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How Games Aid in Teaching Real-World Complex Skills: Positive Impact of Gaming

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Abstract: ***This paper analyzes various skills that youths shall be taught in school or universities. These skills are not mathematical or coding skills but real-life skills that everyone needs in their personal and professional life, both. Historically, educational institutes have struggled to teach these skills to the youths. The author picks these skills and see it through the lens of different gaming genre and analyzes how the skill can be taught by games. The author analyzes the same, presents arguments, gaming examples and cites different research done in this area to show how gaming can not only teach certain skills that are required by everyone in their real-life but also it can help students master the same. Author also analyzes different genre of games and present a map to showcase the complexity of the same.***
Keywords: Video-games, learning, skills, experience, Youth

I. INTRODUCTION

Video games are digital entertainment systems that allow players to interact with virtual worlds and characters. Games are typically played on personal computers, game consoles, or handheld devices. Many popular games are available online, and new games are released every day. While video games have been around for decades, they have only recently become a major part of popular culture. In the past, most video games were simple and not very realistic. Today, video games are much more complex and can even be used for educational purposes. With the advancement of technology, video games have become increasingly realistic and immersive.

All modern mobile devices support games. Mobiles have opened up new gaming models and gaming genres. Then there is laptop or computers that have been around for some time now. Companies are even experimenting with game streaming platform. Google started Stadia to stream AAA titles on chrome browser selling Gaming as a Service (GAAS). But recently Google had to wind it up because of lack of interest from the gamers.

Video games are becoming increasingly popular as a form of entertainment. Gaming market has been valued at $200B in 2021 and is expected to grow at CAGR of around 9% to $340B market. The popularity of video games has led to the development of new genres, such as battle royale and sandbox games. With new markets getting on internet, more people will start gaming. New digital laws around the world will restrict IP piracy. Many countries around the world are creating policies that will benefit game producers. And this will improve the industry overall, bring in legit users and more revenue for the gaming companies. PC gaming industry is $35B market. Steam is the biggest gaming platform for PC gamers. Around 47% of the game developers publishes their game on steam platform. Steam is available worldwide. Microsoft has their own platform as well. Mobile gaming is contributing to this exploding growth. Both, android and iOS have huge markets all around the world. In 2021, Android worldwide market was $37.3B and that of iOS was $52.3 B. In a nutshell, mobile contributed around $90B gaming revenue in 2021. with more markets getting onboarded on mobile, this number is bound to grow.

Mobile gaming explosion can be attributed to the following reasons: 1. Internet bandwidth. Most of the world market is already on LTE and gearing up to welcome the 5G. And with 5G these numbers are bound to go up. As users will be able to play more online games without any lags, spending more time, getting more competitive which will contribute to more dollars spend in In-App purchases (IAP). Secondly, covid also contributed to this growth. With people in lockdown, everybody picked up something to get entertained. With limitation on stepping out of their homes, please took up gaming. Hence, the gaming market just exploded. Thirdly, mobile phones availability and acceptability. The concept of mobile is changing for everyone around the world. With what started as a communication device, mobiles are much more now. It's a platform to communicate, watch movie, play music, play games, do banking, shop, book tickets and much more. More people are getting unlocked on mobile and internet through mobile devices. In the times to come, mobile will play a major role in redefining a lot of industries. Lastly, mobile processing power is on the rise. Apple with their bionic chipset has shown the world what mobiles are capable of doing. And the world is yet to see the ultimate processing power and capability of mobile.

(VR) is a computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. VR has been around for decades, but it was only recently that the technology became advanced enough to be used for gaming purposes. VR headsets were first introduced in the 1990s, but they were not very popular at the time. It was not until 2015 that VR began to gain mainstream appeal with the release of the Oculus Rift and HTC Vive.

Since then, VR has become increasingly popular in the gaming industry. Many big-name game developers, such as Bethesda and Ubisoft, have released VR games. Some of the most popular VR games include Batman: Arkham VR, Resident Evil 7: Biohazard, and Job Simulator. While VR is mostly used for gaming, it has other uses as well. For example, VR can be used for training purposes. It can also be used for therapeutic purposes, such as treating patients with phobias or post-traumatic stress disorder. The future of VR looks promising. With the continued advancement of technology, we can expect even more realistic and immersive VR experiences. For now, we can enjoy the many different VR games and applications that are available to us.

