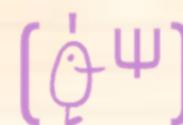


Teaching Statistics in Psychology: An experience of collaborative learning

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Teaching of Statistics in higher education is a major challenge for teachers. A proof of it is the existence of a number of journals related to teaching this subject (i.e., *Teaching Statistics*, *Journal of Statistics Education*, *Statistics Education Research Journal*). This challenge may become more complex when it comes to grades related to the fields of Social, Health or Education Sciences (Conners et al., 1998). The displeasure with this subject for many students is best exemplified by the term "statisticophobia" (Dillon, 1982). In this work we present an innovative teaching experience based on the interdisciplinary collaboration between students and teachers of two Psychology undergraduate subjects at the University of Valencia: Statistics and Work Social Psychology.

The main goal of this project was to motivate students in the subject of Statistics, encouraging them to value it as an integral part of the research process and as an important element of their academic training. We hypothesized that this intervention would give rise to a more positive attitude towards Statistics.

Method: Participants were forty-eight students (academic year 2011-2012) from two classes of Statistics, a subject in the first year of the Psychology Degree at the University of Valencia. These two classes were randomly assigned to the intervention and the control groups. In the intervention class, the students worked jointly with the students of a class of the subject of Work Social Psychology in the statistical analysis of a data set gathered by the latter in order to achieve a research project related to work psychology. We applied a pretest-posttest design in which the Statistics students in both classes answered the scale SATS (Schau et al., 1995), a well-known questionnaire when it comes to measure attitudes towards Statistics. This attitude survey contains 28 five-point Likert items designed to assess four components of students' attitudes toward statistics:

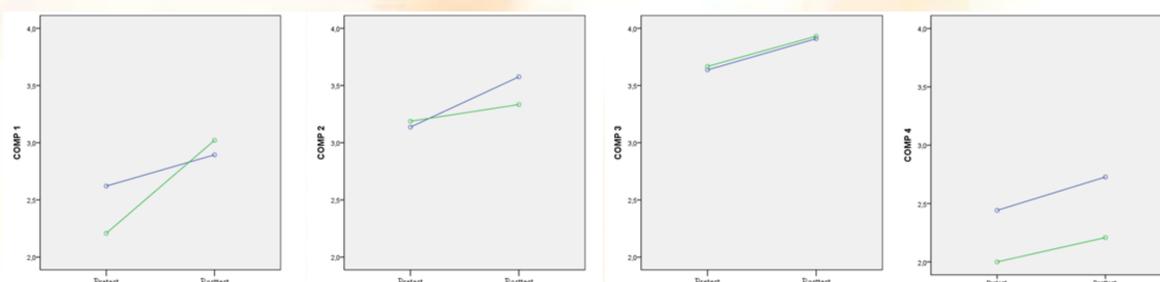
1. (COMP1) Affect: Students' feelings concerning statistics.
2. (COMP2) Cognitive Competence: Students' attitudes about their intellectual knowledge and skills when applied to statistics.
3. (COMP3) Value: Students' attitudes about the usefulness, relevance, and worth of statistics in personal and professional life.
4. (COMP4) Difficulty: Students' attitudes about the difficulty of statistics as a subject.

Results: The main question to answer in this study was if the intervention and control groups change differently from the pretest to the posttest. To answer his question, ANCOVAs were computed considering posttest scores as dependent variables with pre-test scores as covariates in all analyses. ANCOVA is recommended over ANOVA in randomized pretest-posttest design for the purpose of increasing statistical power and statistical precision (Rausch et al., 2003). Moreover, ANCOVA also enables statistical control for differences in the groups on the pretest (Kenny, 1979, p.217).

Descriptive statistics and results from ANCOVAs are presented in the attached table. Additionally, changes between pretest and posttest for the intervention and control groups in each one of the scales considered in this study are graphically displayed in the attached figure. The results of ANCOVAs showed statistically significant differences between intervention and control groups in posttest means, after adjusting for pretest scores, in the Affect Attitude Component. Compared with the control group, students in the intervention group reported statistically significant higher values in this component ($F(1,16)=4,79; p=0,04$); the adjusted difference in posttest means (d') was 0,52 and the population adjusted difference is estimated to be in the range from 0,02 to 1,01 points ($\alpha=.05$).

	Intervention (n=8)		Control (n=11)		ANCOVA					
	Pretest Mean (SD)	Posttest Mean (SD)	Pretest Mean (SD)	Posttest Mean (SD)	F (1,16)	p	Partia ln2	d	d'	CI 95% d'
COMP 1	2,21 (0,58)	3,02 (0,92)	2,62 (0,93)	2,89 (0,88)	4,79	0,04	0,23	0,13	0,52	0,02 – 1,01
COMP 2	3,19 (0,41)	3,33 (0,71)	3,14 (0,77)	3,58 (0,58)	1,02	0,33	0,06	-0,25	-0,27	-0,83 – 0,29
COMP 3	3,67 (0,35)	3,93 (0,28)	3,64 (0,44)	3,91 (0,32)	0,01	0,94	<0,01	0,02	0,01	-0,25 – 0,27
COMP 4	2,00 (0,38)	2,21 (0,87)	2,44 (0,40)	2,73 (0,53)	0,11	0,75	<0,01	-0,52	-0,11	-0,79 – 0,58

Note. d: difference intervention vs. control posttest means; d': d adjusted on pretest values.



Note: Green line represents the intervention group; blue line represents the control group

Discussion: The results of this study have shown a significant effect of our collaborative learning experience on the students' positive feelings concerning statistics. Students in the intervention group had more positive feeling towards Statistics than those in the control group, a result that could be accounted for by the third-year students' boost on the self-confidence of their first-year colleagues. No significant differences, however, were found in the other three subscales. This limited effect might have to do with the size of our dataset, so a larger sample would be advisable in future studies in order to achieve a higher statistical power in the analysis. On other hand, from our experience in the intervention, we also consider that a longer interaction between the students could improve not only the affective attitude component but also the cognitive, the value, and the difficulty components.

References

- Conners, F. A., McCown, S. M., y Roskos-Ewoldsen, B. (1998). Unique challenges in teaching undergraduate statistics. *Teaching of Psychology*, 25, 40-42.
- Dillon, K. M. (1982). Statisticophobia. *Teaching of Psychology*, 9, 117.
- Kenny, D. A. (1979). *Correlation and causality*. New York: Wiley-Interscience.
- Rausch, J. R., Maxwell, S. E., & Kelley, K. (2003). Analytic methods for questions pertaining to a pretest posttest follow-up design. *Journal of Clinical Child and Adolescent Psychology*, 32, 467-486.
- Schau, C., Stevens, J., Dauphinee, T. L., & Del Vecchio, A. (1995). The development and validation of the Survey of Attitudes Toward Statistics. *Educational and Psychological Measurement*, 55, 868-875.