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DISCUSSION

1. TRAINING REGULAR EDUCATION AND SPECIAL EDUCATION TEACHERS IN THE USE OF RESEARCH METHODOLOGY AND STATISTICS

Blumberg's paper gives a most comprehensive overview of the research skills researchers in any social science, and in particular education, should be familiar with before carrying out their own research. The author is to be congratulated for such an informative and well-researched paper.

In discussing the research methodology and statistics needs of primary and secondary level teachers seeking Master's for Special Education teachers, Blumberg outlined the goals and organisation, topics used, and ended with a discussion of some specific research tools of which she felt special education teachers should be aware.

Firstly I like the idea of classifying classroom teachers also as researchers, though I would not restrict this to teachers. I think it would also apply to people in an increasing number of positions such as doctors, police, social workers who all are continually collecting and analysing data on people's health, behaviour and so on. However I did wonder whether, as the author claims "they perform well-designed experiments in their classrooms." How could I not agree with the major goals, that is to:

1. Help them critically read, correctly interpret, and decide the validity of conclusions in the published and unpublished literature;
2. Give them the tools necessary to complete research-based projects and/or theses required for their Master's degrees; and
3. For Special Education teachers, they should learn how to better collect and analyse data that will be used to help determine each student's IEP.

These admirable aims are fine, if not somewhat optimistic, for a 25-hour course in my view. As far as the author's aims go, some questions need to be answered first. For example: What base of statistics knowledge base were the students coming from? From the skills Blumberg suggested, as given by Todd and Reece (1990), such as "Can formulate a testable hypothesis" and "Has an understanding of the standard deviation" it is presumed that they had little or no previous statistical/research methods training, which makes programs such as the author's even more ambitious in such a time period.

Her comment that some 90% of Master's programs require at least one research or statistics courses is very encouraging. However, what they learn in these courses maybe subject to question. Is the program appropriate to these student needs and abilities? Should many have a general statistics literacy program rather than the typical Introductory Statistics course?

The author claims that an advantage of having research methodology and statistics combined into one course is that it is more efficient in delivery. This maybe true, but limits students to the one instructor, students learn different things from different instructors so I tend to favour having different instructors in different courses, even

within the same course (team teaching, visiting lecturers etc). However it is important, as the author points out, that the "faculty members teaching the different statistics courses (to the same students) communicate well with each other to minimise needless overlap".

I agree that descriptive statistics is extremely important (maybe 34% as reported) - I think it should be even higher, as too often more "high level" statistics are reported before the data is seriously looked at. However I am not in full agreement about the author's suggestion that "not much time should be spent training them in the use of a specific computer package" because they are always changing, Once one package is understood well, it can be built into the program, rather than be seen as something separate, it becomes a tool. Furthermore, the use of laptops makes learning with computers in the classroom much more friendly. Certainly understanding the output from statistics packages is most important.

The author's suggestions on the need for these teachers to understand sufficient about hypothesis testing to enable them to critically read and correctly interpret research-based articles and the difference between statistical significance and practical significance is very important. Also confidence intervals must be understood and written in language that third parties such as administrators and parents can appreciate.

A question in the author's mind was "how much these teachers need to know about specific hypothesis testing procedures?" For all of these procedures they should not have to compute anything by hand/calculator or by computer, but rather be able to know what to use and how to interpret the results.

Most of the projects and theses that Master's degree students complete have fairly simple designs. Hence I agree that time should not be spent teaching them a catalogue of complicated designs. but it is especially important that teachers doing research be urged to consult a statistician before they collect their data.

They should appreciate the distinction between correlational and causal studies so appropriate statements can be made. The use of surveys is very popular in many areas and principles of questionnaire design and sampling should be taught in any course on statistics especially in the social sciences. In fact I would say that good teaching in survey research methods may have avoided the huge problems which occurred in Florida during the 2000 Presidential elections!

I agree with the author's thoughts that researchers need to understand the standardised test procedures including reliability and validity so they can be better prepared to prepare their instruments before collecting their data. Also it is good to see that the author does not limit herself to traditional study methods which generally involve groups of subjects. Hence some introduction to other such as example meta-analysis and single-subject and related designs are seen as appropriate due to the fact that these researchers often only have access to small sample sizes.

