

Full Length Research Paper

Using projects in teaching introductory business statistics: The case of Tshwane University of Technology Business School

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Statistics is an essential subject in Master of Business Administration (MBA) programmes. It equips students with much needed ‘data analysis’ skills useful for successful completion of MBA research projects and, more importantly, in management decision-making. All the same, teaching or learning statistics is frustrating and stressful, to both instructors and students. Recent literature proposes using projects as an effective teaching method for teaching Business Statistics, This paper reports on the author’s experience of using project-based approaches in the teaching of introductory business statistics in the MBA programme at Tshwane University of Technology, a South African university. The purpose of the study was to determine the consequence of using projects in teaching Business Statistics. Specifically, to discover the extent to which projects facilitate the learning of data analysis skills among MBA students. In total, 23 MBA students were exposed to small in-class projects and more intensive group projects. Results suggest that using projects enhances students’ retention of statistical theory and its application in real-life management problems.

Key words: Active learning, business schools, business statistics, statistics, MBA, teaching techniques.

INTRODUCTION

Management competence, in the information age, increasingly involves the ability to process, analyse, and interpret data for decision-making (Blass and Weight, 2005, Alam, et al, 2010). For that reason, a vast majority of Master of Business Administration (MBA) schools adopt Business Statistics as a mainstream subject to equip potential managers and managers with the much needed data analysis skills (Rose, Machak, and Spivey, 1988; Blass and Weight, 2005). However, as reported by Diamantopoulos and Schlegelmilch (2000), statistics is rarely fun. “It is boring. It is boring to learn, it is boring to teach, it is hard to learn, it is hard to teach (properly), and it is even harder to remember what little you may have learned” (Diamantopoulos and Schlegelmilch, 2000:vii). Such limitations in traditional teaching methods contribute to the many challenges experienced by students in both the learning and the application of statistics in real-life settings (Alam, 2009; Duru, 2010; Ledolter, 1995).

Much recent literature proposes using projects in teaching MBA Business Statistics (DeVaney, 2010; Libman, 2010; Weltman and Whiteside, 2010; Zieffler et al., 2008).

Ledolter (1995) specifically encourages the use of projects. Projects incorporate solving simulated management problems, which is an essential component lacking in traditional teaching methods (Duru, 2010). Projects, in this context, refer to real-life practical problems, whose resolution requires both the application of statistical theory and practical data analysis skills (Weltman and Whiteside, 2010). Statistics education literature in general and the *Journal of Statistics Education*, 18(1), in particular, posit a convincing argument for project-based instruction. While most of the cited cases therein report on Western experiences, research in developing countries such as South Africa is limited. To broaden the scope of research in the area, it was opportune to undertake this research at a South African university.

Context and background

This current study was done at the Tshwane University of Technology Business School (TUTBS) in Pretoria, South

Africa. TUTBS is one of the 17 MBA schools in South Africa (MBA.co.za, 2010). Current enrolment in the MBA programme stands at over 250 students, and annual intake is approximately 50 MBA students. While enrolment in the MBA programmes in South Africa and at TUT has grown in the recent past, throughput rates are on the decline. Frouws (2007) reporting on the state of throughput rates at TUT found that the throughput rate in 2006 was a paltry 36%. Furthermore, Frouws (2007) cites students' failure to complete dissertations as a major reason to the low graduation rates. She argues that the latter is caused mainly by lack of research and statistical skills. Taube (1986) arrived at the same conclusion with Frouws (2007). Taube (1986) further suggests that this is an endemic problem throughout Africa, where many students grapple with numerical information (Onwuegbuzie, 2004).

