

Artificial intelligence strategies in electronic games and their role in developing creative thinking skill

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Abstract:

Electronic games are considered as a popular tool of entertainment for many people around the world. With the advancement of communication technology, electronic games have become more complex and interactive. And with the proliferation of AI tools has enabled these games to provide advanced and multi-dimensional gaming experiences. This study aims to explore the artificial intelligence strategies used in electronic games and their role in developing creative thinking skills among players.

Keywords: Artificial intelligence, Electronic games, Communication environment, Creative thinking.

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1. INTRODUCTION

Electronic games, also known as video games, are one of the most popular and widespread forms of entertainment in the modern era, particularly with the rapid advancement in communication and information technology. Electronic games have evolved into a media industry that competes with other media practices in terms of influencing individual behavior and knowledge construction. They have seen tremendous development in components, features, and have become more interactive and complex in terms of gameplay mechanics and exchanged content among individuals. Ultimately, they aim to deliver exciting and multidimensional gaming experiences, prominently featuring human communicative dimensions. Among the pivotal factors that have advanced electronic games are strategies and techniques of artificial intelligence (AI). which aims to provide advanced gaming experiences in various fields through technologies such as machine learning, artificial neural networks, and human intelligence, whether in sports, emotional, or social aspects. These technologies are applied to enable games to understand player behavior and provide suitable, dynamic, and unique challenges that adapt to gameplay styles and preferences.

One of the primary benefits of leveraging AI strategies in electronic games is enhancing players' creative thinking skills. Creative thinking is recognized as one of the most challenging communication skills to acquire in modern societies, that requires individuals to think innovatively and devise new and effective solutions to challenges and problems. AI strategies in

electronic games facilitate achieving this goal through various means. For instance, AI-driven electronic games can offer diverse and non-traditional challenges to players, motivating them to think in novel ways and innovate new strategies for success. Moreover, AI can assist players by providing guidance and assistance in solving complex problems, challenges, and puzzles within the game, thereby enhancing their ability to think creatively and utilize highly intelligent mental skills.

Initial research examining the use of AI in electronic games cannot definitively assert its positive impact on developing players' creative thinking skills. However, other studies suggest that players engaged in AI-based electronic games demonstrate higher levels of creative thinking and problem-solving abilities through innovative methods. Additionally, AI strategies can expand players' horizons and enhance their experiences in the virtual world. When players interact with AI-based virtual characters, they encounter diverse and astonishing interactions that reflect the complexities of the real world. This exposure stimulates curiosity, exploration, and experimentation among players, thereby boosting their ability to think creatively and tackle new situations. In the context of a complete digital communication environment, the main question arises: **How do AI strategies reflect on the development of creative thinking skills among gamers?** To grasp the core aspects of this main question, several subsidiary questions emerge:

1. What are the communicative advantages offered by electronic games to players, particularly in terms of technical and artistic aspects, utilizing AI tools?

2. What forms of AI applications are employed in online electronic games, and how are they utilized?

3. What are the key indicators of creative thinking acquired through the use of online electronic games?

The true or somewhat close depiction of the studied phenomenon is evident in the sum of the objectives. These objectives are sought by considering the actual starting points for research. The reality of electronic games has indeed become practical with their evolving forms and methods, transforming into an electronic communicative environment. This environment realizes actual communication, interaction, and influence on individual behaviors on various levels. The goals of the current study are:

1. Attempting to identify and enumerate the various communicative advantages provided by electronic games to players, both in terms of technical and artistic aspects, utilizing AI tools.

2. Extracting some AI usage techniques employed in online electronic games and their deployment methods.

3. Recognizing the most significant indicators of creative thinking acquired through the use of online electronic games.

2. A theoretical and conceptual approach to online electronic games:

2.1 Electronic games: definition and advantages:

Electronic games are activities where players engage in pre-programmed and structured conflicts or disputes, leading to quantifiable outcomes often in the form of behaviors. These

