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Chapter #5

COMPUTER GAMING AND ACADEMIC LEARNING – TARGETING THE ROLE OF ESPORT IN SCHOOL

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ABSTRACT
The role of computer games in school is a controversial topic. An increasing number of upper secondary schools offer three-year programs with an "esport profile" within aesthetics and media. Marketing suggests that esport can attract students who are interested in playing computer games, but the scholastic value of esport remains to be clarified. Whereas "gamification" is an established term for transforming educational and other formal practices into game-like activities, little has been said about its counterpart "schoolification": how originally playful and informal practices are transformed to fit within school curricula and syllabi for achieving academic goals. We discuss the relevance of esport in secondary education, a working hypothesis is that the potential benefits of esport in academic learning is more about *how* students learn than *what* they learn. Specifically, we present and discuss and propose how self-regulated learning (SRL) as a framework can facilitate skills transfer from esport to academic learning. Using examples from multiplayer games, we elaborate on how co-regulation through social interaction can be used as a means for developing SRL. We conclude by suggesting how esport and educational researchers may use the SRL framework to address empirical questions about esport in relation to academic studies.

Keywords: esport, computer gaming, gamification, schoolification, self-regulated learning.

1. INTRODUCTION

In the ever-evolving landscape of education, the dynamic synergy between computer gaming and academic performance has emerged as a fascinating frontier. This book chapter delves into the intricate relationship between these seemingly disparate realms, partly united in the form of esport where students compete in computer gaming. We consider what can be learned from the practice of esport for enhancing academic engagement, cognitive skills, and overall learning outcomes. Some schools are already offering specific esport training at the upper secondary level, motivating educators' interest in and discovery of ways to channel the energy and enthusiasm that gaming ignites into the traditional classroom.

Drawing parallels between the captivating allure of gaming and the pursuit of academic excellence, we discuss the role of esport in a broad educational context, how to approach it scientifically and practically, and the theoretical foundation that bridges the gap between these domains. We uncover how commercial video games, compared to other educational and serious games, relate to core mechanisms of academic learning, which may not be obvious even to the practitioners themselves. More specifically, this chapter sheds light on how game-inspired principles, such as goal setting, problem-solving, and metacognition, can invigorate traditional teaching methods and bolster student achievement.

From a research perspective, our overarching aim is to lay the foundation for a practice-based collaborative research project between researchers and practitioners – including students, teachers, esport coaches and school leaders – for investigating the relationship between computer gaming and traditional teaching-and-learning activities in the classroom. The opening of an "esport lab" at the university where the first author of this chapter is based, can be considered a progressive move in this direction – which was met with interest and curiosity from media and several organisations – but it was also followed by questions to the effect of "What do we do now?". At an early stage, it became clear that previous research in this area is relatively scarce and that theoretical guidance is needed. Many people, including professionals in school and teacher education, did not see the theoretical rationale for such a project; the very concept of "esport" seemed foreign to some. Data collection posed other challenges, considering that computer gaming typically takes place outside of school, whereas educational activities typically take place in the classroom.

Therefore, this chapter begins by presenting a short overview of what esport is, its distinction from computer gaming in general, its recent historical development and how it is positioned in an educational (local and national) context. A theoretical starting point for the subsequent discussion is the concept of "schoolification", as the theoretical reverse of "gamification", referring to how the informal practices of computer gaming are transformed to fit within formal school curricula and syllabi for achieving academic goals. We then relate previous research and make some crucial observations as to how distinct features of computer gaming and academic studies inter-relate, in terms of higher-order cognitive activities associated with developing self-regulatory skills. Critically, we examine the parallells between self-regulation learned in computer gaming and its potential application to academic studies. We conclude by suggesting how esport researchers and educational researchers may use the framework of self-regulated learning as a common ground for addressing some outstanding, empirical questions about esport and computer gaming in relation to academic learning.

2. BACKGROUND

Our point of departure is the intersection between learning and education in the broadest sense, and the cultural phenomenon of esports. Esport is used as a collective name for all competitions that take place in a virtual environment and "scholastic esports" is the common name of the very diverse research area that deals with this intersection (Harvey & Marlatt, 2021). It can thus be about video games, computer games, Virtual Reality (VR), Augmented Reality (AR) or mobile games; our use of the term "computer gaming" refers to all these forms but with some specific examples of games commonly played in an esport context.