At TUTBS, Business Statistics is a core MBA subject taught in the first trimester of the first year. The pass rate for the subject tends to be very low; in 2008 approximately 50% of the class failed the subject. Naturally, the statistics students resemble what Wilson (1995) would call a "hostile audience" of miserable, depressed, and demotivated students. To exacerbate the situation, the TUTBS Examinations Policy introduces two additional obstacles. First, there is no provision for supplementary examinations in the MBA programme. So when students fail any of the MBA modules (including statistics), the only option they have is to repeat the entire subject in the following academic year. Second, a student can only repeat a subject once. That is to say if the student fails say Business Statistics this year (2010), the student may choose to repeat the subject in 2011. If she fails the module in 2011, then she will be deregistered from the MBA programme forthwith. Thus, this 'hostile environment' provided an opportune setting to test the applicability of projects. The purpose of this study was therefore to: (1) assess the appropriateness of using projects to improve students' attitudes towards statistics and (2) evaluate the relevance of project-based instruction in improving students' understanding of basic statistical concepts.

To present this research, the following section provides a synopsis of the Business Statistics literature followed by that of statistics project-based instruction. Thereafter, the methodology utilised in this research and following on, findings are presented. Finally, the paper concludes with a discussion and implications section.

LITERATURE REVIEW

Business statistics is a decision support tool that converts data into meaningful information for useful for management decision-making (Blass and Weight, 2005; Diamantopoulos and Schlegelmilch, 2000). But, as previously illustrated statistics is a nuisance; all the same,

it still is a very important 'business tool,' expected of managers so much so that managers possessing data analysis skills enjoy competitive advantage over their counterparts (Groebner, Shannon, Fry, and Smith, 2008:2).

In the context of management education, Business Statistics is often confused for the mainstream Statistics. The latter is more technical and involves 'deriving and proving' formulae, and the former is a management tool that assist managers in decision-making (Groebner et al., 2008). Although the former utilises statistical theory, it is often not necessary for managers to concern themselves with the "statistical refinements and details." Ideally they should be familiarised to those data analysis processes necessary for business decision-making (Diamantopoulos and Schlegelmilch, 2000: xxi). Therefore, the teaching of Business Statistics and that of Statistics is inherently different. In most cases, as articulated by Rose et al. (1988) and later corroborated by Diamantopoulos and Schlegelmilch (2000), it is mainstream Statistics that that is inadvertently taught in MBA schools. Since "Business Statistics" lectures function on a theoretical basis, students fail to appreciate the rationale for studying formulae and theorems, especially for a life in the business world. This confusion results in many students suffering from the numbers phobia syndrome.

Using projects in teaching business statistics

Business Statistics lectures do not fully prepare students to handle real world management problems, as there is a theory-practice gap (Wilson, 1995). Project-based instruction, unlike traditional teaching approaches, affords learners the opportunity to collect, analyse, and interpret the real-life data. In most cases, this process is fraught with many 'challenges – time constraints, expense, incomplete data, and sometime inadequate resources – which decision makers need to account for in decision-making (DeVaney, 2010; Ledolter, 1995). While in theoretical classes, these are just mentioned in passing, project-based students have the opportunity to experience and deal with them firsthand. It is this reason that appears to justify the exponential growth in the adoption of projects in teaching Business Statistics.

Projects are effective teaching aids because they stimulate the application of theory in simple everyday tasks (DeVaney, 2010). For example, using simple in-class projects such as collecting various students' demographic variables (such as height, age, gender, shoe size, and marital status) and computing descriptive measures from these helps students identify real problems and how statistics can assist in discovering solutions (Libman, 2010). Ledolter (1995) further explains that traditional teaching approaches are "incomplete," in that they do not expose students to real world problem formulation. Specifically, traditional teaching methods

hardly address the difficulties of problem identification as well as the challenges of acquiring relevant data to resolve these problems (Duru, 2010). Libman (2010) found that small projects especially those that require simple resources assist students to think of statistics holistically – from problem identification to data collection, analysis, and interpretation. In the same way, Sabry and AlShawi (2008) posit that projects introduce many advantages in the learning experience. These are: (1) bridging that gap between theory and practice, (2) creating a relaxed learning atmosphere, (3) improving student comprehension, and (4) promoting communication and interaction among students and instructors.

