eSports in K-12 and Post-Secondary Schools

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Abstract: eSports is a rising modality of sports entertainment in the United States and has growing implications for education. Providing competitive eSports teams in schools satisfies the growing desire to train and educate students on the skills emphasized in STEM and Career Technical Education (CTE) education, as well as in programs such as English and Language Arts. eSports develop the soft skills universities and employers like to see in a student graduating from high school. As the market continues to grow for eSports, opportunities for post-secondary education as well as for prospective employment will increase. The popularity of eSports will continue to grow, and this popularity will be reflected in the schools.

Keywords: CTE; eSports; FPS; livestream; Minecraft; MOBA; RTS; STEM

1. Introduction

Competitive video games are a vast growing medium of competitive sports [1], with the most common form of gaming being eSports. eSports are organized, multiplayer videogame competitions, primarily played between professional teams or individuals, which differ from single-player, traditional video games. The differing variable between eSports and traditional video games is the element of teamwork and competition. In the early years of eSports, teens were the primary consumer and practitioner of video game competitions, but in more modern terms, the age groups of participants have expanded to multiple age groups [2], which now include college-aged players [3]. Secondary and post-secondary schools are adopting eSports at an increasing pace, which reflects the demand for the sport among the applicable age group. The past year saw an increased involvement of in high schools in eSports, from 200 schools to more than 1200 in the United States [4]. The educational benefits of eSports are suggested by the fact that school districts are quickly adopting eSports for their students [5]. The most common games associated with eSports include real-time strategy (RTS), multiplayer online battle arena (MOBA), and first-person shooter (FPS). eSport is a spectator sport which is streamed over the Internet and allows the spectators to watch from remote locations, without requiring their presence in the room with the gamer. The game can be shown in a few ways, one of which is streaming the video feed of the game while it is played. The other way to show a match is from a background perspective, using a video camera to give an omnipresent view of the game and the player. Regardless of the way it is broadcasted, the notion of watching a video of someone else playing a video game is now commonplace, whereas it may have been seen as strange a generation ago. eSport-type competitions began in the early 1970s. The videogame competition was held at Stanford University and included a competition involving a game called Spacewar [6]. From the time of this competition and until the emergence of livestreaming and video-based spectators, videogame competitions received little press attention and were not a large-scale spectator sport.

The commercialization of eSports came in the early 2000s, when the emergence of livestreaming and sponsorship created a strata of videogame participants who transitioned from amateur to

professional [7]. With the use of livestreaming services like Twitch, eSports became a large-scale spectator sport which proliferated throughout the world via the internet, with some players averaging from 10,000 to 20,000 viewers [8] in 2013, to over 70,000 viewers for some of the more popular games, such as Fortnite [9]. Individuals are streamed by viewers, and websites like Twitch Metrics measure these stream sessions by averages and peaks, much like the stock market. According to Twitch Metrics, Ninja, one of the most popular gamers on Twitch, averaged 45,889 viewers over seven days (September 16–22) and peaked at 134,612 viewers during 65 hours of gaming [10]. In March 2018, Twitch saw a record number of viewers when rapper Drake challenged Ninja to Fortnite, topping over 600,000 viewers [11].

In the past few years, the popularity of eSports has triggered demands to websites like ESPN and television channels like TBS to carry coverage for eSports. ESPN has a tab heading at the top of its website dedicated to eSports, alongside tabs dedicated to traditional sports like baseball and football [12]. TBS has broadcasted a show called ELEAGUE (EL) since 2016. This show is dedicated to airing EL's tournaments on television [13]. This mainstreaming of eSports shows how demand for videogame competitions is on the rise and increasing in popularity across the globe.

Large viewing numbers and sponsorships translate into large amounts of revenue. In 2017, eSports produced $1.5 billion in worldwide revenue, raised mostly by third-party investors, with revenue amounts projected to rise to over $2.3 billion by 2022 [14]. Ticket sales, brand sponsorship, merchandise, and advertisements also provide increased revenue in addition to the third-party investors [14]. This exhibits that eSports popularity will not slow anytime soon.

