

# Micro duel: adaptation of the game Yu-Gi-Oh for teaching Microbiology

## Micro duelo: adaptação do jogo Yu-Gi-Oh para o ensino da Microbiologia

### Micro duelo: adaptación del juego Yu-Gi-Oh para la enseñanza de Microbiología

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#### RESUMO

**Objetivo:** Relatar a experiência de professores tutores e professores da Educação Básica, participantes do curso EAD Ensino de Ciências para a Promoção de Saúde na Escola Básica, na construção de um material didático-pedagógico para ser utilizado em sala de aula. Método: Para diversificar a rotina de aulas no ensino de Ciências e Biologia, direcionadas para alunos do ensino médio, os professores da Educação Básica que trabalharam os conteúdos do módulo de Saúde e Educação, desenvolveram um jogo de cartas que aborda a microbiologia, inspirado em Yu-Gi-Oh, uma série animada de mangá (histórias japonesas em quadrinhos), onde os jogadores usam cartas para duelar, em uma batalha simulada. Resultados: O material didático descreve os principais conceitos utilizados no jogo (duelo, pontos de vida, tipos de cartas etc.), as fases do duelo e os passos para iniciar o jogo. As cartas foram adaptadas para os assuntos abordados na microbiologia e continham nome do agente, tipo, descrição, atributo em cores, nível de ação em estrelas, número da carta e os pontos de ataque e de defesa. Conclusão: Espera-se estimular a interação e o aprendizado dos estudantes, através da aquisição de habilidades indispensáveis ao desenvolvimento intelectual e facilitação dos conceitos relacionados à microbiologia.

**Descritores:** Ensino de Ciências; Microbiologia; Material didático; Jogo de cartas; Yu-Gi-Oh.

#### ABSTRACT

**Objective:** Report the experience of tutors and Basic Education teachers, participants in the EAD course Teaching Science for Health Promotion in Basic Schools, in the construction of didactic-pedagogical material to be used in the classroom. Method: To diversify the routine of teaching Science and Biology classes, aimed at high school students, the Basic Education teachers who worked on the contents of the Health and Education module, developed a card game that addresses microbiology, inspired by Yu-Gi-Oh, an animated manga series (Japanese comic books), where players use cards to duel in a simulated battle. Results: The teaching material describes the main concepts used in the game (duel, life points, types of cards, etc.), the phases of the duel and the steps to start the game. The cards were adapted to the subjects covered in microbiology and contained the agent's name, type, description, attribute in colors, action level in stars, card number and attack and defense points. Conclusion: It is expected to stimulate student interaction and learning, through the acquisition of skills essential for intellectual development and facilitation of concepts related to microbiology.

**Descriptors:** Science teaching; Microbiology; Courseware; Card Game; Yu-Gi-Oh.

#### RESUMEN

**Objetivo:** Reportar la experiencia de tutores y docentes de Educación Básica, participantes del curso EAD Enseñanza de Ciencias para la Promoción de la Salud en Escuelas Básicas, en la construcción de material didáctico-pedagógico para ser utilizado en aula. Método: Para diversificar la rutina de enseñanza de las clases de Ciencias y Biología, dirigidas a estudiantes de secundaria, los docentes de Educación Básica que trabajaron los contenidos Salud y Educación desarrollaron un juego de cartas que aborda la microbiología, inspirado en Yu-Gi-Oh, una serie animada de manga (cómic japoneses), donde los jugadores usan cartas para batirse en duelo en una batalla simulada. Resultados: El material didáctico describe los principales conceptos utilizados en el juego (duelo, puntos de vida, tipos de cartas, etc.), las fases del duelo y los pasos para iniciar el juego. Las tarjetas estaban adaptadas a los temas tratados en microbiología y contenían el nombre del agente, tipo, descripción, atributo en colores, nivel de acción en estrellas, número de tarjeta y puntos de ataque y defensa. Conclusión: Se espera estimular la interacción y el aprendizaje de los estudiantes, a través de la adquisición de habilidades esenciales para el desarrollo intelectual y la facilitación de conceptos relacionados con la microbiología.

**Descriptor:** Enseñanza de las Ciencias; Microbiología; Material didáctico; Juego de cartas Yu-Gi-Oh.

## Introduction

The teaching of Science in Basic Education faces didactic difficulties, as many contents become complex and abstract due to the absence of adequate didactic-pedagogical materials. This factor generates demotivation in students and makes the teaching of Biology inefficient.<sup>1</sup> Thus, the school is, without a doubt, one of those responsible for the insertion of scientific language in society and in the field of natural sciences.