OBJECTIVES OF THE STUDY

As previously noted, mastering statistics is challenging for many students (Diamantopoulos and Schlegelmilch, 2000). Nonetheless, statistical analysis skills are vital for not only the successful completion of postgraduate studies, but also for the very practice of management (Blass and Weight, 2005). The implication for management schools and Business Statistics lecturers in particular is to devise teaching methods that promote mastering of the subject. Against this background, the purpose of the study is to evaluate the consequence of using projects on students' performance in Business Statistics, and to assess projects' impact on applying data analysis skills in real life settings. To achieve these objectives, the following research questions were formulated:

1. What factors discourage students from effectively learning Business Statistics?
2. To what extent do projects improve students' propensity to learn Business Statistics?
3. To what extent do Business Statistics projects improve data analysis skills?

PROPOSITIONS AND CONCEPTUAL MODEL

From the above research questions, the following propositions were made, and these culminated in the proposed conceptual model, as shown in Figure 1, which guided the methodology and data collection.

P₁: Increased exposure to real-life Business Statistics projects improves develops data analysis skills in real life contexts.

P₂: Improved grasp of statistical theory improves data analysis skills.

P₃: Reduced statistical anxiety (and phobia) enhances data analysis skills.

METHODOLOGY

Participants

Twenty-three MBA students from the TUT Business School participated in the study. Of these, thirteen were male and ten were female. In terms of occupation, 22 (95%) of the participants were employed in managerial positions, and their ages ranged from 30 to 57 years. Almost three-quarters (74%) of the participants were taking statistics for the very first time.

Procedure

The methodological procedure involved using several projects to teach the different aspects of Business Statistics. However, to determine the nature and structure of the projects, the procedure was broken into four distinct phases: (1) reviewing the literature, (2) interviewing TUTBS MBA lecturers, (3) Identifying tools for the study, and lastly (4) implementing project-based instruction.

Reviewing the literature

Conducting a literature review was important for two reasons. First, to discover the extent of the problems experienced by the author, whether these were unique to TUTBS or a widespread phenomenon. Second, the body of knowledge provides an account of the best practices in the teaching of statistics. As such, a good starting point was *The Journal of Statistics Education*. Therein, numerous authors reported much success with project-based teaching.

Interviewing MBA lecturers

In addition to consulting the body of knowledge, the author interviewed other TUTBS MBA lecturers to ascertain their perceptions towards students' challenges in Business Statistics. Only two lecturers and the Head of Department were available for interviews. All other lecturers were employed on part-time basis and accessing them proved difficult. The interview guide and questions used in these interviews are included in the appendix. From the literature and the interviews with MBA lecturers, the author resolved to adopt two forms projects as tools for the study.

Tools for the study

In this present study, two types of projects were utilised – Small Projects and Group Projects. Small projects included in-class activities performed within the 3-hour class period. These projects prompted students to apply specific statistics topics in simple everyday tasks. In total, students participated in five projects throughout the 12-week trimester.

The second tool used was the Group Project. In groups of 4 to 6 members, each group attempted to resolve a business problem, utilising statistics. As a guide, students were required to follow the research process (from problem formulation to data collection to analysis) in resolving the problem.

Implementing project-based instruction

The original 12-week syllabus was modified to accommodate the series projects for the study; these were five small projects and one major project. Each small project was specifically designed to