2. eSports in US Schools

In the past 30 years, technological trends have impacted education in the United States. Although some trends, such as Digital Learning for a Digital World and Competency-Based Education, have failed, some technological trends and fads in education have proven their worth [15]. In an effort to integrate technology and to make learning more attractive to today's student, game-based learning is being established in classrooms everywhere [16]. Game-based learning, or gamification, refers to the teacher's use of video games or physical games to instruct students on concepts aligned with the curriculum. Teachers who have used games in their lessons prove that games increase the likelihood of students being more motivated to learn [5]. Not only are students more motivated to learn, but also, they show greater willingness to work with peers and engage in problem-solving [17].

There exists a balance between integrating technology and introducing unnecessary additions to a curriculum, just for the sake of meeting a quota or satisfying a supervisor. When teachers incorporate eSports or gaming into a curriculum, they allow the students to learn and appropriately use technology. eSports are an example of implementing gaming in a co-curricular or extracurricular setting. It is the duty of a teacher to be attentive to the satisfaction levels of the students and their parents. Teachers are not supposed to create a circus-like environment which entertains all in the room, all the time. However, the job of the teachers is reaching every student with their teaching. With that said, all students learn differently, some through technology and some without technology. The ultimate task of the teacher is to appeal to each student, even if the teacher cannot see or understand the specific learning processes.

One reason why teachers may not adopt gaming is because they do not understand the game or the appeal of the game. What is important in learning, however, is that teaching appeals to the unique mind of each student. Keeping this goal in mind, research was done by introducing gaming into a middle school curriculum [18]. This research focused on the satisfaction levels of students, parents, and teachers, using the game Minecraft. The study resulted in 98.5% of participants agreeing that the game was fun, and 97.1% responding that the game enabled rich interactions among the users [18].

Researchers agree that attitude and satisfaction correlate to student achievement [19]. Gamification is a worthwhile instructional method because of its ability to reach certain students who may not find satisfaction in traditional instructional strategies. David Elliot discussed a student during his research on Minecraft in an English classroom. In his research, John, a 14-year-old student, displayed difficulties

in a traditional classroom setting [20]. Through the incorporation of Minecraft into the curriculum, John found a new enthusiasm for that specific class, which resulted in a change in classroom behavior and attendance [20]. Minecraft is able to reach students who may have learning difficulties or who are just not interested in traditional lecture-based lessons and worksheets. Teachers will not reach all students but may have a positive impact on some who may be have difficulties in learning by integrating an appropriate number of games into the curriculum. This is part of the lure of eSports.

Minecraft and other video games are not necessarily a fix-all for this educational practice rift, but they do appeal to a group of today's learners who are used to living and thriving in a virtual world. When teachers recognize the flexibility of Minecraft, they adopt another modality of instructional delivery—one that does truly integrate technology. In addition, by recognizing how Minecraft and other games can be used across all curricula, the possibilities are not limited to just a few classrooms. Although Minecraft is not considered an eSport, it helps build the case for using gamification, in general, to support student enthusiasm for education and maintain high levels of student satisfaction with respect to a learning environment without gamification. Through the example of Minecraft, teachers can see this is a program they should not fear but embrace as an instructional tool of the 21st century.

Attendance, grades, and behavioral expectations are spelled out in school or district policies; e-athletes will be no exception for these rules. In some cases, eSports are a reason why students make good decisions, like coming to school and obtaining good grades. For example, the principal of the high school participating in Kansas also noted that the students who were involved in eSports had a 94% attendance rate, and their grade point averages topped off at 1.5 points above the school average [21]. This is another positive example of how eSports support positive academic habits, which will lead to continued academic successes for the students.

