

**TRAINING INSTITUTIONAL RESEARCH PROFESSIONALS: TEACHING
A STATISTICS COURSE IN SIX HOURS OR FEWER, THE ART OF TEACHING ®**

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Professionals in the field of Institutional Research must use data analysis and statistical skills on a daily basis. Yet, professionals come to the field of Institutional Research with diverse backgrounds and differentiated knowledge of statistics. As a result, most professionals find themselves searching for review or refresher courses in data analysis and statistics. Thus, teaching a statistics course in six hours or fewer is the challenge. This paper will focus on the difficulties that are associated with teaching statistical content and skills in professional development settings to individuals with a wide range of statistical skills and abilities. The central tenet of the paper is that the art of teaching is what makes for effective training. Various pedagogical approaches designed to increase statistical understanding are explored and defined. Suggestions for sequencing and practical examples illustrating the use of statistics in Institutional Research will be given.

INTRODUCTION

Institutional Research has been defined by Saupe (1990) as “research conducted within an institution of higher education to provide information which supports institutional planning, policy formation, and decision making” (p. 1). Institutional Research Offices have varied mission statements and Institutional Research professionals have varied educational backgrounds and diverse responsibilities. Yet, one key common denominator of all Institutional Research Offices is the analysis and interpretation of quantitative data. As institutions of higher education face greater pressures from both internal and external sources to demonstrate their effectiveness, Institutional Researchers will find increasing need for statistical analyses to guide their planning and evaluation efforts.

Given that individuals come to the field of Institutional Research with a variety of statistical backgrounds, the need for professional organizations to provide development opportunities for individuals to upgrade their statistical skills will continue. Hence, the need exists to explore how statistical educators can effectively train Institutional Research professionals in the appropriate application of statistical procedures. The effectiveness of training is related to fundamental principles of education and effective pedagogy. The premise of the author is that the characteristics of effective training are found in these fundamental principles.

PRINCIPLES OF GOOD PRACTICE IN EDUCATION

The plethora of research that has been conducted to ascertain the characteristics of quality undergraduate education has revealed one major theme. The single best predictor of learning by an undergraduate student is not intelligence or any other demographic characteristic; rather it is the extent to which the student is engaged in educationally purposeful activities (Astin, 1993; Kuh, 2001; Pace, 1990; Pascarella & Terenzini, 1991). Certain educational practices are known to lead to high levels of student engagement. Perhaps the best-known set of indicators of student engagement is the “Seven Principles for Good Practice in Undergraduate Education” (Chickering & Gamson, 1987). These principles include student-faculty contact, cooperation among students, active learning, prompt feedback, time on task, high expectations, and respect for diverse talents and ways of learning.

The most important factor in motivating students and increasing student involvement is frequent contact with faculty both in and out of classes. Reciprocity and cooperation among students has been shown to develop critical thinking and deepen understanding. Active learning encourages students to take the principles that they are learning and apply them to their daily lives. Prompt feedback provides students with suggestions for improvement and the chance to reflect on what they have learned. If time plus energy equals learning, then no substitute exists for

time on task. When teachers expect more of themselves, then this self-fulfilling prophecy becomes contagious and student expectations rise. No one road map exists for student learning. Students bring different talents and styles of learning to their education. All individuals need the opportunity to show their talents and learn in ways that work for them (Chickering & Gamson, 1987).

These principles seem like good common sense and often we overlook the simple answer for a more complex but less appropriate response. These educational principles rest on many years of research that have explored various aspects of higher education (Astin, 1993; Pace, 1990; Pascarella & Terenzini, 1991). Each practice contributes to student learning, but when all are present in the learning environment their effects are multiplied. Thus, a major premise of the author is that these principles can be extrapolated from formal educational settings and applied to the training of Institutional Research professionals.