Pick up a controller and start playing! VR is another trend that is picking up. The new gen is all geared up. Companies are banking a lot on VR. Companies like Meta have started pouring in billions in VR and metaverse research. Apple is also set to release a VR device. So is Google. Video games are not just for entertainment purposes. Many games are now being used for educational and training purposes. Games such as Minecraft and Roblox are being used in classrooms to teach kids about programming and other concepts. Video games can also be used to improve problem-solving skills and hand-eye coordination. The future of video games looks bright. With the continued advancement of technology, we can expect even more realistic and immersive games. For now, we can enjoy the many different types of games that are available to us.

Video games have always been associated with fun, or bad for health, or something that's not considered to be a tool that can be used to teach students/youths that other conventional media cannot do. In this paper the author will use his knowledge, research and cite examples from other research papers to prove that video-games are a great tool to teach skills that conventional teaching method (classroom, books, internet, etc) haven't been successful in teaching. Video games are an underexplored and underused educational tool. As they increase in complexity, they can provide immersive, sensory learning environments [13] which can expedite learning experience with lasting impacts.

II. RESEARCH METHOD

The author has done first level research and backed it by the secondary research to prove his theory, concepts and assumptions. The author went through a lot of research already done in this field to backup his concepts. Video games are changing and have become an important part of youths. Most parents and educators are worried that youths will become addicted to game which isn't helping the students in any way. The author doesn't believe in this concept and hence researched about the benefits of playing video-games and used secondary research to bunk the mis-conceptions.

III. GAMES CLASSIFICATIONS

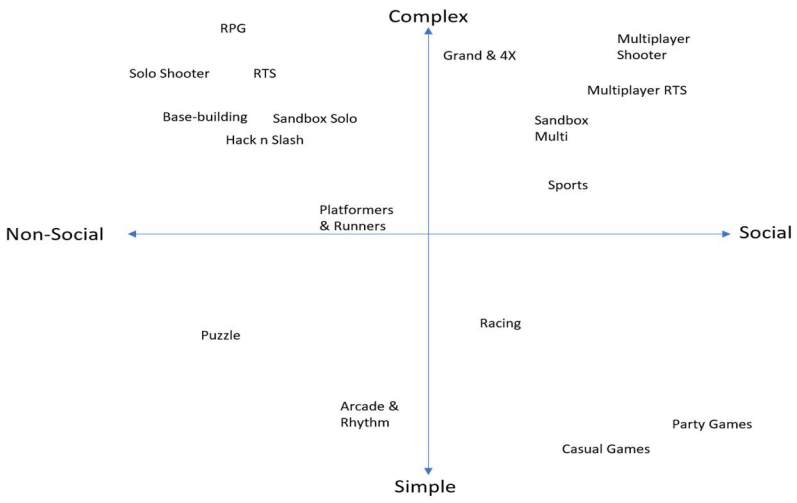

Figure: 1; Source: [36]

The above graph shows a pictorial representation of the games categories in a 2x2 grid across four parameters: Complex, simple, Social and Non-social. Games cannot be just categorized in one of the four buckets. They fall somewhere between these categories and the grid above is fitting . Just taking a glance at the graph it's quite apparent that RPG, Grand & 4X, multi-shooter are the most complex games in all the categories. Casual games and Party Games tend to be simpler and more social. And that's true. If the party game is solo then it's not a party game. Each of the games categories have a different goal and metrics that they measure. The outcome of each category is different and they yield different feelings in the gamers. The motivation is different for each game. Later the readers will see how different categories are used to help the gamers learn different life-skills.

There are many impacts of gaming on the youths. In this paper the author will analyze some positive impacts, present an argument and back it up by research and examples. This paper tends to review the arguments and other research published in this space. Let's start with looking at the positives gaming has on the youths –

IV. IMPACTS OF GAMES ON YOUTH

A. Problem Solving Skills

Video games can help improve problem-solving skills in several ways. First, video games provide a safe environment for players to experiment with different solutions to problems. This is especially helpful for kids who are still developing their problem-solving skills. Second, video games often require players to think abstractly. This means that players have to think outside the box to find solutions. This type of thinking is beneficial for kids because it helps them develop creative problem-solving skills. Third, video games can help players learn how to handle failure. In most games, players will face many challenges and obstacles. If a player fails to overcome these challenges, they will usually lose the game. However, this is not the end. Players can learn from their mistakes and try again. This trial-and-error approach is a valuable lesson for kids because it teaches them that failure is not the end. It also shows them that there is always a way to improve and succeed.