games can be played through various digital communication mediums such as gaming consoles, computers, smartphones, televisions, and other digital platforms. The concept of electronic games is closely linked to video games, which can be defined as follows: The term "video games" specifically refers to games played using video display devices such as TVs or screens. Video games can include those played on dedicated gaming consoles, personal computers, mobile devices, and even tablets. The video game industry has seen significant evolution to encompass a wide range of styles and technologies, ranging from simplistic puzzles with 2D graphics to complex puzzles incorporating 3D elements, artificial intelligence, and virtual reality. (Bernal.Merino, 2015) **Linda Schlegel** and **Rachel Kowert** argue in their study on video games that they cannot be considered a uniform entity. Initially, they were a means of entertainment through computer devices, but their usage has expanded to include multiple platforms ranging from personal computers to gaming consoles, tablets, smartphones, augmented and virtual reality headsets. This wide diversity in platforms enables an astonishing range of gameplay styles, from simple button-pressing experiences lasting a few seconds like Floppy Bird, to vast and continuous virtual worlds like World of Warcraft, and extending to massively multiplayer online battle arenas (MOBAs) such as League of Legends, which is considered the largest e-sport globally with over 150 million players and more than 100 million viewers for championship events. Additionally, there are numerous titles dominating the video game market such as Minecraft, Pokémon, Candy Crush, GTA, Call of Duty, and many other series that attempt to adapt to the preferences and trends of each player. Essentially, audiences find their preferred activities represented in the form of games, including first-person perspective games and simulations. (Linda Schlegel, 2024) In brief, electronic games are



played using electronic devices such as computers, smartphones, or gaming consoles. These games are characterized by interactivity, where users actively participate in the development and progression of events within the game. Some of the key distinctive features of electronic games include:

- **Multimedia:** Electronic games utilize a blend of graphics, sound, and motion to create an interactive virtual world.
- **Interactivity:** Players interact with each other and with the machine through control tools such as keyboards or game controllers.
- **Entertainment:** The main goal of playing electronic games is to entertain and provide enjoyment to users.
- **Variety:** There is a wide range of electronic games covering various genres and styles such as strategy, combat, sports, puzzles, and more.
- **Technological Advancement:** Electronic games benefit from rapid advancements in information technology and communication to deliver more realistic and thrilling gaming experiences.

2.2 Narrative and meaning within games: (Wysocki, 2013)

In their study on video games, **Wysocki** and **Matthew** argue that many researchers in the field of electronic games who adopt a broad view of narrative within games consider the integration of mechanics and story as contributing factors to a deep narrative experience. In this context, there is consensus among several game scholars on the intersection between game studies (the study of play and mechanics) and narrative studies (the study of narrative experiences), resulting in a unique player experience supported by the game environment. Consequently, player participation becomes a highly specific variable that provides

implicit and explicit meaning to gameplay. The narrative construction thus emerges from players' experiences, feedback, and preferences, not only from the game's designed experiences and mechanics. Thus, the concept discussed in this context involves the intersection of game programmers' and developers' stages of design with player engagement through their experiences. Consequently, game studies are no longer confined to the choices of designers and developers alone, despite the importance of these choices in establishing boundaries, roles, and objectives within the game space, influencing the types of player participation the game will elicit. Therefore, modern electronic games contribute to realizing both players' and designers' ideas equally. Consequently, developers or game designers cannot impose a type of control or completely limit the player's ability to introduce their ideas, goals, requirements, and preferences into the game space.

As a result of the aforementioned, it can be concluded that players' experiences, whether individual or collective, significantly enrich the narratives of video games and contribute to generating and expanding meaning. Narratives expand beyond the game's original text to encompass mechanics and content applications. Furthermore, player experiences can drive players toward learning paths and interests that extend beyond mere entertainment content, such as writing books or producing film and series scripts. Additionally, they facilitate the acquisition of new skills and abilities, particularly with the emergence of public digital spaces that enrich discussion from the moment a game or game series or another part of it is announced to the moment the game becomes available to the public through trial previews,

promotional announcements, media coverage, or annual conferences held by game development companies and agencies. Consequently, control shifts from the hands of experience designers to those who take these experiences and add their desires, ideas, and interpretations. Regarding the prominent **features of electronic games** supported by artificial intelligence tools, we mention the following:

- High-quality multimedia and computer components, with a high level of interactivity.
- Technology, design quality, and graphics used in programming online electronic games.
- Most online electronic games operate using player-selected language technology, respecting individuals characteristics.
- Technical information and knowledge related to the game, as well as cognitive information tied to real game events, positively influence individuals' creative thinking skills.
- The technological communication framework characteristic of online electronic games. Additionally, technical features include:
 - Utilization of immersive imagery, whether real-life personal or natural, or artificial.
 - Emphasis on movement and speed within the electronic game environment.
 - Deployment of various assistive sounds in the game, including real human voices of players, programmed artificial voices such as narrators, movement sounds, animal sounds, weapons, etc.

Despite the cognitive focus on the advantages of electronic games being primarily limited to technical and technological dimensions, this study aims to identify a set of artistic benefits, which include:

1.Stimulate vivid imagination: This pertains to both the content of the game and its solutions, as well as the gameplay mechanisms proposed and adopted by the players.

2.Development of creative thinking: Individuals enhance their cognitive abilities in analysis and interpretation, achieving desired objectives through more professional and innovative methods.

