

STOCHASTIC EDUCATION IN THE IBERO-AMERICAN COUNTRIES

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The objective of this paper is to make known some activities in Stochastic Education in the Ibero-American countries. To achieve this objective I have collected information about working groups; Conferences on Statistics Education, Conferences on Statistics and Mathematics Education with papers about Stochastic Education; Journals that devote special issues to the Statistics Education and resources on Internet. Below I summarize this information

1. INTRODUCTION

Research on Stochastic Education (Statistics, Probability, and Combinatory) is having a wide development in the last decades all over the world, also in Ibero-American countries. In these countries a lot of activities to improve statistical teaching and learning are carry out, with a great effort. Part of these activities is unknown for a lot of people and I think that it would be worthwhile to make known this activity to the international community. Consequently, I consider that in this session, 9C, Statistics Education in Spanish-speaking Countries, it would be interesting to carry out a study about Stochastic Education in the Ibero-American Countries. For reasons of length of this paper, I have only taken into account some events occurred in the recent last years, but I think that these are a sample that offer a panoramic view of activities on Stochastic Education at Ibero-American countries.

In May 2001, I sent a questionnaire, by e-mail, to Ibero-American people related with Stochastic Education. I received 17 responses. With these responses, consulting Web Sites and other sources (Newsletter, Journals, ...), I have obtained the information that I considered interesting for the objective of this work. Below I make a summary

2. WORKING GROUPS

2.1. Department of Mathematics at the Faculty of Sciences, National University of Rio Cuarto, Argentina. In this Department a group of researchers on Statistics Education exist. Some Masters' theses and monographs are being developed at the Department. In addition several members have presented papers at several Conferences, as well as different projects. More information in Statistical Education Research Newsletter, Vol. 1(2), May, 2000 (<http://www.ugr.es/local/batanero/Newsletters/newsmay00.PDF>)

2.2. Working group from "Sociedad Española de Investigación en Educación Matemática –SEIEM"– (Spanish Society of Research on Mathematics Education), Spain. Coordinator: Dr. A. Vallecillos (avalleci@platon.ugr.es). Though people of this group were working in Stochastic Education from 1985, the group was formed with the constitution of the SEIEM in 1995. 14 researchers of 6 Spanish universities form this group, but the subgroup with more weight is Granada University one (8 researchers). The research lines are: Assessment of the probabilistic reasoning, combinatorial reasoning, exploratory data analysis, training and conceptions of the teachers, analysis of textbooks and the curricula. 12 Dissertations had been carried out in these research lines. The members of the group have published several papers in national and international journals, also they have presented several communications to international and national congresses. Also they are being carrying out several research projects. More information is available at: <http://www.ugr.es/local/seiem> and <http://www.ugr.es/local/batanero/>

2.3. Working Group from the Universidad Distrital Francisco José de Caldas, Bogotá, Colombia. Three researchers have formed the group, recently. Research line: Conceptions of the students related with randomness and uncertainty concepts. Research projects: Random thinking of a group of students of the eleventh and tenth degrees. Teaching randomness concept using musical letters. Randomness conception in students of Mathematics degree, a first approximation. Teaching central measures using problems solving. More information: Herber Sarmiento, student1965@hotmail.com

2.4. Grupo de la Universidad de Rosario, Argentina [Group of Rosario University, Argentina]. Directress: Elda Gallese (egallese@unr.edu.ar). This group has had a research project during the years 1999, 2000 and 2001, entitled "Problematic on teaching and learning Statistics in not statistics careers ". Members of this group have organized Conferences and meeting about Statistical Education. In addition they have presented papers in several Conferences.

2.5. El Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Cinvestav) (Research Center and Advanced Studies of the Polytechnic National Institute) was created in 1961 and modified in 1982. The main objectives are to train teachers and specialized researchers that improve the teaching and carry out researching of quality. The Department of Educational Mathematics of Cinvestav has a staff of 30 researchers and two programs (with courses on Statistics Education: a) Master degree in Science and b) Doctorate Ph D in Science, both in de specialty of Educational Mathematics. This center has a research line on Didactic of Probability. More information is available at: <http://www.cinvestav.mx/>

3. CONFERENCES AND MEETINGS

3.1. *Conferences on Statistics Education*

3.1.1. Encontro sobre Ensino e Aprendizagem da Estatística, Lisboa, Portugal, Febrero , 3-4, 2000 (Conference on teaching and learning statistics, Lisbon, Portugal, 3rd to 4th , 2000, Faculty of Sciences, University of Lisbon).

