A Piagetian-Bloomsian Approach to Teaching and Learning Economic Concepts

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Abstract

The teaching and learning of economic concepts at undergraduate level can be a frustrating passage for both teachers and learners. Students often arrive with a fear of economics and weak cognitive skills. Over the years, I have had to resort to a number of changes in my teaching strategies and eventually adopted a Piagetian-Bloomsian approach to teaching. The approach involves visual representation and communication of an individual's knowledge structure, of a single or multiple concepts as constructed by the individual. It takes the form of a matrix and is similar to mind mapping. This guided instructional technique is designed to foster students' cognitive growth. The effectiveness of this teaching and learning approach is validated by the results of a survey which demonstrates that students find this teaching approach useful and that there is a strong positive correlation between higher cognitive skills and the teaching approach. In addition, an improvement in examination scores in four teaching semesters has been recorded.

Keywords: Piaget, Bloom, cognitive mapping, teaching and learning strategies, economic concepts, undergraduate level

1 Introduction

It is common knowledge that a number of students arrive at university with educational and cognitive deficits. In the teaching and learning of economic concepts, the passage can be frustrating for both teachers and learners. Additionally, students often arrive with a fear of economics. This is because for many students economics is a completely new disciplinary field. The

subject includes the application of mathematical methods to represent economic theories – and many students do not enjoy mathematics. Also, as in the study of mathematics, the ability to apply logical and rational reasoning is a vital ingredient in the study of economics.

Over the years, I have had to resort to a number of changes in teaching methods and eventually adopted a Piagetian-Bloomsian approach to teaching and learning. At its core is the instructional applicability of Jean Piaget and Benjamin Bloom's theories and educational principles in developing knowledge.

Jean Piaget's learning theory on cognitive and constructivist development has had a major influential impact on education. Whilst Piaget's theory is geared towards knowledge acquisition for children, his much inspired insights on the nature of children and their cognitive growth are useful and can also be applied to adults in higher learning; for essentially what matters in cognitive growth 'is not the age at which skills develop, but the sequence in which they develop and how they continue to evolve' (Burman 2008:162). Echoing a similar viewpoint and influenced by Piaget's ideas, is the work of Jerome Bruner and his influential book *The Process of Education*.

Piaget's assimilation-accommodation model of cognitive growth is insightful. His model allows us to reflect on the mental framework that cognitive development is an active process of acquisition and modification – a continuous process step-by-step of self-construction and discovery. For decades, to emphasise discovery learning, there has been, as Sweller (2009: 127) points out, a large number of works that have used the Piagetian theory.

What is the theoretical link between Piaget and Bloom? For Piaget, the mind of the learner exhibits cognitive dualism. But it is a duality of a particular type. For instance, at the University of KwaZulu-Natal (UKZN), the learner is thrust into a situation where a novel concept is presented by the instructor. Piaget maintains that the learner has two cognitive characteristics. First the learner must assimilate that new concept into her current set of cognate processes which are also two-fold: understanding and acting on the now shifting experiential understanding. These cognate changes are 'plans' as it were, and the learner knows that the external reality can confront these plans or desires and the second response (as part of the duality) is that the learner must reconcile or accommodate this new concept with the external world. To be fair, this explanation of the underlying theory confounds Piaget

and Vygotsky (Gillen 2000). The latter sees as fundamental, the need for an external facilitator in this dual process. Sandwiched in between the learner and the external reality is a conjuncture that an instructor helps the learner negotiate. This is where Bloom's (1984) paper is explicit as to the role of the instructor or tutor indicating that his roots are firmly in the Piaget camp *via* the influence of Vygotsky. Piaget's and Bloom's educational theories and realist-constructivist view see learners as 'the manufacturers of their own development' (Flavell 1996:200). This is what inspired and changed my teaching approach.

Thus, Piaget's and Bloom's educational theories and realist-constructivist views construct learners as 'the manufacturers of their own development' (Flavell 1996:200). This principle has inspired and changed my teaching approach which is now within a connectionist framework.

This paper takes a cognitive-constructivist approach to teaching and learning and proposes a teaching strategy that is designed to engage students and develop their analytical and creative skills as they identify, explore and link key concepts. The effectiveness of this teaching and learning approach is verified by the results of a survey. The overall results show that students find this teaching approach useful and there is also a strong positive correlation between higher cognitive skills and usefulness of the teaching approach. In addition, there has been an improvement in examination scores in four teaching semesters.

The paper is divided into seven sections. The first section sets the background. The second discusses the adapted theoretical framework of the Piagetian-Bloomsian approach. The third section describes the Piagetian-Bloomsian technique and then explores its potential usage as an instructional tool. The fourth section addresses the educational objectives of the Piagetian-Bloomsian approach and offers a practical discussion of its applications. The fifth section provides the empirical framework of this study. The sixth section highlights the hypotheses of the study and discusses the survey methodology and results. Concluding remarks are made in the last section.

