

### SURVEY OF ASTRONOMICAL AND RELATED SCIENCES PRECONCEPTS AMONG SECONDARY LEVEL STUDENTS

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A survey of pupil misconceptions in Astronomy and related sciences was carried out. We took three experimental samples: 1) students aged 14–15 that had not taken an Astronomy course; 2) students aged 15–16 taking an Astronomy course; 3) students over 17 years old that had already taken one course.

It is usual to detect preconcepts in Astronomy and other sciences in the classroom. These preconcepts satisfy ad hoc explanations for certain phenomena. These factors make difficult to achieve a meaningful learning. We intended to detect the presence of preconcepts in order to develop didactic strategies to correct their mental representations of reality through a written test on: sun and moon movement, scientific laws, space orientation, energy and solar system. The total sample of 300 students was representative of different schools. In the evaluation, a statistical treatment was applied to arrays of similar answers. The primary conclusions are:

- Preconcepts are present in 100% of the sample.
- Preconcepts are unevenly distributed among students of the same level coming from different schools (probably because of differences in the quality of the teachers).
- There is a positive influence of Astronomy on the understanding and interpretation of natural phenomena.
- There is a tendency to ignore phenomena and processes that cannot be seen or need more abstract or complex conceptual schemes (difficulty to work with models was present in all the ages evaluated).
- There is a clear influence of mass media on preconcepts.

A further study of the results leads to: the majority of correct answers is for the pupils who are having an Astronomy course (15–16 years old) and decreases sharply for students who have not had it yet (14–15 years old), while it decreases smoothly (in some questions) for the pupils who have already had it (more than 17 years old). In the last case, the answers increase in complexity and elaboration which shows that, even though a meaningful learning did not take place, most pupils achieved the first steps of abstract thinking.

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### FATHER BUENAVENTURA SUAREZ S.J. PIONEER ASTRONOMER FROM SOUTH AMERICA: HIS WORK

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Father Suárez was a self-taught astronomer and a missionary during the XVIII century. He is considered the first astronomer born in the southern part of South America. He worked mainly at San Cosme y Damian, a Jesuit reduction for the Guarani natives, from 1706 to his death in 1750. There were two epochs related to the intensive activities of this outstanding priest. At the first epoch, he made astronomical observations with instruments built by himself and with help of native artisans. They polished lenses to make telescopes from crystal rocks.

He published his book: 'Lunario de un siglo', in 1744. This was an accurate and a local ephemeris of the Moon's phases, solar and lunar eclipses, with data for a century. Several editions were published up to the last in 1856 of this book. With the publication of his book, his Jesuit superiors decided to get more accurate instruments for him. They bought telescopes from England. The second epoch started in 1744. He had an astronomical clock with minute and second hands; an astronomical quadrant with degree and minute rule and several telescopes with 2.20 meters to 6.50 of focal length at his rudimentary observatory at San Cosme y Damian. Father Suárez made observations of the Moon, the eclipses and observations of the Galilean satellites of Jupiter eclipses over a period of 13 years. After the Jesuit expulsion in 1767, these instruments were lost with one exception, a Sundial built by F. Suárez. This dial remains as a testimony and a souvenir at San Cosme y Damian, nowadays a town located in the south of Paraguay. F. Suárez maintained correspondence with astronomers from different places like Saint Petersburg and Peking observatories.

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