IASE SATELLITE CONFERENCE –

STATISTICS EDUCATION AND OUTREACH

18-19 AUGUST 2011

DUBLIN, REPUBLIC OF IRELAND

http://www.conkerstatistics.co.uk/iase/

Abstract Booklet

The abstracts of the oral presentations being given during this conference have been arranged in this booklet under the identified conference themes:-

Theme 1

The School/ University interface. Activities that encourage more school students to take statistics at university; activities that lead to a more statistically literate population in general. Student competitions.

Theme 2

School or University engagement with employers. How do we prepare students for the world of work and how do we involve employers in this process? What elements of our undergraduate curriculum specifically prepare our students for their future careers? How can we improve these elements?

Theme 4

Interaction with other professions e.g. the law, medicine, members of parliament.

Theme 5

Engagement with other academics/learned societies who use statistics e.g. in geography, psychology, business studies, health care, the sciences, social sciences.

Theme 6

School or university engagement with the local community. Improving statistical reasoning, thinking and literacy in the general public.

(There were no contributions under Theme 3)

In addition there will be a poster session across themes.

Please note that the allocation of papers to themes and sessions has taken into account speakers' requests as far as possible, but finally by the Programme Committee to try to ensure a full and coherent set of sessions.

We hope that you enjoy the conference.

Penny Bidgood
Programme Chair

Theme 1A

1A.1 The Role of Statistics in Improving Education: A Dilemma

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The ultimate goal of teaching statistics is to foster an adult population capable of reasoning from and about data and making informed decisions based on quantitative information in the workplace, in their personal lives and as citizens. This paper discusses the statistical skills and reasoning necessary for those involved in the design and delivery of education to understand, interpret and use information about their schools, teachers, and students to improve what they are doing as an educational system. Educators in the United States increasingly have access to data such as achievement trends over time, item analyses from high stakes tests, or comparison data for states and comparable systems, that can help them develop ways to improve student learning. Unfortunately, few educators have sufficient understanding of statistics to make use of this data to help prevent costly errors in decision-making.

In most US curricula, the study of data analysis begins in the middle grades, for students ages 12 to 14. The ideas are revisited in some curricula in high school, but the level of cognitive complexity is rarely deepened, and the applications are typically procedural. At the tertiary level, students intending to be involved in education do not always have to take a statistics course; if they do, the course is often a mathematical statistics course. The dilemma is that as more data about teaching and learning becomes more readily available and the tools for analyzing the data become more sophisticated, the ability to produce useful information from the analyses is outpacing the capacity of the field to use the knowledge productively.

The discussion draws on professional development work with teachers in several settings, including a large project funded by the National Science Foundation and a research project on the use of technology in algebra. The paper describes difficulties educators from these settings have in applying statistical skills in the context of their work in teaching and learning and suggests some strategies for secondary and post secondary classrooms to address the challenges that need to be resolved before statistics becomes an educational tool for guiding practice in the educational workplace.

1A.2 Looking in classrooms: Improving the teaching and learning of statistics in primary classrooms

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A driving question in teacher education centers on how to help prospective teachers become expert teachers. The absence of a shared professional curriculum to prepare primary teachers to teach statistics combined with the difficulty translating traditional research knowledge into forms that teachers can use in their practice have motivated this study. This paper reports on the combined efforts of teacher educators, teachers, and preservice teachers to engage in inquiry-based teaching of primary level statistics. The classroom lesson is used as the unit of analysis in this research and the presentation will focus on the efforts of approximately 20 preservice primary teachers to teach primary level statistics. Lesson Study was the primary method used to support a focus on examining teaching through the design and implementation of 'study lessons'. The methodology of Lesson Study engages participants in cycles of inquiry to produce exemplar statistics lessons at the primary level. Insights into preservice teachers' reflections on lesson study are presented in addition to a discussion of the benefits of efforts such as this which translate traditional research knowledge into forms preservice and practising teachers can use to improve their practice of teaching statistics. Video excerpts of primary level classroom teaching of statistics will be used to provide insights into the lesson study process and into the obstacles faced by preservice teachers when teaching statistics.

1A.3 Attitudes of Portuguese teachers towards statistics: a qualitative analysis

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As part of a study of the attitudes of teachers from the first (ages 6 - 9) and second (ages 10 - 11) cycles of basic education in Portugal towards statistics we present this work that also considers the previous work of Estrada (2002) and the preliminary study of Martins, Nascimento and Estrada (accepted for publication in February 2011).

We think that the full commitment of teachers to the teaching and learning process is fundamental to implement any significant changes in the ways that statistics is taught. Besides the improvement of the cognitive side of instruction, further attention is also needed to non-cognitive factors as attitudes and motivations, like stated by Gal and Ginsburg (1994) for students, but we believe that this is also true for teachers. We will discuss teachers' attitudes towards statistics and the reasons and motivations that they stated in some of the items of the used scale. Since we believe that those attitudes have a key role in the teaching and learning process and because, we believe that some of them will give us guidance about those reasons and motivations and will be important to our future work in this field.

In this context, we will provide a brief summary of the current understanding of attitudes towards statistics and the Scale of Attitudes Towards Statistics (Escala de Actitudes hacia la Estadistica de Estrada EAEE, Estrada, 2002). We will begin the analysis of the open-ended answers of the teachers in the survey done in October/September of 2010 with the in-service Portuguese teachers in the first and second cycles of Portuguese basic education. Since the main purpose of this survey is to analyse Portuguese teachers' attitudes towards statistics, we will establish the reasons/motivations categories and we will present the first qualitative analysis of those data as an exploratory approach. We aim to synthesize understandings which emerge from that analysis help us to 'validate' the quantitative instrument used (Estrada, 2002), as well as to get a first glimpse of teachers' attitudes towards statistics.

1A.4 What statistics do budding teachers learn and is it adequate?

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One way to improve the ways in which the subject is taught in schools is to influence the content and delivery of the statistics curriculum on teacher training courses. Here we report on an investigation into the statistics content and delivery in UK teacher training courses.

In 2004 the post-14 Mathematics Enquiry highlighted widespread concern about the teaching of mathematics (including statistics) in schools and made several recommendations to improve it. One of these was to review the place of statistics and data handling in the national curriculum; this review has since been carried out by the Royal Statistical Society (RSS) Centre for Statistical Education which advocates that statistics should be taught through a problem-solving approach. Another recommendation was to reform and strengthen aspects of teacher training and professional development, which is the focus of the current work on statistics teaching in schools.

This is not solely a UK concern – for example the Joint International Congress for Mathematics Education/International Association for Statistical Education Conference in 2008 had as its theme "Statistics Education in School Mathematics: Challenges for Teaching and Teacher Education". Further, the school level Guidelines for Assessment and Instruction in Statistics Education (GAISE) report (Franklin et al, 2005) from the US concurs with many of the conclusions with regard to statistical literacy and the problem solving approach noted above.