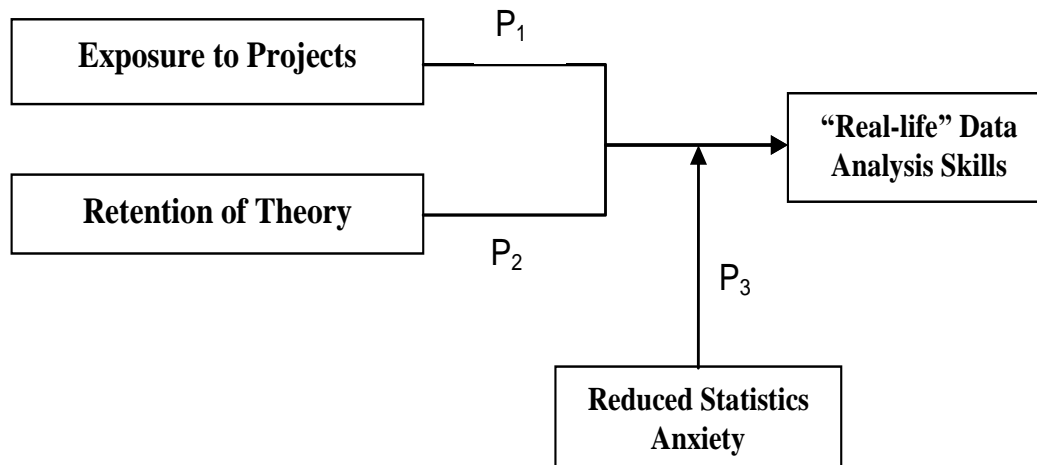


Figure 1. Proposed conceptual model.

address particular learning outcomes. The group projects were attempted in small groups as out-of-class assignment.

RESULTS

The nature of the current research was observational and results were collected from the author's observation as well as from students' course work marks (Singh, Suganthi, Ahmed and Chadha, 2005).

Factors discouraging students from effectively learning Business Statistics

Previous literature clearly demonstrates numbers phobia as a major hindrance in to learning statistics. Before projects could be utilised to remedy the ineffective learning, it was important to discover why and how these negative perceptions materialise. Several key factors emerged as reasons for students' negative perception and the resultant numbers phobia. These include:

Dull and boring lecturing

The traditional approach to teaching statistics is boring. It is not stimulating; students hardly connect with their lecturers. It might as well be two separate worlds in the classroom – the student world and the lecturer world (Duru, 2010). Although existing in one classroom, both these worlds do not know what the other world knows or what the other does not know. Lecturers 'teach' theorems, formulae, and data sets and students wonder 'how do I use that Greek letter at work? And if I do, who will understand it?' While in other modules students take ownership of the learning process through role-plays, discussions, and presentations (Hall, Waitz, Brodeur,

Soderholm and Nasr, 2002; Sabry and AlShawi, 2008), in statistics however it is the lecturer's class, it is the lecturer's way, and it is only the lecturer that participates. Many students find it dull and boring.

Lecturer shortcomings

Lecturer shortcomings, in this context, are deficiencies or limitations in the learning process that are attributable to Business Statistics lecturers. These are divided into three sub-headings: poor coordination of MBA lecturers, failure to engage students, and non-business majors teaching business statistics.

Poor coordination of MBA lecturers: MBA lecturers hardly view the MBA as an integrated management programme consisting of interrelated modules. Overall, there is no coherence in subject themes and content, which may falsely suggest that the MBA covers 15 different modules and yet in reality it should focus on promoting management decision-making.. This lack of coherence could be seen between Business Statistics and Research Methods¹. Prior to this interview, there hardly was any communication and collaboration between these two lecturers. Ideally, these modules should be linked together in a meaningful way – one module building on the next, but that is not the case.

The Research Methods lecturer seemed to confirm Frouws' (2007) findings that practical statistical skills are lacking. Students do not know "why, when, and how," to use statistics. He continued:

¹ At TUTBS Business Statistics is offered in the first year and Research Methods in the second year. Students may only proceed to Research Methods upon satisfactorily completing Business Statistics.

“Students ‘abuse’ statistics, “... they think that firing a big statistical gun and commanding SPSS to return all and every measure under the sun is research. They lack knowledge and focus. Even on qualitative research, they still want to use stats.”

Overall, it appears that there lacks a clear agenda of the purpose of these subjects and as such they are not well coordinated.

Teaching methods inertia: McLaren (1999) states that teaching is a social process, and like any social process should evolve and change. However, there is much resistance to change in many universities. Overhauling teaching approaches is cumbersome, time consuming, laborious, and frustrating (Hall et al., 2002). Apathy to change runs so deep that many students reportedly claim some lecturers use the same slides, same examples, same textbooks, and same approaches semester after semester, and year after year.

