Boletim da Sociedade Astronômica Brasileira, **36**, no. 1, 17-18

Scientific literacy with a digital planetarium

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Abstract. This paper reports the results of an ongoing study on scientific literacy about planets and dwarf planets in the Solar System using the digital planetarium of the Paraná State School. Aiming to assess the significant learning of these concepts by 54 sixth-grade elementary school students, a quantitative data collection was carried out using a pre-intervention questionnaire consisting of ten objective questions on the topic. As an initial result, 71.0 % of them correctly answered the number of planets and dwarf planets in the Solar System and 67.0 % recognized Pluto as the largest dwarf planet in the Solar System. However, the overall average of correct answers in the completed questionnaires was only 32.0 %. Given this low rate, an intervention was proposed with a digital planetarium session as a teaching tool for these concepts. In early September 2024, six months after the first survey, a post-intervention questionnaire was applied. As this is a research applied to students, the final actors within the entire educational process, the approach to the current definitions of planets and dwarf planets for this age group, with a digital planetarium, is believed to be able to contribute to the area of research in Astronomy Education in Brazil.

Resumo. O trabalho relata os resultados de uma pesquisa em andamento a respeito do letramento científico sobre planetas e planetas anões do Sistema Solar utilizando o planetário digital do Colégio Estadual do Paraná. Visando avaliar a aprendizagem significativa desses conceitos, por parte de 54 alunos do sexto ano do Ensino Fundamental, foi realizada uma coleta de dados quantitativa, a partir de um questionário pré-intervenção, composto por dez questões objetivas sobre o tema. Como resultado inicial, 71,0 % deles responderam corretamente o número de planetas e planetas anões do Sistema Solar e 67,0 % reconhecem Plutão como o maior planeta anão do Sistema Solar. Todavia, a média geral de acertos dos questionários completos ficou em apenas 32,0%. Dado a esse baixo índice, foi proposta uma intervenção com uma sessão de planetário digital como ferramenta de ensino desses conceitos. No início de setembro 2024, passados seis meses do primeiro levantamento, um questionário pós-intervenção foi aplicado. Por se tratar de uma pesquisa aplicada a alunos, os atores fins dentro de todo o processo educativo, a abordagem das definições atuais de planetas e planetas anões para essa faixa etária, com um planetário digital, acredita-se poderá contribuir para área de pesquisa em Educação em Astronomia no Brasil

Keywords. Techniques: miscelaneous – Methods: miscellaneous – Teaching of Astronomy

1. Introduction

The current definition of the Solar System consists of eight planets and five dwarf planets (Saraiva 2010) arranged in order of distance from the Sun as can be seen in Figure 1.

2. Theoretical Reference

David Ausubel's Theory of Meaningful Learning (Moreira 1998), which advocates that students' prior knowledge sets parameters for their subsequent interventions and assessments, guides and summarizes this research. Figure 2 shows the introduction to the session at the Planetarium of Parana State College.

The research was quantitative in data collection and analysis and an Intervention Research (Yin 2016) that supported the intervention with the digital planetarium at Parana State College. Figures 3, 4 and 5 show photos of planets and dwarf planets presented to the students of the research.

3. Results

The quantitative research, based on the collection of responses to questionnaires about planets and dwarf planets before and after the intervention, generated the graphs represented in Figures 6 and 7. Figure 6 shows the correct answers for each question. Figure 7 shows the overall average percentage of correct answers for the questions. The numerical improvement is evident. A more accurate analysis shows that the intervention promoted significant potential learning of the definitions of planets and dwarf planets in the Solar System, as recommended in the research hypothesis.

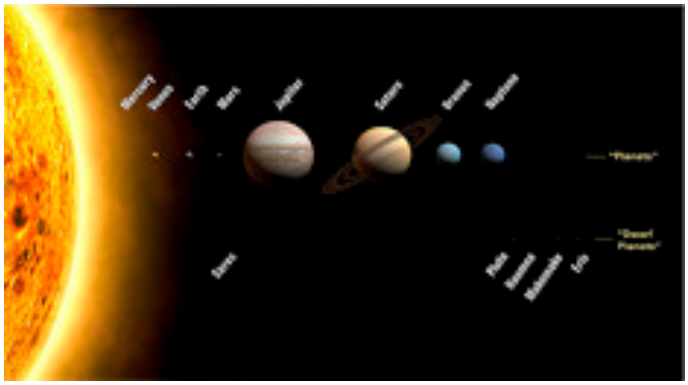

Figure 1. The Solar System today

4. Conclusions

Based on the data from the post-intervention questionnaires, and noting that the questions were the same, it is possible to conclude that there was a significant improvement in the number of correct answers, with an increase of 107,6 %. Despite this, and also