Games are fun because they provide a set of challenges which need special problem-solving skills by the gamers. Once a gamer solves the problem, they are awarded with something relevant to advance in the games, like: Points, badges, more XPs, advances in rank, leadership board mention, social validation (this is the impact of social media), etc. And this in turn makes the gamers solve more of these problems. And the problems are not seen as mere problems but they become an element of fun.

Gamers consume them as a challenge which when solved provide a sense of accomplishment. As a gamer makes progress in a game, the level of challenges keeps increasing and only a few players can solve them. Making the level more exclusive. And solving the problems isn't easy, it requires the gamers to put in effort. And this helps them to develop problem solving skills. Games are uniquely poised to provide such a problem-solving learning experience because of the authentic environment that they present to the gamers. [25].

This is a skill that can be picked up from games and can be applied to real-life problems. And it's seen that youth with great problem-solving skills in gaming world have great sense of problem-solving skills in real-life too. Multiple Researches have been conducted that prove this theory [24]. Thus, video games can be a great way for kids to develop problem-solving skills. With the right game, they can learn how to think abstractly, handle failure, and experiment with different solutions. These are all valuable skills that will help them in their future endeavors.

B. Logic Building

Video games can help improve logical thinking skills in several ways. Video games often require players to use inductive and deductive reasoning. This means that players have to use their logic to figure out the rules of the game and solve puzzles. Gamers usually need to complete a set of puzzles to earn rewards. The rewards are based on complexity of puzzles or challenges. These challenges more often than not require logic to solve. Youths benefit from these a lot. They get attracted towards the rewards piece and aim to maximize them by solving a greater number of challenges. Thus, acquiring a knack of logical approach to problem solving. Logic acquired by the natural order of playing games can be transferred to real life in education or work. Most educational institutes have started teaching logic building classes. But they lack the gamification concept which makes the lesson a dull choice for students. Logical thinking is a process that starts with premises and leads to conclusions. It is a necessary skill for solving problems and making decisions. However, many people are not good at logical thinking. This is because it requires a lot of practice. Video games can be a great way for people to improve their logical thinking skills. This is because video games often require players to use inductive and deductive reasoning. By playing these games, people can learn how to solve problems logically because of their authentic environment experience along with the dynamic interactivity makes the experience of game ever lasting and enjoyable while learning a skill [30].

C. Learning Skills Enhancer

Many educational institutes for younger students have taken the approach of learning while gaming. There are games built for all ages of students because of the interactivity and the learning experience advancement through games. Some examples: Time Table Rock Stars [1] is used in primary schools; Endless Alphabet [2], used in pre-schools can be great aid in helping children learn in a more engaging way. There are physical toys, now a days, that are connected to apps to provide an immersive learning experience with a physical touch and real-world experience. An example of the same is: Osmo [3]. Some other example of pre-school and primary school games are: 2048 [4]; Alphabats Syllables [5] ; Star Climber [6]. And the list goes on. It clearly shows that gaming has an impact on overall learning experience of the students. One other such research has been done by this paper that teaches SQL skills to the students [7]. Educational Games Market size was valued at USD 11.24 Billion in 2021 and is projected to reach USD 93.53 Billion by 2030, growing at a CAGR of 38.67% from 2022 to 2030 [8]. Games can help students at any level learn skills much faster [19].

D. Improved Motor/Spatial Skills

Many people believe that video games can help improve motor and spatial skills. This is because video games often require players to use their hands to control the game. In addition, many video games require players to have a good sense of space and timing. Gamers usually have to do some sort high urgency tasks in any given game which involves rapid eye movements around the screen, hand coordination and clicking of multiple keys without even looking at the keyboard. Once such example is Shooting Games, where the gamers keep moving around in the immersive world, look for enemies, and engage with them. A study shows that people who play first-person shooter games are better at mental rotation tasks. This means that they can visualize objects in their mind and rotate them to see how they would look from different angles. This type of thinking is beneficial for the youths because it helps them develop spatial awareness. In addition, it helps them understand how objects work in the real world. This skill learned in the games can be applied in the real life when the gamers run into such situations they start acting with urgency and make real-life decisions really quick. The motor skills developed by playing games will start kicking in without my extra mental-effort and the gamers will be able to solve the crisis without much mental pressure. This is something no school or college can teach the students but video-games is one such thing that's able to do so. Research done by University of Toronto study finds that action video games bolster sensorimotor skills [12]. The research found that gamers learn new sensorimotor skills like riding a bike or driving car faster than the non-gamers.