This inertia is problematic for academic practice. First, it is antithesis of the very essence of academic scholarship. While students are required to consult the latest literature for assignments, their very lecturers continually violate this principle by using ‘out-dated’ teaching resources (Duru, 2010). Secondly, the expected outcomes and the teaching of Business Statistics does not relate to each other. Students are expected to be able to use statistical packages like STATA, SAS, and SPSS for data analysis, but the course is designed in a way that only accommodates manual calculations. Why teach using formulae lists and tables and yet expect students to use computer packages? Investigations revealed that a significant number of the lecturers that were teaching Business Statistics did not know how to use these statistical packages.

Non-business majors and non-researchers teaching Business Statistics: For the purposes of promoting skills transfer, MBA schools habitually contract practitioners to teach MBA courses. For instance, marketers teaching Marketing or accountants teaching Accounting, in the same way, statisticians often teach Business Statistics (Rose et al., 1988). Likewise, at TUTBS the former Business Statistics lecturer was a statistician, and many students complained of the over-use of formulae with little practical examples. As previously illustrated, Statistics and Business Statistics are not the same, so having a statistician teaching management research is like having a physician teaching engineering. Concurring, Rose et al. (1988), reports that in a survey of American MBA schools, students in classes taught by non-statisticians performed much better than the students taught by statisticians, even those of taught by reputable statisticians of high calibre.

Projects improve students’ propensity to learn Business Statistics

With respect to learning Business Statistics, it was important to consider projects’ ability to amplify factors that facilitate learning and at the same time minimise those factors that inhibit learning. To answer this question, the researcher relied on findings from interviews with MBA lecturers and student observation in class as they executed activities.

The most significant contribution of projects is that they allow the teaching of statistical processes and reasoning (Ledolter, 1995), which for managers is most crucial. Second, projects relax the learning environment and encourage the participation of all students. Third, communication, bonding, and connection among students and between students and lecturer are enhanced.

Teaching statistical processes, not the content

Unlike theoretical lessons, projects introduce the much-needed realism in the learning process. Because project-based instruction incorporates real-life problems, the learning process becomes purposeful and motivating (Ahmed et al., 2010). Such learning facilitates the application of theory in different contexts (Alam, 2010). In order to illustrate the significance of Business Statistics as a management tool in different contexts, a variety of small projects and group projects were used. For the purposes of resolving simple and routine problems, small projects are ideal. On the other hand, group projects were most useful for discovering solutions for unstructured and loosely defined problems.

Small projects

For example, there was a project dedicated to the measures of central tendency. For the project, students collected information about themselves including heights, age, gender, shoe size, and marital status.

The data collection and data management processes were in their own right valuable lessons. Following data capturing, participants computed the relevant measures of central tendency, depending on the type of data. For instance, most students agreed that it did not make sense to try and get an average of marital status, as the nature of the data cannot be quantified. Thus, it was very clear to explain why the mean or median could not be used for categorical data such as marital status. Moreover, the exercise reinforced the concepts of data types and measurement.

Another clear advantage of using projects was that the data made sense to the students (Neumann, Neumann, and Hood, 2010). Data was not just figures (as in the textbook) whose meaning hardly made any sense to

students; however, their data was 'real,' it represented real things – Student X's height or Student Y's age. While this may seem insignificant to a seasoned analyst, to the below-average students this was a world of a difference. To explain the central limit theorem, for example, students arranged themselves in terms of height, from shortest to the tallest.

The resultant sequence was recorded and compared to the array and histogram produced in MS Excel. It was fascinating to the students to note that the two approaches yielded almost similar results. Overall, the exercise promoted communication and teamwork – important skills for success at the workplace – and boosted students' self-efficacy.

Advantages of small projects

Ledolter (1995) explains that traditional teaching approaches are usually "incomplete" in that they do not expose students to real world problem formulation. Specifically the difficulties associated with acquiring relevant data to resolve these problems (Libman, 2010). Small projects especially those that use simple resources assists students in thinking of statistics holistically – from problem identification to data collection, analysis, and interpretation. Some of the advantages of these projects are (Sabry and AlShawi, 2008):

1. Increased comprehension – a wide variety of concepts are learnt simultaneously
2. Learning while having fun
3. Easy and inexpensive to conduct
4. Helps develop communication skills
5. Relaxes the learning atmosphere

One other critical issue of andragogy that is ignored is that of dealing with students' tendency to feel embarrassment. Older students tend to feel more embarrassed especially amidst younger students. This applies to MBA students particularly those that hold senior positions at work. For instance, a certain senior executive used to call after class, for extra lessons because for it was too embarrassing for him to ask 'silly questions.'

