VENOMOUS TRAIL: A PEDAGOGICAL GAME FOR SCIENCE TEACHING

TRILHA PEÇONHENTA: UM JOGO PEDAGÓGICO PARA O ENSINO DE CIÊNCIAS

SENDERO VENENOSO: UN JUEGO PEDAGÓGICO PARA LA ENSEÑA DE CIENCIAS

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ABSTRACT: Accidents caused by venomous animals are a serious public health problem, especially in tropical countries. Therefore, deepening the knowledge about these animals and disseminate information through educational processes can be a way to prevent accidents and assist in raising students' awareness that all animals, including venomous ones, are of great importance for ecological balance. The objective of this work is to use and evaluate the effects of applying a game as a didactic resource in the classroom, aiming at the discussion and reflection on the identification of venomous animals and the prevention of accidents. This research is part of a study that was developed with students of the 7th year of elementary school, from a state school, located in the Rural Zone of the municipality of Santa Maria (RS), from October 2014 to July 2015. The data analysis was done in a qualitative way, and for the collection of these, the answers given by the students during the game were used, in addition to the conversation wheel. The results obtained showed that the teaching about venomous animals was favored by the use of the didactic game entitled "Venomous trail", because the students became multipliers of correct information, not only during the activity, but with their relatives and people around them, thus reducing the number of accidents involving humans and venomous animals.

KEYWORDS: Educational game. Rural school. Accident preventions.

RESUMO: *Os acidentes causados por animais peçonhentos constituem grave problema de saúde pública, sobretudo em países tropicais. Sendo assim, aprofundar o conhecimento sobre eles e difundir informações por processos educacionais pode ser um caminho para prevenir acidentes e auxiliar na sensibilização dos estudantes, de que todos os animais, inclusive os peçonhentos, são de suma importância para o equilíbrio ecológico. O objetivo desse trabalho foi avaliar os efeitos da aplicação de um jogo como recurso didático em sala de aula, visando a discussão e a reflexão sobre a identificação dos animais peçonhentos e prevenção de acidentes. Essa pesquisa é parte de um estudo que foi desenvolvido com estudantes do 7° ano, de uma escola estadual, no município de Santa Maria (RS), no período de outubro de 2014 a julho 2015. A análise dos dados foi qualitativa, e para a coleta destes utilizou-se as respostas dadas pelos estudantes durante o jogo, além de roda de conversa. Os resultados obtidos evidenciaram que o ensino sobre animais peçonhentos foi favorecido pelo uso do jogo didático intitulado "Trilha peçonhenta", pois os educandos tornam-se multiplicadores de informações corretas, não somente durante a atividade, mas com seus familiares e pessoas do seu convívio, podendo diminuir, assim, o número de acidentes envolvendo o ser humano e os animais peçonhentos.*

PALAVRAS-CHAVE: *Jogo didático. Escola rural. Prevenção de acidentes.*

RESUMEN: *Los accidentes provocados por animales venenosos son un grave problema de salud pública, sobre todo en países tropicales. De esta forma, profundizar el conocimiento sobre ellos y propagar informaciones por medio de procesos educacionales puede ser un camino para prevenir accidentes y contribuir para la sensibilización de los estudiantes, de que todos los animales, incluso los venenosos, son muy importantes para el equilibrio ecológico. El objetivo de ese trabajo fue evaluar los efectos de la aplicación de un juego como recurso didáctico en clases, proponiendo la discusión y reflexión sobre la identificación de animales venenosos y la consecuente prevención de accidentes. Esa investigación forma parte de un estudio que fue desarrollado con estudiantes del 7° año, de una escuela estadual, en la ciudad de Santa Maria (RS), en el período de octubre de 2015 hasta julio de 2015. El análisis de los*

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datos fue cualitativo, y la recolección de esos se utilizó las respuestas de los estudiantes, mientras el juego se desarrollaba. Los resultados evidenciaron que la enseñanza sobre animales venenosos fue productiva por medio del juego "Sendero Venenoso", pues los educandos se convirtieron multiplicadores de informaciones correctas, no solamente durante la actividad, sino también con sus familias y personas de su convivio, lo que puede contribuir para la diminución de accidentes entre el ser humano y los animales venenosos.