E. Reduced Risk of Alzheimer's Disease

Some studies have shown that playing video games can reduce the risk of Alzheimer's disease. This is because video games can help improve cognitive function [31]. A study shows that people who play 3D platformer games have better working memory than those who don't. This means that they can remember more information and recall it more easily. In a research study, researchers developed a new game called, Sea Hero Quest, and collected over 4 million data points to prove that poor spatial orientation can help as an early indicator in the diagnosis of Alzheimer's disease. The researchers drew parallel between spatial ability in the games and in the real-world [32]. This type of thinking is beneficial for people because it helps them keep their mind sharp as they age. In addition, it helps them reduce the risk of Alzheimer's disease.

F. Enhances Decision-making

Games often require players to make decisions. For example, in strategy games, players need to decide which units to build, where to deploy them, and when to attack. In first-person shooter games, players need to decide which weapons to use and when to reload. Most of the games often require gamers to make a lot of decision making, like whether to take a gun or not, whether to buy some gems or not, whether to take the short cut or not, whether to pick up a fight or not, where to build houses, how many to build, what skills to acquire, etc. The decisions made at a given point will have an affect at a later stage in the game. Gamers learn to make decisions and most of the time, over a period of many decisions, they tend to correct course and make right choices. This helps gamers to make clear decisions. This is something that everyone requires in their daily life. Students who learn this skill can implement this at every stage of their personal and professional career. One such proof is a statement made by a leading research scientist: "*Video games are played by the overwhelming majority of our youth more than three hours every week, but the beneficial effects on decision-making abilities and the brain are not exactly known*," said lead researcher Mukesh Dhamala, associate professor in Georgia State's Department of Physics and Astronomy and the university's Neuroscience Institute [9], [11].

In their paper, Mukhesh Dhamal and Timothy Jordan conducted research with students and taken their MRI scans to prove that video-games have a positive impact on cognitive training to human brains and improved decision making.

G. Ecology & Conservation Education

There are many studies that show that gamers have become more sensitive and matured towards the environment and conservation after playing certain types of video-games. One such study was done on players who played Red Dead Redemption 2. It's a AAA game, meaning it's a massive game with high graphical representation of the world that has many layers of complexity. It's built and published by Rockstar Games. The game took a lot of time to be developed. Getting a AAA title in gaming industry is a massive achievement. This game in particular, is well liked in the industry. Gamers love this game, purely from an experience, game play and the beauty of the world. And for the authors to use this game to test the participants on a quiz, was a bold move. They found via a quiz that participants who played the game in details, identified more wild species and reported learning about animal behaviors and interspecies interactions [17]. As seen in other researches, playing video-games can have increased cognitive learning, immersive experiences that open up a new path to education and exploration and has more engagement element that leads to acquiring new skills. Video games have a positive impact on biodiversity conservation [14]. Some games that teach or at least try to provide that message are: Zoo Tycoon, The isle [15], Planet Zoo which has an extension called: Conservation Pack [16]. There are many more that can be listed here. Games have an unconventional way of providing the knowledge and education to the students. Educators need to explore these unconventional ways of helping the students learn about things that otherwise seems boring. Today's youths need modern approach to education.

H. Intergalactic & Space Education

Games producers have been very creative in representing the world, be it medieval times or some futuristic cyber city. Games have also gone in creating inter glactic experience and showing different planets. Gamers know more about different galaxies and planets than a non-gamer youths, with of course certain conditions applied. There are games that let players create life in mars and manage the logistics, human needs, emotions and farming on other planets. These types of games teach the youths about the planet, its characteristics, resources available, resources needed to sustain life and other basic needs of human life. An example of such a game is: Surviving Mars [18]. Surviving Mars is a simulation, real-time strategy game where the gamer takes the role of an enterprise that wants to colonize Mars. The enterprise has limited resources with the help of which they start a colony on Mars by sending people from earth. With limited resources, no oxygen or water supply, the colonists have to create a living. They have to create electricity, create homes for themselves and find ways to start farming. The game teaches the gamers the hardships of starting a colony on Mars, the soil quality of mars, how things will be so different. And these valuable lessons couldn't be easily given to the students. But the game does an amazing job of helping the youths learn more about mars without them knowing that they have learned about Mars. Virtual Reality [20] is another such device that could help the students learn more about the space and its challenges. The possibility is endless in VR, if done right. Students will be able to explore any planet they want to, do moon walk in space, defy gravity and learn more about the space then any book can teach them. Google Expeditions is one other example used by students to explore space and incorporate the learning in their education system. Titans of space is another VR tool created to help students learn about the space travel and solar system [21].