The Conference was sponsored by Portuguese Statistical Society, Association of Teachers of Mathematics and the Departments of Education and Statistics & Operational Research of the Faculty of Education at the University of Lisbon. 600 peoples (primary and secondary school teachers, and University lecturers from Portugal, Brazil, Argentina, Cuba, Mexico and Spain) attended the meeting. At the closing session came the Head of the Sections of Primary Education and Secondary Education of the Departments of Education.

In the Conference there were four Plenary lectures: "Funny and serious matters in statistics" by J. P. Viana; "Statistics at secondary school level: Its teaching and its problems" by J. Branco; "Students' difficulties with basic statistical concepts: the case of averages" by C. Batanero, University of Granada, Spain; and "What sort of statistics should be taught in schools and why?" by P. Holmes, Nottingham, Trent University, UK.

Also two Round Tables were part of the meeting: "Statistics in the curriculum" (A. Porralho, F. Nunes, Joana Porfirio, Joao Pedro Faria, & Paulo Albergá), and "Statistics in the initial training of teachers" (Isabel Rocha, Joana Castro, Joao Filipe Matos, & Nazaré Lope). Teachers and researchers presented papers on teaching experiences and students' learning (the references of the papers can be found in "Statistical Education Research Newsletter" Vol. 1(2), May 2000, pp. 33, <http://www.ugr.es/local/batanero/Newsletters/newsmay00.PDF>)

Conclusion of the conference: a) Statistics has a limited role in the curricula of Primary school; b) There is a computational trend in the teaching of the statistics that hides to the students main statistic processes; c) The students tend to have wrong, previous ideas about statistics; d) It is necessary to create a positive attitude in the teachers toward the teaching of the statistics.

3.1.2. Conferencia Internacional "Experiencias e Expectativas do Ensino de Estatística – Desafios para o Seculo XXI (International Conference "Experiences and Perspectives on Teaching Statistics - Challenges for the XXI Century), Florianópolis, Brazil, 20-22 September, 1999 (<http://www.inf.ufsc.br/cee/>)

The Conference was sponsored by Federal University of Santa Catarina (Department of Statistics and Computer); the PRESTA program (Research and Teaching Program on Applied Statistics) and IASE (International Association of Statistical Education). The conference has financial support of the European Union, Inter-American Statistics Institute and Brazilian Statistics Association. The International Program Committee was composed by notable researchers from Belgium, Italy, Spain, Australia and Brazil. The speakers in plenary session were: Dr. Jandyra M. G. Fachel (UFRGS); Dr. M. G. Ottaviani (University of Rome): "Promoting the teaching of the Statistics: The function of the IASE and its cooperation with the countries in development process", there is a Spanish language version in <http://www.inf.ufsc.br/cee/mesa/MGOTTAVI.html>; Dr. E. Crivisqui about explanation of PRESTA program.

The papers were distributed in six topics: a) Research on Statistical Education; b) Teaching Statistics in the professional training; c) Teaching Statistics in 1st and 2nd degree; d) Training Students to research and applied statistics; e) Research and curricula to Statistical Education.

The Conference had four Round Tables: a) Teaching statistics in the professional training. Organiser: M. G. Ottaviani (Italy). Speakers: Pedro A. Barbeta (Brazil), Renato Dittrich (Brazil), Ana S. Haedo (Argentina), Pedro A. Morettin (Brazil), and Pedro L. N. Silva (Brazil); b) Training statisticians for research and teaching. Organiser: Clóvis A. Peres (Brazil). Speakers: Lisbeth K. Cordani (Brazil), German C. Iglesias (Colombia), Cesar Aguirre (Argentina), and João Riboldi (Brazil); c) Teaching statistics in primary and secondary schools. Organiser: Carmen Batanero (Spain). Speakers: Elena Carrera (Argentina), Margarida Cesar (Portugal), Celi A. E. Lopes (Brazil), Ernesto A. Sanchez (Mexico) and Dinara W. X. Fernandes (Brazil); d) Continuing training in statistics. Organiser: Pedro L. N. Silva (Brazil). Speakers: Eduardo Crivisqui (Belgium), Omar Barriga (Chile), Carlos M. Batista (Brazil), Mercedes Delgado (Cuba) and José Francisco Soares (Brazil).

