STUDENTS' SOCIAL REPRESENTATION OF STATISTICS IN THE HUMANITIES AND SOCIAL SCIENCES

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Our starting point is how undergraduates in the humanities and social sciences perceive statistics when they discover the topic through their university curriculum. We highlighted in previous papers that they associate statistics with mathematics, numbers, calculus… (Marion & Bihan-Poudec, 2012; Bihan-Poudec, 2013). Our theoretical framework is to consider learning as a social and individual construction. To that effect, we did a statistical analysis on a survey with 147 students majoring in Education either initial training or adult education. We first investigated the relationship between the type of course chosen by the students and their conception of statistics; second, we examined the students' answers concerning their attitude towards statistics. Results reveal the link between attitude and cognitive factors, and between the students' conceptions of statistics and their own experience of the discipline.

WHAT IS STATISTICS?

In a recent article (Statistique, Informatique, Mathématiques et Interdisciplinarité, 2013), Jeanne Fine proved that defining statistics is a challenge, as possibilities may be different depending on the theoretical corpus, social practices, subjects' education. Therefore, how do students perceive statistics in the humanities and social sciences when they enter university? The basic idea is that they arrive in their first statistics course with preconceptions that may be barriers to learning: this reality has been amply demonstrated by works in the Educational Sciences in general (Astolfi, 2008) and in Statistics (Shaughnessy, 2007). Before any conclusions can be drawn for statistics teaching, it is essential to know the social representations of statistics for students. We consider the classroom as a situation where communications between teachers and learners aim to construct a shared representation of what is taught and what must be learned

What about statistics before the first course in university? According to a previous survey of 614 students in the humanities and social sciences, twenty words seem to be enough to characterize statistics: mathematics, numbers, calculations, percentages… However, a more detailed analysis has proved that the richness of vocabulary and the preferred use of some words depended on the educational background (Bihan-Poudec & Marion, 2012; Bihan-Poudec, 2013). We propose a new survey and its statistical analysis to investigate more deeply student conceptions of statistics.

A SURVEY OF STUDENTS IN HUMANITIES AND SOCIAL SCIENCES

In this aim, a survey was conducted using a questionnaire among 147 students majoring in Education either initial training or adult education. The cohort included initial education students (101 individuals) and continuing education students (46 individuals returning to their studies). Several questions were asked. First, students were asked what words they associate with the term "statistics," in order to see if the results of the previous survey were validated by this new population. Then they were asked to place their interest in statistics on a 10 point scale ranging from "exciting" to "repulsive." Afterwards, a list of questions was given, which concerned the students' interest in statistics: the first one asked whether they would take an optional statistics course if this one was optional; another question asked to specify if statistics should be taught as part of their university curriculum (the students had to justify the answer); similar to the previous one, the last question asked to assess the interest that students have in statistics, not as part of their curriculum but as part of their professional life (current or future). At the end, a list of statistics definitions was submitted to students, from performing calculations and formulas to statistical thinking (Reid & Petocz, 2002). Students had to choose the one that best corresponded to their way of thinking. They also had the option of giving their own definition.

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SOME RESULTS

As in other curriculum in humanities and social sciences (Bihan-Poudec & Larose, 2010), connections between different words produced by students are similar (see Table1).

Table 1: Distribution of the first twenty words

Items	Number of occurrences	Percentage of occurrences	Percentage reported to the number of students
mathematics	90	7.87	61.64
percentage	86	7.52	58.90
calculation	63	5.51	43.15
number	62	5.42	42.47
data	55	4.81	37.67
study	51	4.46	34.93
analysis	46	4.02	31.51
average	38	3.32	26.03
graphics	35	3.06	23.97
survey	30	2.62	20.55
poll	27	2.36	18.49
tables	27	2.36	18.49
comparison	23	2.01	15.75
evaluation	20	1.75	13.70
measurement	17	1.49	11.64
populations	16	1.40	10.96
research	16	1.40	10.96
result	16	1.40	10.96
probability	15	1.31	10.27
proportion	15	1.31	10.27

As in previous observations, differences between initial education (FI) and continuing education (FP) were observed. In particular, words with a connection to the practice of statistics *study, analysis* were pointed out by older adults and *mathematics, percentage* by young students. (Table 2).

Table 2. Distribution of the most cited overall words depending on the type of training

	mathematics	percentage	calculation	numbers	data	study	analysis	average	Total
FP	19	17	18	20	15	22	22	11	144
FI	71	69	45	42	41	29	24	27	348
Total	90	86	63	62	56	51	46	38	492

What do these differences in vocabulary mean? Are statistics “exciting,” or are they “repulsive”? Table 3 indicates to us:

Table 3. Interest in statistics

	exciting								repulsive				
Interest	1	2	3	4	5	6	7	8	9	10	Total	Mean	Std. dev.
FI	0	0	9	17	28	15	14	10	5	2	100	5.68	1.73
FP	0	0	7	7	17	7	4	3	0	0	45	5.06	1.39

It is interesting to review the responses to the question of taking a statistics course if it is optional: 39 students in continuing education take the course against 31 in initial training. The interest of statistics also differs between these two populations, both in terms of training during their studies (Table 4) or with a professional perspective (Table 5)

Table 4. Distribution of the importance the students give statistics for their studies

	yes	no	no opinion	yes and no	Total
FP	46	0	0	0	46
FI	63	24	6	8	101
Total	109	24	6	8	147

Table 5. Distribution of students about their opinions on the importance of statistics for their work

	yes	no	no opinion	yes and no	Total
FP	42	1	3	0	46
FI	51	37	9	4	101
Total	93	38	12	4	147

CONCLUSION

Statistics is not perceived the same way depending on whether students are in initial education or in continuing education. For students in initial education, it is related to different contents in their courses and more abstract; it is related to professional use for students in continuous education. So, a model is built in the field of statistical education, highlighting the relationship between affective dimensions, cognitive and practical. Then, it will be important to see how the student design evolves (or not) with input from teachers.

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