Conceptions and Attitudes Held by Pre-service English as a Foreign Language Teachers

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Abstract

This article reports on a study on how pre-service English as a Foreign Language (EFL) teachers approach to learning statistics and what distinct features each approach has. Data were collected from 15 participants by using open-ended questionnaire and deep interviews. The results of the analysis revealed that students who adopted surface approach in learning statistics tended to view statistics as a collection of numbers and formula and were not aware about the utility of statistics, while those who adopted deep approach were more likely to consider statistics as a useful tool and referred statistics as beyond the data and formulas. Despite attitudes toward statistics were not empirically related to deep approach, better performance on statistics exams was identified among the students adopting deep approach to learning. Students' responses also exhibited that learning environment was one major factor that encourages them in learning statistics.

Keywords: Approach to Learning Statistics, Attitudes toward Statistics, Conceptions of Statistics, Pre-service EFL Teachers

1. Introduction

The fact that statistical skills could be used in various fields such as business, education, economy, and industry, has been a reason for enacting statistics as a service course for students majoring other disciplines at higher education institutions. Moreover, as the educated citizens, students need to be able to consume the information that they inundated with on a daily basis, think critically about it, and make good decisions based on that information (Rumsey, 2002) so that they can detect any misuse of statistics by policy makers, physicians and others (Utts, 2003). A positive view of statistics and an appreciation for the potential uses of statistics in future personal and professional areas should be possessed by each student from statistics courses (Gal, Ginsburg, and Schau, 1997).

It is important for students to use deep approach in learning statistics, beside they will tend to have good learning outcome, their developed strategies and motivation in learning will make them become lifelong learners so as in the future they can apply the skills either as professionals or literate citizens. As reported by PISA (OECD, 2003) that learning approaches

are among some factors that can influence students' cognitive outcomes and suggested that students' approaches to learning need to be considered in overall assessment of the outcomes of schooling.

Accordingly, there have been an increased attention on the studies of student approaches to learning beside the teaching methods used. It has been proved that students tend to take a different approach to how they study depending on the perceived objectives of the course they are studying. Felder and Brent (2005) argued that the phenomena appeared due to the different levels of motivation, maturity, response to specific educational and classroom environments, reception to specific instructional design, and different attitudes toward teaching and learning possessed by each student. This is also evidently suggested in higher education study (Prosser and Trigwell, 1999), music (Reid, 2001), as well as in statistics (Reid and Petocz, 2002). How students' understanding of their discipline in a work context was also found to have strong link with the way they go about learning their discipline as suggested by Prosser and Trigwell, 1999; Marton and Trigwell, 2000; Reid, 2001. A range of factors such as teaching approaches, learning theories, assessment methods and students' prior learning experiences and perceptions were identified to influence students' approaches to learning in some educational researches (Gordon, 1995; Gow et al., 1994; Kember, 2000; Ramburuth and McCormick, 2001).

This study is a preliminary research aimed at investigating how pre-service EFL teachers approach to learning statistics and what distinct features each approach has. The framework used to analyse student approaches to learning statistics was based on the dimension developed by Biggs (1985, 1987a; 1987b) in his Study Process Questionnaire (SPQ) scales. The study explored the nature of the learning process complex, particularly in its metacognitive aspects and produced a model called Presage-Process-Product (3P) model for describing an educational event in which students' approaches to learning are conceived as forming part of the total system (Biggs, 1987a, 1993a, 1993b). Three main approaches were introduced as Surface, Deep, and Achieving where each approach is a composite of a motive and an appropriate strategy as shown in Table 1.

Table 1
Motives and Strategies in Approaches to Learning and Studying (Biggs, 1987a)

	Surface	**Deep**	**Achieving**
Motive	Fear of failure	Intrinsic interest	Achievement
Strategy	Narrow target; rote learn	Maximize meaning	Effective use of space and time

Students who apply surface approaches were driven by extrinsic motivation in learning and usually learn through memorizing facts from the books or lectures (Marton and Säljö, 1984), and reproduce them through rote learning (Biggs, 1985, 1987a, 1987b). Students using deep approaches, on the contrary, learn due to their intrinsic interest to master the contents of the subjects, seek the meaning and enhance understanding through wide reading and inter-relating with previous knowledge (Marton and Säljö, 1984; Biggs, 1985, 1987a, 1987b). Whereas strategic (Marton and Säljö, 1984) or achieving (Biggs, 1985, 1987a, 1987b) approaches were defined when students learn through systematic or smart study, schedule time to compete with other learners and to attain the highest grade.