C. Batanero (Spain) organized a workshop: “Exploratory Data Analysis in Secondary School”, directed to secondary school teacher (complete text in Spanish language in <http://www.inf.ufsc.br/cee/frame2.htm>)

180 researchers from several countries attended the Conference: Brazil 110, Argentina 35, Uruguay 10, Spain 5, Peru 3, Portugal 2, Cuba 2, Belgium 1, Colombia 1, Italy 1, Mexico 1, Venezuela 1. This fact shows the interest on educational topics by persons linked to Statistics.

3.1.3. Jornadas Europeas de Estadística. La enseñanza y la difusión de la Estadística, [European Conference of Statistics. Teaching and diffusion of Statistics], Palma de Mallorca (Spain). October, 10, 11, 2001. “Intituto Balear de Estadística” and “Eurostat” sponsored the Conference. There were four Sessions and two Round Tables on “Teaching Statistics and Statistics into Teaching” and “Diffusion of Statistics”. Some topics of Conference were: Experiences of the statistics institutions in diffusion and teaching statistics. Teaching statistics in educational levels: primary, secondary, university: Contents. Teacher’s training. Main obstacles. Resources for the teaching of the statistics: software, Internet, resources in the net. The media and the statistics. Research on Statistical Education. 28 paper was presented and they will be included in a book that will be edited by Eurostat. More information is available in <http://ibae.caib.es/> and http://www.caib.es/ibae/esdeveniment/jornades_10_01/main.html and ibae@caib.es

3.2. *Conferences on Mathematics Education with Activities on Statistics Education*

3.2.1. VII ENEM. VII Encontro Nacional de Educação Matemática. Educação Matemática e novas Tecnologias. O maior evento de Educação Matemática do Brasil, Rio de Janeiro 19-23 de julio de 2001 [VII ENEM. VII National Meeting on Mathematics Education. Mathematics Education and New Technology. The greatest event on Mathematics Education in Brazil, Rio de Janeiro 19-23 July 2001]. There was a working group, the working group 12: Teaching Probability and Statistics. Organizer: Clayde Regina Mendes, PUC Campinas, clayde@puc-campinas.br. More information is available at <http://www.viiennem.ufrj.br/home.html>

3.2.2. 15^a Reunión Latinoamericana de Matemática Educativa (15th Latin-american Meeting on Educational Mathematics), Buenos Aires, Argentina 23-27 July, 2001. This meeting was sponsored by Comité Latinoamericano de Matemática Educativa (Latin-american Committee on Educational Mathematics) and Universidad Nacional General San Martín. The activities were focalized in sharing experiences, knowledge and researches in learning and teaching Mathematics with Latin American colleagues and others from different parts of the world.

Activities on Statistics Education: Two short courses: a) Construction of probability and statistics models with the graph calculator by T. Queralt (Spain). b) Conditional probability and the stochastic independence: Learning and teaching problems by E Sanchez (México).

Three workshop: a) Statistics workshop to teachers by A. S. Haedi. b) A Teaching proposal of probability and Statistics in the Secondary School: Activities workshop by R. Ramirez, Mexico. c) Elemental Statistics and probability: Activities to play by E. Rivero (Puerto Rico).

Two research reports: a) Teaching geometric probability by A. J. Rivera, Venezuela. b) Research on Statistics Education: Cases study, by G. Molina and alt. Argentina. There were five communications, two posters and discussion groups: About teaching and Learning Statistics, coordinator: E. Gallese, Argentina. More information is available at <http://webs.sinectis.com.ar/ccrespo/>

3.2.3. X JAEM, X Jornadas para el Aprendizaje y la Enseñanza de las Matemáticas [X Conference on Teaching and Learning Mathematics], Zaragoza, Spain, 7 - 9 of september, 2001. This kind of conferences are held in Spain every two years. In this occasion more of ten papers were presented about teaching and learning inference, randomness, chance understanding, probability in the school, probability, statistic curriculum, chance.

3.3. *Conferences on Statistics with Activities on Statistics Education*

3.3.1. Statistics Education in Conference CLATSE IV, Mendoza Argentina, 26-30 July, 1999. The Sociedad Argentina de Estadística (SAE) and the Sociedad Chilena de Estadística (SOCHE) organized jointly the CLATSE Conferences. In the CLATSE IV the activities on Statistics Education: An opening session by M. G. Ottaviani (University La Sapienza, Rome, Italy) "International perspectives on Teaching Statistics", followed with interest by assistants. A Round Table about statistics education problem, organizer: Dr. Silva Haedo, Participants: Dr. M. G. Ottaviani, Dr. M. Aliaga (University of Michigan, USA), Dr. Elsa Servi (National University of Rosario, Argentina), Dr. Pilar Iglesias (Catholic University of Chile). The topics discussed were: experimental method to teach statistics with graphic calculator at university level (Aliaga), current problem and projects (Servi), new methodology for teaching statistics at Chilean school (Iglesias).