There are no formally published details of the extent to which UK teacher training courses embed training in teaching statistics in preparation for school teaching. However there is much anecdotal evidence that statistics has a low priority in the content and delivery of many mathematics teacher training courses and is rarely delivered well, although statistics forms a key part of the mathematics national curriculum at both primary and secondary stages.

Statistics is a pervasive subject that occurs not only in the mathematics curriculum, but in several other school subjects. Whilst all these routes for learning statistics are important, in the first instance the main focus of this research is on courses for secondary mathematics teaching. We report here results from a pilot survey of student teachers in mathematics on their attitudes, background and understanding of statistics and how they expect to develop the skills to teach it.

This study is funded by the Teaching Statistics Trust, who see the results as contributing to the underpinning of the RSS 10 year *getstats* campaign.

1A.5 Rolling out a sustainable program to upgrade statistics knowledge of in-service teachers through a TEAMWORK approach in South Africa

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Statistics was recently introduced into the South African school syllabus along a sliding scale, with full implementation in all grades as from 2008 onwards. As is the case in many countries, teachers in South Africa often do not teach this section of the syllabus with confidence, as they have not yet received adequate training.

Challenges faced by statistics education at grass roots level in South Africa are – shortage of teachers with adequate mathematics training, lack of statistics interpretation skills, multiple languages in one class room, very large classes and many more!

The author gives an overview of the various programs that have been put in place to assist teachers to cope with the new statistics content of the school syllabus and then discusses the rolling out of a new program that attempts to address the statistics training of in-service teachers by defining a team consisting of members from

- a university Statistics department,
- the Department of Education and
- the Government Official Statistics Office.

The "team" jointly presents a sustainable program for upgrading the statistics knowledge of teachers as an outreach project in a particular province that will run each year. The main features of the project are that it draws on the expertise and skills of each component of the team, is relatively cheap to run and results in large numbers of teachers coming to grips with the basic skills needed when teaching the Statistics component of the new school syllabus.

Though the introduction of statistics is relatively "young" in South Africa, lessons learnt could possibly be of value to other countries, and in particular, to other developing countries.

Theme 1B

1B.1 Comparison of Data Sets as a Precursor to Inferential Statistics

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Comparison of two data sets is one of the most important activities in statistics education. Comparison of two data sets helps students remain engaged in reasoning about distributions, as they need to focus on variation as well as center as they are comparing data sets (Konold & Higgins, 2002). Most previous research about comparisons of data sets investigated students' reasoning levels or their strategies, focusing on informal reasoning as the students compared data sets. However, Makar and Confrey (2004) suggest that comparison of two data sets also can be a powerful tool in light of its use toward a consideration of inferential statistics. Both informal and formal statistical reasoning are developed when comparing data sets, which has implications for researchers who investigate ways to help students transfer from informal to formal reasoning.

In this paper, we identified students' reasoning to determine the aspects of it that can serve as a basis for transferring from informal reasoning to formal reasoning, inferential statistics. Seventy students in Grades 7 and 8 were presented with tasks in which data sets were compared, after which discussions were held in the classes. The results included that most of the students conceived of an interval instead of a specific point such as a cut point as a standard of comparison; students tried to compare data sets with multiplicative reasoning rather than additive reasoning; moreover, they considered that the given data sets were samples, allowing them to recognize the possibility of different results. All of these reasoning formed a basis of inferential statistics. From the results, we suggest instructional ideas for connecting informal and formal statistics.

1B.2 Nappy Changing Challenge and Classroom Olympics: Competitive and cooperative hands on data collection activities

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It is well recognised that hands-on school activities can encourage engagement and learning. However, for many years such activities with a competitive element have taken a back seat to the promotion of activities that encourage cooperation. With careful consideration to the inclusion of all class members at KS3 level, Conker Statistics have worked closely with secondary school teachers in developing two themed sets of activities that have elements of competition and cooperation.

The Nappy Changing Challenge, designed to raise awareness of childcare, uses realistic baby dolls and real nappies. A well designed data collection form provides the necessary guidance to perform the three stages of the activity including estimation, opinions and measurement. Analysis of the data collected motivates class discussion and presentation of the key results.

Classroom Olympics, launched at the English Institute of Sports in 2010, encourages all pupils, regardless of their athletic ability, to take part in competitive activities such as the bean bag shot put and standing start triple jump.

To date over 2000 students have taken part in these activities within the classroom and at school events. We discuss our experiences of The Nappy Changing Challenge and Classroom Olympics.

1B.3 Statistics in life and for life.

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Even at this point, we keep wondering what the use is, but descriptive statistics is to understand and describe the world around us. Moreover, many secondary education mathematics teachers still wonder why a branch of mathematics which can be related to the real world is introduced to students as just the learning of formulas as this discourages our students and creates two major groups, those who get lost in both conventionality and those who are bored by the lack of application.

In this paper we look for ways that allow students' motivation to increase, giving them knowledge that they will find useful and, above all, making them reconsider the world around them. In this respect we have decided to work on projects related to everyday problems, with the active participation of students in the resolution of situations. If we want our students to be mathematically literate they need to face everyday problems by themselves; that way they will discover that mathematics is not only applicable, but necessary to understand the world around them, and only then can they integrate the new knowledge and be able to apply it when needed.

There are two contexts that have the same base: collaborative learning and working in learning scenarios. This is based on the European project "EarlyStatistics", whose main goal is to improve students' statistics education. This project has been selected as the "2009 Best Cooperative Project Award in Statistical Literacy." Since humans are social beings, we need teamwork-based learning, and it makes sense if it is located in a familiar environment for students so they feel safe and dare to face new challenges.

Theme 1C

1C.1 Istat's new strategies to increase statistical literacy

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Official statistical information is a public good and therefore should become common heritage in a full sense. A society of statistically illiterate people is not a fully democratic society.

One of the fundamental aims of a National Institute of Statistics is to increase people's statistical literacy. In order to achieve this, Istat decided to review its communication and didactic priorities and strategies and to start from young people: they must be considered as one of the key groups towards which new statistical literacy activities should be directed. Our goal is clear: to increase young people's statistical awareness in order to make them more responsible citizens.

Many activities have been already performed and many others are going to be performed. However, the main difference from the past lies in the idea of using the high computer technology and web2.0 skills which young people nowadays possess in order to attract them to statistics. According to that, Istat is planning new projects which focus on the use of web technologies, social networks, mashups etc. In order to achieve better results, Istat is also building new partnerships with public institutions and private societies interested in statistics.