In basic education, working on this issue has been a challenge. Teachers are daily invited to seek strategies to motivate their students' learning, either because the contents are associated with the memorization of concepts that, most of the time, are disconnected from the student's daily life, or because of the teaching methods and means, combined with the absence of material resources and infrastructure such as laboratories, microscopes, magnifying glasses and other elements that enable the existence of practical classes for the contextualization of what is studied in theory. The teaching of Biology in High School is indispensable to form citizens with environmental awareness and ensure that they learn the concepts about all forms of life and their relationships with the environment. To this end, this training must be based on classes that instigate curiosity and autonomy, enabling the student to seek to think about their own concepts in line with their reality. This search goes through knowledge of Biology, which is the Science that studies life, the interaction of living beings with each other and with the environment.<sup>2,3</sup>

Biology encompasses everything from microscopic organisms to the largest living beings on the planet, be they fungi, viruses, bacteria, protozoa and helminths. Some of these microorganisms are important public health problems and the lack of information has contributed to the maintenance and spread of diseases caused by these beings. Therefore, it is necessary that a participatory and playful approach be carried out, especially for those who are now being introduced to this theme, mainly due to the complexity of its contents. In this way, didactic games can be great allies in terms of stimulating students' interest and being used as a didactic resource to facilitate assimilation and help learning in the classroom, in a light and fun way.<sup>4</sup> The purpose of this study was to report the experience of tutor teachers and Basic Education teachers, who participated in the distance learning course Science Teaching for Health Promotion in Basic Education, in 2022, in the construction of a pedagogical didactic material to be used in the classroom, contemplating the contents of module 2, Health and Education: from micro to macro. The Basic Education teachers elaborated, under the guidance of the tutor teachers, a didactic game based on the anime (animation produced in Japan) Yu-Gi-Oh, with the objective of diversifying the classroom routine in the teaching of Microbiology, stimulating the interaction and learning of students with the use of the game that addresses themes about viruses, fungi and bacteria. Inspired by an animated manga series (Japanese comic books). The didactic material was designed to serve high school students (from 1st to 3rd grade), in an age range ranging from 14 to 18 years old.

In this sense, this study aimed to diversify the classroom routine in the teaching of Science and Biology, stimulating interaction and learning with the use of the card game that addresses microbiology, inspired by Yu-Gi-Oh, an

animated manga series, where players use cards for a "duel" among themselves, in a simulated battle.

## Method

The proposed didactic game is an adaptation of Yu-Gi-Oh, a manga game, based on comic books originating in Japan that involves a fictional card game called Duel Monsters where each player uses cards for a "duel" against each other, in a simulated duel battle of "monsters". The game was designed for the study of microbiology, presenting the main concepts used in theoretical classes. The cards used were adapted and contained, the name of the agent (example: SARs-COV-2), type (enveloped virus), description (contagious to humans and causes COVID-19), attribute in colors (virus, blue color, bacteria, red color and fungus, green color), action level with stars (the more stars the stronger the agent's action potential), the card number and the number of attack and defense points. Below are described the main concepts, the types of cards and the rules of the game.

### 1. Game Concepts

#### 1.1 Duel

It's the battle itself, which takes place between two players. It concerns the process of attack and defense and the result of this.

#### 1.2 Hit Points (HP)

It is the value to be maintained in order to win the game. Each Duelist starts a Duel with 5000 HP.

1.2.1 You win a Duel if you reduce your opponent's HP to 0 (zero), if your opponent is unable to draw a card, or if a card's special effect says you have won. If you and your opponent reach 0 (zero) HP at the same time, the duel is declared a draw.

#### 1.3 Deck

It is a set consisting of 50 cards. In it will be the types of cards agent, prophylaxis, defense cells and effect.

#### 1.4 Types of cards

1.4.1 *Agent chart* (Figure 1): virus (blue attribute), bacterium (red attribute), fungus (green attribute).



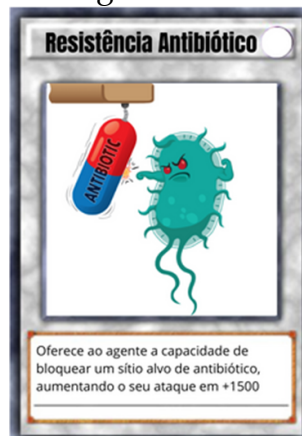
**Figure 1.** Examples of agent cards used in the game Yu-Gi-Oh, adapted for Microbiology.