2. Methodology and Data Analysis

This study involved 15 pre-service EFL teachers, which would be regarded as students in this paper, from three different class units comprising of 5 males and 10 females from a college in Northern part of Aceh Province, Indonesia. The study was conducted at the end of their fifth semester in which they were enrolled in Introductory Statistics course. All the participants who have agreed to voluntarily take part in the study were gathered in a classroom and gave their written responses to the questionnaire. Three of the participants were subsequently invited to participate in the in-depth interview on another day. Hence, data collection consisted of written responses from a set of open-ended questionnaire, interviews, and also some teaching documents.

The analysis of the written responses took place in three main stages. Content analysis which involves identifying, coding, categorizing, classifying, and labelling the primary patterns in the data (Patton, 2002) was applied for analysing the written responses from the section one of the questionnaire as well as the interview transcripts. At the first stage, identifying and coding the responses were carried out for both written and verbal responses. The responses

were read repeatedly by two researchers to familiarize themselves with contents and become aware of the variation that emerges from them. Among the six open-ended questions provided, one question initially aimed to inquire students' conceptions of statistics and the others were to explore their approaches to learning statistics. Even so, students' conceptions could likely arise from the learning approach responses and vice versa. Moreover, the responses occasionally exhibited students' attitudes toward statistics which could be used to clarify their levels of attitudes that emerged from their response to attitude toward statistics questions provided in the other sections of questionnaire.

The second stage of data analysis was categorizing and classifying of codes that defined participants' approaches to learning statistics and conceptions of statistics. In the process of classifying these codes, re-examination the data was carried out at some places to assure that all the information was properly interpret. Likewise, follow-up interviews with some participants were conducted at this stage when some responses were found to be ambiguous and needed more clarification. The last stage of data analysis consisted of labelling of the primary pattern in the data, i.e., the categories found at the previous stage. The labelling was assigned to represent each category with the simpler terms in order to facilitate the subsequent analysis which is investigation of between-factors relationships.

Meanwhile, attitudes' scores were used to classify each participant into one of the three levels, i.e., Upper, Middle, and Lower levels. The scores were obtained from their responses to the 5-scale attitudes statements provided in the sections two, three and four of the questionnaire.

Following questionnaire responses analysis, three participants were selected from different class units to be interviewed one week later. The interview was designed to be similar to the focus group interview by Krueger & Casey (2000), unless there were only three rather than at least five participants selected to participate. The discussion was audio-taped and transcribed for further analysis. Despite the topics of discussion had been pre-planned as guidance, the discussion was situated in such a way to allow the participants to be able to share their thinking unrestrictedly. The topics were used to find out the characteristics of participants regarding the followings:

- Their conceptions about statistics which include their thinking about the nature and utilities of statistics.

- Their views, understandings and difficulties in solving statistics problems from each topic given in questionnaire.
- Their attitudes towards statistics.
- Their approaches to learning statistics.

Data from group interview were referred to illustrate the categories resulted from previous analysis. For these three participants, their written responses were compared with those given to the same questions during interview. Efforts were made to investigate whether the categorization of their written responses matched that of their interview responses. Follow-up interviews through internet social media and phone were also undertaken to explore all aspects of the transcripts that needed clarification. On separate occasion, Introductory Statistics teacher was involved in discussion and interviews regarding some students' responses, her views about the nature of statistics and the pedagogy of statistics for English as a foreign language teachers.

Copies of teaching documents (such as text-materials and class hand-outs), students' test paper and students' final grades were collected. The documents served as additional sources to provide a basis for qualitative validating the data obtained from the previous two methods. Comparisons were conducted among these sources to find out an accurate interpretation of and confirmation to the information given by participants.

3. Results and Discussions

3.1 Conceptions of Statistics

The following question was asked in the purpose to gain insight into students' conceptions of statistics: *If there was someone asking you "what is statistics to be about?" how would you explain it?* The analysis of their responses to this question resulted in a set of categories describing their conceptions of statistics as presented in Table 2.