1C.2 Use of case studies and new software to motivate statistics teaching and learning at school and undergraduate university

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Interesting data provide motivational benefits when learning statistics. This occurs equally for statistics specialists and students in subjects that use statistics. Videos describing study designs and contexts are presented. Researchers from University Departments or Research Institutes in New Zealand are recorded, presenting their data for analysis. The studies have been selected to illustrate how statistics is used in research. Nineteen edited videos of 10 to 20 minutes duration have been produced and posted on the web. The studies involve experimental data, observational data, cohort data and data from large surveys. Tasks are suggested for classroom exercises or university projects. New, powerful, free-to-use menu-driven software is used as an alternative to other good but expensive programs. Each video with matching data has a set of lessons posted with it using the new package. Extensive graphical procedures, estimation, hypothesis testing, time series analysis, regression modeling, bootstrapping and randomization reflecting the New Zealand school curriculum can all be carried out easily. Teacher and student opinions are reported. The software is licensed for free home use by students in schools adopting the software for educational purposes. A second free version of the package with more advanced statistical options is available for university undergraduate work. The access key authorizing use of the package at no charge is available and the software with the supporting videos and lessons is available for educational use internationally. Videos and lessons are continuing to be developed. A discussion site where new data sets and lessons can be posted is being established on the website.

1C.3 Mastery tests to cope with mixed backgrounds in an introductory statistics course

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In many countries, a considerable amount of statistics is now taught in the mathematic stream at high school level. At tertiary level, this causes problems in statistical methods courses since there is often a mixture of students who did little statistics at school level, others who were exposed to statistics but have limited understanding, and students who have already mastered much of what will be taught in the course. It is difficult to teach such courses in a way that retains the interest of the best students while coping with a majority of weaker students who struggle with the material. This paper describes an introductory statistics course in New Zealand for such a mixture of students.

Since all students are expected to reach the same level at the end of the course, it is inevitable that students who did less statistics at school will need to do more work during the course. Most introductory statistics courses are taught assuming no background knowledge of statistics, so the new material is intermingled with material that is already known by the better students. This paper describes a course that is split into two halves with the first covering the overlap with the school syllabus. The overlapping material is assessed by three computer-based mastery tests whose questions are based on CAST exercises. Each question has enough random variations to make repeating a test easier only if the concepts being assessed have been mastered. The mastery tests give immediate feedback about errors and can be repeated (after 24 hours) as many times as it takes until a mark of 9/10 has been attained. The best students can take the mastery tests early and avoid attending the lectures for this material.

The second half of the course contains new material for all students, so it should keep the attention of the better students. It is hoped that this will encourage better students to consider more advanced statistics courses in later years. The paper discusses results from the first offering of this course.

1C.4 What happens if non-overlapping universes collide? Reaching out into the statistical unknown

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For many students at school level, at least in the United Kingdom (UK), the worlds of social science and of mathematics and statistics inhabit non-overlapping universes: the vast majority of students never encounter real social problems as substantial contexts in which they work to develop or apply mathematical or statistical techniques, nor do they encounter data where mathematics and statistics offer real insights into social issues. When they work in social sciences and humanities, the academic work is substantially text based with occasional headline statistics to support an argument, but those headline statistics are commonly of aggregated data, taking no account of the differences which exist between sectors of the population.

The new curricula recently introduced in New Zealand and in South Africa employ a radically new approach, with multivariate data being introduced at an early age. Reasoning from evidence in increasingly refined contexts, using more sophisticated arguments and more complex data, is a central thread of each curriculum. Curriculum reform on that scale is unusual and the very heavily structured qualifications framework which exists in the UK means it is very unlikely there will be a similar shift in the mathematics and statistics curriculum in the near future.

However, there is an alternative approach which may go some way to mitigating the effects of the formal mathematics curriculum not engaging with complex data: to work with other subjects which already engage with the big social issues, but which currently have no way of accessing the complex data in a comprehensible form. This paper will report on a project funded by the Nuffield Foundation, in which we present multivariate data via interactive displays in social science subjects. For example, the A-level Sociology course (studied by some 16 – 18 year old students) requires them to consider health inequalities: headline statistics suggest there is a large gap between rich and poor, that there are substantial regional, ethnicity, gender and age differences in health across the population and that these patterns can be quite different for different aspects of health.

Theme 2

2.1 Reflections on designing a statistical consulting capstone unit

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Statistical analysis is required in many different projects throughout most work areas, which makes statistical consulting both exciting and challenging. Most students majoring in statistics do not have real-life experience of statistical consulting, and so it is very important that we as educators prepare our students for the statistical consulting needs of the workforce by offering training in this important area of statistics. We have recently set out to design a final-year undergraduate capstone statistical consulting unit (course) for our students majoring in statistics at Macquarie University, Sydney, Australia. This unit brings together the various technical aspects of students' studies via a problem-based approach to learning about statistical consulting. In this paper, we document our planning of a statistical consulting unit: we discuss the challenges that we faced and indicate our solutions to these challenges during the planning stages of this capstone unit.

2.2 Using customer satisfaction surveys as a teaching resource in statistics education: Methods and benefits

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This paper examines how students who learn business or applied statistics can be prepared for the world of work in a way that improves their understanding of statistics as well as their ability to interpret and discuss the results of statistical analyses in a business context. We focus on the use of data associated with a central question in the life of virtually every service organization – that of customer satisfaction levels and trends.

Customer satisfaction levels and trends are usually determined by questionnaires of various lengths and formats (e.g., paper, phone, web). Customer satisfaction surveys are thus an important method, though not the only one, for collection of data about customers' view of service quality. The results of such surveys, when properly interpreted, can facilitate informed decision-making in the business context and beyond, e.g. in healthcare, government, or civic organizations.

From the viewpoint of statistics educators, data emerging from customer satisfaction surveys should be recognized as a tool for effective outreach and engagement of students in topics which have practical relevance for their future employment and their communities. In addition, a discussion of such data and of the planning and realities of surveys from which they emerge can help statistics educators to go beyond pure technical analysis into issues of measurement, sampling methodology, use of non-random samples in the real world, data visualisation, and more.

In the paper we first outline some of the core characteristics of customer satisfaction surveys and then provide illustrative examples which demonstrate the advantages of including data from such surveys in the undergraduate statistics curriculum.

2.3 Preparing students for the world of work: an evaluation of undergraduate work placements by students and employers

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All undergraduate students at the University of Limerick are required to undertake relevant work experience, normally of eight months duration, as part of their degree programme. The University places 2,000 students annually, making it one of the largest placement programmes in Europe. Some 1,600 employers participate in the programme annually and about 75% of these employers also employ graduates of the University. Mathematics and Statistics degree students are placed in a wide variety of sectors including financial services, manufacturing, market research, statistical consulting and government agencies. These students are visited by a faculty member of the Dept. of Mathematics and Statistics during their work placement and are required to rate aspects of the work environment including relevance to their course, career implications, support structure and achievements. Employers are also asked to rate aspects of the student's performance such as technical knowledge, problem solving and analytical skills, interaction with others and communication skills.

The objective of this study is to report on the evaluation of work placements by the most recent cohort of Mathematics and Statistics degree students from 2009/10 (n=20). A summary of the qualitative comments from students, ratings and overall assessment are given together with evaluation from their employers on their performance and the benefits of the work placement programme. This feedback facilitates careful monitoring of the effectiveness of this programme for students and employers but also provides useful information for faculty on how well students are prepared for the world of work and what areas could be improved on.