QUALITIES OF EFFECTIVE TEACHERS

Content and pedagogy interact in complex ways. What is taught is at least as important as how it is taught. If two courses or trainings are offered and content is held constant, then logic holds that effective pedagogy will increase student learning. Several researchers (Berliner, 1986; 1988; Bloom, 1986; Brophy, 1979) have explored the topic of teacher expertise, experience, and effectiveness. Teacher expertise can be defined as teacher knowledge; however different forms of teacher knowledge exist: content knowledge, general pedagogical knowledge, and pedagogical content knowledge (Shulman, 1986). Content knowledge is a given; effective teachers must possess knowledge of their content fields. General pedagogical knowledge defines what a teacher knows about the principles and strategies of instruction. An effective teacher must also have general knowledge of how students acquire knowledge. Finally, pedagogical content knowledge is specific to the subject matter. A teacher possesses pedagogical content knowledge when he or she can effectively formulate and present content knowledge in a manner that makes the material understandable to others. Effective teachers possess all three forms of knowledge.

Experience is also a necessary, but not sufficient, condition for teacher expertise and effectiveness. Experienced teachers often display what Bloom (1986) termed automaticity. Automaticity refers to the capability that experienced teachers have displayed to discriminate between the successful and unsuccessful transfer of knowledge and their ability to respond more quickly than novice teachers to this situation. In addition, effective teachers have larger response sets. Not only do they react more quickly to a lack of student understanding, effective teachers have a wider array of corrective measures. This notion of a wider array of response sets, clearly links back to Shulman's (1986) definition of pedagogical content knowledge. Thus we have come full circle in our discussion of teacher expertise, experience and effectiveness. If you are unclear about the distinction between the three you are not alone; clearly all are interrelated. The terms effectiveness and expertise have been used interchangeably in the literature and experience has been cited as a necessary prerequisite for expertise. What is clear is that effective teachers are experienced and possess both content and pedagogical expertise.

TRAINING INSTITUTIONAL RESEARCH PROFESSIONALS

Professionals in the field of Institutional Research must use data analysis and statistical skills on a daily basis. Yet, professionals come to the field of Institutional Research with diverse backgrounds and differentiated knowledge of statistics. Therefore, two of the major challenges in developing training in the area of statistics for Institutional Research professionals are the diversity of statistical knowledge that participants bring to the session and the diversity of applications that they will be engaged in as they apply your training to the issues of their institutions. In a review or refresher training session, I may have a Director of Institutional Research who has completed a doctorate and taken several courses in statistics, but has not applied that knowledge for several years and therefore is looking for a review session. In addition, I may have an Analyst from an Institutional Research office with a variety of different computer skills who has only taken one undergraduate statistics course and wishes to gain more basic applications of statistics as it relates to his or her office. Given that Offices of Institutional

Research have different mission statements and are charged with a variety of specific responsibilities with a wide range of potential analyses, a diverse range of interests also exists within professionals attending sessions. The Director of Institutional Research may be interested in applications related to enrollment management, while the Analyst could have interests in analysis of survey data that will be collected from the web-based survey that he or she is creating. A final challenge to presenting training for Institutional Research professionals is that the main opportunity that these professionals have for development is during professional conferences. Many professional organizations such as the Association for Institutional Research and its regional and state affiliates have gone to a model of presenting trainings prior to the annual conference. Thus, teaching a statistics course in six hours or fewer is the challenge. As a result of these challenges, the trainer must possess the qualities of an effective teacher and apply the basic principles of good practice in education. Therefore, the author suggests the following tenets.

Curriculum development. Carefully consider curriculum. Develop a series of trainings that are relevant and appropriate for the target audience. Scope and sequence are essential to quality curriculum. Do not assume that your audience has an understanding of basic concepts. I have found that it never hurts to take a few minutes to go back to basics. Often participants “get lost” in training sessions because they lack a key fundamental principle that the trainer has assumed that the participants would know. Review fundamental principles in one to two slides of your presentation, however, tie these fundamental principles to the examples from Institutional Research. This approach will develop an active learning environment in which participants can gain an understanding of the principles of statistics in a manner that relates to their reason for pursuing in the training.