***PALABRAS CLAVE**: Juego didáctico. Escuela rural. Prevención de accidentes.*

Introduction

In Brazil, due to the high frequency and severity of cases, the Ministry of Health has incorporated accidents caused by venomous animals into the National List of Compulsory Notification of Diseases and Public Health Events (BAHIA, 2019). It is known that the control of these accidents is based on prevention, emergency care and rehabilitation of the victim, and prevention is undoubtedly the most important item (SCHVARTSMAN, 2003)**,** something that is only possible when one has knowledge about the subject.

Busquets and Leal (1998) suggest that teaching for accident prevention could be included in school curricula, being part of children's daily activities, such as during the production of texts. Since having knowledge about the subject is extremely important, since most land accidents occur around homes and schools (ALONSO *et al.,* 2006; ANDRADE; JORGE, 2001). In addition, education professionals themselves consider the school as an appropriate place for the development of educational actions aimed at the prevention of childhood accidents (GONSALES; GIMENIZ-PASCHOAL, 2007). And accident prevention activities carried out in school institutions seem to have a good result in several studies (ANDRAUS *et al*., 2005; FREDERICK *et al*., 2000; GONSALES, 2008).

Work with accident prevention in schools is also recommended by the Ministry of Education, which recommends that information be made available to students, and they are able to "know and avoid the main risks of accidents in the domestic environment, at school and in other public places" (BRASIL, 1997, p. 117, our translation).

The National Curriculum Framework for Early Childhood Education (BRASIL, 1998) also points out the importance of teachers assisting students in identifying situations of risk for accidents. This happens in the rural area, because it is a place of little movement and because they are areas away from large urban centers, where there are few investments in relation to sanitation and physical structures. In the hollow so where there are easily agglomerations of

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rubble, wood debris and accumulation of food, consequently, attract venomous animals (BRASIL, 2009).

In this sense, deepening knowledge about venomous animals and disseminating information through educational processes can be a way to prevent accidents and assist in raising public awareness, that all animals, including venomous and poisonous, are part of the biological chain, and that each has a function and importance in ecological balance (SATO; PASSOS, 2002).

Thus, Freire (2004) proposes the construction of a teaching material that dialogues with the students and their realities, so that they present autonomous thought and learning. In this sense, the use of didactic resources, different from those traditionally used, is a valid alternative to leverage the teaching-learning process (PALHETA JUNIOR *et al*., 2018). For Araújo (2014), the use of varied resources facilitates the understanding of the contents, adding strength in the constant search for students' learning, thus ensuring quality teaching.

The use of games as an educational resource is important, since the child is motivated to learn the contents of the disciplines (CARBO *et al*., 2019). In addition, they have some advantages, such as the introduction and development of concepts that are difficult to understand; the active participation of the student in the construction of his own knowledge; socialization between students and awareness of teamwork (GRANDO, 2001).

Stortti and Pinhão (2007), also state that the games allow the recognition and understanding of rules, the identification of the contexts in which they are being used and the invention of new contexts for the modification of these. In addition, it is also a motivating activity, with a view to a more significant learning for the student and that can attribute meaning to the knowledge worked (BUENO *et al*., 2018). According to Gomes and Friedrich (2001), the didactic game is used to achieve certain pedagogical objectives, being an alternative to improve the performance of students in some difficult-to-learn content.

In this context, the objective of this work was to use and evaluate the effects of the application of a game as a didactic resource in the classroom, aiming at discussion and reflection on the identification of venomous animals and accident prevention.

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Materials and Methods

This work is part of a master's research that was developed at the State School located in the Rural Zone of the municipality of Santa Maria, central region of the state of Rio Grande do Sul - Brazil. Prior to the use of the didactic game, the students participated in an exhibition class on venomous animals and, in a second moment, a practical class with specimens of the main species of venomous animals of Rio Grande do Sul, however, the emphasis of this work is given only to the third moment of the research.