2.4 Taking statistics outside the classroom: researching the community

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Oftentimes, students who take Introductory Statistics fail to see the significance of statistics for society, or for their future careers. In order to make statistics more valuable to students and show them how statistical results are put into use, regional research projects are brought in.

Firstly, research questions from regional (non) profit organisations are adjusted to fit to the level of Introductory Statistics. Then, the projects are announced in class. Based on their interest - and competency level (and a motivation letter), students are assigned to the available project groups. The projects start during the first weeks of the semester, and they last 10 to 15 weeks. A group presentation and a research paper mark the end of the project. Supervision is provided by the statistics instructor and an expert from the client's organisation, thereby warranting control over reliability and validity of the method. This paper reports on the set up of such regional research projects and the results of student evaluations, by means of an example of good practice.

Regional research projects do cost more effort, as students report to have put in more hours. Nevertheless, the first evaluation results are promising, as students who took part in these research projects report higher self confidence, they perceive their math skills to be better and they more firmly believe in future use of statistics. Furthermore, after finishing the project, they show more interest in statistical topics, they believe it is less difficult and they value statistics higher. Most importantly however, the grades of students who participated in group projects improved compared to students who did not take part in any student projects in their course.

Qualitative evaluations show that students experience the usefulness of statistical results in everyday life, as they find their results are for example used as a starting point for project plans, policy changes, and organizational changes. In sum, students start to see the added value of statistics.

Theme 4

4.1 Statistics and the Working Nurse

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Recently, Bellarmine University's Nursing department introduced two new programs: a bachelor's degree for registered nurses, and a professional doctorate in nursing practice. These programs enroll working nurses, who have substantially different needs than the traditional undergraduate population. This paper discusses how statistics course offerings have adapted to the demands of the other profession.

More specifically, this paper considers several topics. Funding differs, since the employer pays most costs. Because participants have full time jobs, course meetings must become less frequent and longer, leading to substantial challenges. The topics and examples need to balance customary choices with the rapidly changing demands of the medical profession. Students' experience and computer availability shift computing requirements. Finally, the students have different demographics and personalities; this alters how classes are conducted, including the perplexing problem of perfectionism.

4.2 Building statistical capability for evidence based decision making in the government sector: Initiatives of the Australian Bureau of Statistics

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The Australian Bureau of Statistics' (ABS) mission is *to assist and encourage informed decision making, research and discussion within governments and the community, by leading a high quality, objective and responsive national statistical service (ABS, 2005).*

The ABS recognises the importance of high quality official statistics to identify, inform, monitor and evaluate policy and to assist decision making within government. This ensures that policies respond to the real needs of the community, and also enables decisions to have transparency and accountability.

However, informed policy and decision making requires both ***access*** to relevant data and the necessary ***skills*** to use and understand the statistics. The ABS has not only provided free access to statistics on the website since 2005 but proactively promotes the development of capability to utilize these statistics effectively. This includes increasing awareness of available information; improving understanding of the statistical concepts and methodology underpinning the data; developing skills to analyse, interpret and evaluate statistical information; and promoting better communication of statistical information.

The ABS has implemented a range of initiatives, including the development of resources and support services which are aimed at assisting '*decision makers'* to effectively use ABS statistics and standards. These decision makers include members of parliaments and staff from government agencies at all levels of Australian government – federal, state and local.

ABS initiatives include those aimed at engaging with government stakeholders *to build a richer statistical picture for a better informed Australia (NSS, 2010).* For example, the establishment of the National Statistical Service (NSS) aimed at promoting data sharing and data quality standards; a program of 'out-posting' expert ABS officers within government agencies to provide practical assistance and advice; and committees such as the Australian Statistical Advisory Council (ASAC) aimed at ensuring the organisation remains nationally responsive and relevant.

Other initiatives include the establishment of a Statistical Literacy Unit to lead a national ABS program aimed at improving statistical capability across a number of different target groups; the provision of professional training to external clients; the development of online tools to assess data quality; and specialised client focussed web portals for accessing information.

4.3 An interactive methodology to teach sampling and statistical inference

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During our experience in teaching statistics to students in the biological field we notice that they have great difficulty understanding the statistical inference process and the sampling theory. These students should be prepared to understand scientific papers, to develop research to help the increase of knowledge in the health area and to maintain a good relationship with patients, explaining the disease or decision about treatment to them. The aim of this paper is to test a new methodology to teach biostatistics by developing statistical thinking to understand statistical inference. Two classes of biological courses students were chosen to be the experimental and control groups. One group was the freshmen of the School of Dentistry (the experimental group) and the other was the freshmen of the School of Veterinarian Medicine, (the control group), both studying at the University of State of São Paulo of Araçatuba, Brazil. The students were selected by the same college entrance examination.

In the experimental group, a new methodology was developed. At the beginning of the course each student drew a sample using the same database related to their area of knowledge. These samples were used to teach descriptive statistics, the comparison of the results of different samples and the understanding of the Central Limit Theorem. The control group used classical methodology, using the theoretical concept of sampling and inference only after descriptive statistics had been taught. At the end of the year, both classes were assessed taking the same test as to the understanding of statistical inference. It was verified that the understanding of the subject was greater in the experimental group than the control group, by the analysis of the proportions, at a 5% significance level. So we suggest that the students draw the samples to be used during all the course, comparing the parameters which were obtained with those samples, and building the Distribution of Sample Means to understand the theoretical concept on statistical inference. This is the interactive methodology proposed.

4.4 Making statistics friendly to users.

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Statistics have great potential to generate knowledge and serve as a basis for decisions taken by policy makers and the public; however, the understanding of the facts and figures behind policies and political processes is confronted with growing difficulties. This is because many people do not know about statistics or do not care about them as they do not understand them. This paper explored innovative tools for exploring statistics and ways of disseminating them in such a way that it would be understood by the common man. The main focus of the paper is on methods to enhance the understanding of the production and use of statistical data. This would be done to increase transparency regarding the National Statistical Systems, to foster the ability of critical data interpretation through the public, to prevent misuse of data, and to improve confidence in policies based on statistical data.

Theme 5A

5A.1 Reaching out to the sports science setting: The impact of academic practice on student learning

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Sports science is a multidisciplinary subject that encompasses biomechanics, physiology, and psychology. These disciplines are heavily reliant on experimental research to challenge the boundaries of knowledge. Academics are usually expert in one of the three disciplines, which influences their use and interpretation of statistics.

A recent research project was conducted using a sample of 336 sports science students to investigate the impact of degree programme (Sport and Exercise Science, Sports Coaching Science, Exercise and Health Science or Sports Therapy) on marks in statistics examinations. Gender and previous mathematics qualifications were included as additional factors in the analysis. Unstructured and semi-structured interviews were undertaken with a sub-set of the sample (n=12) to better understand the student experience of learning statistics in a particular university setting.