Globally, it is estimated that close to 200 million people practice or follow competitions that take place in virtual, digital environments. In Sweden, where the present research took place, it is estimated that approximately 100,000 young people are organised and active in esports. Considerably more – and not only young people – engage in e-sports on their own and yet more people consider themselves "gamers".

Based on national statistics, there should be approximately 1,000 actively organised esports players just in the immediate vicinity of the university where the first author of this paper is based. Since 2021, the Halmstad university opened an "esport lab", which is adapted for young people with disabilities. A nearby school offers a three-year program on the upper secondary level (high school) focusing on esports, where computer gaming has a pronounced role. For example, on the school's website, their educational program is marketed as stemming from "knowledge of a gamer's needs" in order to "…create a gamer profile linked

to a training program to make you the best gamer you can be" (translated from Swedish, www.lbs.se/programinriktning/e-sport/).

Research on esports has increased exponentially in recent years (Pizzo et al., 2022; Reitman, Anderson-Coto, Wu, Lee, & Steinkuehler, 2020) since the seminal book on video games and learning by Gee (2003), but only rarely is education weighed into the discussion of this phenomenon's culture, industry and/or ecology (depending on which metaphor is used). Therefore, there are good conditions to begin the mapping of how esports and education can fit together at different levels and forms of education. Several variants have emerged on how esports can constitute both goals and means in education at different levels and in different countries (Harvey & Marlatt, 2021; Jenny, Gawrysiak, Besombes,2021; Scott et al. 2021). Above all, the literature on "scholastic esport" (Harvey & Marlatt, 2021) has focused on what is learned in computer games, how digital tools contribute to the motivation of learning, what possible career paths it offers, and thus how curricula, courses and training plans should be designed.

All in all, the vast general interest in esport, its scholastic relevance and local conditions beneficial to research, triggered our interest in further investigating the relatively recent role of computer gaming in traditional educational programs and processes, and the main factors that influence it.

3. HOW CAN ESPORT INFORM ACADEMIC LEARNING?

Two types of transformative processes, significant to digitalisation in the 21st century and important for the present discussion, are *gamification* and *schoolification*. Both terms were coined in the aughties, at the start of the millennium. The former, gamification, has gained more fame, pervading many societal sectors, from education to marketing. The latter, schoolification, is lesser known. Mainly as a pendant to the increasing academic character of early childhood education, schoolification is a term coined to described to denote when curricular content begins to pervade educational institutions, where prior freer forms of learning had reigned. An intensification of adult knowledge transfer is also part of the definition of schoolification (Gunnarsdottir, 2014).

Although well developed as a cultural grassroots phenomenon and a commercially potent industry, esport lacks formalisation and distinction at the education level (Jenny et al., 2021; Scott et al., 2021). This creates a need to understand how features and efforts attract its target group, manage and develop the target group's knowledge, prepare it for further studies, and professional practice within different parts of the sector. In addition, an investigation of these relationships with a focus on specific cognitive concepts and principles (cf. Gee, 2003/2007) could map and discover what scholastic esports has to offer that is not done within the framework of educational programs without computer games and gaming in the syllabus. An important observation, however, is that the learning potential of computer games only marginally resides in the subject content of the games (such as learning some facts about World War II from a game, while most of the time playing the game is spent thinking and acting out on strategies to survive). Rather, to make headway in research on the relationship between computer gaming and academic learning, we first need to distinguish between the "what" of the subject content, and the "how" of the actual learning process. This is the focus of the next paragraph.

3.1. From Learning "What" to Learning "How"

Whereas formal education is typically divided into subject areas (e.g. math, history, biology) and domain-specific skills (e.g. sports, handicraft, creative arts), it can be argued that the scholastic values of computer gaming is more about *how* students learn than *what* they learn. This conceptualisation rests upon the distinction between "knowing how" and "knowing that", famously addressed by the philosopher Gilbert Ryle in 1945 and itself derived from ancient Aristotelean philosophy (Ryle, 1945). Ryle focused on the fact that "knowing that" is insufficient for "knowing how", in terms of actual problem-solving. In his words, "A silly person can be stocked with information, yet never know how to answer particular questions" (p. 16). This observation points to the need of targeting more directly *what we do* with information that we learn or, in other words, how skills (such as answering a question or solving a problem correctly) develop from the required, but in itself not sufficient, knowledge. Computer games may provide just the arena for investigating such information-driven skill acquisition in action.