As subjects of the research, the students of the 7th year of the Final Years of Elementary School participated, in a total of 10 students, and this occurred in the first half of May 2015. The theme for the development of this game is due to the content living beings and, consequently, the subject reptiles, arachnids and insects, which are addressed at this stage of the teaching of basic education, thus justifying the choice by the 7th year. Regarding ethical aspects, this research project was reviewed and approved by the Ethics and Research Committee of the Federal University of Santa Maria (UFSM), with the number CAAE 58113416.0.0000.5346.

For data collection, the students' answers were used during the game and then a conversation wheel was performed. This is a discussion focused on specific topics in which participants are encouraged to express opinions on the topic of interest (IERVOLINO; PELICIONI, 2001). According to Melo and Cruz (2014, p. 31-39), the opinions expressed in these Conversation Wheels are 'speeches' on certain topics discussed by the participants, without the concern with the establishment of a consensus, and opinions may converge or diverge, provoking debate and controversy. With the filming, we can reproduce the fluency of the process researched, see aspects of what was taught and seized, observe points that are often not perceived in the heat of the moment (BELEI *et al*., 2008, p. 30).

The activities that make up this study were analyzed qualitatively. According to Minayo (2001), qualitative research works with the universe of meanings, motives, aspirations, beliefs, values and attitudes, which corresponds to a deeper space of relationships, processes and phenomena that cannot be reduced to the operationalization of variables.

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Preparation, assembly and execution of the venomous trail

The elaborate didactic game was titled "Venomous Trail". The trail was divided into two parts, named: Track A and Track B; each was approximately 4m x 0.50cm wide. Each of these parts was numbered from one to 10, then arriving at the piece that represented the end. The trail called "A", instead of presenting the numbers two, six and eight, featured the words "keep an eye on" the words, while track "B" presented, in place of numbers one and three, the words "keep an eye on".

For the preparation of this trail, the following materials were used: 20 sheets of Ethyl Vinyl Acetate (EVA) blue, three orange EVA sheets, 10 yellow EVA sheets, four black EVA sheets, two sheets of red EVA, 20 sheets of cardboard, four meters of brown paper, 15 hot glue sticks, a hot glue gun, ruler, pencil, eraser, scissors. A sketch was made on a cardboard of what the trail would look like, with the draft of all questions; in a second moment, from the drawing of the trail, this was then built. The 20 blue EVA sheets were glued to each other until they formed the trail, plus an orange EVA leaf at the beginning of each trail and, under neath all these leaves, sheets of cardboard paper were glued for a better resistance of the EVA. Then, the numbers and letters were drawn, measuring five centimeters wide by 10 in length in cardboard paper and these served as templates for the final design of the EVA. The letters were drawn and cut into the yellow EVA, while the numbers, on the red EVA, and glued with hot glue to the EVA sheets that formed the trail. For the division of each track number, strips three centimeters wide by 50 lengths of black EVA were glued (Figure 1).

Figure 1 – Assembly of the "Venomous Trail"

Source: The authors (2021)

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After the completion of the preparation of the trail, 20 questions were printed, one in each rectangle that measured eight centimeters wide by 15 centimeters in length. And rectangles were used as game chips. In addition to the tokens, five sheets of craft were printed, all with colored figures. The first of them contained images of venomous and poisonous animals; the second, in turn, with correct and incorrect attitudes in the event of an ophidian accident; the third, with films about venomous animals; the fourth, with scorpions of medical interest and others harmless and finally one last, with the body parts of a snake.

The class was divided by draw into group A and group B, and each group chose a representative to walk the trail. The students positioned themselves at the beginning of the trail and then the game began. Each member of the group could collaborate with their representative to resolve the questions that were asked and, at any time in the game, the representatives could be replaced by another of the same group. The group who answered all the questions and challenges correctly, thus reaching the end of the trail, won the game.

Findings

Two weeks after the practical class with the main species of venomous animals of RS, the class participated in the game entitled "Venomous Trail" (Figure 2). This was elaborated and applied with the objective of making the theme 'venomous animals' more pleasant and fun, thus clarifying, through the ludicity, the doubts not yet addressed.