Courses organized for elementary and secondary school teachers: a) Teaching statistics at elementary school. First and Second level of EGB (6 - 11 year old students). Adriana Mallea de Fuentes, and Ana María Ruiz (National University of San Juan); b) Teaching statistics at elementary school. Third level of EGB (12 - 14 year old students). Mónica Guitar (University of Mendoza). c) Data processing and education. Simulation and randomness, Ana Silvia HAEDO and Daniel Vazquez Vargas (University of Buenos Aires); d) Teaching Statistics at University level (18- 21 year old students). Martha ALIAGA (The University of Michigan, USA). Also there were posters and oral communications with interesting results and experiences from different Ibero-american countries.

3.3.2. XXVIII Coloquio Argentino de Estadística, Posadas, Misiones, Argentina, 8-11 August 2000. (XXVIIIth Statistics Argentine Meeting, Posadas, Misiones, 8-11, August, 2000). In this Conference there was a Section devoted to the teaching of Statistics, as a contribution of the Argentina Statistical Society to improving the teaching of Statistics at the different educational level. 8 papers and 4 posters were presented. More information is available at: <http://www.ugr.es/local/batanero/Newsletters/newssep00.PDF>, Newsletter 1(3) September, 2000.

3.3.3. XXVII Jornadas Nacionales de Estadística, Valdivia, Chile, 9-11, October, 2000 (XXVIIth National Conference of Statistics, Valdivia, Chile, 9-11, October, 2000). This Conference has on Statistics Education a plenary lecture, "Interactive Statistics" by Dr. Martha Aliaga (University of Michigan, USA) and a course "Teaching statistics and probability at secondary school level (Dr. Carmen Batanero, University of Granada, Spain). More information is available at: <http://smtp.uach.cl/eventos/jnestadistica/>

3. 4. *Other Meetings*

3.4.1. The Jornadas ASEPELT sobre Nuevas Tecnologías para la enseñanza de Economía Aplicada (ASEPELT Meeting on New Technology for Teaching Applied Economy) November 1999, Alcalá de Henares, Madrid. In this Conference 13 papers were presented related to Statistical Education (references of these papers can be found in Statistical Education Research Newsletter, Vol. 1(2), May, 2000, <http://www.ugr.es/local/batanero/Newsletters/newsmay00.PDF>

4. SPECIAL ISSUE ON STATISTICS IN THE SPANISH JOURNAL

Most of journals edited in Spanish or Portuguese language have in its issues papers on Stochastic Education, as the extension of this paper is short (6 pages), it would be impossible to

relate them here. However, in the last years, two journals have devoted each numbers to the stochastic education, below we list its contents.

4.1 The Volume, 5 (July, 1995) of *Uno. Revista de Didáctica de las Matemáticas*, a Spanish Journal has focused on Probability and Statistics and on different topics related to its studies. This issue was coordinated by C. Batanero. This is the table of contents:

- Batanero, C. Probabilidad y Estadística [Probability and Statistics], pp. 4.
- Garfield, J. B. La evaluación del aprendizaje de la Estadística, [Assessment of learning Statistics], pp. 5-14.
- Batanero, C. & Serrano, L. La aleatoriedad, sus significados e implicaciones educativas [Randomness, its meanings and educational implications], pp. 15-24.
- Tormo, C. Dificultades del alumnado respecto a la media aritmética [Students' difficulties in relationship to the mean arithmetic], pp. 29-36.
- Ojeda, A. M. Dificultades del alumnado respecto a la probabilidad condicional [Students' difficulties in relationship to the conditional probability], pp. 37-44.
- Godino, J. D. ¿Qué aportan los ordenadores a la enseñanza y aprendizaje de la Estadística? [What provide the computers to the teaching and learning Statistics?], pp. 45-56.
- Espinel, C.; Bruno, A. & García, J. A. Diagramas para visualizar desigualdades y clasificaciones [Diagrams to visualize inequalities and classifications], pp. 57-68.
- Estepa, A. Algunas consideraciones sobre la enseñanza de la asociación estadística [Some considerations on teaching statistical association], pp. 69-79.
- Vallecillos, A. Consideraciones epistemológicas sobre la inferencia estadística. Implicaciones para la práctica docente [Epistemological considerations about statistics inference. Implications for educational practice], pp. 80-90.
- Shaughnessy, J. M. & Batanero, C. Un enfoque visual para enseñar las probabilidades binomiales [A visual approach to teach the binomial probabilities], pp. 103-112.
- Pérez Cuenca, P. Actividades de probabilidad para la enseñanza primaria [Probability activities for the primary teaching], pp. 113-122.