In the present context, we thus want to direct our attention to what there is more to learn about the "how", in this case with respect to computer gaming, in order to facilitate the "what", in this case, learning the subject content of scholastic knowledge. As noted, the factual content of a game, whether in a historical setting or a futuristic fantasy, is seldom important for learning skills or making progress in the game. Still, the gamer needs to attend to, process and take proper action to various informational sources and events on screen. Above all, students need to make choices (sometimes within fractions of a second, depending on the type of game) as to what, when, where and how to learn.

The function of instant feedback to the player's choices likely has a vast impact on the player's motivation and willingness to make efforts, especially in contrast to non-interactive, non-social environments where no or much-delayed feedback is given (such as when reading a book is eventually followed by a test, and a subsequent test result). It was not surprising when our initial contacts with teachers revealed that students in the esport program were highly motivated gamers, but less motivated in traditional schoolwork. Such observations motivated us to examine how the students approached the different domains of gaming and schoolwork. Research in this field is scarce, but one study (Trotter, Coulter, Davis, Poulus, & Polman, 2022), allegedly the first longitudinal study of its kind, found that the positive psychological development of students enrolled in a high school esport program did not decrease compared to a control group. However, because the study was impacted by the covid-19 lockdown, the specific effects on motivation are hard to distinguish. This points to the fact that the virtual context of esport education has some pedagogic potential to unpack.

Perhaps most importantly from an educational point of view, we wondered whether students could learn to apply some principles from their gaming activities to improve their schoolwork, not by transforming the actual school tasks (reading, writing, doing math, etc.) but rather transforming how students think about, and hence approach, the same tasks. For example, constructs such as winning/losing may be explicit and repeatedly present in a computer game (and often crudely so, as the game character survives/dies), with a clear effect on the player's efforts and motivation to try again. On the other hand, in school subjects such as math or physics, one's construct of success/failure may be an implicit, even unconscious, motivating factor of performance. Hence, the differential effects on students' motivation and skills might not be due to the topic itself, but to the process of how students approach and learn the material. The role of esport in school in school syllabi – its schoolification – would then reside in its potential to offer more, and previously non-existent, ways of interacting with learning material that ideally broadens students' study skills.

A precondition to such successful learning is, however, that there are opportunities to apply similar goals and strategies across settings and disciplinary boundaries. Next, we consider how different types of games scaffold different kinds of learning, before considering how the learner (i.e. the student and gamer) can use learning principles common to both domains. This implies moving from an analysis of the concrete and highly situated level of gaming activities to the metacognitive level of more generally applicable skills involved in self-regulated learning (SRL).

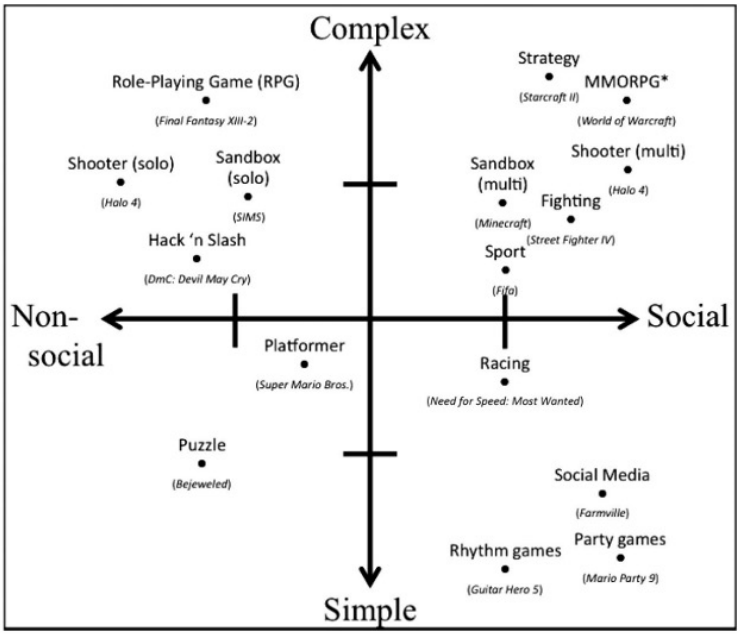
Development of an individual's self-regulatory skills have been linked to a range of outcomes in adulthood, such as elite performance in sport (Kitsantas & Zimmerman, 2002), better academic performance (Li, Ye, Tang, Zhou, & Hu, 2018; Thierry, Bryant, Nobles, & Norris, 2016; Toering, Elferink-Gemser, Jordet, & Visscher, 2009) and health outcomes (Sirois, Kitner, & Hirsch, 2015). In childhood, an individual's ability to regulate their learning is associated with a range of developmental outcomes (academic performance, higher level of adult educational achievement, better ability to cope with stress). Much research has focused on self-regulation in academics and sport (Lee et al., 2021; Toering et al., 2009) domains, however Brevers, King, and Billieux (2020) has called for a better understanding of how self-regulation unfolds within esports. Esports mirrors sports and academic domains, in that those with greater self-regulation outperform their peers with less developed self-regulatory skills (Trotter, Coulter, Davis, Poulus, & Polman, 2021, Trotter, Obine, & Sharpe, 2023). Kleinman, Gayle, and Seif El-Nasr (2021) suggests that esports may be an engaging domain to train SRL skills, which could then transfer into other domains such as academia. However, to date, no research has explicitly explored this possibility empirically. Even the empirical basis for such research warrants some clarification.