I. Creative Writing

Video games enhance the students' ability to express themselves in a more creative way. Students who are asked to describe about Mars after playing the video game will be able to express a lot as compared to the students who haven't played the game and was just taught about mars through text books and images. A similar experience was also shared by a class teacher who asked students to experience WW1 through VR and spend some days in the trenches [22]. Students who experienced the WW1 via VR had a real-life experience of the soldiers, what they went through, the environment, the tension, what they ate, where they slept, etc. These students were able to describe the life of soldiers in a much creative way as compared to the students who have only learned about the WW1 through history book or Google search.

J. Analytical & Critical Thinking

Games are an excellent way to teach children and teens the importance of thinking on their feet, analyzing situations quickly in order not be left behind by non-game playing peers.

According to Wing (2006), computational thinking includes understanding problems as well as finding solutions; it also encompasses abstracting information from its original context for use at another time or location [23]. Researchers have found that gaming encourages students' reasoning skills through algorithmic problem solving which requires looking into how things work while being reflective about your thought processes along with having access to a variety of resources in order to carry out the task at hand. As video games have become more popular and their appeal has grown beyond just the traditional "male gamer" stereotype, so too has the research on their effects. Computer Scientists have been talking about computational thinking for a long time. Games encourage students to utilize their reasoning, algorithmic, reflective thinking and problem-solving skills in authentic contexts and thus could improve computational thinking [25]. There was a study conducted among high-school students to measure the difference in different skills acquired in these students with respect to the types of games they play. The research outcome was students who played Simulation games had the highest level of Critical Thinking. Additionally, students who played Educational or Logical Games had the highest problem-solving skills [26]. Another point to note here is that games make gamers break-down complex system, gameplays, environments, which enables the gamers to have a critical point to the situations and problems at hand. Gamers are able to critically analyze the problems and provide a holistic, analytical and strategical solutions without getting biased.

K. Promotes Teamwork & Interpersonal skills

Video games have become more popular than ever before with gamers playing online, friends and colleagues. The old days of gaming in your attic are long gone; today's video game players enjoy them on almost any device they can get their hands onto! There is even an e-sports league where teams from all around compete for millions every year while it broadcasts live over the internet and TV (and sometimes cable).

There're plenty of video games that have become a popular pastime in recent years, with players from all around the world collaborating online to play upcoming titles like Fortnite or PUBG. At e-sports events these days you can find millions of people watching live streams as their favorite competitors duke it out on screen! These competitive yet fun events require skillful coordination between teammates who work together both strategically & emotionally as well which makes this career path perfect if you're looking into something new or exciting. The e-sports series see competitors from around the world competing against each other on their respective stages which can be watched live by audiences both large and small alike thanks to not just TV broadcasts but also streaming services such as Twitch where viewers donate money towards prizes awarded at endgame competitions during streams. Team coordination, communication, leadership, and inclusivity are some of the must have skills required to be a successful team player and team. It teaches one negotiation skills, because as team members you are always negotiating. Successful corporations struggle to teach team building to employees [27]. They spend millions of dollars every year to help employees learn the art of teamwork.

Even schools and universities struggle to teach the concept to the students. The idea of gaining high ranks, the concept of social rewards and being categorized as top player are enough motivation for the players to act in the best interest of team. If they act cordially, the team wins. If they don't, the team loses. The changing landscape of work will see more companies adapting games to teach teamwork to the employees. Games can teach organizations more than just how well workers play video games because there are many other lessons that need teaching like good communication techniques between peers within different departments when working toward shared objectives. A lot of companies have dedicated gaming rooms with gaming consoles, TV, designated sitting areas, etc. According to a study one-third of all employees in Australia and New Zealand have used video games in some form to enhance their workplace productivity [28]. Video games have been successful in bring the best of team work, cohesion and community building sense [29].