1.4.2 *Prophylaxis card* (Figure 2): these are cards that act as auxiliaries to the defense cards, increasing their points against the agent's cards.



**Figure 2.** Examples of prophylaxis cards used in the game Yu-Gi-Oh, adapted for Microbiology.

1.4.3 *Effect card* (Figure 3): cards that give some additional score to the other cards.



**Figure 3-** Example of an effect card used in the game Yu-Gi-Oh, adapted for Microbiology.

1.4.4 *Defense cell card* (Figure 4): represent defense and can only attack agents, or defend themselves from them, are positioned in the same space reserved for the agent on the dueling mat.



**Figure 4-** Example of a defense cell card used in the game Yu-Gi-Oh, adapted for Microbiology.

### 1.5 Calling a card and attacking

To call is to place the card on the dueling mat face up. Attacking is the process in which the agent card attacks the opponent.

### 1.6 Damage

This is when players lose HP.

### 1.7 Cemetery

It is the place where all the cards that come out of the dueling mat are deposited after the battle phase.

### 1.8 Attribute

Each type of card will have a different color for the attribute (ball in the upper right corner - Figure 1). The attribute is what explains variations within the same type of card: the virus agent has a blue attribute, the bacterial agent has a red attribute and the fungus agent has a green attribute.

### 1.9 Agent Cards and Effect

They feature stars that represent the level of action. The more stars, the stronger the card's action potential.

## 2. Duel Phases

### 2.1 Initial phase of the first round of the duel

In this step, players take five cards from the top of the deck and place them in their hands, with the main face facing themselves and the face facing the opponent, so that they don't see their arsenal.

The player who is going to start, lowers one of his cards in order to damage the opponent. After the initial player's introduction, the opponent presents his defense (defense cell card) in order to minimize the other player's damage when attacking.

2.1.1 *Drawing card(s) for the remaining turns:* After each turn, players must draw card(s) from the top of the deck always to complete five cards in hand.

### 2.2 Support

The effect cards and the prophylaxis cards empower the agent and defense cards, respectively, increasing their damage power (agent) or decreasing their damage (defense). The effect or prophylaxis cards must be used in conjunction with the agent or defense cards in the same turn. For example, the Macr letter.

### **2.3 Main Phase**

This is the phase where the player uses most of his cards: you can download an agent or defense card and activate effect and prophylaxis cards. These actions can be done in any order you want.

2.3.1 Calling or Lowering a Defense Agent/Cells: You can only download an agent or defense cell card once per turn. The defense cell card must be put down after the opponent puts down the attack (agent) card.

2.3.2 Activate a prophylaxis or effect card: You can activate effect or prophylaxis cards or the effect of agent/defense or prophylaxis cards as many times as you want during this phase and your round.

### **2.4 Battle Phase**

It's time to battle it out with your agent cards and defense cells! This phase is divided into stages. Players need to conduct their battle phase every turn, and a turn is made up of their attacking action, followed by the opponent's defense action. Players can also activate effect and prophylaxis cards in their attack round.

2.4.1 *Battle Start Stage*: The turn player should announce: "I'm entering the battle stage". Remember, the player who starts the duel cannot conduct his attack phase during his first turn (this phase is only for picking up the cards in the deck).

2.4.2 *Battle stage*: The goal is to lower the opponent's hit point. To do this, one of the players must select an agent card with which they want to attack. He must present the card that is going to attack the opponent directly. The opponent must present the card to defend himself. After that, proceed to the damage stage.

Agent cards attack, and only defense cards can be used as defense.

When the attacking player does not have an agent card in his hand, he must discard one of the cards and will not cause damage to the opponent. However, the opponent can use a defense card to deduct the HP of the attacking player. Similarly, if the player being attacked has no defense cards, they must discard a card and take all damage from the opponent's attack card.

2.4.3 *Damage Stage*: In this stage, players calculate the outcome of the battle and any resulting damage. Damage is calculated by the difference between the values of the attack subtracted by the value of the defense. The value of the difference is deducted from the opponent's hit points. If the value of the opponent's defense is higher than that of the attacker, the difference is deducted from the attacker's life points.

2.4.4 *Final stage*: After resolving the damage, which is calculated as per item 2.4.3, the player announces to his opponent that he is finishing the battle phase.

2.4.5 The attacking player must "draw" cards in the deck to replace the five cards in hand.

### **2.5 Result**

After the battle, both attacked and defended cards - the player's and their opponent's - must be removed from the field and sent to the graveyard.

## 2.6 Finals

The winner of the game is the one who manages to "zero" the opponent's points.