Figure 2 – Students participating in the game "Venomous Trail"

Source: The authors (2021)

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On this day, there were 10 students in the class and these were separated into two groups through a raffle; then, one group was called "A" and the other "B". The members of each group met to discuss the answers to the questions asked by the researcher, and these did not take more than five minutes to give the answer and thus advance a number on the trail. Table 1 selects the main questions of the didactic game and answers given by the students. After the end of the game, before the end of the activity, the two teams were assembled, starting a conversation wheel with discussions about the questions and answers given by the students during the performance of the game.

Table 11 – Key questions and answers given by students during the game

Number	Questions	Group responses
01	OPEN YOUR EYES You and your younger brother watched the films Anaconda and Damn Spiders represented by the images below. Your brother was horrified by what he saw and very afraid of these animals. You who had already participated in the theoretical and practical class on venomous animals can calm you by telling you the truth about these animals. What was the explanation?	What was shown in the films did not exist that the snakes do not attack if the person did not get close, that the spiders in the film were crabs and that did not cause serious accidents because the one that caused serious accident, liked the dark and was small and known as brown spider.
02	OPEN YOUR EYES With the exception of true coral, which(s) of the characteristic(s) below is found exclusively in venomous snakes? a) Slit-shaped pupil b) Triangular head c) Hole between eye and nose d) Tail that thins sharply e) Triangular scales	The group marked the letter "C" and got it right.
03	OPEN YOUR EYES Look at the images and circle only those of venomous snakes.	Two of the five images were venomous snakes. They identified by the presence of the loreal pit and settled the question.
04	Do all venomous snakes have loreal pit (hole located between the eye and the nose)? Explain.	All except the real coral have loreal pit.

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05	OPEN YOUR EYES During the weekend fishing with his father and his uncles. One of his uncles was bitten by a venomous serpent. Circle the images below that indicate the correct procedures to be performed.	Of the seven images they circled three and got it right. - Take to the hospital; - Load the injured; - Wash the affected place with soap and water;
06	Some simple attitudes can prevent snake accidents. Name at least three.	Wear gloves and boots and do not put your hand in holes, especially rural workers.
07	Is it true that snakes stick their tongues out and in when they get angry and want to sting a person? Explain.	No. They do it to smell.
08	OPEN YOUR EYES Observe the images and circulate only those that are from scorpions that have very toxic poison to humans.	From six images the students circled three and settled the question.
09	Are snakes important in nature? Explain.	Yes. Without them I wouldn't have crops and there'd be a lot of rats transmitting diseases, besides producing drugs with their poison.
10	Many people confuse the wood spider with the garden spider. Through a feature found in the garden spider we can differentiate them. What is this characteristic?	Students confuse each other and cannot remember what the characteristic would be.

Source: The authors (2021)

Discussion of results

On the theme "snakes", we chose for discussion the answers to the questions that students could only outsource correctly during the game. In this sense, questions number two and number three, which were related to the identification of venomous snakes, and question number nine, which dealt with the importance of snakes in nature, were listed, since in the previous stages, during the exhibition class and the practical class, several students were still confused when asked about these subjects.

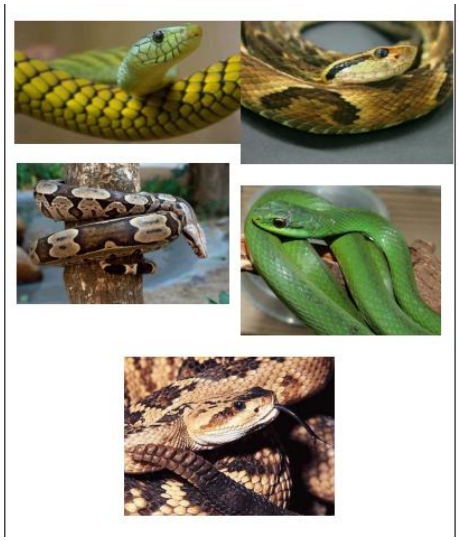
According to Cabrera (2007, p. 30, our translation), "[...] the playful creates relaxed, favors involvement and flow, conditions that are necessary to establish the climate for learning in search of positive results" exactly as happened while the students participated in the venomous trail and in which they correctly matched the correct characteristics of a venomous snake. In addition, Oliveira and Soares (2005) and Maluf (2012) report that an excellent

alternative to facilitate the student's teaching-learning is to relate the content that was worked in the class with issues that can be experienced in the individual's daily life. Therefore, it is of central importance for students living in the rural area to identify the main species of venomous snakes that occur in this environment, which would probably lead to a decrease in the mortality of these animals.

