

Learning to Work with Databases in Astronomy: Quantitative Analysis of Science Educators' and Students' Pre-/Post-Tests



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Motivation

Although astronomy is increasingly moving towards the use of large databases, to date research on the transition from expert to novice has focused on how learners work individual problems. This study presents quantitative analysis of pre-/post-test responses with an intervention of a lab activity focused on learning to work with astronomy datbases.

Pre-/Post-Test and Bloom's Taxonomy



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Abstract

The authors studied a matched set of 77 participants working with 200-entry databases in astronomy using Google Spreadsheets, with limited information about a random set of quasars drawn from SDSS DR5. Here the authors present the quantitative results from an eight question pre-/post-test, with questions designed to span Bloom's taxonomy, on the skills of using spreadsheets, and the content of quasars. Participants included 54 college ASTRO 101 students, in-service K-12 teachers, and science/sci-fi writers (the latter two grouped together as 23 professionals). There were 46 men and 23 women. All groups showed statistically significant differences between their pre- and post-tests gains, women's and men's gains (0.127 and 0.423, respectively) showed statistically significant differences, and while professionals had higher pre- and post-test scores than students, their gains were the same.

Men/Women Pre-/Post-Tests

Comparison	Y1	Y2	N1	N2	Р
Pre/Post All	62.5	78.2	77	77	0.0000
Pre/Post Men	61.7	80.7	46	46	0.0000
Pre/Post Women	62.9	74.6	28	28	0.0109
Gain Men/Women	0.42	0.13	46	28	0.0331

Students/Professionals Pre-/Post-Tests

Comparison	Y1	Y2	N1	N2	Р
Pre/Post Students	58.1	74.5	54	54	0.0000
Pre/Post Prof'ls	72.8	87.0	23	23	0.0014
Pre Students/Prof'ls	58.1	72.8	54	23	0.0010
Post Students/Prof'ls	74.5	87.0	54	23	0.0003





Conclusions

- All subsets of participants showed improvement from their pre-tests to post-tests (p<0.05)
- Men had higher gains than women (p<0.05)
- Professionals' scores were higher than students' on both the pre-test and the post-test (p<0.05)
- Students and professionals had the same gains of 0.29 (no evidence to reject the null hypothesis)
- Activities about astronomy datasets can lead to significant learning in both students and professional teachers and writers.