3.Immediate response or feedback: The interactive nature of electronic games' communicative environment, which is fundamentally based on the exchange of small or encoded information, facilitates immediate feedback among individuals.

4.Planning and decision-making skills: Games develop logical thinking and self-learning techniques, thus improving leadership skills.

5.Enrichment of linguistic aspects: The use of multiple languages in communication, given the global nature of players, helps avoid cognitive interference that might hinder effective communication.

6.Self-affirmation: Players can prove themselves by progressing through various levels and achieving multiple objectives, such as winning, activating communication, interacting, and establishing

social relationships. This, in turn, fosters a digital culture for the individual on multiple levels. It can be argued that artificial intelligence tools have transcended mere gameplay to enhance social communication within the gaming environment.

3. Studies of gaming in new media and communication:

3.1 The concept of gaming in new media and communication studies:

In the contemporary landscape of new media and communication studies, electronic games have emerged as a significant subject of academic interest and discussion. The rise of video games as a communicative media phenomenon has prompted investigations into prevailing forms of entertainment and social interaction, and how the function of entertainment has evolved into the entertainment industry. In this context, numerous researchers have sought to explore the multifaceted role of video gaming within new media and communication studies, as well as its impact on social interaction, cultural production, and identity formation—especially virtual identities enhanced by artificial intelligence tools and various modern digital communication technologies. The development of advanced graphics, storytelling, and multiplayer online worlds has positioned video games at the forefront of digital media innovation, drawing researchers to investigate both technological advancements and the cultural and communicative implications of video games. Gaming studies within media and communication research draw on several theoretical frameworks. One prominent framework is the media environment, which examines how media environments affect human perception,

understanding, and interaction. From this perspective, video games are seen as complex systems that create unique spaces for communication and social interaction. Another theoretical framework is game studies, which focuses on the study of games and gameplay, emphasizing the rules, mechanics, and structures that define video games as interactive media.

3.2 Social interaction and virtual community building in electronic games: video games are inherently social, offering players numerous ways to interact and communicate. Online multiplayer games, in particular, facilitate the formation of virtual communities where players from diverse geographical and cultural backgrounds come together to collaborate, compete, and interact. These virtual communities often exhibit rich social dynamics and complex hierarchies that mirror real-world social structures. Researchers have examined how these communities function, the types of social capital they generate, and their impact on players' offline lives. For instance, massively multiplayer online role-playing games (MMORPGs) like World of Warcraft and Final Fantasy XIV provide spaces for players to engage in cooperative quests, form guilds, and develop long-term friendships. Studies have shown that these interactions can lead to strong social bonds and a sense of belonging, countering traditional assumptions that games promote isolation and antisocial behavior typically associated with electronic gaming. Social interaction in electronic games includes behaviors occurring between players, where individuals interact through the characters they control and the scenarios they encounter. Interaction can be direct, through talking and negotiating, or indirect, through participating in tasks and cooperating to

achieve common goals. This enhances collective spirit and contributes to strengthening social communication among players.

3.3 Types of social interaction in electronic games:

Electronic games serve as a source of diverse social interactions, which can manifest in various forms. One common type is cooperation between players to achieve common goals, such as battling a shared enemy or solving puzzles together. This collaborative interaction fosters teamwork and collective problem-solving skills. Another form of interaction is competitive engagement, where players compete against each other to win contests or challenges. This type of interaction promotes a spirit of competition and personal development as players strive to improve their skills and achieve victory. Additionally, social interaction in electronic games can involve communication and the exchange of experiences and knowledge among players from different backgrounds and nationalities. This interaction helps to enhance tolerance and social coexistence, as players learn to appreciate and respect diverse perspectives and cultures through their gaming experiences. Thus, two key points can be identified as the most prominent benefits resulting from social interaction:

Regarding the benefits of social interaction in community building through electronic games, one of the key advantages is the enhancement of social relationships and cooperation among players. When individuals play together, they share various challenges and rewards, which fosters communication and strengthens social bonds between players. Additionally, electronic games encourage teamwork and promote a spirit of

collaboration in finding solutions and achieving common goals. This collective engagement not only enhances individual skills but also contributes to the creation of a cohesive and supportive community.