Most students still mistakenly believed that features such as the shape of the head, the type of pupil, the thickness of the tail and even the shape of the scales are morphological structures that easily differentiate a venomous snake found in Brazil from a non-venomous one. These physical characteristics mentioned "[...] were imported from Portugal as a way of differentiating venomous and non-venomous snakes there, thus not proving to be efficient for Brazilian species" (COSENDEY; SOLOMON, 2013, p. 5, our translation).

Currently, there are non-venomous snakes with triangular head, while there are venomous snakes in which the head does not stand out from the body (SILVA; BOCHNER; GIMÉNEZ, 2011). In addition, there are many species of arboreal and non-venomous snakes that have the round pupil while the true corals, which are venomous, also possess it. Thus, the use of educational resources such as educational games can be an effective tool to assist students in the correct identification of these animals. Still with regard to the differentiation between a venomous and non-venomous snake, we noticed that during the discussions related to question number three of the didactic game, the students debated each other and got the answer right. The students indicated only the images of the snakes that presented the loreal pit and also explained that the true coral was an exception (Figure 3).

Figure 3 – Images of snakes used in the game "Venomous Trail"



Source: Google Images (2021)

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The orifice with thermal perception function, located between the eye and the nose, which was formerly called the lacrimal pit, now called the loreal pit, is the most easily determinant factor in the identification of a venomous snake, with the exception of the true coral (SILVA; BOCHNER; GIMÉNEZ, 2011). Cavalcanti and Soares (2010) highlight that the use of games and playful activities allow evaluating or diagnosing conceptual difficulties in certain contents, enabling the exchange of ideas, as well as correcting evidenced flaws.

Also, in relation to snakes, the negative conceptions were modified throughout the research, because when the students participated in the game, they answered correctly question number nine, referring to the importance of snakes in nature. In addition, during the conversation wheel, students explained about the ecological imbalance that could be caused if snakes were decimated from the planet. Moura *et al*. (2010, p. 133-142, our translation) state that "snakes are important for maintaining the national ecological balance, and consequently the numerical decline of their populations, or even their extinction, are related to the increase in the number of disease-vector animals, such as rodents". Corroborating Fialho (2007) and Robaina (2008), they report the importance of games to make classes more interactive, dynamic, interesting to students, improving participation and interaction.

When playful situations, such as the use of didactic games, are created by the teacher, aiming to stimulate learning, the educational dimension is revealed (SZUNDY, 2005). Thus, the educator needs to assume his effective role as a social modifier, capable of proposing changes that awaken in the student the desire to learn and seek new knowledge, besides giving him/her conditions to acquire it in a pleasant and pleasurable way, exploring situations consistent with the reality of daily life (FREITAS *et al*., 2013). In addition, the game serves as an evaluative instrument, where, through it, the student can perceive whether the contents were actually assimilated, if his learning was consistent with the intended (SILVA; AMARAL, 2011).

Regarding question number 10, when students should recognize the wood spider and differentiate it from the garden spider, there were some misconceptions, as the students recognized the garden spider as the wood spider. This issue led to a great discussion during the conversation wheel, as many were still confused in the identification of these spiders. Wood spiders have a highly toxic poison and can reach up to five centimeters in body length and 15 centimeters in wingspan. The coloration is brown or dark gray, with brown hair on the legs and abdomen and back of the abdomen with a series of pairs of light spots (BRASIL, 2001). Unlike the garden spider, which has the design of an arrow or arrow clearly visible on the back of the

abdomen and are found more frequently, but they are not a public health problem, because its poison is little active for humans, requiring no medical care (CARDOSO *et al*., 2003). However, the symptoms of poisoning caused by the wood spider are characterized by severe pain and irradiation, and tachycardia may also occur (CARDOSO *et al*., 2003). In addition, because they have a higher risk of developing systemic manifestations of poisoning, children and the elderly need to be observed for at least 6 hours after the accident (BURINI, 2011).