The changing landscape may mean we'll see companies adapting this method into training sessions where employees learn about collaborative gaming through competitive titles such as DOTA 2 [33] or League of Legends [34]. Gamification has long been used in education and it looks like businesses are catching on to the benefits too [35].

Organizations like Ubisoft want their employees to feel ownership over their projects so they give them a lot of creative freedom - this way people are more likely to be passionate about what they're working on day-to-day. It also helps with team building since people who are friends outside of work are more likely to cooperate with each other while at work, leading to a more positive environment and culture overall. This is a video game company that encourages its workers to think outside the box, and it has paid off handsomely for them. The games they create are original and popular, and the company has won numerous awards for its innovative gameplay and design. The key to Ubisoft's success is its willingness to take risks. The company allows its employees to experiment with new ideas, and it has resulted in some of the most original video games in the industry.

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V. SKILLS VS GENRE MAPPING

The author analyzed a lot of study, lab reports and his own analysis and came with the following skills to genre mapping:

SKILLS	Shooter	Strategy	Educational	RPG	Sports
Problem-Solving	Medium	Very-high	Very-high	High	Low
Logic Building	Medium	Very-High	High	High	Low
Learning	Low	Medium	Very-High	Low	Medium
Spatial/Motor Skills	Very-High	Low	Low	High	Very-High
Decision Making	High	Very-High	Low	Very-High	Very-High
Ecology & Conservation	Low	Very-High	Medium	Very-High	Low
Intergalactic & Space	Low	Very-High	Low – Medium	Very-High	Low
Creative Writing	Low	Low	Medium-High	Low	Medium
Analytical & Critical Thinking	Medium	High	Low	High	High
Teamwork	Very High (multiplayer)	Low	Low	Low	Low

The author has ranked each skill that can be acquired in different game's genre in 4 different levels: very High, High, Medium and Low. Very high means, the chances of a gamer acquiring a particular skill by playing this game genre is very-high. Low means, the chances of acquiring the skill by playing this game genre is Low.

VI. CONCLUSION

In conclusion, games are a great source to teach the youths the skills that otherwise would be hard to teach. Games could be used as a great motivation for youths and even adults. The sensory environments, immersive experience and real-time experience are a perfect combo to bring results that otherwise isn't possible. The gaming market is on the rise as discussed earlier and even there are educational games. Educational games are a great way to teach kids a lot of basic things. But the traditional games shouldn't be looked over and thought of something used for fun and entertainment only. Those games have more visual experience power to surface real-life lessons. Of course, these games aren't built to teach classroom lessons but their approach is to help the gamers learn real skills like: problem solving, analytical thinking, decision making, patience, strategy crafting, logistics management, resource management, critical thinking, teamwork, dexterity, etc.

With the rise in digitization, more and more students are questioning whether or not they need to be on campus. With online courses that provide at least an equal education with face-to face classes for less money spent - if not better – it's time educators start thinking about how we can engage this new generation. It's time for current education systems to be replaced with new, innovative methods that better engage and teach our youth. The way we receive information has changed drastically over the past few decades; why not change what they learn? We can no longer rely on outdated teaching styles like lectures when technology offers at least equal if not better opportunity through Coursera or YouTube. And kids don't need an excuse as easy access anywhere they want it since most mobile devices these days offer internet connection capabilities so there really isn't any reason not to use those platforms outside of preference alone! Video games are not just for kids anymore. In fact, they are becoming increasingly popular among adults. A recent study found that adult video game players are more likely to be employed and have higher incomes than those who do not play video games. The study also found that adult video game players are more likely to report being happy with their lives. These findings suggest that video games can have a positive impact on the lives of adults.

Embracing gaming and gamification concepts are the path to successful future education and learning. The positive impact of video games on the lives of individuals is becoming increasingly clear. As technology continues to evolve, it is likely that the games will become even more realistic and sophisticated, offering even more benefits to those who play them. The popularity of gaming has led to the development of a new entertainment industry, with professional gamers now competing for large sums of prize money in international tournaments. The skills learned from playing video games can have a positive impact on an individual's life. Games that require strategic thinking and problem solving can help players develop these skills, which can be applied to real-world situations. For example, the military has used video games to train soldiers for combat situations.