3. STEM

Like most electronic-based phenomenon, people are researching ways in which eSports may have a place in education. eSports do not take place in the real world, as do sports like soccer and tennis. eSports, however, require some of the same skillsets that exist within successful sports teams: teamwork, coordination, communication, and cohesion [22]. Critics are quick to dismiss eSports' place in education, but the benefits of gained skills from eSports could be worth dollars for the students' futures. One reason for spreading eSports in STEM education is for the development of soft skills. Soft skills are defined as intra- and interpersonal skills essential for human development, social participation, and success in the workplace [23]. Soft skills, such as communication and the ability to work with others on simple or complex tasks, are what employers look for. Soft skills are not natural but are obtainable and can be learned whenever needed [24]. Orange County, California, school superintendent Al Mijares stated that "It's an incredible opportunity to build on existing interest while introducing them to 21st century skills and careers" [25] (p. 1). In Orange County, high schools have developed an eSports league based on the game League of Legends, which is a game incorporated into their curriculum. The league carefully incorporates Career Technical Education (CTE), STEM, English Language Arts, and social and emotional learning [25].

These soft skills, like communication, teamwork, and high-pressure problem-solving are what employers look for in future employees graduating from today's high schools and post-secondary institutions. Universities also look for students who have these skills to attend their institution considering the correlation between students who have strong teamwork experience and their academic performance [26].

According to Zoltan Andrejkovics [27], eSports require a different set of soft skills relating to preparedness, when compared to other sports like football and basketball. Instead of physical skills, which are required for team-based sports, technical skills, tactics, and mental preparedness take priority over the development and preparedness of the physical body. Andreikovics [27] also describes stages of preparation, which are broken down into two categories: physical and mental. The main points are summarized in Tables 1 and 2.

Table 1. Physical and mental preparation.

Activitiy	Description of Activity
Physical Conditioning	Rest, Relaxation, and Balanced State of Mind.
Technical preparation	Fast reaction time aids decision-making and deductive reasoning.
Tactical preparation	Mastering nuances of the games for strategy purposes.
Goals	The players should be cognizant of the goals.
Values	The team establishes a set of values.
Motivation	What drives the team?
Sensing/Concentration	The team is aware of what causes loss of concentration and intervenes where needed.
Emotions	Improving on team member reactions to certain situations.
Thoughts	Maintain control of our thoughts and not allowing them to hinder our progress.
Knowing the self	Balancing the ego, allowing self-awareness.

Source: [27].

Table 2. Skills developed by eSports.

Skill	Description of Skill
Communication	Students Develop Communication Skills by Participating in eSports because of the Dependent Nature of Team Members to Achieve Certain Tasks within the Game.
Teamwork	eSports games have goals and objectives which can only be achieved by the team.
High-pressure problem-solving	Because of the competitive nature of the game, team members have to make quick decisions and plan strategies.

Considering Andrejkovics' research, for eSports with a competitive team in one location or a team made up of remotely located individuals, teamwork is an essential skill. Other than physical considerations related to other sports like football or hockey, all team sports require the considerations of preparedness outlined in Table 1. Table 2 summarizes skills obtained by participating in eSports, which are related to the skills intended to be obtained in a STEM-oriented educational program.

4. Counterargument

Some experts consider playing video games such as League of Legends or World of Warcraft an addiction severe enough to be considered a serious adolescent public health issue [28]. Other experts claim, although this is not proven, that excessive use of video games can cause mental health concerns and conditions such as Attention Deficit/Hyperactivity Disorder (ADHD) and Obsessive-Compulsive Disorder (OCD) [29]. Many of the games used in eSports involve some level of violence. Although some settings can be adjusted to reduce the amount of gore and death, the added violence presents the risk of mocking behaviors outside the videogame. The level of aggression in violent video games could result in an increased level of real-life violence displayed by the gamer and could pose a risk to the community [30]. Research has shown there exists a correlation between violent video games and violent behavior [31–33], with aggression occurring long after exposure to violent video games [34].