2 Theoretical Base

Good teaching involves getting students to use higher cognitive level processes (Biggs 1989) and involves the creation of problem solving

scenarios for learners that follows onto one another with some guidance and freedom (Piaget in Evans 1973:53). To be able to discuss with others what one is learning and learning by doing translates into better understanding (Piaget 1926). The theoretical considerations of the proposed Piagetian-Bloomsian approach supports and draws on the realist-constructivist views of both Piaget and Bloom and visually, is closely related to various graphical organisers that are used in a variety of disciplines. Most graphic organisers such as mind mapping are based on a cognitive approach. This section explores the conceptual framework of the Piagetian-Bloomsian approach.

The theoretical base of Bloom (1984) is relatively easy to discern. While the analysis is mostly empirical the categories that are set up to evaluate improved performance have an implicit link to the theory of learning. These categories are first instruction in a class with a teacher and the occasional test, second, the class now with formative testing and feedback from the instructor and peers, and finally the one-on-one tutoring approach. Abstracting from Piaget, this structure is directly from Vygotsky and Bloom's contribution is to realise the final category is prohibitively expensive and his second category is a 'middle way' without losing too much by way of affecting learning. Whether this compromise is entirely effective has to be established. Slavin (1987) shows that it is not. However the study does have a short-term bias (Bloom 1987). Berger (2004) is closer to the type of Piaget, Vygotsky and Bloom study we conduct here.

2.1 A Cognitive Conceptual Framework

The term 'cognitive' gives a broader and deeper theoretical perspective on the idea of how mapping techniques can improve the quality of teaching. Historically, the term 'cognitive mapping' was supposedly first linked to the experimental investigations of Edward Tolman (1948). He referred to cognitive mapping as mental constructions of the spatial layout of the environment, indicating the location of different features of the environment and the paths linked to them. Others such as Jonassen, Beissner and Yacci (1993) have referred to cognitive mapping as two-dimensional or three dimensional diagrams that represent the structure and relationships between ideas.

Piaget's assimilation-accommodation model of cognitive growth can

be used as a basis for cognitive maps and to the end this active instructional strategy results in conceptual change since economic concepts are now better and more accurately reasoned and represented – satisfying theoretical views regarding knowledge coherence.

According to ongoing research in education, cognitive maps are useful tools for:

- Problem solving (Buzan & Buzan 1993)
- Creative thinking (Buzan 2000);
- Representing, assessing, conveying, and acquiring structural knowledge (Jonassen, Beissner, & Yacci 1993); and
- Identifying, exploring, understanding and linking key concepts (White & Gunstone 1992; Novak & Canas 2008)

The aforementioned assumptions that cognitive mapping can be helpful and increases learning effectiveness suggest that cognitive mapping techniques could play an important role in teaching. The *sine qua non* of most current cognitive maps is that of Bloom's taxonomy. Usually put in a pyramid structure (although it need not be, see for instance, Sam Weinberg and Jack Schneider 2010), the elements of any attempt to come to grips with a novel idea, helped by an instructor, must include knowledge, comprehension, application, analysis, synthesis and evaluation. All of these elements include the four areas above. Bloom's influence is clearly evident in these expressions of cognitive maps.

2.2 A Constructivist Conceptual Framework

Universities are said to be among the most promising candidates for encouraging constructivist-learning environments (Jonassen, Mayes, & McAleese 1993). Likewise, Piaget and Bloom recognise the importance of students active participation. By implication, the educational principle is based on a hardly debatable psychological fact that; 'intelligence proceeds from action' (Piaget 1950:35). Cognitive mapping as a cognitive tool is constructivistic because it actively engages learners in the creation of knowledge that reflects their comprehension and conception of the information (Kommers & Lanzing 1997).

In higher learning at UKZN, all courses, now termed modules, require a module template. These templates set out the goals and objectives of a course. In addition, the template also requires some framework for establishing how these goals or objectives are met. No matter one's assessment of this structure, it is easy to discern that the template structure has antecedents in the taxonomies of Bloom, which, we have argued above, have strong theoretical links to Piaget and Vygotsky. Thus at UKZN, we have the practical expression of well-established (but not without its detractors) educational and cognitive theory. Arising from this practical application of Bloom, it is thus of some interest to determine if the theoretical ideas, on which these practical ideas are based, can be tested in the classroom context at UKZN. Also given that online instruction, using the so called Web 2.0 applications is now commonplace, the taxonomy of Bloom is undergoing renewed interest. See, for example the Schoenfeld-Tacher, McConnell Graham (2001) study where computer aided instruction combined with Bloom's taxonomy provided measurable benefits to learners.

