanics", or means of interaction, towards this goal. Drawing from the evidence-based approaches described by Schwarz et al. (2016), we identified specific core mechanics for learning in the popular esport game *League of Legends (LoL)*. Whilst a multiplicity of learning mechanisms are present in computer gaming, we focus on *deliberate practice* as an overarching concept for the driving interactions for learning that can be empirically investigated. We describe how students' use of these learning mechanics can be assessed empirically by observing how students plan, perform and reflect upon a study task. Our hypothesis is that training these strategies from computer gaming can facilitate their application to studying, by means of skills transfer from one domain to the other. We present a tentative experimental design of how this can be assessed, and hence proper supports be developed, by observing how students engage in self-guided deliberate practice in the game (LoL) and in their academic studies, respectively.

Keywords: *Esport, computer gaming, transfer, learning, schoolification.*

1. Introduction

The aim of this paper is to present, and open up for scrutiny, an experimental design for assessing how skill acquisition when playing commercial computer games may transfer to study-relevant skills in a school context (i.e., academic learning). The practical relevance and theoretical underpinnings for such a project have been elaborated in previous publications of ours, which looked into the increasing "schoolification" of competitive computer gaming known as esports (Sjödén & Jonasson, 2023) and how its integration into formal education can be analyzed within the framework of self-regulated learning (Sjödén & Trotter, in press). Here, we will therefore cover the background in brief, in order to build upon previous findings and focus on the empirical questions on how skills transfer from computer gaming to academic learning can be investigated and evaluated, for a relevant target group. Central to this project is the concept of *deliberate practice*, which we discuss in some detail, as a "core learning mechanic" (Schwartz et al., 2016) for developing specific skills and concepts. As a case in point and empirical material, we consider the highly popular, commercial computer multiplayer game *League of Legends*. We propose that computer gaming, and the systematic, explicit and structured form it takes in esport, might provide excellent learning opportunities for deliberate practice that can be applied also for academic learning.

A particular challenge to be addressed is how to balance experimental rigor with ecological validity, considering that computer gaming typically takes place in an unregulated setting, outside school, while academic learning (especially for young people) largely takes place under regulated conditions in a school and classroom context. We argue that the results of such a project would be highly important for providing clear measures on the possible educational value of esport in school, beyond previous theoretical accounts, and hence for making headway in developing evidenced-based educational practices in this domain.

2. Deliberate practice for developing self-regulatory skills

Deliberate practice is an activity central to theories of self-regulated learning (SRL) and skill acquisition. Ericsson (2006) defined deliberate practice as "activities specifically designed to improve performance" (p. 693), something which requires both effort and focus on the specific skill or concept to be learned. Zimmerman (2000) proposed that during skill development, learners move towards the ability to being able to systematically adjust strategies and adapt to task demands. There is evidence of more predominant use of SRL strategies among higher performers in both academic contexts (Zimmerman and Martinez-Pons, 1986), and in esports (Trotter et al., 2023; 2021). Together, this evidence suggests that it is important for performers to have a deliberate approach to their training or practice and be able to adapt their behaviours through effective self-regulatory skills. In contrast, "autonomous practice", refers to the repetitive performance of a skill or task without focused attention or deliberate effort to improve specific aspects, typically after a certain level of proficiency has been achieved, and may not lead to significant improvement on its own.

As to professional computer gaming, esports players have generally low levels of self-regulatory skills (Trotter et al., 2023) and tend to spend between 5,5 and 10 hours each day practicing (DiFrancisco-Donoghue et al., 2019). No research has directly determined if these hours are spent on deliberate or autonomous practice. However, a recent case study has shown that deliberate practice is anecdotally effective for improving communication within *League of Legends* teams (Bubna et al., in press). Since esports high school programs have been suggested as an effective method for recruiting young people who are not traditionally sporting interested (Polman et al., 2018; Tjønndal and Skauge, 2021; Trotter et al., 2022), esports may be an avenue to encourage development of both self-regulatory strategies and an understanding of how deliberate practice can be used to improve developmental outcomes in academia.

For the present purposes of developing effective deliberate practices that can transfer from the gaming domain to the academic domain, one goal is to maximize its supporting conditions while countering its risks. For example, it seems clear that success in both domains depends on proper goal setting, responsiveness to feedback, sustained efforts and motivation. Setting goals and interpreting feedback are subskills that are particularly supported by the help of experts, such as a teacher or a more competent peer. Sustaining efforts and motivation are probably better supported from a time perspective of "less is more", that is, shorter periods of more focused practice is better than longer periods of stretched out practice.

Risks associated with successful deliberate practice might be that the learner needs to step out of their comfort zone (that is, doing something less enjoyable) and that they become so specialized in the task they have practiced, that they lose flexibility (Schwartz et al., 2016). Computer games may serve well to counteract such risks, since they are designed to be intrinsically motivating, whereas the effects on flexibility for expert gamers remains an open empirical question. As to the academic domain, there are potentially desirable external rewards (e.g. higher grades) associated with advanced academic skills, besides the intrinsic value of "learning to learn" as an aspect of personal growth and development.

2.1. *League of Legends* as an arena for skills practice

League of Legends (LoL) was chosen as the game for the design of this study for two main reasons. The first was that LoL is one of the most popular competitive computer games (esports) and much of the literature examining self-regulation in esports has focused on LoL (Kleinman et al., 2021; Trotter et al., 2020; 2021). The second reason is that the first phase of gameplay in LoL is generally relatively predictable, where players 'farm' gold from 'minions' (AI non-player-characters). A player's ability to farm gold at the start of the game is very important to level up and purchase upgrades which give them an advantage. Farming minions requires careful micro-management of the player avatar to deal the final blow and killing the minion to obtain gold. If the player does not deal the final blow to the minion, they do not get gold and thus miss out on the potential advantage. Learning to effectively last hit minions is a skill which can be honed through deliberate practice. Players can learn this skill by watching tutorial videos on Youtube, professional players on Twitch, or from feedback from other players in their match. On a metacognitive level, the strategies used by players to learn mechanical skills in esports such as farming minions could be applied to academic learning, for example when it comes to reflecting upon which strategies lead to desired educational outcomes.

3. Towards an experimental design

In conclusion, we hypothesize that metacognitive or self-regulatory skills and strategies developed and honed in an esports context can transfer to enhance academic learning. Table 1 describes our tentative experimental design for assessing this hypothesis.

Table 1. Proposed experimental design and empirical assessments.

I.	Baseline self-report measures and/or objective physiological measures of activation and stress.
II.	Tasks in multiple conditions with varying degrees of support, conducted in phases 1-3.
1.	Computer gaming task (farm gold in LoL) conditions:
a)	Full support; coach-assisted co-regulated learning (incl. access to online resources).
b)	Partial support; participants are made aware that they can spend time researching the problem and are provided with access to a computer with online resources.
c)	No support; participants are given access to the game, and online resources but are not encouraged to employ self-regulatory strategies beyond unstructured playing of game.
2.	Academic task (e.g. science or math problem) conditions:
a)	Full support; coach-assisted co-regulated learning (incl. access to online resources), encouraging students to deliberately employ previous strategies for problem-solving.
b)	Partial support; participants are made aware that they can spend time researching the problem and are provided with access to a computer with online resources.
c)	No support; participants are given the academic problem to solve, and online resources but are not encouraged to employ self-regulatory strategies beyond self-guidance.
3.	Reflection and assessment:
	Participants are interviewed by the researcher and given multiple questions, as to how they rate their strategies to solve the problem in the different conditions, and how the esports condition influenced the learning approach in the academic condition.

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