

# Astrodicac e Unidade Astronômica

## Uma forma lúdica de ensinar astronomia

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**Abstract.** Difficulties in teaching science for elementary and secondary levels are accentuated in the case of blind people. Lack of appropriate material, insufficient training of teachers makes this process even more difficult. In addition, there is an increasing number of blind or low vision students enrolled in regular schools in the country, and think of more attractive and inclusive ways to talk about science. The educational games have been shown to be a powerful support tool for science education for a long time. The pedagogical or didactic game is the one produced with the objective of providing certain learning, differing from the pedagogical material, as it contains the playful aspect. It is an interesting alternative to improve student performance in some difficult-to-learn content. In this sense, we developed two games, within the Accessible Universe extension project, Astrodicac and Astronomical Unit, which will be described below. Astrodicac is a guessing game where themes are divided into astronomical objects, astronomical events and important astronomers (as). Each round, a moderator chooses a card that contains five hints about the drawn item. The current player must guess it with as few hints as possible, as the number of spaces to be advanced depends on how many hints are used. The winner is the one who gets to the square designated as the end first. The game board was textured with string-like lines to demarcate the target audience. Embossed arrows indicate the way forward. The pieces have different colors and textures for each participant. A notebook containing the items will be transcribed to the Braille System. The Astronomical Unit game is played through a book in digital format (e-book), where there are more than 100 questions, in true or false format, about various objects in the Solar System, from Mercury, passing through Jupiter, to the Oort cloud. Each question is designed to have a brief explanation of the content in question to go beyond true or false, right or wrong. The minimum number of players is three, where one of them must only read the questions and answers. The game system is similar to a race, where all players start side by side and, upon hitting a question read by the GM, step forward. The questions are simultaneous and apply to all players, who respond at the same time raising their left arm for true and right for false. The player who gets the first eight questions right wins. Both games described above were created to be played by the target audience in question, but they can be played by sighted children as well. Due to the moment we live in, it has not yet been possible to test them in the classroom. However, it is important to emphasize that this type of material has great potential for teaching astronomy, as it encourages students to learn by playing.

**Resumo.** As dificuldades no ensino de ciências para os níveis fundamental e médio se acentuam no caso de pessoas cegas. A falta de material apropriado, a formação insuficiente dos professores dificulta ainda mais esse processo. Além disso, há um crescente número de alunos cegos ou com baixa visão matriculados nas escolas regulares do país, e deve-se pensar em formas mais atrativas e inclusivas para falar de ciências. Os jogos didáticos têm se mostrado uma poderosa ferramenta de apoio para o ensino de ciências há muito tempo. O jogo pedagógico ou didático é aquele produzido com o objetivo de proporcionar determinadas aprendizagens, diferenciando-se do material pedagógico, por conter o aspecto lúdico. É uma alternativa interessante para melhorar o desempenho dos estudantes em alguns conteúdos de difícil aprendizagem. Nesse sentido, desenvolvemos dois jogos, dentro do projeto de extensão Universo Acessível, o Astrodicac e o Unidade Astronômica, que serão descritos a seguir. Astrodicac é um jogo de adivinhação onde os temas são divididos em objetos astronômicos, eventos astronômicos e astrônomos (as) importantes. A cada rodada, um moderador escolhe uma carta que contém cinco dicas a respeito do item sorteado. O jogador da vez deve adivinhá-lo com menos dicas possíveis, pois o número de casas a serem avançadas depende de quantas dicas forem utilizadas. O vencedor é aquele que chegar primeiro até a casa designada como final. O tabuleiro do jogo foi texturizado com linhas do tipo barbante para demarcação ao público alvo. Setas em relevo indicam o caminho a seguir. As peças possuem cores e texturas diferenciadas para cada participante. Um caderno contendo os itens será transcrito ao Sistema Braille. Já o jogo Unidade Astronômica é jogado através de um livro em formato digital (e-book), onde se encontram mais de 100 perguntas, em formato verdadeiro ou falso, sobre diversos objetos do Sistema Solar, desde Mercúrio, passando por Júpiter, até a nuvem de Oort. Cada pergunta foi pensada de maneira a ter uma breve explicação do conteúdo em questão para ir além do verdadeiro ou falso, certo ou errado. O número mínimo de jogadores é três, onde um deles deve apenas ler as perguntas e respostas. O sistema de jogo é semelhante a uma corrida, onde todos os jogadores iniciam lado a lado e, ao acertar uma pergunta lida pelo mestre, dão um passo à frente. As perguntas são simultâneas e valem para todos os jogadores, que respondem ao mesmo tempo levantando o braço esquerdo para verdadeiro e o direito para falso. Ganha o jogador que primeiro acertar oito perguntas. Ambos os jogos descritos acima foram criados para serem jogados pelo público alvo em questão, mas podem ser jogados por crianças videntes também. Devido ao momento que vivemos, ainda não foi possível testá-los em sala de aula. No entanto, é importante ressaltar que esse tipo de material apresenta grande potencial para o ensino de astronomia, uma vez que incentiva os alunos a aprenderem brincando.

**Keywords.** Ensino de astronomia, inclusão

### 1. Introduction and motivation

The Universo Acessível project has been developed thanks to the cooperation agreement signed between UFRJ – Valongo

Observatory and the Instituto Benjamin Constant (IBC), in 2017. Our objective is to bring knowledge of Astronomy to people who are blind and those with low vision. The support of the IBC is

essential, since the Institute is a reference center, at the national level, for issues related to visual impairment. It has a school, offers ongoing training to professionals in the field of visual impairment, advises schools and institutions, produces specialized material, printed in Braille and scientific publications. In addition, the IBC can distribute, upon request, didactic material adapted to public educational institutions in Brazil that serve students with visual impairments. With the support of teachers and professionals from IBC, we developed two games to facilitate the teaching of astronomy to blind people, which address different aspects of Astronomy, in addition to carrying out classroom assessments as we will describe in the next section.

## 2. Methodology and discussion

**Astrodicas:** Is a guessing game where themes are divided into astronomical objects, astronomical events and important astronomers. At each round, a moderator chooses a card that contains five hints about the drawn item. The player at the time must guess it with less hints as possible. The number of places to be advanced depends on how many hints are used. The winner is the one who gets to the final square. The board of the game was textured with string-like lines for demarcation to the target audience. Embossed arrows indicate the way forward. The pieces have colors and textures differentiated for each participant. A notebook containing the items will be transcribed to the Braille system.

**Unidade Astronômica:** It is played through an e-book, where there are more than 100 questions, in true or false format, over several Solar System objects. For each question there is a brief explanation of the content, going beyond right or wrong. The game system is similar to a race, where all players start side by side and, when hitting a question read by the moderator, step forward. Wins the first to get the total of eight questions right. The e-book format was made to facilitate the inclusion of new questions in order not to make the game repetitive and also to streamline quick reading by a screen reader on the mobile phone. In this way the moderator can also be a person who is blind or with low vision.

## 3. Conclusion

Both games were developed with inclusive purposes and non-exclusive, of so that they can be played integrating blind and seers. due to the moment we live, not yet it was possible to test them in classroom, but, in the future, we plan make available the materials for the the test is done by students of Instituto Benjamin Constant. Even in the pre-test phase, it's important note that this type of material has great potential for the astronomy teaching, since it encourages the students to learn playing in a playful way

## Universo Acessível, Educação e Inclusão em Astronomia

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FIGURE 1. Book cover of the game Unidade Astronomica



FIGURE 2. Game board of Astrodicas



FIGURE 3. Game board of Astrodicas