Also an important component that is often assumed, but probably rarely taught, is Statistical Thinking. Blumberg proposes this needs to be incorporated in general statistics teaching, which I approve.

Overall this was a most useful and thought provoking paper and I recommend it to anyone teaching statistics to education researchers.

2. THE ROLE OF A RESEARCH RESOURCE CENTRE IN THE TRAINING OF SOCIAL SCIENCE RESEARCHERS

This paper showed how teaching and research are fundamental and indispensable

activities. The authors gave an excellent example of a Research Resource Centre, which provides and facilitates regular on-going research training and other related support to academic staff and postgraduate students.

I agree with their concept of a Research Resource Centre, which is viewed within the context of the University as a whole. As statisticians we need to see statistics and research methods not as our sole territory, rather we are probably in the best position to control joint schemes for research methods training across our institution. An advantage of such a centre is that researchers from many disciplines can make use of the same resources and expertise and share ideas and knowledge across disciplines.

The need for the type of workshop activities outlined is crucial for any researcher. As the authors state these include: formulating a research problem, research design, conceptualisation, operationalisation, sampling, data collection, data analysis, interpretation and writing the research report.

I am comfortable with students getting some in depth knowledge with a statistics package, even though packages change as time passes. As mentioned earlier a package can be integrated as a tool, rather than be seen as something separate, though in Africa it cannot be assumed that researchers have sufficient computer literacy to get straight into a package. In such cases some basic computer skills need to be incorporated into the program.

The knowledge of secondary data sources and how to access data is increasingly important enabling researchers to readily make use of the raw data from other studies along with their own research. I would not be so confident as the authors that researchers really understand issues of sampling, they may be familiar with the ideas, but do they really use them?

As in Blumberg's work, they see issues of reliability and validity as important as many of the researchers make use of questionnaires. The tactic of asking questions rather than simply telling people what to do is an excellent approach for researchers who may not like being treated as an undergraduate and may think they know the basic ideas. I agree with the authors' claim that "the best way to introduce statistical ideas is within the context of a particular research project and its data set has been beneficial and less threatening to workshop participants." Another advantage of a set-up like a Research Resource Centre is being able to try things on the spot.

I also agree with their opinion that such a Research Resource Centre has a pivotal role to play in facilitating research capacity development and research excellence within the University generally and particularly in the research training and statistical education of social science researchers.

These activities are to be applauded and the involvement of a young statistician at an international conference is an example others are encouraged to follow.

3. OVERVIEW

Summing up about both papers I strongly agree with the Blumberg's comments that "researchers should be strongly urged to consult with a statistician when they design their studies, before they begin data collection, as changes are being made during data collection, and before beginning their data analysis."

An important part of any training for researchers is for them to learn to know when they should ask questions and what questions to ask.

To give some recent examples from PhD students who approached me with problems, which although not uncommon, still surprises and depresses me:

> Student A: *"I want to find out what are the characteristics of successful business women. I have sent out questionnaires with about 300 questions. It has taken me about 3 years to get to this stage and I want to know what to do with the answers."*

I asked how many responses she had, and the answer was 14. But she said they were good respondents!

> Student B: *"Another even more extreme case, he had not yet collected the data but had about 3000 questions."*

I asked how long it would take for someone to answer the questions and he said about 6 hours, if they were quick!

In neither case were they prepared to change their questionnaires as their supervisors had been approved them, and they did not have time - they just wanted to know what to do with the data.

The statistical methods in both papers cover a lot of territory. What is appropriate for one group is not important or even of interest for another. For example we can often get hung up on hypothesis tests, but if they are mainly concerned with estimating rather than comparing, confidence intervals may suffice.

There were a number of other topics mentioned in each paper which could be included in courses for research students, trying to include too many may well overwhelm students. A variation would be to have the program, in which some topics are given a only a very brief introduction and which directed different students to specific courses such as short course modules relevant to their specific research.

Such modules could be available to researchers across the institution or even from neighbouring institutions to help share resources. My main point is that it is not necessary for a particular department to try to do everything themselves, rather make use of the diverse and rich resources which usually already exist within their institution structure, or which in some case can be easily found outside.

Both papers are give very useful ideas for people training researchers who use statistics in the social sciences and the authors are to be praised for their efforts.

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