3 The Piagetian-Bloomsian Approach

In this section, a description of the Piagetian-Bloomsian technique is provided and its potential usage as an instructional tool is explored.

3.1 What is the Piagetian-Bloomsian Technique?

The Piagetian-Bloomsian instructional technique is designed to offer a conceptual change regarding knowledge coherence and foster student's cognitive growth. The Piagetian-Bloomsian technique is a visual-guided representation and communication of an individual's knowledge structure of a single or multiple concepts as constructed by the individual. It takes the form of a matrix and is similar to mind mapping.

This technique is aimed at stimulating learners and creates a more effective teaching and learning environment. The matrix system of learning has five essential characteristics similar to mind mapping:

1. The main topic is identified.
2. The key themes relating to the main topic are then identified.

3. Colours are used to highlight the main topic and the key themes.
4. Key themes are explored-linked and can comprise key words, definitions, questions, codes, symbols, diagrams or tables.
5. Sub themes are explored-linked and can comprise key words, definitions, questions, codes, symbols, diagrams or tables.

For a visual distinction between the mind map and the Piagetian-Bloomsian approach I refer readers to Figure 1 and Figure 2 in appendix 1. Technically, it aims to visually provide a one-page recording of knowledge showing relationships or connections among multiple topics/concepts and also allowing one to draw conclusions. As a visual representation of ideas or knowledge it can help learners to think or review a subject in a more structured holistic sense.

3.2 Uses of the Piagetian-Bloomsian Technique

Learners need opportunities to discuss their tentative understanding with others and build conceptual connections to their existing knowledge. Piaget (1926), Laurillard (1993), Jonassen *et al.* (1993) and Brown (1997) argue that the learner, through active participation in both arriving at, and articulating their personal understandings of new ideas and concepts, constructs knowledge. Similarly, echoing this viewpoint is the Bloom's taxonomy and its learning expectations.

As an instructional tool, the Piagetian-Bloomsian technique can be used by teachers in testing, reviewing and stimulating thoughts in a particular unit of a course. A very recent paper in this regard, is that of Lundquist and Hill (2009) who still find use for Bloom's methods in English language instruction. In this case, Bloom's approach helps to align class test results with university standards and benchmarks. This reinforces our earlier impetus for examining Bloom as UKZN's quality control processes rise out of the underlying theory.

The Piagetian-Bloomsian representation can be a useful structure/framework for testing, reviewing and stimulating thoughts in a particular unit of a course. It aims to create a way for the teacher and the learner to see interconnections and potential relationships between topics and concepts in the course, thus assisting users to see how best to present the

connection between the concepts in the course. This, allows learners to present their knowledge in a more logical and coherent form with the freedom to discuss and confer with peers.

This teaching approach when used correctly can help reduce the need for student memorisation and accelerate meaningful cognitive development. This Piagetian-Bloomsian technique can further be used by the instructor as the basis for the organisation of a lecture and to generate questions so as to stimulate 'dormant' thoughts. I have often taught using this approach but found that this method of teaching works generally better for smaller groups. Also in my experience, for a better response and more meaningful cognitive processing if the 'skeleton' concept maps are made available in advance as lecture notes, it gives the learners a preview of what they will be working on and also helps to ease the instruction.

4 Objectives and Application of the Piagetian-Bloomsian Approach

To provide a sense of realism and to be able to gauge the achievement effects of this Piagetian-Bloomsian instructional approach, the paper uses Bloom's classic taxonomy of educational objectives (started in 1948 and completed in 1956). The first part of this section of the paper begins by addressing the desired and reasonable educational objectives. The second part then provides a description as to how students can be introduced to this teaching method and in the process targets the cognitive skills desired in the teaching of economics.