Figure 2. volunteer students participating in the research

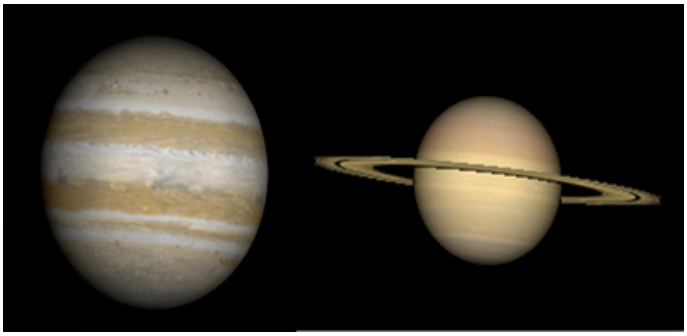

Figure 3. Jupiter an Saturn

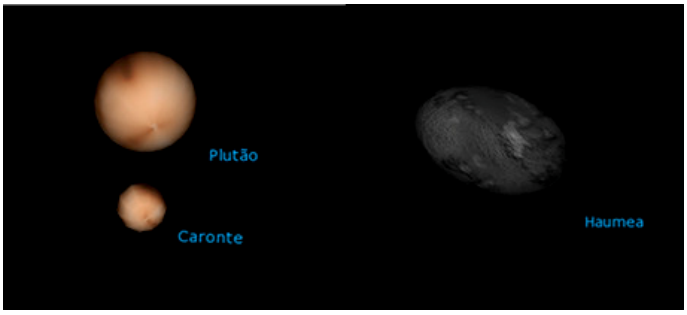

Figure 4. Dwarf planets - planetarium dome

taking into account that the students' average score was 7.1, this score is relatively low and indicates the need for greater and better future interventions. Questions 2 and 7 addressed the text defining planets and dwarf planets, and it can be seen that despite the improvement, for more than 40 % of the students these concepts were not correctly absorbed. Slightly better, but also with low performance, questions 4 and 8, which deal exclusively with concepts linked to dwarf planets, which was a new topic presented to the students, had a low rate of correct answers, also indicating a need for attention to these concepts, probably requiring more than one planetarium session for their correct understanding.

References

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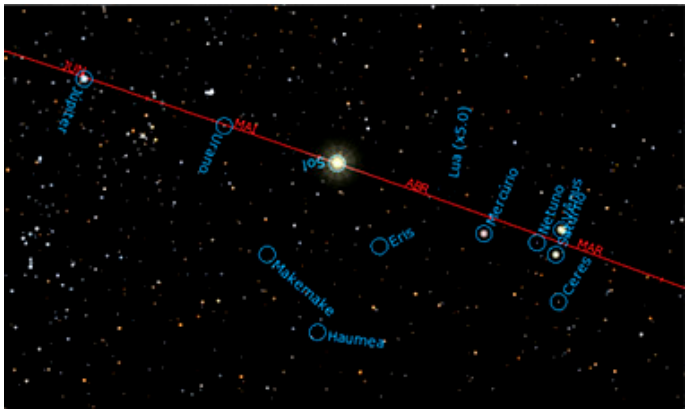

Figure 5. planets and dwarf planets - planetarium dome

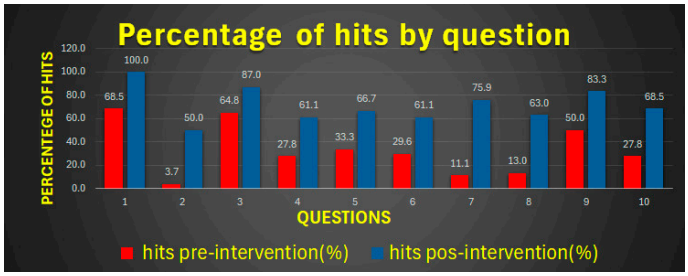

Figure 6. Percentual of hits

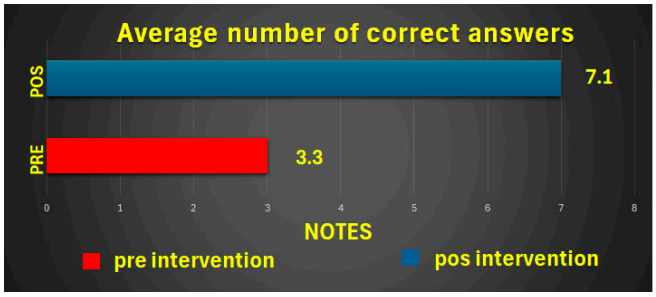

Figure 7. Pre and post intervention hits