A synthesis of quantitative and qualitative findings revealed mathematics qualification, categorised by examination grades, to be the only factor that had a significant effect on achievement in statistics examinations at first and second year undergraduate level ($F_{(2,303)}$= 11.633, $p<0.001$ and $F_{(2,203)}$=9.384, $p<0.001$ respectively). The interview participants perceived statistics as something impossible to master unless they were "good at maths", and expressed insufficient confidence to engage with statistical activity.

The exposure to statistics in a variety of sport related disciplines hindered rather than aided students' statistical literacy as they experienced ambiguity in the use and interpretation of statistical procedures. Professional development to improve the Sports Science/Statistics interface and challenge the boundaries of modular degree structures is critical for future development of statistical literacy, reasoning and thinking in sports science contexts.

5A.2 Teaching statistics to economists: Statistical Department in Higher School of Economics (Moscow)

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The Russian economy is a typical emerging economy and it is changing structurally from year to year. This is a reason why employer's demand for new specialists is also changing. Russian universities have to follow this demand.

Currently, there is a strong demand for statisticians. With the development of a market economy many banks, big corporations and research centers need economists with strong statistical skills to research markets, modeling, forecasts, etc. Demand for statisticians from government institutions is also growing.

A Statistical Department was established in the State University – Higher School of Economics (HSE) three years ago. There is nothing new here because Russia has always had a strong tradition in statistics but before the collapse of the planning economy the main target for Soviet universities was to prepare enough statisticians to work in the official statistical service, planning agency and other government institutions. Currently the main consumers of our services are market oriented enterprises. It does not mean that HSE will not teach the professional producers of statistical information for the statistical service but most of our students see their future in business.

The Statistical Department (SD) in HSE is the part of the Economic Faculty. Our students are well prepared in general economic disciplines. During the first two years they have the same courses as other students of the Economic Faculty. There are macroeconomics, microeconomics, mathematic, foreign languages, and economic history. Starting from the third year, they have specialization. It means much more classes on statistical methods (probability theory, indexes, regression and correlation, etc.) as well as classes on subject oriented statistics (system of national accounts, business statistics, government statistics, financial statistics, social statistics). Demography is another option – students may choose between economic and social statistics or demography. Finally, our students will receive a diploma of economists with specialization in statistics.

There are both bachelor and master programs in the SD HSE. Master program is mostly focused on statistical methods and mathematics. But in the near future we hope to create the practice oriented master program.

HSE is very interested in cooperation with foreign universities to create a joint program in statistics or even a double diploma program. We are ready to coordinate our courses and to invite foreign guest-professors. All our students speak English well enough to understand lectures in English or to have classes abroad.

5A.3 Statistical thinking foundations for postgraduates across disciplines

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Provision of statistical assistance to postgraduate students in other disciplines is a perennial challenge in universities. If there is provision, it is usually part of, or in association with, statistical consulting, whether university-wide or within a faculty or institute. This places assistance to postgraduates in financial and/or time competition with researchers or perhaps external clients. Even if at least some financial concessions are in place for postgraduate students, such arrangements are oriented to considering them as researchers. Although postgraduate students often do need individual help with specific issues in their projects, they also tend to need to feel at least reasonably confident and secure in the statistical tools they are using and in statistical thinking in general. That is, the statistical needs of postgraduate students tend to overlap but also fall between those of undergraduates, graduates in workplaces and researchers.

This paper analyses five years of student and staff experience of a symposia series in statistical thinking specifically designed to provide statistical foundations for research across disciplines. The series is provided free and university-wide as part of a university centre in learning support in mathematics and statistics. The series consists of four 2.5 hour symposia, with sufficient modularisation to allow participants to choose to attend all or some. Essentially, the symposia consider the common concepts and procedures of statistics across disciplines within reference to the whole data investigation process, and from a research point of view. A pre-symposia questionnaire focuses on statistical misconceptions and difficulties frequently seen in research in other disciplines, and is organised within sections that generally correspond to each symposium, facilitating potential participants' attendance choices.

Participants have come from all disciplines with a wide variety of backgrounds, confidence and needs, and have included staff and coursework postgraduates as well as postgraduate research students. A series of three SPSS workshops has also been developed to provide hands-on experience, with the sessions modularised and in tandem with the symposia, but with attendance choice completely open. The paper analyses participant responses, questions and requests with reference to other reports and to implications for undergraduate learning across disciplines.

Theme 5B

5B.1 Using forest plots to introduce meta-analysis, including simple moderator analysis, early in statistics education

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Meta-analysis is becoming very widely used across many disciplines. In medicine and other professions it is the main technique used to integrate the evidence needed to support evidence-based practice, which is increasingly required of practitioners. However, statistics education, especially at introductory levels, has been slow to recognise the importance of meta-analysis, and has largely failed to find ways to introduce it as a topic early in the statistics education of students in disciplines that make considerable use of the technique. At ICOTS-7 I presented a paper titled 'Meta-analysis: Pictures that explain how experimental findings can be integrated' (Cumming, 2006, tinyurl.com/teachma) in which I argued that meta-analysis should be introduced in the introductory statistics course, using simple forest plots. I offered an ESCI (Exploratory Software for Confidence Intervals) module to assist. In this paper I will report on my further four years of experience introducing meta-analysis to classes of some 400 first year undergraduate psychology students. I will argue that the next step is to explain and illustrate moderator analysis, which is a highly valuable feature of meta-analysis. The simplest moderator analysis identifies two subgroups of studies, subjects them to separate meta-analyses, then compares the two. I will demonstrate an ESCI module that offers an enhanced forest plot that highlights separately the results of the two subgroups, then calculates the two subgroup meta-analyses, and an overall meta-analysis. It uses a novel display based on confidence intervals to include in the forest plot the results of all three meta-analyses, in a way that allows evaluation of the difference between the overall effect size estimates for the two subgroups. It thus supports visual evaluation and interpretation of the possible moderator. This software and its displays can support the explanation of moderator analysis to students, even at early levels in their statistics education.

5B.2 Teaching statistics through problem solving: using real time data retrieval

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Many teachers of statistics to non-specialists are faced with problems of engaging the students in the subject. In this session an approach to engaging students who experience introductory statistics as a service course will be presented. A problem solving approach is used and the students collect their own data via a real-time classroom survey tool. The online tool has been developed within LimeSurvey and allows tutors to control the publishing of the results as soon as each class of students have completed the survey.

Exemplar resources will be introduced alongside an opportunity to develop resources based on a PowerPoint template.