Critics say that video games may not encourage physical fitness or appropriate nutrition, which in some cases may be true, but eSports in K-12 settings have addressed issues regarding nutrition. A school district in Kansas adopted eSports as a model to develop healthy practices as well as educational support. The students involved in this course are required to exercise and practice good nutrition, which is logged and submitted to the teacher [21]. In a K-12 setting, standards for nutrition, grades, and any other form of eligibility may correlate with the established standards of the existing athletic governing body. If this governing body does not stipulate nutritional guidelines for school athletes, then special considerations could be put in place by the school for e-athletes.

Other pundits say that "playing games" [35] is not a prudent educational attribute, nor does it have any benefits. However, research supports the existence of academic considerations which are often tied to athletics in schools [21,26].

Regardless of these arguments, eSports develops skills that many worry are disappearing in the age of smartphones and personal electronics, in which our youth tend to turn into introverts with no abilities to work together in a team, socialize, have an appropriate online behavior [21] and engage in problem-solving in real-time settings. The social aspect of eSports gets educators excited about potential links to STEM-related soft skills which are perceived as disappearing among today's students [36].

5. Educational Opportunity

Many reactions from cynics range from the educational value of the videogame to the lack of benefits for the futures of the students. An educational opportunity is available for students who participate in eSports in the form of scholarships for being a member of a collegiate eSports team. This allows for educational opportunity for a group of students who may have been previously excluded from traditional academic or athletic scholarships. As eSports become more recognized throughout the world, colleges and universities are seeing the potential of this untapped group of potential students, who excel at teamwork, critical thinking, and technical skills. In March 2016, the University of California, Irvine (UCI), announced that it would become the first public university to create a scholarship program based on the game League of Legends, a MOBA. In addition, Robert Morris University (Chicago) offers a scholarship based on League of Legends that covers 50% of tuition and all room and boarding costs [37].

Another example of scholarship opportunity for eSports is Stephens College, which offers more than 30 videogame scholarships and is the first women's college to sponsor eSports programs [38,39] These institutions see the value in e-athletes because they understand the skillsets needed to play these games. The institutions see more than just an opportunity to create a niche program. This is a chance to invest in students who exhibit teamwork abilities. Students who excel at competitive gaming can take advantage of schools like Robert Morris (IL) and many other across the nation that recognize eSports as a regular sport that offers the same benefits as football or track athletics. An eSports track to a college or university offers new educational opportunities to a student who did not excel on a standardized test, such as the ACT of SAT, or who was a top-ranking athlete.

An additional argument for an emphasis on eSports at a post-secondary level is the demographic of the sport. According to SuperData [40], 15% of eSports viewers are 13–17 years old, and 46% are 18–26 years old, as shown in Figure 1. This data uncovers that over 60% of eSports viewers are either secondary or post-secondary age, with post-secondary-age viewers being the majority. This data alone show that post-secondary students show interest in the concept of eSports, which supports the adoption of an eSports program at the post-secondary level.
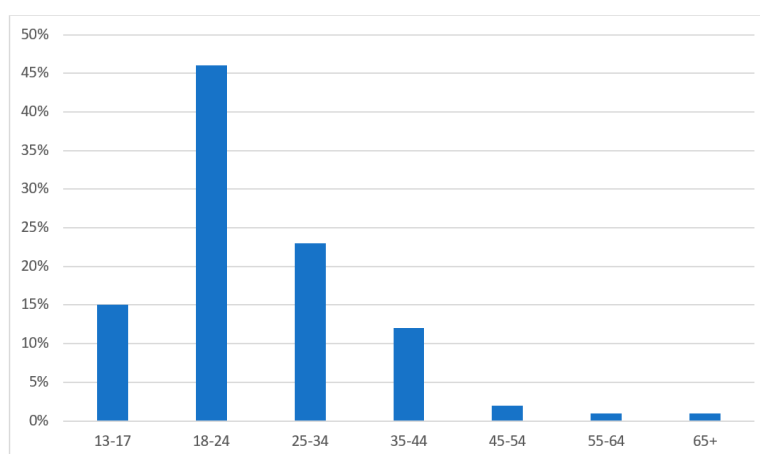

Figure 1. U.S. eSports viewers by age group. Source: [40].