When it is outdoors, the spider is used to shelter in rubble, building materials, firewood, logs, straws, plants, banana trees, etc. (ZANNIN, 2002). Therefore, it is more likely that the accident will occur with people living in the rural area, including students and their families, making it extremely important to correctly identify this animal so that first aid care is done properly.

We observed, then, that didactic games are not ends, but means that complete and add up, but never replace the teacher's work (ALMEIDA, 1998). That is, it is necessary for the teacher to work, before or after the application of the game, the theme that is addressed during the activity. Thus, play, in addition to boosting teaching, should be an activity with the purpose of challenging the school group to think and solve the problem of gambling (AMORIM, 2013). Thus, we observed that during the performance of this activity, the students ended up seeking more information about the wood spiders and the garden that occurred in the region while participating in the discussions of the conversation wheel, because the game instigated the search for new knowledge, further arousing interest in the subject addressed. In this context, teaching about venomous animals can be much simpler and more enjoyable if other alternative teaching resources are added to teach the content sat in class. This is exactly what happened during this stage of the research, because the students were able to get completely involved during the didactic game and clarify the issues not yet addressed previously.

Final considerations

The results showed that teaching about venomous animals was favored by the didactic game used in this activity, providing the discussion of aspects rarely considered in the school environment. In this sense, the didactic game can be an innovative proposal in the teaching of sciences, provided that the student reflects his actions during the game and knows how to use them correctly in his daily life.

The students' knowledge on the subject of venomous animals, which was explained with little scientific content prior to the didactic game, changed throughout the activity, enabling the

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understanding that all animals, including venomous animals, are important in nature and that the extermination of these can cause some kind of ecological imbalance.

Thus, we conclude that activities that use educational games can be a viable strategy in the identification and prevention of accidents caused by these animals. In addition, students became multipliers of correct information, not only during the activity, but probably with their families and people living together, which is of vital importance to reduce the number of accidents involving humans and venomous animals.

REFERENCES

ALMEIDA, P. N. **Educação lúdica**: técnicas e jogos pedagógicos. São Paulo: Loyola, 1998.

ALONSO, J. L. *et al*. Análisis de la prevalencia en la atención al traumatismo pediátrico prehospitalario y hospitalario en Gran Canaria. **Anales de Pediatria**, v. 65, n. 2, 2006.

AMORIM, A. D. S. **A influência do uso de jogos e modelos didáticos no ensino de biologia para alunos de ensino médio**. 2013. Monografia (Trabalho de Conclusão do Curso de Ciências Biológicas) – Universidade Aberta do Brasil, Beberibe, CE, 2013.

ANDRADE, S. M.; JORGE, M. H. P. M. Acidentes de transporte terrestre em município da região sul do Brasil. **Revista de Saúde Pública**, v. 35 n. 3, p. 318-320, 2001.

ANDRAUS, L. M. S. *et al*. Primeiros socorros para criança: relato de experiência. *Acta* **Paulista de Enfermagem**, v. 18, n. 2, p. 220-225, 2005.

ARAÚJO, C. M. L. R. **A importância dos recursos didáticos no ensino de ciências e biologia**. 2014. Monografia (Trabalho de Conclusão do Curso de Especialização em Fundamentos de Educação: práticas pedagógicas interdisciplinares) – Universidade Estadual da Paraíba, João Pessoa, PB, 2014.

BAHIA (Estado). Acidentes por Animais Peçonhentos na Bahia, 2018 e 2019. **Boletim de Toxicovigilância**, v. 1, p. 1-8, 2019. Available: http://www.saude.ba.gov.br/wp-content/uploads/2019/08/boletim-epidemiologico-animais-pe%C3%A7onhentos_agosto2019-V_3.pdf. Access: 03 June 2020.

BELEI, R. A. *et al*. O uso de entrevista, observação e videogravação em pesquisa qualitativa. **Cadernos de Educação**, v. 30, p. 187-199, 2008.

BRASIL. **Parâmetros Curriculares Nacionais***:* meio ambiente e saúde. Brasília: Ministério da Educação e do Desporto, 1997.

BRASIL. **Manual de diagnóstico e tratamento de acidentes por animais peçonhentos**. Brasília, DF: Ministério da Saúde, 1998.