4.1 Objectives

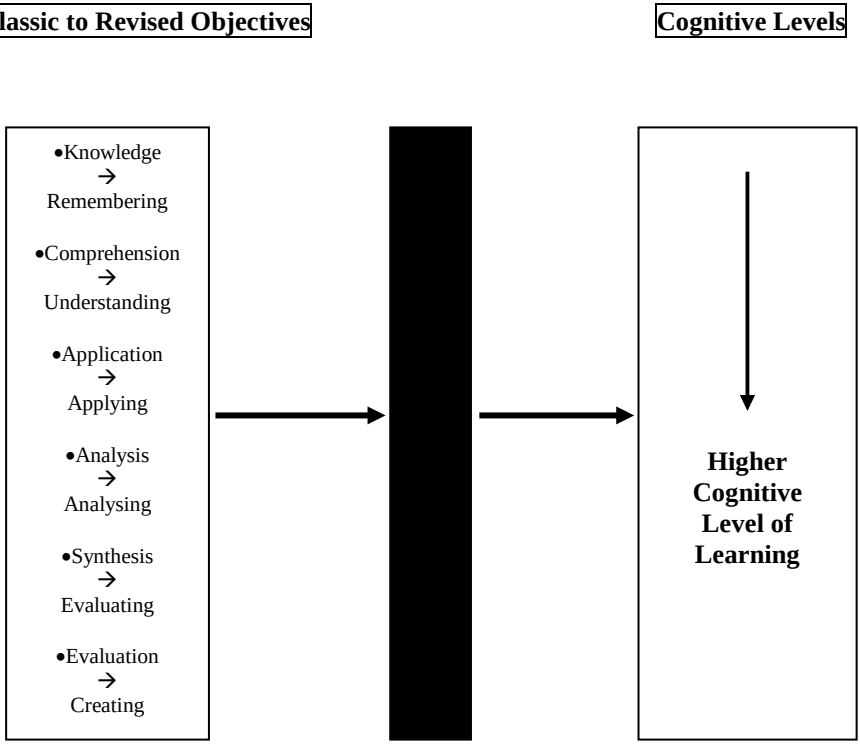
Whilst the paper chooses to follow Bloom's classic Taxonomy, it does acknowledge that the twenty-first century has brought us a revision (as illustrated in Figure 1 below) of Benjamin Bloom's work on the taxonomy of the cognitive domain (Anderson & Krathwohl 2001). Technically, it is worthwhile pointing out that in the revised taxonomy, whilst the hierarchical systems have changed; their instructional objectives have remained essentially the same. For instance, Bloom's 'synthesis' is essentially addressing the revised higher cognitive level of 'creation' – the classic

Bloom's taxonomy remains useful and for this paper, the *de facto* standard for the educational objectives of learners in economics courses.

Bloom's taxonomy presented in Figure 1 below identified six educational levels arranged in hierarchy from the least to more complex cognitive objectives. Since the heart of this paper is not on the determination of educational objectives, I refer interested readers to Bloom (1956); Bruner (1960); Saunders and Walstad (1990); Clerici-Arias (1994) and Anderson and Krathwohl (2001).

Figure 1

Classic Bloom's and Revised Bloom's Taxonomies of Cognitive Domain



In educational objectives, when relating to Bloom's taxonomy of the cognitive domain more explicitly, the first four levels target students' recall

of prior learning; translation of information based on prior learning; the selection and application of data to problem-solving followed by comparative and contrasting analysis.

The two highest levels of learning objectives namely synthesis and evaluation are closely tied. The *synthesis* cognitive objective requires the integration of elements and parts so as to form a whole. This much desired outcome addresses the construction, creativity and inventiveness of learners. On the other hand, the *evaluation* cognitive objective placed on the highest cognitive hierarchy is concerned with the learner's ability to make a judgment either quantitatively or qualitatively based on their own or external criteria. This learning outcome is most challenging in Bloom's levels of cognitive performance since it requires competence beyond all the other categories and added logical value.

4.2 Applications

If one accepts that every '*learning involves a restructuring of the student's schemas, learner involvement becomes mandatory*' (Webb 1980:96). The Piagetian-Bloomsian teaching and learning promotes active student engagement (discussing, writing or drawing, asking and answering questions) in teaching and learning. This section of the paper provides an application of the Piagetian-Bloomsian technique in the context of the analysis of Demand and Supply theory. A classroom-lecture/tutorial discussion at first year undergraduate level on the subject of Demand and Supply concepts is the framework of this section of the paper.

For teachers applying the Piagetian-Bloomsian technique, it is best to start by identifying the main topic of a question/problem that students generally struggle with which provides the context for their concept map. After the domain or related question/problem has been selected, the next stage is to identify the key concepts that apply to the domain starting from the most general concepts and arranged hierarchically. Once the preliminary map is built learners are then guided to seek linkages.

In the context of the demand and supply theory of the application, one can refer to a constructed illustrative targeting framework (see Figure 1 in appendix 2). As illustrated in Figure 1, the main topic and learning objectives as key themes are first identified and later probed. Students are asked to

use this framework in discussing and recording their thoughts and notes.

Contextualising the key concept and identifying key themes are a first step. The discussion of each key theme takes the form of several questions; for example, in a discussion on the demand theory, students are required to use their environment to bring about what the law of demand means for each learner's purchasing decisions, they are also expected to identify related key economic variables, to assess any possible relationships between the key variables and raise hypotheses.

Students are encouraged to use both their knowledge of prior learning and their environment to raise questions and possible links so as to discuss each theme. For instance, a basic discussion on the basic 'demand concept' could include and lead to questions such as: (1) what does a demand curve look like and why? (2) Since demand can affect price, what is the impact of demand on price and why? (3) How sensitive are demanders in the market? And so on ….