3.2. Different Games, Different Learning

Not all games are created equal. Importantly, "gaming" with reference to students' (and others') free-time activity implies commercial video games, which differ in several, critical respects from the digital games typically used in a scholastic or educational context. These latter educational games are often referred to as serious games. Abt (1987, p. 9) defined serious games as games which "have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement". Educational games have been designed for use in a variety of fields (de Freitas, 2017). Granic and colleagues (2014) suggest that a potential flaw of serious games is that they may lack the core engagement element commercial video games are designed around, namely – fun.

Commercial video games made for entertainment are considerably more popular, possibly evidenced by the difference in the size and value of the commercial games industry compared to that of serious games. In contrast, the main objective of serious games is to educate (Garcia-Martinez, 2014). The serious games industry is valued at 7.581 million USD in 2021 (precisionreports.co, 2023), in comparison the video games industry is valued at over 217 billion USD (Grand View Research, 2023). The greater resources generally available to commercial games made for entertainment could be a factor underpinning their success in engaging their audience. There are a great variety of genres and types of commercial games, and the way these games seek to engage, and audience varies. Granic et al. (2014) suggested that the genres of commercial games sit on two axes, the degree of sociality (social interaction) and complexity of the game, as depicted in Figure 1 (from Granic et al., 2014, p. 70).

Figure 1.
Conceptual map of the main genres of video games organised according to their level of complexity and degree of sociality; from Granic et al. (2014).
** MMORPG = Massive Multi-player Online Role-Playing Game.*



Considering the centrality of the social dimension and the fact that esport at its core is a competitive activity, it becomes imperative to distinguish between games played by a single player, and games played by multiple human players, typically over networks at diverse geographical locations. While sociality is a strong motivating factor in general, social interaction also adds to the cognitive and emotional load on the individual player. From a designer's perspective, a major difference between single-player and multiplayer games is that the game designer of single-player games has considerably more control over the game outcomes (Harteveld & Bekebrede, 2011).

A strategy game such as *Starcraft 2*, which involves both a single and multiplayer experience may serve as an illustrative example. In the *Starcraft 2* single-player campaign, the player completes "missions", which begin at a relatively simple level of complexity with a guided tutorial for how to use each of the basic units, and the mission acts as an environment which is structured to enable the player to learn how to use a specific unit. Each new mission typically unlocks and introduces a new unit, and the level design is constructed in such a way that the player must use the new unit to win the match, and in doing so learns how to best use the unit. During the multiplayer experience of *Starcraft 2*, the game's intention is not to guide player strategy or learning, but to encourage choice and autonomy (Harteveld & Bekebrede, 2011).

Hence, in multiplayer games, the onus is on the player to discover the most effective strategies available to them to increase their skill level to achieve victory over their opponents. We propose that the learning strategies used by players of competitive video games (i.e. esports), can be conceptualised through the self-regulated learning (SRL) framework (Zimmerman, 2000, 2013). Next, we examine more closely how SRL skills developed in esports can be transferred into other domains, with some concrete examples.

3.3. Self-Regulated Learning as a Metacognitive Framework for Skills Transfer

Self-regulated learning has been defined as "the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning processes" (Zimmerman, 2013, p. 137). SRL is understood to be a cyclical process, which is aimed at reducing the distance between an individual's current state and a goal state, in three distinct phases: preparation, performance and appraisal (Panadero, 2017). Various models of self-regulation or SRL use different names for these phases. One of the most prevalent models of self-regulated learning was proposed by Zimmerman (2000) which has theoretical roots in social cognitive theory. According to this theory, SRL involves a person, their behaviour and their environment. In order to reduce the distance between a desired goal and a current state, a person needs to observe, monitor and adapt both their behaviour and the environmental conditions that influence this goal to increase performance. We suggest that these same mechanisms contribute to how skills trained and developed in computer gaming can transfer to other domains, and academic learning in particular, on the metacognitive level.