BRASIL. **Manual de diagnóstico e tratamento de acidentes por animais peçonhentos**. 2. ed. Brasília, DF: Ministério da Saúde, 2001.

Rev. Educação e Fronteiras, Dourados, v. 10, n. 00, e021004, 2021. e-ISSN: 2237-258X
DOI: https://doi.org/10.30612/eduf.v11i00.12428

BRASIL. **Manual de diagnóstico e tratamento de acidentes por animais peçonhentos**. Brasília, DF: Ministério da Saúde, 2009.

BUENO, A. J. A. *et al*. Atividades Práticas/Experimentais para o Ensino de Ciências além das barreiras do Laboratório. **Revista de Ensino de Ciências e Matemática**, v. 9, p. 94-109, 2018.

BURINI, J. P. Invertebrados aranha. **Instituto Rã-bugio para Conservação da Biodiversidade**, Santa Catrina, 27 dez. 2011. Available: http://www.rabugio.org.br/ver_especie.php?id=968. Access: 30 May 2020.

BUSQUETS, M. D.; LEAL, A. A educação para a saúde**.** *In*: BUSQUETS, M. D. (org.). **Temas transversais em educação**: bases para uma formação integral. Porto Alegre: Ática, 1998.

CABRERA, W. B. A **Ludicidade para o Ensino Médio na disciplina de biologia**. 2007. Dissertação (Mestrado em Ensino de Ciências e Educação Matemática) – Universidade Estadual de Londrina, Londrina, PR, 2007.

CARBO, L. *et al*. Atividades práticas e jogos didáticos nos conteúdos de química como ferramenta auxiliar no ensino de ciências. **Revista de Ensino de Ciências e Matemática**, n. 10, p. 53-69, 2019.

CARDOSO, J. L. C. *et al*. **Animais peçonhentos no Brasil**: biologia, clínica e terapêutica dos acidentes. São Paulo: Sarvier, 2003.

CAVALCANTI, E. L.; SOARES, M. H. O ludismo e avaliação da aprendizagem: possibilidades para o ensino de química. *In:* ENCONTRO NACIONAL DE ENSINO DE QUÍMICA, 15., 2010, Brasília. **Anais [...]**. Brasília, DF: UnB, 2010.

COSENDEY, B. N.; SALOMAO, S. R. Visões sobre as serpentes: répteis ou monstros? *In:* ENCONTRO NACIONAL DE PESQUISA EM EDUCAÇÃO E CIÊNCIAS, 9., 2010, Águas de Lindóia. **Anais [...]**. São Paulo: ABRAPEC, 2013.

FIALHO, N. N. **Jogos no Ensino de Química e Biologia**. Curitiba: IBPEX, 2007.

FREDERICK, K. An evaluation of the effectiveness of the Injury Minimization Programme for Schools (IMPS). **Inj. Prev.**, London, v. 6, n. 2, p. 92-95, 2000.

FREIRE, P. **Pedagogia da Autonomia**: saberes necessários à prática educativa. Rio de Janeiro: Paz e Terra, 2004.

FREITAS, K. C. T. *et al.* Utilização de jogos didáticos para o ensino de química: up and down chemical. *In:* CONGRESSO DE INICIAÇÃO CIENTÍFICA DO IFRN, 9., 2013, Currais Novos. **Anais [...]**. Rio Grande do Norte: IFRN, 2013.

GOMES, R. R.; FRIEDRICH, M. A. Contribuições dos jogos didáticos na aprendizagem de conteúdos de Ciências e Biologia. *In:* ENCONTRO REGIONAL DE ENSINO DE BIOLOGIA, 1., 2001, Niterói. **Anais [...]**. Niterói: UFF, 2001

GONSALES, T. P.; GIMENIZ-PASCHOAL, S. R. Opinião de professores do ensino fundamental de uma escola pública a respeito da realização de ação educativa na escola para a prevenção de acidente infantil. *In:* CONGRESSO BRASILEIRO DE EDUCAÇÃO, 2007, Bauru. **Anais [...]**. Bauru: UNESP, 2007.