5B.3 Attitudinal Predictors of Reform-based Pedagogy in Introductory Statistics Education

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Reform-based pedagogy in statistics education is guided primarily by the constructivist learning theory, and is aimed at facilitating statistical literacy, a core competency for effective evidence-based practice. This instructional approach is relatively innovative, and may therefore be in conflict with instructors' assumptions and beliefs about teaching and learning. This is particularly so, given that a large proportion of instructors would have come from the traditionally-taught system. This cross-sectional study explored the overall and relative contribution of five dimensions of attitude in explaining reform-based pedagogy (teaching practice) in a purposive sample of 227 instructors (USA and international) of introductory statistics in the health and behavioral sciences, at the tertiary level. Attitude was measured using the FATS© scale (Faculty Attitudes Toward Statistics) and teaching practice was assessed with the TISS© (Teaching of Introductory Statistics Scale). Following multiple regression analysis, overall attitude explained 28% of the variance in teaching practice. Intentionality (a component of attitude) emerged as the strongest predictor ($\beta = .26$, $p = .003$) of teaching practice, followed by personal teaching efficacy ($\beta = .24$), and avoidance-approach ($\beta = .20$). Perceived usefulness and perceived difficulty (components of attitude) were not statistically significant predictors of teaching practice, in this model. However, in bivariate analysis, perceived usefulness (beliefs about the benefits or value of reform-based pedagogy) was the strongest correlate of intentionality (Pearson's $r = .7$, $p < .01$). Accordingly, it is prudent to recommend that professional development programs, aimed at reinforcing and facilitating positive attitudes toward reform-based pedagogy, include activities to target instructors' beliefs, particularly with regard to the benefits or usefulness of reform-based pedagogy, in this context. Support interventions may also be required to achieve attitude-practice consistency, that is, to facilitate positive attitudes to translate into the adoption and use of reform-based pedagogy. The role of perceived difficulty (ease of use) in attitude formation (and predicting teaching practice) in this context, is not clear, albeit its moderate and plausible relationship with personal teaching efficacy ($r = .4$, $p < .01$) could suggest a possible nested, higher-order or hierarchical factor.

5B.4 Passion-Driven Statistics

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Outreach needs to begin in our introductory statistics classes. However, for some, that may be a problem. Archie Bunker once told his son-in-law, "Don't give me no stastistics (sic), Meathead! I want facts!" What he was saying was: We statisticians get our kicks from stastistics (i.e., the technical aspects of statistical data analysis), while our clients and collaborators are turned on by the facts (the subject-matter insights provided by data). We create Archie's impression of a difference between statistics and facts early on by lifeless, sometimes clueless, textbook examples that seem aimed only at teaching formula plug-in; there are no apparent or interesting facts either driving the investigation or revealed by the analysis. If we want people to be passionate (and intelligent) about the use of statistical methods in their work, we need, from the beginning, to connect their enthusiasm for their chosen fields to an appreciation of statistical methods that will help them learn more about their world. Examples will be given.

Theme 6

6.1 Collaboration and cooperation: the key to reaching out.

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Although the national statistics office of New Zealand, Statistics New Zealand, is primarily responsible for the production and dissemination of national statistics it is also interested in raising the statistical capability of key groups of users. Currently, priority groups are government, the media and Maori (indigenous New Zealand). All of the educational initiatives implemented so far have been developed collaboratively with educational institutions. An example is the compulsory statistics unit now contained in national journalism courses.

A network of academics in official statistics (NAOS) was established in 2007. This has representatives from the statistics departments of all the major New Zealand universities as well as academics in other areas, such as social science and economics, and one or two research consultants. Members of NAOS have presented short (one or two-day) courses for government employees on topics such as ethics and legislation, interpreting opinion polls and demography but the most innovative programmes for qualification have resulted from full cooperation between Statistics New Zealand staff and NAOS members to design, implement and deliver courses. These include the first-year university level Certificate of Official Statistics that has been reported on at previous IASE meetings (Forbes 2009) and an honours/ masters paper in official statistics, reported on here. The latter will be taught simultaneously to students in at least two universities in the second semester of 2011 and will be taught by individuals from five separate institutions using video-conferencing. Use of the technical equipment has already been piloted.

In addition to an overview of the new paper, both the collaborative process and the key role of an independent agency facilitating cooperation between universities are discussed.

6.2 Outreach through Open Education

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Universities today are facing a changing educational environment, operating within rapidly developing technology, an unprecedented level of engagement with that technology by the new generation of learners, and a push by governments worldwide to increase the educational level of citizens in order to maintain global productivity. Evidence of this can be seen in the proliferation of online university education providers (increasingly privately owned) offering open access fee for service programs. In Austalia we have seen extraordinary growth in this domain over the last ten years, and one vehicle for this growth has been the university consortium Open Universities Australia, of which Swinburne University of Technology is a member. These students tend not be be the traditional university student, but are often those who do not attend university for a range of social, health or economic reasons. Many have incomplete secondary schooling, and have not studied formally for many years.

Involved in this work since 2000, and now with just under 2000 students enrolled in 2010 in OUA online statistics subjects, we have designed and delivered programs which are able to meet the educational needs of these non- traditional students. In this paper, the pedagogical principles underpinning our approach to teaching statistics online will be dicussed. We will also present data relating to student feedback in this area, and compare the academic success of the OUA students to that of the on-campus student cohort.

6.3 The Royal Statistical Society's GetStats campaign

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On 20 October 2010, the Royal Statistical Society launched a ten-year campaign to drive improvements in UK statistical literacy, known as 'getstats'.

The campaign has three long-term objectives:

- closing the gap between current levels of statistical knowledge and skills and what is needed;
- creating a new culture by altering beliefs around the role of statistics, both as data and as a discipline; and
- repositioning statistics so it is recognised and desired as a valuable life skill.

Data about society is more available now than ever before. For example, UK official data is being opened up, initially through data.gov.uk, and subsequently the Public Data Corporation with its aim to "…provide an unprecedented level of easily accessible public information…". The public has access to an increasing number of exploratory tools, such as Google's Public Data Explorer and Tableau Public. Data-journalism is fast emerging in the media, visualising data and enabling public exploration, such as the UK *Guardian* newspaper's Datablog.

Although the data and tools are there, the skill to apply one to the other is generally recognised to be lacking. Employers cite gaps in the numeracy and problem solving skills held by school leavers, graduates and their current staff. School teachers describe a lack of confidence in their ability to teach statistical skills effectively. Journalists report a similar lack of understanding and confidence when using data.

The session will introduce the getstats campaign. The objectives and strategy will be explained, with reference to a review of existing statistical literacy initiatives, and approaches to benchmarking effectiveness of interventions will be discussed. Two initiatives will be presented as case studies: one to support statistics teaching through the use of relevant, real-world data in the classroom; the other to improve the use of statistics in communications in public relations and journalism.

6.4 All Statistics Are Socially Constructed

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This paper supports Best's thesis with examples involving graphs, tables, surveys, studies and experiments. Examples are classified using the "Take CARE" classification: C=Context, A=Assembly, R=Randomness and E=Error/bias. The examples presented have been analyzed by hundreds of students in over a dozen classes. Their feedback is presented and analyzed. To help students understand that all statistics are socially constructed, students are asked to reflect on where statistics come from. For many, statistics just are -- they come from newspapers, TV or the web. Getting them to understand that statistics are counted, measured, defined, classified, compared and presented by someone -- someone with interests in having a statistic that is bigger or smaller -- is one of the big ideas in statistical literacy. Isaacson (2011) presented responses and misconceptions for 200+ undergraduate and graduate students. These responses are reviewed and analyzed.