3.4 The construction of Virtual Identity and Digital Content Production and Cultural Representation of Play in Media and Communication Studies:

Video games play a crucial role in shaping and representing the digital identity of players. Often, players create and embody characters that act as representations and extensions of their real-life identities. This process of character creation and role-playing allows players to experience different aspects of their personalities, genders, and nationalities in a relatively safe and controlled environment. Furthermore, video games have become a field for cultural representation, debate, opinion exchange, and the expression of various social patterns. The portrayal of characters and narratives in video games reflects cultural attitudes, enabling us to transcend previously formed stereotypes about their negative aspects. The participatory and non-mass nature of video games significantly impacts media and communication studies. Players are not just passive consumers but active participants in creating and disseminating content. This is evident in the modding community, where players modify and create new content for both new and old games, as well as in

the proliferation of user-generated content on platforms such as YouTube and Twitch. The rise of esports and live streaming has blurred the lines between digital content production and consumption. This phenomenon is highlighted by esports competitions that attract millions of viewers regularly, with professional players becoming broadcasters and influential media personalities. This trend has prompted researchers to explore new forms of media work and digital content production arising from video game culture, as well as the economic and social dynamics it generates. Through these theoretical approaches to the concept of play in communication theories, a range of impacts resulting from electronic games can be identified and categorized as follows:

3.5 Positive Impacts of Electronic Games:

- Development of Cognitive Abilities: Electronic games stimulate thinking through problem-solving and puzzle-solving activities, enhancing individuals' mental capabilities.
- Boosting Confidence in Modern Communication Technologies: Games increase individuals' confidence in modern communication technologies by meeting their desires and needs.
- Transforming Education and Learning: Games shift education and learning from rote memorization to interactive practices with programmed learning and teaching devices, promoting self-directed learning.

-Fostering Creativity and Innovation: By encouraging children to design, store, and share computer games, electronic games cultivate skills in creativity and innovation.

-Enhancing Knowledge and Experience Exchange: Electronic games promote the exchange of knowledge, information, and experiences among players, reinforcing human cooperation principles and ethics such as teamwork, honesty in interaction, and maintaining trustworthiness. With regard to the Negative impacts of electronic gaming: (Adam, 2006) **Mai** believes that the negative impacts of electronic games outweigh their positive aspects, as most games used by children and adolescents contain harmful content that affects them at all stages of development. Moreover, a significant percentage of electronic games focus on the enjoyment of killing others, destroying property, and engaging in unlawful aggression. The most significant negative impacts include:

- **Teaching Criminal Behavior:** Electronic games can educate children and youth on the methods and tricks of committing crimes, enhancing their abilities and skills in practicing violence and aggression. This leads to higher rates of violent behavior, murder, and assaults.

- **Religious Harm:** In the absence of official oversight of electronic game stores and gaming centers, coupled with a lack of effective parental supervision over the content their children

are exposed to, and a general unawareness of the associated risks, harmful games and programs have proliferated. These games promote ideas, language, and behaviors that contradict religious teachings and social customs and traditions.

- **Behavioral and Security Damages:** (Weiss, 2011) Research conducted in Western countries has demonstrated a correlation between violent behavior among youth and their exposure to or engagement with violence through electronic games. Regarding **social damages**, numerous studies have indicated that electronic games can disrupt social relationships. Individuals who become accustomed to the fast-paced nature of these games often experience significant difficulties in adapting to the normal pace of daily life.

- **Academic Damages:** The use of electronic games negatively impacts academic achievement. It leads to neglect of school assignments, absenteeism, and causes disturbances and negative consequences in the learning process.

4.The Relationship Between Online Electronic Games and Creative Thinking Skills:

4.1 Concept of Creative Thinking:

The term "creative thinking" refers to a set of general mental abilities that are believed to be utilized in creative achievements. The higher the levels of these abilities, the greater the likelihood that an individual will act creatively. (Matt Baker, 2010) Also **Dr. Ali Hassan Dalla** believes that creative thinking constitutes the highest and most refined level of knowledge, as it represents

an appropriate conclusion or synthesis of subjects that have been previously addressed or processed (علي، 2020). Therefore, creative thinking is the ability to generate new and innovative ideas that surpass conventional frameworks and concepts. Creative thinking is characterized by its ability to solve problems in unconventional ways, explore different angles of topics, and effectively use new tools and methods to convey messages with impact. Some of the key characteristics of creative thinking include:

1. **Innovation:** Generating new and diverse ideas that contribute to the development of media content.
2. **Flexibility:** The ability to quickly modify and develop ideas and strategies to keep pace with continuous changes.
3. **Experimentation:** Trying new tools and experimenting with new communication methods with the audience.
4. **Inspiration:** Drawing ideas from diverse and unconventional sources.
5. **Creative Problem Solving:** The ability to find innovative solutions to challenges encountered in any situation, such as how to attract audience attention or address fake news. From this, we can conclude that for video game users, creative thinking involves using imagination and creativity to solve problems and challenges within the game in unconventional ways. This means maximizing the use of tools and elements within the game to achieve goals in innovative and unexpected ways. In essence, creative thinking for players is about using imagination and innovation to overcome challenges and enjoy new,

unconventional approaches, thereby enhancing the gaming experience and making it more exciting and thrilling.