There are many graphs in economics which are used to convey information graphically. However, many students are uncomfortable with graphs and graphing. Understanding the basic parts of any graph makes reading and graphing easier. On the demand concept a discussion of the graph would start by hypothesising the relationship between identified variables and learners then construct an abstract graph of the relationship. Thereafter, they use the graph to question and determine the steepness or slope of the curve and possible shifts and movements along the curve. In the process, exceptional cases are compared and hypothesised.

For a discussion of the basic supply theory, interested readers can adopt a similar approach. In my experience, a mirror-image approach to teaching economics (applicable in this case) works well with students since it simplifies their learning. Students are reminded to integrate the economic issues that have been raised and encouraged to attempt a comparative and contrasting analysis of the key economic concepts under study and draw their own conclusions.

In another classroom session, or if time permits, at the end of the session, students' answers can then be discussed and students are encouraged to critically appraise their efforts against a 'sample format' provided by the teacher. In the context of the application of this paper, for readers, an illustration of a potential sample format is provided in Figure 1, Appendix 2.

5 Empirical Framework

The following section takes a look at the three measures used in this study to assess the validity and reliability of the proposed Piagetian-Bloomsian approach to the teaching and learning of economics:

1. Class Observations
2. Examination results and questions
3. Survey

5.1 Class Observations

The class observations used the first year undergraduate Economics 101 students at the University of KwaZulu-Natal (Pietermaritzburg campus) as the case study. The Economics 101 module is taught during the first semester.

Over the years, with a gradual increase in the use of the Piagetian-Bloomsian teaching strategy, many students remain sometimes opposed (judging by their behaviour) or quite receptive to this teaching and learning approach. This is possibly due to the students' previous educational backgrounds (especially learners who have spent most of their schooling learning by rote) and or the fact that this teaching approach requires much 'effort'.

Over the years, I have also found that in the initial stages of development, the process of application is much harder, especially among bigger teaching groups. There are a number of factors hindering its full potential benefits. In my experience, the most important are students' interest and attitude, followed by the increasing size of the classroom. At this juncture, it is important to mention that there has been a distinct increase in first year economics' intake impacting teaching and learning severely by stretching the existing resources. Needless to say, the application of a Piagetian-Bloomsian teaching and learning approach is increasingly more demanding and challenging.

5.2 Examination Results and Questions

I first introduced the Piagetian-Bloomsian approach to teaching and learning in 2005. Between 2005 and 2006, students were introduced to this approach on an irregular basis since the different aspects of the approach were not

fully designed. It was only in 2007 and 2008 that I used the Piagetian-Bloomsian approach more extensively. In four teaching semesters, during the period 2005-2008, the examination scores for the case study (economics 101) have steadily risen with a distinct improvement in 2007 from a fifty four per cent pass rate to sixty six percent in 2008. As a matter of interest to readers, this Piagetian-Bloomsian approach was not applied in 2009 owing to a sabbatical break. The examination score was found to be relatively lower in 2009. It is worthwhile pointing out that in 2009, the new intake of learners in Economics 101 were the first group solely educated via outcomes-based educational methods. An alternative explanation is that the school system does not impart the necessary learning skills that ease the application of the Piagetian-Bloomsian approach.

I have also noticed that the academic profile of students has declined with larger numbers of weaker students more visible especially after 2008. Whilst we do acknowledge the assistance of tutor support, the support structures (such as budget) and profile of tutors have also weakened. Nevertheless, the standard of examination papers have improved for a comparison of a higher-order 2005 exam question relative to the higher-order 2008 exam question (see Figure 2 below). It is worthwhile pointing out that in 2005 the pass rate was 48 percent and 66 percent in 2008.