The demographic reflects the desirability of eSports in the post-secondary setting. Many schools have already taken advantage of this groundwork. In 2016, only 7 U.S. colleges had eSports teams, but by 2018, 63 post-secondary institutions created eSports teams [41]. According to the National Association of Collegiate eSports (NACE), there are over 80 post-secondary schools in the United States and Canada that have eSports teams, with over 1500 athletes and $9 million in scholarships and aid [3]. As shown by colleges and universities like the University of Akron, Southern New Hampshire University, and Ashland University [35], there is growing interest in universities to invest in eSports and in the educational benefits with which they are associated.

6. Educational Impact

Extracurricular activities have positive outcomes based on student motivations. These motivations include school grades, coursework selection, homework, educational and occupational aspirations, self-esteem, university applications, subsequent college enrollment, and eventual educational attainment [42]. According to the United States Census Bureau [43], 57% of children between 6 and 17 years old participate in at least one athletic extracurricular activity, and 35% participate in other extracurricular activities such as musicals, drama, or academic competitions. On average, 57% of the student body in a district participates in at least one extracurricular activity (10% participating in two) [43]. When examining the educational factors, researchers have reported that students at a risk of dropping out of school were less likely to participate in extracurricular activities [44]). On average, athletes missed 6.06 fewer days than nonathletes over the course of a school year [45]. A study conducted with 428 Missouri school districts found that students who participated in highly visible extracurricular activities, such as athletics and fine arts, were more likely to remain enrolled and graduate from high school [46]. The National Center for Education Statistics found that high school students who participated in extracurricular activities were less likely to cut class and play hooky than kids who were not involved. Compared to students not involved in extracurricular activities, three times as many students involved in extracurricular activities had a Grade Point Average (GPA) of 3.0 or higher, and twice as many scored in the top quarter in math and reading tests, in addition, 68% expected to get a college degree (compared to 48% of kids who were not involved in extracurricular activities) [47]. A study of Iowa graduates found that the mean self-esteem score among those who participated in extracurricular activities was nearly one full GPA point higher than that of students who did not participate in extracurricular activities [48]. Extracurricular activities not only appear to improve academic achievement but also are shown to improve a student's overall well-being. An examination of National Education Longitudinal Study (NELS) data showed that participation in extracurricular activities created many positive educational achievements, behaviors, and aspirations throughout high school and as far as through the sophomore year of college [49].

7. Career Opportunities

The career opportunities that stem from video gaming is a worthwhile field of study. Technical jobs and business opportunities offer potential payout for people with eSports experience and post-secondary training. Technical jobs such as game designers, programmers and software developers, animators, audio engineers, along jobs such as writers and video game testers are just a few examples of jobs available in video game-related fields [50]. However, jobs in the video game industry can be very trying, cutthroat, and demanding [51]. Business jobs relating to video games range anywhere from producers to sales representatives, but with eSports, the money (at least on the professional level) lies with sponsors.

According to Business Insider, the current value of eSports is about $900 million—a value that will continue to rise. As for a career, there is the lure of playing professionally. Sponsors like Coca-Cola, Intel, and Red Bull pay premium amounts of money for their logo and products to be used and displayed during competitions [52]. In 2016, companies spent over $325 million on marketing eSports, and it is estimated they will spend more $800 million by 2019 [53]. As for money made, Ninja pulls

in more than $560,000 per month playing Fortnite (considering, however, that not every game will reach the notoriety of Ninja). This is money gained from the small $4.99 fee for premium services on Twitch and does not account for advertisements, donations, and revenue from other streaming sites [54]. With this said, professional eSports and streaming competitions may not be a sure payout for everyone, but Ninja's success shows there is money to be gained and that the market for eSports is growing, not shrinking.