Therefore, creative thinking is a cognitive mental process where new ideas are generated based on previous cognitive experiences shaped through sensory or non-sensory experimentation to reach new solutions that align with the nature of the communication situation. This process is characterized by diversity and innovation in presenting ideas, which positively influences behaviors resulting from the information reception process. This process requires five essential elements:

1.Creative Individual: with Advanced Cognitive Skills and Abilities.

2.Creative Process: Information processing occurs in innovative ways.

3.Creative Environment: The environment where the creative process takes place.

4.Creative Output: Creative outputs resulting from the interactive creative process by the creative individual.

5.Creative Idea: An idea that arises from deep contemplation or through innovative thinking, characterized as new and innovative, offering something different or distinctive from what preceded it. Creative ideas often exceed familiar boundaries and involve renewal, improvement, or new uses of ideas or available technologies. Creative ideas typically entail aspects such as audience interaction, adding new value, and potential for future development or expansion.

4.2 Mechanisms of Artificial Intelligence and Their Relationship to Creative Thinking Skills:

If we aim to showcase the creative outputs or results among individuals, we must propose a set of methods and strategies that foster the development of creative thinking:(2004، غانم)

- **Creative Problem Solving Techniques:** Creative problem solving is a procedural methodology that mirrors the steps of traditional problem-solving. This strategy relies on several fundamental principles, the most important of which are:

- Identifying and Understanding the Problem Comprehensively: Thoroughly understanding the problem is essential.

- Processing the Problem and Developing Possible Solutions: Strategically addressing the problem to generate potential solutions.

- Evaluating and Selecting the Best Ideas and Solutions: Critically assessing the proposed solutions and choosing the most appropriate one.

- **Brainstorming Techniques:** Brainstorming involves looking at a problem in a new and creative way, relying on effective techniques to generate ideas and creativity. Widely used in various fields, including video games, this method aims to stimulate both individual and collective creative thinking to arrive at new and innovative solutions. Whether a player is seeking ways to enhance their gaming experience or is part of a game development team, brainstorming strategies for video games typically include:

- **Defining the goal:** For example, developing new strategies to overcome a difficult level, improve performance in a specific game, or create new features.

• **Suggesting ideas for game improvement:** Proposing enhancements by adding new features or modifying existing ones. Brainstorming can be divided into two types:

✓ **Individual brainstorming:** Where a player independently generates ideas on how to improve their gaming experience and strategies.

✓ **Group brainstorming:** in multiplayer scenarios, discussions and idea exchanges occur among players. Here, the saying "Share your ideas freely and encourage each other to innovate" becomes relevant.

To ensure the success of brainstorming strategies, adherence to certain principles is necessary:

-Encouraging creative ideas: thinking outside the box.

-Diversity in the team: including individuals with different experiences and backgrounds in the team.

-Maintaining a positive spirit: Creating a supportive and encouraging environment during brainstorming sessions.

Adhering to all required steps, from defining the goal or problem, preparing tools, generating ideas without criticism, organizing them, evaluating them, and then implementing the most suitable ones, ensures the success of brainstorming and leads to tangible results.

• **Morphological analysis technique:**

Morphological analysis systematically breaks down a problem into its fundamental elements. The different categories to which these elements belong are then identified. The individual connects these categories with potential methods and tools for

solving the problem. This analytical and synthetic approach helps explore diverse and creative solutions to the problem under study and enhances critical and innovative thinking in facing complex challenges. In the context of video games development and analysis, this strategy can be applied as follows:

✓ **Identifying the problem or goal:** defining the primary objective of the analysis, such as designing a new game level, improving an existing game, or solving a specific problem within the game.

✓ **Identifying the components:** listing all elements that make up the game or affect the identified problem. These components can include:

- Story and Plot: narrative, characters, historical background.
- Mechanics: gameplay system, rules, interaction with the environment.
- Graphics and Design: artistic style, designs, animations.
- Sound and Music: soundtrack, sound effects, voiceovers.
- Social Interaction: multiplayer features, interaction with other players, social elements and feedback.

✓ **Creating a morphological table:** constructing a table or matrix containing all possible components. These are placed in the left column of the table, while the possible values or options for each component are listed in the corresponding rows. For example: - Story or Plot: fictional, historical, war.

- Gameplay Mechanics: Strategy, combat, puzzles.
- Graphics: 2D, 3D, virtual reality.

- Sound: classical music, modern, war themes.