By "informalising" the learning environment with activities, students' learning space changed in numerous ways. First, it expanded from just the textbooks to other resources including the library and the Internet. Second, the 'two separate worlds' – the students' world and the lecturer's world were merged into one. As a result, the lecturer's persona as a teacher and examiner changed to that of a facilitator – a repository from which students can bounce ideas back and forth. Third, communication patterns changed; students were more relaxed to interact among themselves and to participate in class. Eventually, students' negative perception of statistics was slowly replaced by a sense of confidence and achievement.

Improving data analysis skills with projects

As previously stated, the MBA seeks to enhance management decision-making through effective data processing, analysis, and interpretation. In that sense, the focus of the MBA is to develop skills transfer beyond the classroom (Alam, 2009; Groebner et al., 2008). To test students' ability to apply business statistics in a real-life setting, group projects involving real world management problem were used.

Group projects

Students worked in small groups, and worked through the various stages in the research process:

- (1) Reviewing the literature pertaining to the management problem;
- (2) Formulating a research problem;
- (3) Designing a data-collecting instrument and collecting data;
- (4) Analysing collected data (using MS Excel and SPSS);
- (5) Reporting findings in a report (submitted at the end of the trimester);
- (6) Finally, each group prepared a 15-minute presentation to report on their respective findings. A panel of three MBA lecturers and students peers assessed the presentations.

To promote realism, students were encouraged to identify a problem within their work and use it for the project. One such project considered the declining sales at a group of hotels in Pretoria. As in real research, the requisite permission and ethical clearance had to be sought prior to conducting the research. Thus, negotiating skills learnt in other modules (and at work) were also put to the test. A problem that emerged early on in these projects was that of uncooperative group members. Each group was allowed to decide on how best they would handle such matters. One group sought permission to constitute a disciplinary committee to deal with an errant member. The offender was threatened with expulsion from the group, which would have meant a 'zero.' Thereafter, the member began participating and no other issue of that nature were reported.

All groups reported some difficulty in the data collection phase. Most of the complaints concerned rude respondents, incomplete questionnaires, and non-response. While the experience of collecting incomplete data may have been frustrating for the students, it was opportune to introduce the concept of 'missing values.' This far-from-ideal situation, different from those explained in the textbook, encouraged students to apply a wide variety of skills.

Overall, the greatest utility of group projects is that they teach students that the textbook and the lecturer are only guides in the learning process. They are means to an

end, and not the end in themselves. In other words, they are the beginning of real learning. The latter corroborates the view that research acts both a process and a product of postgraduate studies (Alam, 2009; Tshwane University of Technology, 2008). As in the declining sales problem, after this research was presented to the panel, the group worked on the comments and feedback provided during the presentation and subsequently submitted it to the hotel group. The report was well received and initiated a much bigger study for the company.

Especially for the elderly students, using projects encourages students to think like managers and not as students. While in a normal classroom setting, students for some reason develop 'tunnel vision' and concentrate on only one chapter, but with project activities, they are empowered to utilise all sorts of resources and skills to solve problem, which seems to the objective of management education and training (Blass and Weight, 2005; Groebner et al., 2008).

DISCUSSION

The results in this current study are explained in light of Taube's (1986) findings that due to cultural influence, people of African origin are more inclined towards qualitative principles, and as a result lack a feeling of magnitude of quantitative data. Many students grapple with applying statistical theory to actual data (Duru, 2010). "In most cases, numerical results are not linked with reality" Taube, 1986). Duru (2010) further argues that since traditional teaching methods have many limitations, "the modern teaching of statistics must therefore be much more directed towards training students in reasoning with quantitative information." Hence, the latter was motivation to investigate projects' consequence on both the learning and mastering of data analysis skills. In other words, whether students could acquire the relevant data analysis skills required to solve management problems using project-based instruction.