GONSALES, T. P. **Ação educativa de prevenção de acidentes domésticos em escola de ensino fundamental**. 2008. Dissertação (Mestrado em Educação) – Faculdade de Filosofia e Ciências, Universidade Estadual Paulista, Marília, SP, 2008.

GRANDO, R. C. **O jogo na educação**: aspectos didático-metodológicos do jogo na educação matemática. São Paulo: Unicamp. Available: www.cempem.fae.unicamp.br/lapemmec/cursos/el6 54/2001/jessica_e_paula/JOGO.doc. Access: 15 May 2020.

IERVOLINO, S. A.; PELICIONI, M. C. F. A utilização do grupo focal como metodologia qualitativa na promoção da saúde. **Revista Escola de Enfermagem USP**, v. 35, n. 2, p. 115-21, 2001.

MALUF, A. C. M. Atividades lúdicas como estratégias de ensino aprendizagem. **Portal do Educador**, 2012. Available: https://portaleducador.wordpress.com/2012/02/27/atividades-ludicas-como-estrategias-de-ensino-e-aprendizagem/.Access: 12 June 2020.

MELO, M. C. H.; CRUZ, G. Roda de conversa: uma proposta metodológica para a construção de um espaço de diálogo no ensino médio. **Imagens da Educação**, v. 4, n. 2, p. 31-39, 2014.

MINAYO, M. C. de S. **Pesquisa social**: teoria, método e criatividade. Petrópolis: Vozes 2001.

MOURA, M. R. *et al*. O relacionamento entre pessoas e serpentes no leste de Minas Gerais, sudeste do Brasil. **Biota Neotropica**, v. 10, n. 4, p. 133 -142, 2010.

OLIVEIRA, A. S.; SOARES, M. H. F. B. Júri químico: uma atividade lúdica para discutir conceitos químicos. **Química Nova Escola**, n. 21, p. 18-24, 2005.

PALHETA JUNIOR, A. R.; BARROS, D. J. P.; SILVA, A. S.; SILVA, L. P. Jogo didático como instrumento mediador no ensino de nomenclatura de hidrocarbonetos. **Revista de Ensino de Ciências e Matemática**, n. 9, p. 14-132, 2018.

ROBAINA, J. V. L. **Química através do lúdico**: brincando e aprendendo. Canoas: Ulbra, 2008.

SATO, M.; PASSOS, L. A. **Biorregionalismo**: identidade histórica e caminhos para a cidadania. São Paulo: Cortez, 2002.

SCHVARTSMAN, S. **Conceito de risco e segurança**. Segurança na infância e adolescência. São Paulo: Atheneu, 2003.

STORTTI, M.; PINHÃO, F. As representações sobre "jogar nas aulas de ciências" de alunos da 8° série do ensino fundamental, de uma unidade Escolar pública de Magé, RJ. *In:*

e-ISSN: 2237-258X
DOI: https://doi.org/10.30612/eduf.v11i00.12428

ENCONTRO REGIONAL DE ENSINO DE BIOLOGIA DA REGIONAL RJ/ES, 4., 2007, Seropédica. **Anais [...]**. Seropédica: UFRRJ 2007.

SILVA, T. C.; AMARAL, C. L. C. Jogos e avaliação no processo ensino-aprendizagem: uma relação possível. **Revista de Ensino de Ciências e Matemática**, v. 2, n. 1, p. 1-8, 2011.

SILVA, E. S.; BOCHNER, R.; GIMÉNEZ, A. R. M. The teaching of the main features of Brazilian venomous snakes: didactic literature evaluation of the Elementary School of the Municipality of Rio de Janeiro. **Educar em Revista**, n. 42, p. 297-316, 2011.

SZUNDY, P. T. C. **A construção do conhecimento do jogo e sobre o jogo**: ensino e aprendizagem de LE e formação reflexiva. 2005. Tese (Doutorado em Linguística Aplicada e Estudos da Linguagem) – Pontifícia Universidade Católica, São Paulo, 2005.

ZANNIN, M. Acidentes com aranhas arenismo. **DIVE/SC**, 20 abr. 2002. Available: http://www.dive.sc.gov.br/conteudos/zoonoses/capacitacao/aula-aranha.pdf. Access: 02 June 2020.

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