Personal or covert self-regulation involves monitoring internal states such as emotions, thoughts or feelings and their influence on performance, such as self-talk or negative emotions (Zimmerman, 2013). Zimmerman's (2000) model has three phases: forethought, performance and reflection. First, the forethought phase is characterised by the setting of goals and choosing task strategies aimed at achieving goal-directed behaviour. This phase is influenced by self-motivational beliefs such as self-efficacy and outcome expectations. If a person believes that their chosen goals or strategies can be achieved and will result in a desired outcome, then there is a greater likelihood of more effort and more effective goal setting.

Highly self-regulated individuals have hierarchically organised goals, with more proximal goals serving as stepping stones to more distal goals. These goals provide evidence that the individual is making progress towards the more distal goal (Zimmerman, 2000). Furthermore, these goals can be either focused on an outcome or a process (Keith & Jagacinski, 2023). For example, a *Counterstrike* player might set a distal outcome goal to improve their kill/death ratio (KDR). To achieve this outcome goal the player might also set a process goal of being more active in team communication to better coordinate their position during matches. This process goal, might lead to achieving more proximal outcome goals, such as winning individual fights with the opposing team, which then ultimately improves the players outcome goal of improving their KDR.

Kleinman et al. (2021) found that in *League of Legends*, experts and non-experts set more outcome goals than process goals, compared to novices who only set process goals. In an academic context, students might set a distal outcome goal to gain entry into a desired higher education university degree. A process goal might be to improve note-taking and essay writing skills to accomplish a proximal outcome goal of achieving a higher grade on a current written assignment. It may be easier to motivate an individual to learn self-regulated learning processes in an esport environment if they have greater self-efficacy in playing video games than in school work. Once players are confident in setting effective goals and strategies in an

esport context, teachers or coaches can demonstrate how these same processes can be employed in an academic context.

Second, in the performance phase, task strategies are mobilised in the pursuit of a goal, while an individual also records key aspects of their performance to enable effective self-reflection. Some strategies include self-instruction (self-talk), imagery and attentional focusing (Zimmerman, 2000). For example, using our previous example, a *Counterstrike* player may choose to focus their attention on the process of being more active in team communication. By increasing participation in team communication, the player achieves the proximal outcome goal of being in a better position on the game-map to win fights with the opposing team. Further, players may use imagery as a task strategy, by building mental representations to learn a skill or overcome a negative emotional state (Cumming, Bird, Brown, Kolitsida, & Quinton, 2023). Munroe-Chandler, Loughead, Zuluev, and Ely (2023) developed an imagery intervention with *League of Legends* players to reduce players' anxiety to better regulate their emotions. They suggested that players who are seeking to gain better control over their emotions during important moments in a match, (i.e.,when their character "dies") could use imagery to regulate their frustration or anxiousness and return to having a clear mind before returning to the game and setting their next goal. Previous research has shown that esports players with higher ranks more frequently use task strategies such as imagery, arousal control and self-talk (Trotter et al., 2021).

Self-regulatory task strategies such as attentional control and self-talk have been shown to be effective at increasing academic performance. Sánchez, Carvajal, and Saggiomo (2016) found students with worse academic outcomes exhibited less positive and more negative self-talk than their more academically successful peers. Sánchez et al. (2016) further suggested that an individual's predisposition to positive or negative self-talk tends to transfer into other life domains. In a meta-analysis of two decades of SRL research, Li et al., (2018) found that effect sizes for SRL task strategies were relatively large, suggesting their importance to academic performance. These strategies, therefore, could be developed in an esports context, where the process of applying well-known psychological strategies (e.g., self-talk, imagery) could be practised with the intention of learning transfer into other domains such as academia.

Third, in the reflection phase, the individual reflects on her goal-directed behaviour. This occurs either in comparison to a previous performance, a normative comparison, a set standard, or as a collaborator.

Players then make judgements regarding the causal attributions of the outcome and subsequently make adaptive or defensive inferences regarding subsequent approaches to self-regulation attempts. In esports it could be argued that it is only possible to evaluate one's performance against previous performance, a normative standard or their role in group processes, as formal measures of mastery found in standardized testing doesn't exist in esports.