Games that require quick reflexes can help players develop hand-eye coordination and improve their reaction times. And games that require players to think creatively can help them develop innovative solutions to problems. In addition to the cognitive benefits of playing video games, there are also social and emotional benefits. Games that require teamwork and collaboration can help players develop social skills, such as communication and negotiation. And games that allow players to express themselves creatively can help them develop self-confidence and a sense of accomplishment. With all the examples discussed above and research cited, it is proven that games have more positive impact on youths and adults, alike.

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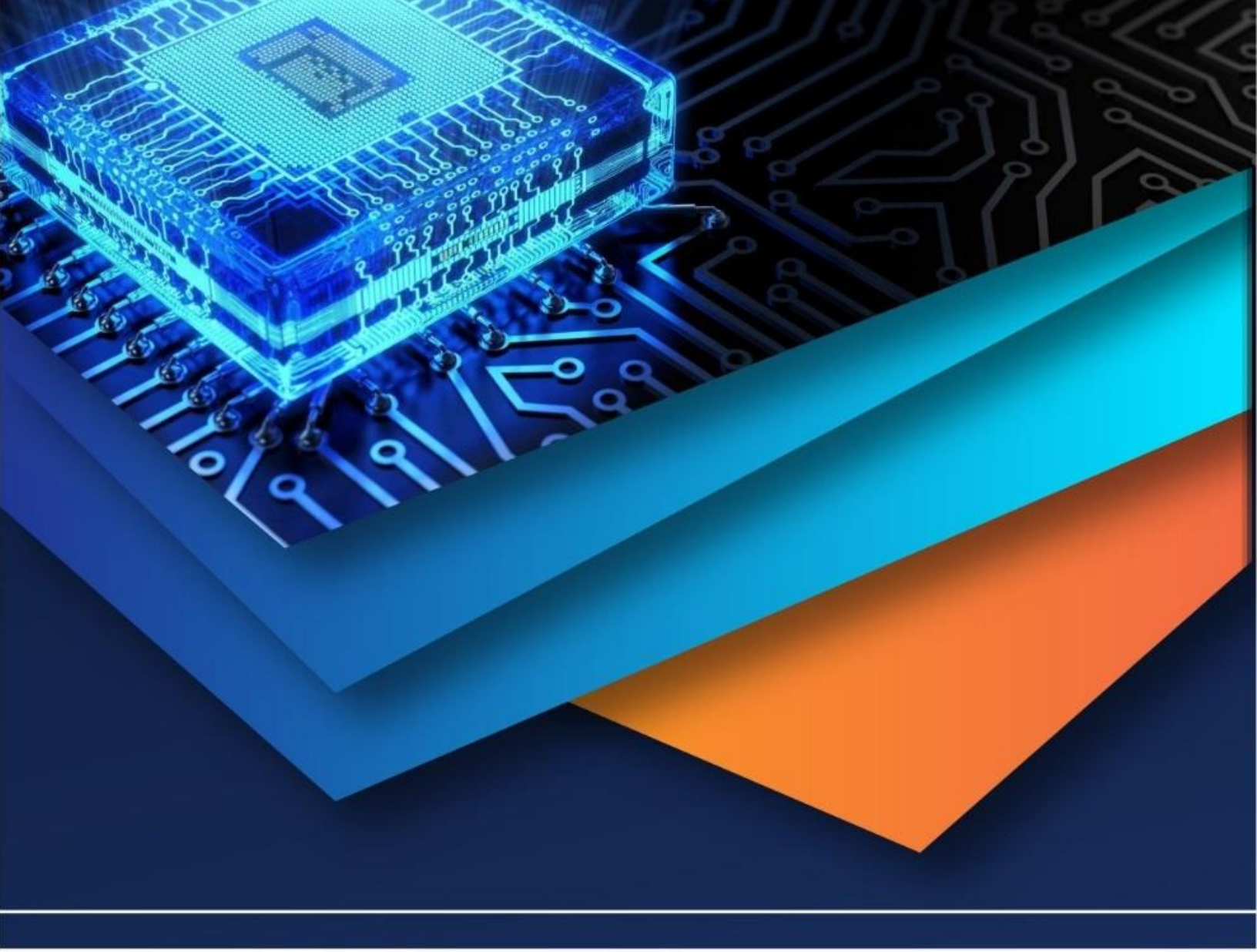

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