-Social Interaction: single-player, cooperative multiplayer, team-based multiplayer.

✓ **Exploring combinations:** for example: Historical war game + real-time battles + 3D graphics + electronic music + cooperative multiplayer.

✓ **Analyzing combinations:** evaluating the feasibility of the chosen combination, developing a prototype, and testing it with a group of players to gather feedback.

✓ **Choosing and Implementing the Most Promising Combination:** fully implementing the selected combination and refining it based on player tests and feedback. We can conclude that the morphological analysis strategy is a powerful tool that can be used in designing, developing, and playing video games to generate innovative ideas and effective creative solutions by:

-**Generating creative ideas:** encouraging out-of-the-box thinking by producing new and unconventional combinations.

-**Solving complex problems:** providing a means to view problems from different angles and breaking them down into manageable parts.

-**Enhancing Collaboration:** encouraging teamwork and fostering a cooperative spirit among players, whether opponents or team members.

• **Attribute Listing Technique:** attribute listing is a method aimed at generating ideas to improve or develop a product by identifying and listing its key characteristics. In the field of electronic games, attribute listing can significantly enhance

player experience and refine game features. Typically, attribute changes in the game, such as characters, objects, or environments, are made using programming languages like C++ or Python. Players can enrich and apply their creative ideas within the game by participating in attribute listing in various ways, especially in games that offer customization tools or support mods. Some methods include:

-Mods: many modern games support mods, allowing players to change or add new content. Players can use mod tools to alter in-game attributes. For example, in the game Skyrim, players can use mod tools to change everything from character appearances to fundamental game attributes.

-Configuration files: some games provide configuration files that players can edit to change attributes. These files can be in formats like JSON, XML, or INI.

-In-game tools: some games come with integrated mod tools that allow players to change attributes directly within the game. For example, Minecraft provides a creative mode where players can modify world and creature attributes as desired.

-Feedback and Suggestions: players can influence game development by providing feedback and suggestions to developers, which may lead to updates and modifications of game attributes. engaging players in attribute listing through mods, configuration file editing, in-game tools, and feedback can contribute to improving the gaming experience and aligning it more closely with player expectations and needs.

• **Assumptions and Contradictions Strategy:** this strategy uses

"What if" or "What if" questions to build what can be called a deep understanding of what exists or an abstract comprehension of the natural world and social order. Understanding is acquired by asking, "What if...?" Generally, this strategy is used in game design and involves players in creative thinking to improve quality and ensure the coherence and consistency of all game aspects. The strategy relies on identifying the fundamental assumptions behind game design, then looking for potential contradictions arising from these assumptions. The goal is to discover problems before they escalate into major issues affecting the player experience. Overall, creative thinking strategies adopted in electronic games aim to: (غانم م، 2004)

-Expanding perception: developing the ability to view matters from multiple perspectives and broadening the scope of understanding and awareness.

-Organizing information: Arranging and categorizing information in a logical and efficient manner.

-Solving problems: employing critical thinking in decision-making processes and enhancing problem-solving skills, enabling effective decisions through logical and creative thinking.

-Improving writing skills: developing and refining writing abilities

-Becoming Self-Confident.

-Building self-confidence and fostering a positive self-image.

-Creating a positive self-concept for the individual.

-Cultivating positive attitudes towards social interaction and

cooperation.

-Enhancing the sense of ethical responsibility.

5. Applications of Artificial Intelligence in Electronic Games and Their Relationship with the Development of Creative Thinking Skills An Analytical Perspective:

Contemporary electronic games, especially those connected to the internet, known as "online video games," rely on artificial intelligence (AI) technologies and applications that mimic human cognition and behavior within a highly accurate communication environment. This has made these games an important source of information and knowledge, in addition to fostering self-learning skills.

5.1 Theoretical Approach to Artificial Intelligence:

In this context, artificial intelligence can be defined as a modern cognitive science that officially began in the 1950s. (2009، ابراهيم) Many researchers and specialists have differed in defining artificial intelligence (AI), primarily due to the lack of precision in defining human intelligence itself. Consequently, it is not surprising that there is disagreement about the exact nature and definition of AI. As procedural concept, artificial intelligence can be defined as a branch of computer science aimed at developing computer systems capable of mimicking human cognitive abilities such as learning, creative thinking, planning, problem-solving, decision-making, understanding natural languages, and visual perception. AI relies on various techniques and methods, including neural networks, fuzzy logic, machine learning algorithms, reinforcement learning, deep learning, natural language processing, and more, to achieve these

objectives.