Another key aspect of curriculum development is sequencing. Carefully plan your presentation so that you have developed a progression that guides participants through basic applications into more advanced applications. Often presenters place concerns for illustrating the appropriate, but more advanced, statistical analysis above the needs for appropriate sequencing of materials. For example, when teaching Analysis of Variance, a correct progression is to review one-way ANOVA procedures prior to covering factorial designs. In training Institutional Research professionals, I often use an example for a one-way design where I compare SAT scores across three different schools at a hypothetical institution. As I move forward and cover factorial designs, I will use the same analysis of SAT data and introduce a second independent variable of gender. Now if the researcher were in fact addressing the latter question of the interaction of gender and school on SAT performances, the initial analysis is inappropriate. However, since I am using these as illustrations of applications of the statistical procedures to Institutional Research, the need for proper sequencing supercedes the need to initially present the full scope of the research design and analysis. Of course, after covering both procedures, I would engage the participants in the discussion of the appropriate application of both analyses and point out my intent in sequencing the material.

A final key thought on curriculum development is appropriate description. Be sure that you carefully advertise the content of your curriculum to potential participants. Remember Institutional Research professionals come into the field from varied backgrounds. Some professionals have PhD's in statistics (they don't need my trainings!), others come to the profession with limited training in statistics. Thus, the professional organizations need to offer a wide range of training and professional development opportunities across a variety of statistical topics from fundamental review or refresher courses to more advanced specialized topics. The key to the successful training opportunity is in presenting the material that meets the expectations of the learner. Institutional Research professionals have an understanding of their current state of knowledge with regard to statistical applications and select trainings that are designed to increase their knowledge base. Thus, the participant must be able to ascertain a solid understanding of the curriculum from the advertised description of the training in order to select the appropriate training.

Presentation skills. Within the presentation, the skills of the presenter are critical to the learning process. The presenter must engage the participants in the training. Enthusiasm of the presenter is critical. Although I would never consider any topic in statistics as boring, some of my

prior undergraduate and graduate students do. My overt demonstration of my interest and enthusiasm for the topic area engages my students in the learning process, at least temporarily. The joy that I find in training Institutional Research professionals is that I am actually teaching an audience that I do not have to lecture on the importance of statistics to their professional development. Even given the conviction of Institutional Research professionals toward their training in statistics, these professionals still are actively engaged only if the presenter is. Thus for the participants to be engaged and actively involved in the learning process the presenter must model that behavior.

Speaking of engagement and active learning, whenever possible provide hands on application of statistical procedures within the training. The analysis becomes more meaningful to the participant when they can perform the analysis themselves. I most often do my training seminars in computer laboratory settings and while a large portion of presentation time in my overview course is spent either in a more traditional lecture or discussion mode, I utilize SPSS and common data set examples where participants actually run analyses in SPSS and we interpret the output. Of course the same information could be presented by simply providing participants with the output, but by allowing participants to perform the analysis they have become more actively engaged in the process. Another example of an exercise that actively illustrates a statistical concept is the M & M experiment. I use an example of the illustration of the principles of the Central Limit theorem by having all participants draw a sample of approximately 100 M & M's. The data from the group is then used to create a sampling distribution. The experiment does have its flaws such as sampling without replacement, as opposed to sampling with replacement and the fact that we only estimate the sample size at 100 with the use of a consistent cup size; but for the most part the illustration does bring more meaning to the statistical concept. In addition, the participants enjoy the M & M's and we can talk about the flaws of the experiment as they relate to the statistical concept of the Central Limit theorem and sampling distributions.