This study indicates that projects do in fact stimulate students' propensity to learn and apply Business Statistics. In particular, project activities were most beneficial to more mature students and the below-average students as suggested by (Weltman and Whiteside, 2010, Alam, 2009). Since projects go beyond the 'traditional' passive learning, students are engaged in more activities than just listening to the lecturer. They are involved in dialogue, debate, writing, and problem solving, as well as higher-order thinking and creativity (Duru, 2010). In the context of Business Statistics, project-based instruction is stimulating and interesting; involves students in doing things and thinking about what they are doing (Alam, 2009). This conforms to Ahmed et al. (2010), whose findings indicate that student motivation greatly improves their performance. This is particularly true for statistics, which many students grapple with

understanding its relevance; thereby using in-class projects helps students appreciate its importance and utility in management. With this greater sense of the perceived usefulness, statistics students are more likely to apply their knowledge in their work (Alam, 2009; 2010).

The utility of projects is that they accommodate integrative (Sabry and AlShawi, 2008) and active learning (Duru, 2010), minimises 'numbers phobia syndrome' (Diamantopoulos and Schlegelmilch, 2000), and bridges the gap between statistical theory and practical application (DeVaney, 2010; Libman, 2010). All these, ultimately stimulate students to learn theory for the purposes of using it to solve problems. Learning Business Statistics therefore assumes a new meaning – students eventually overcome their fear for numbers and begin to appreciate the significance of the subject in management (Alam et al, 2010). Upon establishing this connection, the lecturer may introduce new topics with a greater degree of ease. In other words, students increasingly are motivated to learn and apply new knowledge.

Finally, the present study can also be explained according to Ledolter's (1995) notion that traditional teaching approaches are "incomplete," since they fail to expose and orientate students to real world problem solving. Project exercises familiarise students to the multiplicity of realistic situations and challenges, including incomplete and irrelevant data, when making decisions (DeVaney, 2010), thereby calling for creativity and flexibility (McLaren, 1999).

IMPLICATIONS

It should be noted that the purpose of this paper is not prescriptive but descriptive, and that the use of projects in Business Statistics should not necessarily be considered the 'magic bullet' in teaching Business Statistics. However, if used appropriately depending on the particular context, projects can be an effective tool to empower below-average students and non-traditional students realise the power of Business Statistics, especially those with limited exposure to mathematics and statistics. In this regard, the findings support the hypothesised propositions: exposure to projects develops data analysis skills (P1) is supported. Furthermore, projects facilitate students' retention of statistical theory (P2) is supported, and reduced statistical anxiety improves data analysis skills (P3) is also supported.

Previous studies also show that projects' most significant contribution is in transforming Business Statistics into a student-friendly subject (Duru, 2010; Hall and Vance, 2010; Hiedmann and Jones, 2010). In particular, Neumann, Neumann, and Hood (2010) point out that projects which use students' real data not only promotes a favourable learning environment, but also improves student performance. Hence Duru's (2010:584) explanation, that "traditional teaching methods are not

sufficiently appropriate for mathematics teaching.” With projects, the rigidity of traditional lectures is replaced by a fun and relaxed learning atmosphere, in which students take full control of their learning and the lecturer’s role of facilitator is pronounced. More importantly, non-traditional methods, according to Duru (2010), help minimise student drop-out rates in mathematics and statistics courses, as they present the subject in a friendly and unthreatening manner. It therefore would be interesting for future research to consider empirical research in a different setting. A much larger sample could be utilised to assess the fit of projects on students with limited mathematics experience.

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APPENDIX: INTERVIEW QUESTIONS

Research methods Lecturer

1. What would you want students to learn in statistics (a prerequisite of Research Methods) before attending the Research Methods module?
2. What do you think is the best approach to teach this?

Marketing Lecturer

3. What do you expect a student who has just completed a course in Business Statistics should know?

HoD, Business School

1. When you included the Business Statistics module, what exactly did you want students to learn/ know?
2. What advice would you give me to be effective in achieving these objectives?
3. Provided I manage to achieve my objectives, how creative can I be in teaching this module?