6.5 Statistical Literacy Among Barangay Officials and Senior High School Students: A University Outreach Program

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One of the main functions of State Colleges and Universities in the Philippines is extension and being one of the Mathematics professors of Jose Rizal Memorial State University (JRMSU), I did it in terms of a statistics literacy outreach program in the local government units and public schools in the province of Zamboanga del Norte, Philippines where the University is located through a Memorandum of Agreement between the involved parties.

In this paper, I will be presenting on how I conducted the literacy training among selected barangay (village) officials and how these officials applied what they have leaned in their respective barangays. The literacy program for these officials was limited only to descriptive statistics as this is the aspect of statistics that they needed based on my initial survey of their duties and responsibilities. Microsoft Excel Data Analysis ToolPak, Calculators and SPSS were used in the program.

On the other hand, in terms of the senior high school students, I provided an intensive program for an introductory statistics course with an objective of providing initial knowledge in statistics to the participants as well as encouraging them to pursue a degree in Statistics. The course covers descriptive and inferential statistics with emphasis on the use of available technologies. Since this is intensive program and some benefits were offered to the participants especially the deserving ones, a qualifying test was administered to determine the final participants of the program.

The programs for both barangay officials and senior high school students gained positive results as manifested on: 1). how the barangay officials collected, presented and analyzed data on their respective barangays and 2). how the senior students won a statistics quiz bowl conducted by the National Census and Statistics Office of the Philippines and the number of students who pursued BS Statistics.

Posters

P1 Death to the Textbook!

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It will be argued that, at the introductory level at least, the Internet has rendered the statistics textbook redundant. This is because textbooks are inevitably out-of-date, suffering such faults as
-- design obsolescence
-- the ossification of techniques rather than the exploration of fundamental concepts, especially those which continue to excite controversy to this day; these include Bayes' theorem and the competing merits of significance and of confidence levels.

The author will cite evidence from the library of his own former university, and outline his plans for a Statistics *Vademecum*. This will not be a textbook, but rather series of questions which direct the reader to look up concepts on the internet and then think logically about them. The vision is that the reader should arrive at an informed opinion on the oft-repeated cliché about 'lies, damned lies….', and appreciate that is neither mathematics nor IT, but rather logic that presents the challenge in understanding statistics

P2 Risk in health issues: more information and more uncertainty

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In the public health sector we deal with risks. This means we have to deal with probabilities. However, reliable data is often missing or hard to get. Moreover, the results of studies are easily interpreted wrongly – even experts do not always interpret them correctly.

Patients often wish to get clarification on their personal issues. With the informed consent debate, there is a growing tendency to explain to the patients their case and potential side effects of the suggested treatment. There remains the question whether the patient really understands all the concepts involved. Shared decisions and shared responsibilities should empower those involved to be effective.

New sources of information like the Internet drastically change the relation between medical doctors and patients. People have to learn about their new roles. The 'system' reacts differently; sometimes in a reluctant way, sometimes it 'informs' the patients more extensively but it also transfers responsibility to them to an extent, which patients perhaps should not take – at the current status of their knowledge.

Well-informed patients do positively change the communication between medical doctors and themselves. But poor communication increases the risk of mis-treatment. Moreover, better information may reduce the mutual trust (part of any treatment may be a sort of placebo effect which is grounded in the trust in the doctor on the side of the patient). Hence it is an open question on how to communicate health risks properly. It involves abstracts ideas and concepts. There are some promising new developments such as by Gigerenzer to facilitate easier and visually oriented formats to cope with the task of communicating risks.

To describe the status quo in summary, one may use the phrase: 'more information' means 'more uncertainty'. Until we really have a situation that people are also well-informed patients, there is a long way to go. There is a need of systems so that we will be able to read and understand all the available information.

P3 How do students understand confidence intervals? Identifying competing intuitions through semi structured interviews

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In a recent survey we identified two misconceptions that many students have about confidence intervals (CIs). First, many believe that as the confidence level of a CI increases the width of the CI decreases: they believe a 99% CI is shorter than a 95% CI. Second, many believe that at the limit of a CI there is a sharp drop in likelihood of a value being the population mean. We invited students who had completed our survey for a 45 minute semi structured interview in which we asked them to think aloud as they considered their answers to the original survey. We asked them to focus on the reasoning behind their answers. Analysis of the transcripts identified several competing intuitions about CIs. We will present quotes to illustrate common themes, which included: 1) That the population mean could be anywhere inside the CI. 2) That there is a bell shaped curve likelihood distribution inside the interval. 3) That the sample mean is the best estimate for the population mean. 4) That we prefer short CIs. 5) That a higher confidence level is better. 6) That it is unlikely the population mean is outside a 95% CI. Note that each of these intuitions can be defended, at least to some extent, yet together these intuitions seemed to confuse the students. We will discuss how the intuitions may lead to CI misconceptions. We will also discuss the confusions evident in students' responses. Finally we will present a novel picture of a CI, the 'cat's eye confidence interval' that represents the way relative likelihood for the position of the population mean varies over and beyond the CI. We discuss the potential of this novel picture to help student improve their intuitions and overcome CI misconceptions.

P4 Fifth graders' Consideration of Variability: In Measurement and Chance Situations

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The purpose of probability and statistics is to describe variability and variation in meaningful ways (Watson, 2006). For this reason, researchers have suggested that educators focus on variability and to teach reasoning about variation as a means of developing students' statistical thinking in school mathematics. They have studied students' reasoning about variation and methods of developing students' reasoning about variation. According to previous research, many students have difficulties in reasoning about variation, which may be caused by the nature of variability. For instance, it is not considered as a special concept because we are always in constant flux. This implies that noticing and acknowledging variability must come first.

Wild and Pfannkuch's (1999) consideration of variation includes four components: noticing and acknowledging variation; measuring and modeling variation for the purposes of prediction, explanation, or control; explaining and dealing with variation; and using investigative strategies in relation to variation. Most previous research, however, has focused on the measuring and modeling of variation: they paid little attention to the other three components, especially the noticing and acknowledging of variation as well as explaining and dealing with variation. There are many types of variability (Franklin & Garfield, 2006) including measurement variability, natural variability, induced variability, sampling variability, and chance variability.

This study investigates the statistical reasoning characteristics of fifth-grade students in measurement situations and chance situations in relation to the components of consideration of variation, especially noticing and acknowledging variation and explaining and dealing with variation using clinic interviews. The results show that there are four levels of noticing and acknowledging variation and explaining and dealing with variation in each case. It was also found that there were differences in the students' reasoning between measurement and chance situations.

P5 Smart Learning for Teaching Statistics

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Keywords:
e-learning, m-learning, u-learning, multimedia course

Mobile learning (m-learning) is novel in that it facilitates delivery of learning to the right person, at the right time, in the right place using portable electronic devices. In the near future, m-learning will be a normal part of lifelong education and self-directed learning. In Korea, m-learning has expanded in almost every sector of educational fields. From last year KNOU kick off the mobile learning system with KT. In this paper mobile learning for statistics education will be introduced.