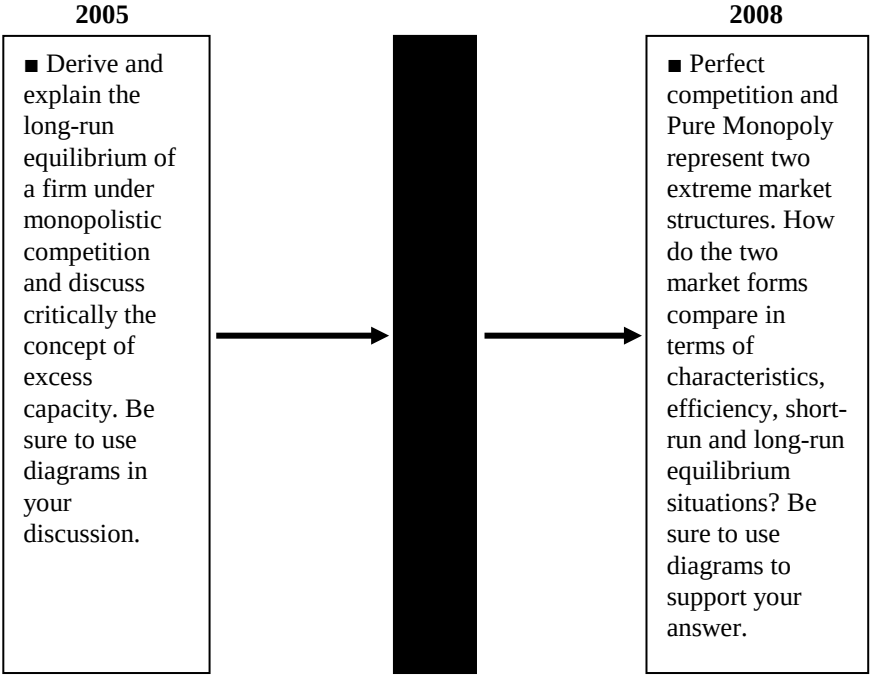
In the year of this survey, concern had been raised by the university regarding the low pass rates and low throughput rates; an unacceptable number of learners were taking much longer to finish a degree. Clearly, a fresh approach was needed to overcome student's fear and indifference as well as addressing the low pass rates and to decrease completion tries.

The purpose of conducting a survey was to determine the usefulness and reliability of the Piagetian-Bloomsian teaching approach. In particular, the aim was to assess the correlations between higher cognitive skills and usefulness of the lecture approach as well as the relationship between overall intellectual development and usefulness of the lectures.

Student feedback from the case study (First Year Economics 101) was collected through a survey administered during the last lecture in May 2008. A total of 205 students took the survey. The students were given an evaluation questionnaire and asked to anonymously evaluate the usefulness of the lectures as well as the higher perceived cognitive skills acquired and the perceived increased intellectual development.

Figure 2

Examination Questions



The survey questions used a Likert-scale with values ranging from 'agree', 'neutral' to 'disagree'. The relationships between the survey questions were examined using the Spearman correlation analysis.

6 Empirical Survey Assessment.

6.1 Hypotheses

This study aims to test the following four hypotheses:

H_0: There is no correlation between cognitive skills and usefulness of lectures;

H_0: There is no correlation between two highest order cognitive skills;
H_0: There is no correlation between increased intellectual development and usefulness of lectures;
H_0: There is no correlation between increased intellectual development and cognitive skills.

We do this in the next section and find support to not fail to reject these null hypotheses.

6.2 Methodology

This study elects to use the Spearman's rank correlation also known as Spearman's ρ (denoted as S_ρ in this study) to carry out the above hypothesis tests of this study. The Spearman's correlation technique is appropriate for this study since we are dealing with non parametric ordinal data and the variables in this study are also not normally distributed. The correlation tests aim at measuring the magnitude and direction (positive or negative) of the association between paired variables.

The null and alternate hypotheses for the Spearman test are:

H_0: $S_\rho = 0$
H_1: $S_\rho \neq 0$.

Mathematically, the Spearman Rank formula is:

$$S\rho = 1 - \frac{6\sum d^2}{n^3 - n},$$

where:

$S\rho$ = Spearman rank correlation;
d = the difference between the ranks of corresponding values;
n = number of observations in each data set.

The Spearman's rank correlation coefficient will take on a value between -1 and +1 and with an adjustment which is distributed approximately

as student's t distribution with $n - 2$ degrees of freedom under each null hypothesis. All our variables are positively correlated as expected.

6.3 Results

The overall results show that seventy percent of students found this teaching method useful and the results also indicate that sixty-four *per cent* believe that '*at the end of this module, I have developed intellectually beyond the point I was at when I started studying this section of economics*'. However, only forty-nine *per cent* of students indicated that '*as a result of attending lectures, I have learned to think in new ways*' and fifty-two *per cent* reported that they have '*developed an ability to critically evaluate issues or problems in the field of economics*'.

The correlation results for the questions (Q) related to the variables under study (for example, evaluation) are shown in the upper correlation matrix below (Table 1) and further supported by the mean statistical results in Figure 1 Appendix 3.

Table 1

Correlation Matrix

Spearman Rank Order Correlations (All P-Values <0.01)				
	Q evaluation	**Q useful**	**Q intellect**	**Q synthesis**
Q evaluation	1	0.784	0.838	0.945
Q useful		1	0.911	0.785
Q intellect			1	0.821
Q synthesis				1

The statistical results are indicative of a positive correlation between both higher cognitive skills (synthesis and evaluation) and the usefulness of the lecture approach (n = 205, $S\rho$ = 0.785 and n = 205, $S\rho$ = 0.784). The findings therefore suggest that a cognitive-constructivist instructional approach may well be associated with the attainment of higher cognitive educational objectives. The P-Values are all at (low) levels that by the usual

conventional criteria, this difference is considered to be extremely statistically significant. Thus we are able to put ourselves in the position of being able to 'do not fail to reject all the null hypotheses.'