Games such as *Counterstrike: Global Offensive* have elements of their design that promote certain types of self-evaluation. For example, at any time during a match, a player can hold down the 'Tab' key and see their own and their teammate's KDR. Players also move up and down this table of statistics based on the number of points they have earned (based on their overall damage or completing objectives) promoting normative comparison with teammates. Negative normative comparisons can overshadow personal improvement, which may be evident when comparing efforts against previous performance. If we look at our previous example, even though the *Counterstrike* player has improved their communication skills, they may still lose more fights against their opponent than their teammates. However, if the players' performance was framed through how they performed their role in the team, it

might be identified that the improvements in their individual communication led to their teammates performing more effectively, despite not personally achieving as many kills compared to other teammates. If the players attempts were judged solely on their own KDR they might judge their efforts as being ineffective, however by evaluating how they performed their role as part of the team their efforts to improve may be seen as successful.

In academia, reflection has been widely recognised as an important part of the learning process (Radović, Firssova, Hummel, & Vermeulen, 2023). Li et al. (2018) found that the self-reflection phase of SRL was as important as the performance phase for Chinese students. Previous research has shown that university students whose success is measured based on a comparison to their previous performance are less likely to have their performance negatively affected by situations outside of their locus of control (Was & Greve, 2021). Once an individual has reflected on their performance, they then attribute the outcome to either their effort or ability. More self-efficacious individuals are likely to attribute errors to a lack of effort rather than ability and subsequently persist longer to achieve their goals. Those who are self-doubters are likely to attribute failure to a lack of ability and are more likely to give up. As with the other phases of the Zimmerman (2000) model of self-regulated learning, within an esports context, teachers could foster more effective and adaptive approaches to self-reflection and self-regulation, while highlighting how these methods can also be used to build competence and success in other domains, such as academia.

In summary, self-regulation is achieved when the skill can be used adaptively across changing personal and environmental conditions. Stress might be one particularly noteworthy condition, which beset students and esports players alike. Poulus, Coulter, Trotter, and Polman(2020) reported that more elite esports athletes employed adaptive strategies (e.g., positive reframing, active coping, planning) to regulate their stress.

Critically, without observation and emulation of the skill with social assistance self-regulation cannot occur. Assistance from peers, parents, teachers, coaches or a capable other is critical for developing skills that cannot be learned alone. In line with Vygotskian theory, self-regulation has been suggested to first be developed through co-regulation (Hadwin & Oshige, 2011), that is, through the gradual appropriation of interaction with others. According to this theory, students will only transition to self-regulated learning from co-regulated learning with the help of a capable other. This makes an important point with respect to the collaboration and competitive practices from which players learn multiplayer games.

4. CONCLUSIONS AND OUTSTANDING QUESTIONS

By embracing the interactive nature of games, educators are empowered to cultivate a dynamic learning environment that not only resonates with the modern learner but also nurtures the essential skills and processes needed for success in an increasingly interconnected world. As with any change process, however, it assumes that the individual takes responsibility for their learning and learns how to self-regulate with respect to their own goals and adaptation to the environment. Computer gaming provides a particularly dynamic, rich and socially complex environment in which to study such processes empirically, besides having value in its own right as a naturally appealing learning environment for youth worldwide.

We have argued that in esports, each phase of self-regulation is important, where players can learn specific skills to improve their in-game performance. On the metacognitive level of observation, self-monitoring and adaptation, these same skills can be used in a variety of other domains including academia. An observation from our reading of the literature is

that the research on reflection in academic contexts was not as concrete as in sports. This is notable because reflective practices in sports are very predictive of performance above all other phases of self-regulation, whereas the evidence in academia is seemingly less conclusive. More research would be needed for clarifying the value of reflective practices in esport specifically.

As researchers within education and psychology, rather than esports program developers, we conclude that some major questions about the scholastic role of esport remain unanswered and thus warrant further investigation. Our proposal is that esport researchers and educational researchers may find common ground in using the framework of self-regulated learning for addressing questions such as the following:

- How do the students themselves perceive their esport performance in relation to academic performance?
- How do students perceive fear of failure, gains of winning, competition and success, across esport and traditional school topics?
- How do students collectively regulate their goals and behaviours in esports contexts, in comparison to classroom contexts?

Scholastic esport programs may provide a fruitful basis for empirically examining these and similar questions. The results would make substantial progress towards clarifying the role of esport in relation to larger educational goals and knowledge needs, such as those formulated in the Digital Competences Framework by the European Union.

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