Respect for diverse talents and ways of learning was another essential principle for good practice in education. This is especially true in training settings. The Institutional Research professionals that have received training from me in the area of statistics are extremely talented individuals that come to the trainings with diverse backgrounds and skills. While I provide expertise in statistics, participants in my training seminars may be experts in the analysis of faculty workload, enrollment projections, or design of web-based surveys. In addition, all individuals acquire knowledge and information in a variety of different ways. The challenge for me in each new seminar is to adapt to the skills and learning styles of the participants. To believe that only one correct approach to instruction exists for a basic training session on the application of statistics in Institutional Research is false. The presenter must be able to adapt to the questions and issues of the current group of participants, or they have failed to respect the talents and learning styles of the group.

Trainer-Participant Contact: Before, During and After. One of the seven essential principles for quality education was student-faculty contact; in a professional development setting this principle translates to trainer-participant contact. While I have implied the need for trainer and participant contact during the training session to increase participant engagement, trainer-participant contact both before and after the training session is also critical to increasing participant's knowledge. Trainer-participant contact prior to the session is critical so that the participant can select a developmentally appropriate session and, if the participant so desires, can prepare for the session. The trainer needs to make him or herself available either via email or telephone to answer questions from participants about curriculum, the appropriateness of the curriculum to the need of the participant for professional development, the appropriateness of the curriculum to the participant's current level of statistical knowledge, and any activities that the participant might engage in prior to the training (should the participant be so motivated).

Engagement between the presenter and participant during the training seminar improves the desired outcome of increased knowledge for participants. As an instructor who is more traditionally grounded from a pedagogical perspective, I constantly am caught between two suppositions. First, my internal perception that "participants will learn more if I cover more material, have more material on slides (overheads) and I follow a more traditional lecture style;"

and second, my knowledge of pedagogical research that individuals learn best when they can interact with me as the trainer and other participants. In the end, understanding is the main objective. Trainer-participant contact and reciprocity and cooperation among participants will result in greater understanding. Remember that in many educational settings, “less may equal more”.

Contact between presenter and participant after the training seminar increases the professional network of both the presenter and the participant. Institutional Research is a profession that fosters professional networking. As a presenter, I have made contacts with many content experts in our field. I have assisted many prior participants with the analysis of their research projects and have been able to utilize their content expertise on many projects for my institutions. The current technologies available through the Internet have provided a medium for this networking. Given that all of the training that I provide is considered a professional service, this form of post training seminar contact can be difficult and sometimes counterproductive to my daily job responsibilities. Thus, providing materials from the presentation that can be used by participants after the seminar as they apply these statistical principles to their research projects is critical.

The materials that you provide to participants from the training seminar should be reviewed from the perspective of how the participant will use the material after the seminar. As a student, I always took terrible notes from class. I would constantly find myself engaged in the material being presented in class and would either feel that I understood it and didn't need to write it down or was so involved in the material that I simply forgot to take notes. As I progressed in the educational system, I developed a note-taking system that worked for me. This process included taking down key concepts and terms during class and then re-writing notes after class that were much more detailed. As a presenter, I have progressed through this same cycle. I have gone from presenting little to no training materials, to presenting a detailed outline with key terms and phrases, to currently presenting participants with fairly detailed slides from PowerPoint presentations. I have progressed to this latter stage, because I have found that during the training session participants are engaged in the training and have gained an understanding in the moment, but when they return to their institution and wish to apply this knowledge they need the detailed information from the presentation materials to make the notes make sense. I have used common questions from prior participants to further refine the training materials that I provide to participants. Certainly today's technology (i.e., PowerPoint slides and handouts) is a great asset in creating these important training documents.

DISCUSSION

This discussion has explored the experiences of the author with regard to training Institutional Research professionals on the appropriate application of statistical procedures. The fundamentals of effective teaching are what make for effective training. Conclusions drawn from this specific application of statistical education can be generalized to teaching statistical content and skills in professional development settings to individuals with a wide range of statistical skills and abilities. Various pedagogical approaches designed to increase statistical understanding were defined and explored. Suggestions for sequencing and practical examples illustrating the use of statistics in Institutional Research were provided.

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