4.2. The Volume, 15 (November, 1999) of *Blaix*, a Spanish Journal published in Catalan language, has focused on statistics and on different topics related to its studies. This is the table of contents:

- Batanero, C. Cap on va l'educació estadística? [Where statistics education is going to?], pp. 2-13.
- Borrell, F., Pol, A., & Sagner, E. L'estadística. La seva presència a la societat actual i al currículum de l'educació secundària [Statistics. Its place in present society and in the secondary school curriculum], pp. 14-25.
- Gomá, A. Fer estadística: una experiència col·lectiva [Doing statistics: a collective experience], pp. 26-36.
- Monzó del Olmo, O. L'estadística a l'Educació secundària [Statistics at secondary school level], pp. 60-69.
- Corbalán, F. Estadística aplicada a la vida diària: una enquesta electoral [Statistics applied to everyday life: a voting survey], pp. 70-71.
- Cruset, B., & Fernández, X. Una experiència: estadística a cicle mitjà de primària [An experience: statistics at middle primary school level], pp. 77-79.

5. BULLETIN

5.1. "*Hipótesis Alternativa*" (Alternative Hypothesis) is the bulletin of the International Association for Statistical Education, IASE for Venezuela, published in Spanish language in the Web Site of Group of Statistical Education of Granada University (Spain), (<http://www.ugr.es/local/batanero/Hipotesis.htm>), edited by Audy Salcedo, from the Universidad Central de Venezuela (Central University of Venezuela). The aims of this bulletin are: a) to divulge professional information and interesting documents for the statistical education community in Venezuela, b) to serve as a bridge between the local members and the IASE, including the transmission of information about activities of IASE and making known the

Venezuelans in the association. Consequently, it is interested in publishing information about Statistical Education like: contents, teaching, learning, assessment; projects and finding of research; summary of papers presented in Conferences on Statistical Education; information about next Conferences; resources in Internet. This bulletin will have three issues on the year, February, July and November.

6. INTERNET

Above, I cite several Web Sites, but I think that the following Web Sites are interesting for the objectives of this paper.

<http://www.sbem.com.br/> Sociedade Brasileira de Educação Matemática

<http://www.ciudadfutura.com/matematicas/estadistica/index.html> Web Site of Statistics

<http://www.uv.es/~lejarza/estadistic.htm>, You can obtain the program “HIPESTAT 2.1. Hipertexto de Estadística Económica y Empresarial” [HIPESTAT 2.1. Hipertext of Economic and Business Statistics] by Juan Martínez de Lejarza Esparducer & Ignacio Martínez de Lejarza Esparducer, Department of Applied Economics, University of Valencia (Spain). This program is a statistics book presented by means of hypertext. In addition, it has a lot of interesting information in the Web about course, book, software, data, journals, university, and links.

<http://proem.pucsp.br/>. Studies and researches programs in Mathematics Education.

<http://alea-estp.ine.pt/> (Portuguese language) it contains topics, resources, materials for teaching and learning Statistics

<http://www.ibad-laspalmas.com/inferencia/index.html> (Spanish language) it contains a course on statistical inference.

<http://www.ucv.cl/web/estadistica/> (Spanish language) Course of Introduction to Descriptive Statistics by the members of Instituto de Estadística de la Universidad Católica de Valparaiso (Chile) [Statistics Institute of Catholic University of Valparaiso (Chile)]

http://ima.udg.es/~cls/ee/cls_ee_rd.html Catedra Lluís Santaló d'Aplicacions de la Matemàtica (University of Girona-Spain). It contains courses, resources, materials and information about software, journals and Conferences.

I have tried to compile and summarize information about Stochastic Education in Ibero-American countries. It is difficult to gather this information, I think that other interesting information could exist but it has not been taken into account here; for this, requested excuses.