## 3. Steps to get started

3.1 Give the deck to the opponent to shuffle;

3.2 Cut the deck and position it on the dueling mat;

3.3 By draw, the winner chooses to start or not;

3.4 Draw 5 (five) cards from the top of the deck: This is the initial round.

3.5 Start the game!

## Results and Discussion

The proposal of the didactic material in the form of the Yu-Gi-Oh game, built by the Basic Education teachers, is exemplified in Figures 1-4. In this same format, in addition to the Microbiology theme, other themes can be adapted to this same game dynamic. The initial idea is that it is applied within the time of one hour class, providing students with a different learning experience that is dynamic, interactive and playful.

The initial and continuing education of teachers is one of the priorities in Brazilian education in the 21st century. It is recognized that successful learning results from pedagogical practices that involve the teacher and motivate the student.<sup>5</sup> This paper reports the experience of Basic Education teachers who participated in the distance learning course Science Teaching for Health Promotion in Basic School, who worked on the content of Module 2: Health and Education: from micro to macro. As a final product, to be used in the classroom, the author teachers developed a card game that addresses Microbiology, inspired by the anime Yu-Gi-Oh, an animated manga series, originating in Japan, where players use cards for a "duel" among themselves, in a simulated battle.

The use of didactic games is an interesting way to propose problems, as they allow them to be presented in an attractive way and favor creativity in the elaboration of solving strategies and search for solutions to work on the contents of Science and Biology. Santos<sup>6</sup> reinforces the importance of this didactic strategy in the school environment by saying that the game: [...] can facilitate the work of the education professional, arousing the interest of the child or adolescent in the proposed activities.

The insertion of a game during classes needs to be present in the teacher's planning so that it is not considered as a pastime without a pedagogical purpose. According to Messeder Neto<sup>7</sup>, games should not only aim at mobilizing and interested students, but also use this potential to teach.

The use of didactic games in the teaching of Science and Biology becomes a possibility to give new meaning to the teaching of this area of knowledge in a gradual way, complementing the methodologies used by teachers and enhancing the moments of learning scientific knowledge.<sup>7,8</sup> Pinto<sup>9</sup> argues about the potential of didactic games in science teaching, when he says that "the use of didactic games in science teaching is an effective strategy, because it creates an atmosphere of motivation that allows the student to actively participate in the teaching-learning process." As the content of Biology is broad, comprising a great diversity of living beings (from micro to macro), be they fungi, viruses, bacteria,

protozoa and helminths, the use of the proposed game can be worked to address this diversity of themes, such as the theme Microbiology, chosen by Basic Education teachers in the construction of this methodology. The participation of students during the game increases interest and motivation on the topic, in addition to facilitating the assimilation of concepts by stimulating the cognitive process, allowing the expression of opinions, clarification of concepts, thus reinforcing learning. Finally, it is recognized that active methodologies, which are premised on the articulation of theory with practice, reality and contextualization, make the student the protagonist of their development and the construction of their knowledge.<sup>2</sup>

The potential of the Yu-Gi-Oh game for learning other content has already been reported in other areas, such as mathematical content<sup>10,11</sup> and in the teaching of chemistry.<sup>12</sup> According to Lima Filho & Carvalho<sup>11</sup>, Yu-Gi-Oh is a commercial game where it is clear that its ability is only fun, because to play it is necessary to have a good additive and logical mastery. where each duel can bring a great exercise to those involved and this can and should be explored in education. In a social context where new technologies emerge daily, they cannot be far from socialization environments and schools, since student engagement is greater when something playful is proposed as a learning strategy.

Taking advantage of the students' taste for cards, for example, it is possible to use this resource as proposed to contribute to learning in a playful and fun way, thus developing in the student dynamism, the strategy of the best decision to be made in different situations, in addition to stimulating healthy competition, both in victory and defeat.<sup>10</sup>

It is expected that the benefits obtained through the use of this game as a pedagogical tool will be able to allow the student the possibility of acquiring skills indispensable to a good intellectual development, allowing the stimulation and facilitation of learning about concepts related to Microbiology.

## **Conclusion**

The game "Micro duel: adaptation of the Yu-Gi-Oh game for the teaching of Microbiology" has a great capacity to streamline the teaching and learning process. It is possible to notice its relevance with regard to the breaking of the paradigms of expository classes, in addition to its positive participation in the fixation of contents, creation of revisional moments, possibility of teamwork, in addition to the creation of a healthy atmosphere of competition, which helps in learning and, consequently, in the formation of individuals.

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