An e-learning system for statistics education has improved the lack of two-way communication and repetition, the main weakness of the existing media, TV, radio and written text. And it has extended the opportunity of the learner by operating a variety of curriculum on the basis of e-learning.

The objectives of this study were to evaluate the effectiveness of smart m-learning courses and to propose suggestions for future improvement of m-learning courses and suggest the future view of more advanced education system of mobile learning and ubiquitous learning system.

Mobile technologies, like mobile devices and wireless internet services, have the potential to introduce new innovations in the area of education. m-learning, a new form of education using mobile internet systems and handheld devices can offer students and teachers the opportunity to interact with and gain access to educational materials, independent of time and space.

This paper describes the new paradigm of statistics education with the e-learning contents, smart learning and ubiquitous learning system for statistical education that anyone who wants to study could study anywhere, anytime with the internet and multimedia system.

P6 Coordinating between histograms and box plots

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The correct use of graphs and other external representations is an important outcome of statistics education. Two elements play an important role in representational competence: representational fluency and representational flexibility. The latter refers to being able to choose the optimal representation for a certain task, while the former concerns the efficiency with which one uses a representation and with which one is able to coordinate between representations. This study focused on this last skill: coordinating between representations. We chose to work with representations of data distributions as (data) distributions are seen as an important concept students have to master. On top of that, there are many representations available to present data distributions, such as histograms and box plots. Furthermore, recent studies have shown that students have great difficulty interpreting these representations. In this study we wanted to see how these difficulties would interfere with students' ability to coordinate between representations.

We asked 167 first year university students to find the matching box plot for a skewed histogram and to match two box plots to two histograms with different variation. We also asked the students to explain how they found the matching representations.

We found that students had one major difficulty when interpreting box plots: they tended to interpret the area of box plots incorrectly by assuming that a larger area represented more observations than a smaller area. In both items this led to incorrect responses and especially incorrect explanations of the responses. Furthermore, some students ignored the whiskers of the box plot and only used the information in the box to match box plots to histograms.

These results suggest that the design of box plots is not optimal. This is also what graph design principles of Tufte (1987) and Tversky (1997) tell us: box plots are redundant and are two-dimensional while they only present information about one dimension of one variable. Furthermore, box plots present densities, which work completely different than histograms, which present frequencies or proportions (Bakker, Biehler, & Konold, 2004).

P7 wsd (2010) … what a wonderful day!

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As the United Nations General-Secretary Ban Ki-Moon said (2010):

On this first World Statistics Day I encourage the international community to work with the United Nations to enable all countries to meet their statistical needs. Let us all acknowledge the crucial role of statistics in fulfilling our global mission of development and peace.

This first World Statistics Day (WSD) occurred on the 20th October, 2010 and was an opportunity to practice some tasks in statistics. In this paper we will report the exploratory data analysis made by the students during the classes of the first WSD, 2010.10.20. To begin the class a statistical joke – retrieved from the ALEA (Portugal Statistical Site from the Portuguese Statistical Office for students) – was introduced, and then the students analyzed the statistical opinions collected after their study visit to geological sites in northern Portugal. This first part of the class ended with the making of WSD Posters that were exhibited in the halls of the schools at the request of the students that wanted to show their work to colleagues, parents and teachers. In the second part of the class, and to finish it, a two dice game was devised to make geology revisions to the student's task during the week after the WSD celebration. We have also analyzed the opinions of the students at the end of the classes which led us to Louis Armstrong title variation of the song "What a Wonderful World": Students were very enthusiastic of the tasks proposed.

Since those tasks were developed in a non-math class environment we analyzed them using the Watson (2006) stages of Development of Statistical Literacy, since we also saw the WSD as a SLD (Statistical Literacy Day).

P8 The new institution for the professional training of Russian speaking statisticians: International Institute for Training in Statistics, Moscow.

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There is a strong demand for well-trained staff among national statistical offices of former USSR countries. Most of the countries do not have their own training facilities so the only possibility to provide training is cooperation with international sponsors. Unfortunately, most of international courses are in English while English speakers are still very rare in statistical offices especially in Central Asia. This is a reason for the NSO of former USSR countries to welcome the new training center with the basic mission to provide practically oriented training in Russian. At the same time, this center should provide the international quality of training services to meet requests of NSOs and their sponsors.

The new International Institute for Training in Statistics (IITS) was established in Moscow with the strong support of the World Bank to provide such services. Negotiations with other potential sponsors are continuing. The Russian statistical service and Statistical Committee of Commonwealth of Independent States also support this project. The leading Russian university – Higher School of Economics delivers teaching facilities such as auditoriums, computers, library and hostels. Among IITS basic staff are professionals with the significant experience in statistical practice and international consulting as well as professional lecturers.

The following general approach will be used to achieve the good results. International agencies and training centers will provide IITS with programs and teaching materials. Focus areas are SNA, price statistics, industrial statistics, agriculture statistics, social statistics, R&D statistics, sampling, and statistical management. IITS will translate it to Russian and teach the Russian speaking students under the supervision of international experts.

Researches and consulting in statistics are also among IITS activities. Comparative assessment of CIS countries' statistical capacities including desk study, skills profiling, and training needs assessment will be the first IITS output. This study can be financed with the World Bank grant. Results will be distributed among potential sponsors and other interested users.

IITS is interested in cooperation with potential partners and is ready to discuss any suggestion about partnership from international agencies and research and training centers.

P9 Statistical Professional Training of Statistician for Effective Presence in Reliability Engineering Teams

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Today, with continuing changes of the technology, increase in scientific knowledge, new sources of data and other information and then creation of complex products, statistics with a set of analytical tools, thought and approaches plays an essential role in assessment, prediction and develop of science. Scientists by use of probability theory and inferential analysis could come to some fields of the pure and applied science that they were not able to enter, previously. Because of this important problem, graduate programs have concentrated on the statistical methods.

One of the fields in which statistical methods play an important role is "**reliability or quality over time**". Reliability is a survival factor in competition marketing and strategic products and systems. When the human factor and also cost play critical roles, reliability is very important. Reliability Engineering is a multiobjective engineering discipline and special statistical tools that focus on reliability are needed. These tools help the reliability engineering team in planning appropriate experiments, data collection, effective use of field data, combining information from different sources, data reliability mining, development of appropriate stochastic/semi stochastic models (linear or nonlinear and univariate or multivariate) for physical/chemical failure modes, methods of estimation of suitable reliability parameters, filling in the gaps in engineering knowledge by designing experiments to understand the effect of a failure mechanism, understanding the source of variation and modeling variation and risk, designing systems for reliability in a life cycle and related to quality management systems, designing reliability tests, simulation, use of other statistical quality tools such as Measurement System Analysis, Statistical Process Analysis, Acceptance Sampling to reliability improvement and effective results presentation.

This paper provides a brief of reliability engineering and presents some special statistical methods that statisticians should learn in an academic program to be more effective in reliability engineering teams.