5.2 Characteristics and Advantages of Artificial Intelligence:

Among the notable advantages of artificial intelligence (AI) is its ability to process vast amounts of data in a short time with high accuracy, making it highly effective in completing complex tasks. AI is also characterized by its ability to learn and evolve over time, enhancing its capacity to provide innovative and creative solutions to problems. Additionally, AI is reliable in terms of continuity and stability in performing tasks without fatigue or deviation from the specified goal. The key characteristics of AI include:

- 1.The ability to Solve Complex Problems and Make Appropriate Decisions:AI can function effectively even with incomplete or missing information.
- 2.Higher Cognitive and Thinking Abilities:AI possesses advanced cognitive skills such as perception, creativity, inference, and logical reasoning.
- 3.Capacity to Acquire Knowledge: AI can learn from past experiences and apply this knowledge to new situations.
4. Rapid and Effective Response to Changing Situations: AI can efficiently handle difficult and complex scenarios characterized by a lack of information.
5. Understanding and Interpreting Visual Data: AI can recognize, analyze, and derive meaning from visual elements and images. Furthermore, AI-based intelligent systems exhibit several distinctive features:

➤ **Knowledge Representation Capability:** (مطاي، 2012) AI

applications have specialized mechanisms for representing information and knowledge in an organized structural manner, unlike traditional statistical programs. These knowledge structures include the following elements:

1. Facts: basic data and information related to the knowledge domain.
2. Relationships between Facts: describes the connections and interdependencies between different facts.
3. Rules: logical laws and principles that link relationships and govern the system's behavior.
4. Knowledge Base: a central repository that integrates all the aforementioned knowledge structures into a cohesive and interconnected system.

The ability to represent knowledge enables intelligent systems to handle information flexibly and adaptively, facilitating inference and deduction processes based on specified rules and relationships. This contrasts with traditional programs that rely on simple statistical data processing.

➤ **Utilizing an Optimistic Experimental Approach:** One distinguishing feature of AI programs is their ability to address problems for which no general solutions are known. This means they do not follow specific sequential steps to arrive at the correct solution. Instead, these programs choose a particular method that appears promising, retaining the ability to change the approach if the initial choice does not quickly lead to a solution. This approach focuses on "sufficient solutions," meaning obtaining satisfactory solutions rather than striving for

the optimal one. This enables the programs to effectively tackle complex issues that lack general solution methods.

➤ **Flexibility in Handling Incomplete or Fragmented Data:**

A notable advantage of AI is its ability to draw conclusions and suggest preliminary solutions even in the presence of incomplete or fragmented information. Although these conclusions may be less accurate or realistic compared to those derived from complete data, they allow intelligent systems to continue functioning and reach useful results in a timely manner. Moreover, it is important to note that some of these conclusions may be accurate despite the lack of data, especially in fields heavily reliant on rules and logic.

➤ **The ability for Continuous Learning:** The capacity for continuous learning and the ability to utilize prior experiences and knowledge are fundamental characteristics of modern artificial intelligence. This feature enables intelligent systems to continually enhance their performance by analyzing past mistakes and gaps, acquiring new knowledge, and is closely linked to the ability to generalize concepts and conclusions, draw parallels, and critically evaluate information to discard what is redundant or irrelevant. Thanks to this capability, AI can dynamically adapt and evolve, making it a powerful tool for addressing complex and ever-changing challenges. In the context of AI strategies in electronic games, the feature of continuous learning plays a pivotal role in developing creative thinking and enhancing the gaming experience. This can be explained as follows: In traditional games, the behaviors and strategies of intelligent systems are programmed in a fixed manner, making the competition limited and predictable after a period of practice.

However, with the introduction of machine learning techniques and learning-based AI, systems have become capable of analyzing gameplay patterns and player decisions, deriving new strategies and tactics. This ability for continuous learning imparts a degree of creative thinking and dynamic adaptation to intelligent systems. Instead of following the same pre-programmed pattern, AI can invent new playing methods and employ unexpected tactics, making the experience more challenging and engaging for players. Moreover, learning-based intelligent systems can learn from human players and emulate their creative methods and unconventional strategies, leading to greater diversity in playing styles and the creation of new challenges continuously. Therefore, the capacity for continuous learning in AI supports the development of creative thinking in video games by allowing intelligent systems to adapt and evolve dynamically, resulting in more exciting and unpredictable gaming experiences for players.

➤ **The Capacity for Reasoning and deduction:**

This ability is one of the fundamental features of artificial intelligence, enabling it to derive possible solutions to problems from available data and past experiences, particularly in situations where traditional known methods do not apply. Practically, this is achieved by storing all possible solutions in the computer, along with using logical inference rules and decision-making strategies. In the realm of video games, this technique is applied to make the game more challenging and engaging. Designers present problems to players and propose assumptions for solving them, offering levels of graduated

difficulty so that each player can select the level appropriate to their abilities. These games are programmed by feeding computers with intelligent systems that operate in specific environments according to certain theories.