Additionally, the statistical results point towards a strong positive association between the two higher cognitive skills of evaluation and synthesis (n = 205, $S\rho$ = 0.945). This study, therefore provides robust empirical evidence that creative skills and critical skills are strongly and positively related.

Lastly, the empirical estimates also indicate a strong positive relationship between increased intellectual development and the usefulness of the lecture approach (n = 205, $S\rho$ = 0.911). The findings thus indicate a strong positive relationship between increased intellectual development and the two higher cognitive skills (n = 205, $S\rho$ = 0.821 and n = 205, $S\rho$ = 0.838). Increased intellectual development is thus significantly correlated with both the theoretically identified categories and points to the usefulness of the Piagetian-Bloomsian teaching approach in enhancing cognitive skills.

Overall, the above empirical findings confirm the usefulness, validity and reliability of this Piagetian-Bloomsian teaching strategy with an acceptable measured effect size for social science research.

7 Conclusion

This study has explored the effectiveness of a cognitive-constructivist approach to teaching and learning economic concepts. The empirical findings of this study suggest that: (1) creative skills are associated with critical skills; (2) the higher cognitive skills are correlated with the usefulness of the Piagetian-Bloomsian teaching and learning approach; (3) an increased intellectual development is significantly correlated with the Piagetian-Bloomsian teaching and learning approach and (4) an increase in intellectual development is associated with higher cognitive skills.

It is well-known that there are a number of students arriving at university with educational deficits. In my experience, although not all students appreciate the Piagetian-Bloomsian teaching and learning approach, the method will evolve over time since we are dealing with an ever-changing heterogeneous group of students. However, I hope that the Piagetian-Bloomsian teaching and learning strategy presented here along with the

findings on its effectiveness will inspire others to interrogate its potential. Also, considering the challenges facing undergraduate studies in South African Universities, educators and educationalists should perhaps pay more attention to the need for constructivist learning and the value to be derived from Jean Piaget and Benjamin Bloom's work.

I hope that in sharing my views and providing a statistical analysis of teaching and learning in economics inspires us to find other approaches to teaching and learning. After all, for Jean Piaget, in conversations with Bringuier (1980:132), '*education means making creators…You have to make inventors, innovators, not conformists*' and Bloom's taxonomy encourages this view of Piaget.

