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## PROBING INTRODUCTORY ASTRONOMY STUDENTS' NOTIONS OF RELATIVE SIZE AND DISTANCE OF CELESTIAL OBJECTS. PART I

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As part of ongoing efforts to improve teaching in astronomy an instrument, the Introductory Astronomy Questionnaire (IAQ) was developed at the University of Town (Rajpaul et al. 2014). The IAQ covered a wide range of topics that are usually covered in an introductory astronomy course and was first administered to a cohort of students who had enrolled for such a course as a pre- and post-test. The IAQ was subsequently translated into Norwegian, (NIAQ), which investigated pre-service science teachers and middle school students (Lindstrøm et al. 2015, 2016). Despite the differences between the cultural contexts of the two studies, both studies yielded similar results in terms of students' views of astronomy. What stood out most was the fact that understanding of distances and sizes were equally poor across contexts. The present study, focuses on these two aspects which are key to students' being able to engage meaningfully with astronomy as a discipline.

To this end we modified the IAQ (hitherto IAQ\_R) with regard to the questions that involves ranking 1) celestial objects (galaxy, planet, star, universe, solar system, and sun) by size and 2) similar objects (centre of the Milky Way, edge of the observable universe, edge of the Solar System, the Moon, the Sun, Alpha Centauri, the ozone layer, centre of the Earth, Neptune) by distance from the Earth. The modifications include the omission of the asteroid belt in the distance ranking, the swapping of Polaris for 'the nearest star to the sun (Alpha Centauri)' and the addition of 'star' in the size ranking. Most importantly we added in the facility for respondents to set objects equal (=) to each other in the size ranking. The original IAQ only allows for '<' and '>' comparisons. Allowing students to set size of objects equal to each other permits many more response combinations. (The same responses could in principle be elicited as per the NIAQ, but the extra possibility and additional object potentially prime different cognitive resources). This present study seeks to accomplish two things: 1) to see to what extent the present study can replicate the results from the previous studies and 2) to set the groundwork for future qualitative analysis and intervention methods focusing on size and distance visualization in astronomy education.

The modified IAQ (IAQ\_R) only focuses on questions pertaining to size and distance of celestial bodies. The IAQ\_R was administered to a comparable cohort of students at the University of Cape Town who were taking the Introductory Astronomy course. The IAQ\_R was administered during the first lecture, in order to probe students' pre-instruction understanding of the ranking tasks. The accompanying paper, Part II (Sivitilli et al.,) details the analysis, results and a possible interpretive framework.

**Apply to be considered for a student award (Yes / No)?**

Yes

**Level for award (Hons, MSc, PhD, N/A)?**

PhD

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