STEM initiatives in schools all over the United States emphasize the soft skills, which are the skills employers are seeking in a future workforce [24]. eSports participants are not just sought out by video game and technology industries. The intra- and interpersonal relationships that are developed by learning in a STEM-oriented environment add a desired element to a future employee [23], especially to those who have the ability to work on a team [26] and the technological ability and critical thinking skills to work in jobs of the 21st Century [25].

In addition, the skills that are acquired in competitive team sports, such as proper communication and the ability to work in teams, are desired by employers, [55]. More often, employers see a lack of soft skills in college graduates who have no experience in a team environment. These skills can be gained from experiences in a team sport or even from simple life experiences such as having a job [26], working with others, and having the ability to communicate, present oneself, and react appropriately in a given situation.

8. Future Trends

One may consider the evaluation of eSports and their future trends as a bit silly or even impossible to dictate, but one can be assured that this analysis is based on current variables. Cell phones, for instance, are not going away. Some schools have embraced this fact and have taught appropriate use, but others continue to clench on to the archaic policies and ideals and restrict the use of cellphones for learners. With this in mind, eSports can be considered the next cellphone phenomenon in schools, both in K-12 and in higher education. Administrators can either embrace this technology or fight the recognition of its existence.

The fact is that eSports will continue to grow in the sports entertainment sector as the number of streamers continue to grow. As an example, 2016 saw 13.8 million viewers for the MLB World Series and 15.5 million viewers for the MBA finals, but the League of Legends final saw 27 million viewers, just under the World Series and MBA finals combined [56]. eSports viewership will continue to increase, with an estimated amount of 303 million viewers in 2019, an increase from the 188 million viewers in 2015 [40]. This upward trend will continue, and as eSports remains into the mainstream, we will find it competing with the likeness of the NFL Super Bowl. eSports in schools will also continue to grow and become commonplace. Much of the resistance is due to the lack of awareness and lack of understanding of how a video game competition can foster the skills desired in tomorrow's society.

As emphasis continues to grow in STEM- and CTE-related education, competitive eSports will become the next newest thing in education, developing an outlet for students to grow as teammates without the risks of contact sports. In addition, as eSports grow on the secondary education levels, more colleges and universities will take notice and find that competitive gamers are the most desirable students. Institutions of higher education will have no choice but to embrace eSports, compete for the gamers, and offer more scholarships and incentives. For those who consider this a hinderance on education or proclaim its irrelevance to the educational advancement of the learner, they will miss out on learners with skillsets which will be required for the 21st Century. The future of eSports is bright. The future of eSports in the educational setting is even brighter thanks to the skills and the opportunity they provide for the future of the students.

9. Conclusions

Without doubt, competitive gaming, especially eSports, is an increasingly popular phenomenon. No longer the video games of old, eSports athletes possess many of the desired attributes employers

want to see in a problem-solving team player. These soft skills develop when STEM initiatives are zeroing on to produce workers who can think on their feet, work well with others, and possess deductive reasoning skills to be independent problem solvers. As K-12 schools support the STEM initiatives, they are adopting eSports teams. With very positive results, they are proving the benefits of competitive gaming among learners within that age groups.

As universities or other post-secondary institutions begin their strategic planning, consideration should be made for establishing eSports teams and facilities. As successes are recorded in K-12 settings, universities must take notice and invest in e-athletes to attract those learners with desirable skills. The educational, career, and economic opportunities associated with eSports far outweigh any objection to their diffusion in educational programs. Whether it be the creation of a team, a funding of a scholarship, or the construction of a facility, eSports are a sound investment for any post-secondary institution.

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