This advancement in AI and its applications in video games has generated significant optimism among researchers, especially when these systems were applied in more realistic environments that use natural languages for human communication. This indicates the potential for developing intelligent systems capable of interacting and communicating in a more natural and human-like manner.(2021، الخولي)

5.3 Applications of Artificial Intelligence in Electronic Games:

- **Development of intelligent opponents:** Creating AI opponents capable of learning and adapting their strategies during gameplay, making the experience more challenging and exciting.
- **Cooperative learning systems:** Allowing human players to collaborate with AI to solve problems and overcome challenges.
- **Intelligent storytelling engines:** Adapting story content and events based on the player's decisions and actions.
- **Intelligent guidance systems:** Providing smart guidance and hints to players during gameplay based on their performance.
- **Realistic simulation techniques:** Using AI to simulate highly detailed and complex virtual worlds.
- **Human imitation learning techniques:** Enabling AI to learn from human players' gameplay styles to present more engaging challenges.
- **Procedural content generation:** Utilizing AI to dynamically

generate game content, such as level and area design.

5.3 Indicators of Creative Thinking Enhanced Through Electronic Games: to ensure the success of the communication process, the discourse used among individuals must be impactful, persuasive, and engaging. This can be achieved by incorporating various influential levels into the discourse, which can reveal prominent indicators of creative thinking among individuals using AI-enhanced electronic games. These indicators can be accessed through the following levels:

▪ **Cognitive Level:**

- Abundance of information and data density: Ensuring the presence of ample, often real and factual, information.
- Knowledge acquisition: Facilitating the exchange of knowledge and experiences among players, especially those from different countries.
- Development of creative thinking skills: Providing players with opportunities to find solutions to various problems, and the ability to connect real-world events with in-game scenarios, fostering flexibility and fluency of ideas.

▪ **Perceptual Level:**

- Representation of reality: Utilizing virtual worlds composed of objects, symbols, and models to enable individuals to understand and participate in these events virtually.
- Diversity of linguistic and Symbolic Codes: Employing various symbols and languages to help individuals understand the meaning and purpose of the communication message.

▪ **Communicative Level:**

-Effective communication skills: Employing a range of effective communication skills and creatively transmitting messages among players using diverse methods and multiple languages.

-Mastery of modern communication technologies: Ensuring proficiency in using modern communication technologies, which is essential for engaging in this type of electronic game.

▪ **Emotional-Affective Level:**

- Persuasion strategies: Utilizing social codes, statistics, and data at or after the end of each round, along with moral motivation mechanisms after victories or failures.

- Appeals: Employing various appeals such as fear-based threats, emotional appeals like musical effects after victories, and motivational phrases exchanged among players.

6. Conclusion:

The study's findings underscore the pivotal role that artificial intelligence plays in the realm of video games, significantly influencing players' creative thinking and problem-solving abilities. The dynamic and adaptive nature of AI-driven environments fosters an atmosphere where unconventional strategies can flourish, and innovative solutions are continuously pursued. Furthermore, the implications of these findings extend beyond gaming, suggesting that the principles and techniques derived from AI applications in video games can be effectively harnessed to enhance creative thinking across various domains, including education, business, sports, tourism, and history. This highlights the potential of AI not only as a tool for entertainment but also as a catalyst for broader cognitive and strategic

development. So The study concluded with a series of significant findings, which are summarized as follows:

1. The implementation of artificial intelligence (AI) strategies in video games enhances players' abilities to think outside the box and generate new and unconventional ideas by presenting unexpected challenges and scenarios that require creative solutions.
2. Machine learning techniques and artificial neural networks help virtual opponents in games adapt and learn from players' gameplay styles, motivating players to continuously develop novel and unfamiliar strategies.
3. AI-driven virtual gaming environments provide opportunities for players to practice creative thinking skills such as fluency, flexibility, and originality in safe and stimulating contexts.
4. AI technologies in games allow for the generation of dynamic content, stories, and constantly changing virtual worlds, requiring players to think in new ways and adapt to ever-changing situations.
5. Intelligent systems in video games can analyze players' thinking patterns and creative strategies, providing feedback and recommendations to improve their creative thinking skills.
6. Advanced interactions between players and intelligent systems enhance collaboration and cooperative thinking, leading to the exchange of creative ideas and the solving of problems in new ways.
7. Data and analytics derived from player behavior in video games can be used to develop new models and methods to foster

creative thinking in other fields such as education, business, sports, tourism, and history.

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