Appendix 1

Figure 1: The Mind Map Approach

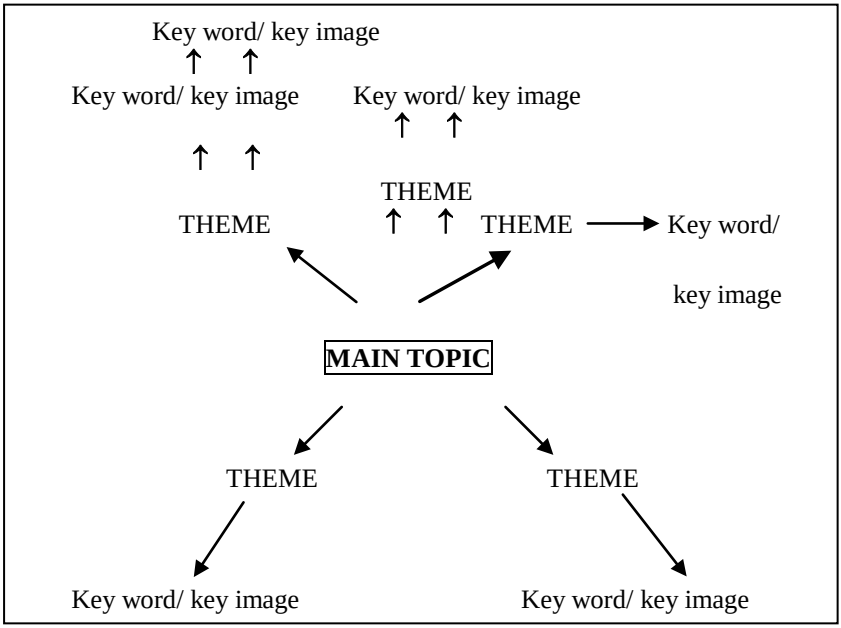


Figure 2: The Piaget-Bloom Approach

MAIN TOPIC				
THEME	**THEME**	**THEME**	**THEME**	**THEME**
• definitions & / key words & / symbols & / diagrams & / tables & /	• definitions & / key words & / symbols & / diagrams & / tables & /	• definitions & / key words & / symbols & / diagrams & / tables & /	• definitions & / key words & / symbols & / diagrams & / tables & /	• definitions & / key words & / symbols & / diagrams & / tables & /
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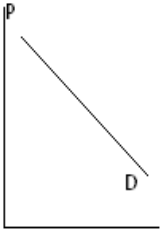
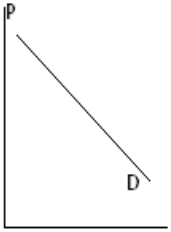
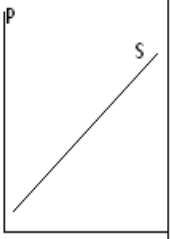
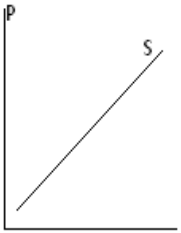
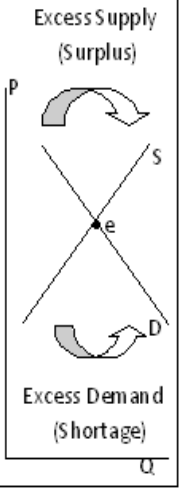
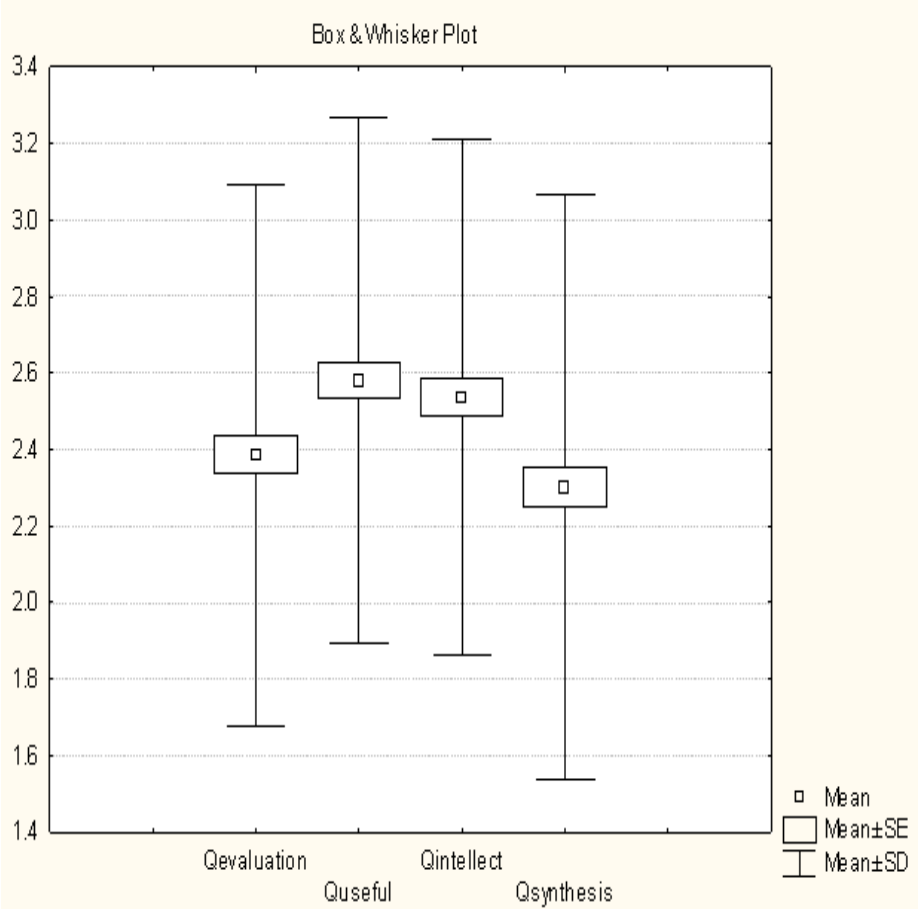
Appendix 2

Figure 1: Piaget-Bloom Application – Demand and Supply

	Law	Graph	Movement (curve)	Shift (curve)	Equilibrium
DEMAND	• ↑P ↓Q • ↓P ↑Q • -ve	•Slope (-ve)  •	•▲ P  •	•▲in: •Income •Taste/ preferences •Population •Expectations (future prices) •Prices of other related products (complements and substitutes)	•Qd = Qs •Equilibrium price is the price that equates quantity demanded to quantity supplied. If any disturbance from that price occurs excess demand or excess supply emerges
SUPPLY	• ↑P ↑Q • ↓P ↓Q • +ve	•Slope (+ve)  •	•▲ P  •	•▲in: •Prices of inputs •Technology •Number of firms •Expectations (future prices) •Prices of related goods (complements and substitutes)	

Appendix 3

Figure 1: Box & Whisker Plot



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