Table 2. Categories of Pre-service English as a Foreign Language Teachers' Conceptions of Statistics

Coding	**Category**
a part of/just like mathematics; using formulas and numbers	A. Statistics is formulas and numbers

a science about data and is (still) related to mathematics	B. Statistics is Data
about how to present data; some activities to analyze data	C. Statistics is data presentation and analysis
a collection of methods for research	D. Statistics is a way to research
It is applicable for thesis writing, for future profession, and for daily life	E. Statistics is an applicative / practical Instrument

The categories presented in Table 2 have two different characteristics, where categories A, B, C, and D show what students refer statistics to be about (designative conception), while category E expresses students' awareness about the utility of statistics (practical conception). Designative conceptions are empirically and logically inclusive. For example, the aspect of category D is inclusive of the aspect of category C in the sense that there is an extension in student awareness from category C to category D. That is, a student who viewed statistics to be a way to research has a more extended awareness than a student who only viewed statistics as the presentation and analysis of data. Whereas in this practical conception, students admitted the benefit they would get from statistics, whether for their undergraduate thesis writing, their daily life, or their future professions. Almost all students were involved in this category excepting those who conceived statistics as only a composite of numbers and formulas. However, the diversities of practical conceptions rely on their designative conceptions of statistics. Students who conceived statistics as data presentation and analysis mentioned that statistics would be benefit for them in analyzing data as some certain parts of their undergraduate thesis. While students in a more extended conception could see statistics to be as well applicable in their daily life and future professions.

3.2 Categories of Approaches to Learning Statistics and the Related Features

There were four questions which were designed so that students had opportunities to report their motives and strategies in learning statistics. These questions are:

"What factors make you like learning statistics? And what factors make you dislike learning statistics?"

"Did you study hard in statistics course? Why or why not?"
"What did you do when learning statistics?"

"What targets do you set to achieve when learning statistics?"

Consequently, the responses to these questions were analyzed together to identify to which category each participant would be best classified. The first step was assigning each response into some suitable codes. The analysis resulted in five different coding for motives and six different coding for strategies adopted by students in learning statistics. The motives are: (1) passing the examination; (2) good learning environment; (3) maximizing grade; (4) acquiring for the skills; (5) finding challenging and interesting. The motives described in coding 1 and 2 show extrinsic motivations as the willing to learn was driven by either requirement to pass the course or due to the existence of good learning situation. Meanwhile, the motive in 3 apparently shows achieving motive and those in 4 and 5 show intrinsic motivation.

At the same time, the six strategies were identified as: (1) Listening and reproducing; (2) rote memorizing formulas; (3) practicing lots of (selected) examples and problems; (4) competitive learning; (5) seeking for meaning by reading widely; (6) co-operative learning. These motives and strategies coding processes were then advanced into classification of each codes into appropriate categories of approaches to learning statistics. The classifications are presented in Table 3.

The combination of motives and strategies would exhibit what approach was adopted in learning statistics. First category is surface approach which constitutes a unification of extrinsic motivation and superficial learning strategies. For instance, a student listened and reproduced the material due to the class environment which he/she found to be excited, or memorized some formula motivated by the fear of failure in the examination.

Table 3. Categories of Students' Approaches to Learning Statistics

<table>
<tr><th rowspan="2">Group</th><th colspan="2">Coding</th><th colspan="2" rowspan="2">Category</th></tr>
<tr><th>Motive</th><th>Strategy</th></tr>
<tr><td>1</td><td>Passing the examination; Learning environment

(Surface Motive)</td><td>Listening and reproducing; rote memorizing formulas

(Surface Strategy)</td><td colspan="2">Surface Approach (SA)</td></tr>
<tr><td>2</td><td>Acquiring for skill; Finding interesting/challenging

(Deep Motive)</td><td>Seeking for meaning by Reading widely; Practicing lots of examples and problems; Co-operative learning
(Deep Strategy)</td><td>Deep</td><td rowspan="2">Deep Approach (DA)</td></tr>
<tr><td>3</td><td>Acquiring for skill; Finding interesting/challenging ; Maximizing grade;

(Deep and Achieving Motive)</td><td>Practicing lots of selected examples and problems; Seeking for meaning by reading selected readings; Co-operative learning; Competitive learning
(Deep-Achieving Strategy)</td><td>Deep-Achieving</td></tr>
<tr><td>4</td><td>Seeking for meaning; Finding interesting/challenging (Deep Motive)</td><td>Listening and reproducing; Give up when stuck
(Surface Strategy)</td><td colspan="2">Deep Motive – Surface Strategy</td></tr>
</table>

One of the students in the surface approach category stated that her target was to pass the course, hence she would push herself to learn only when there were tests. She reported:

"I spent some times to learn statistics, but it was only at the time of the tests."

She did not mention specifically how she learned, nonetheless from her statement we could deduce that it would be unlikely for her to adopt deep strategy in such a short time she set for studying. Moreover, she stated that:

"Rarely did I learn statistics, because I don't like mathematics, it is difficult and confusing me a lot."

This student considered statistics as having difficult contents like mathematics which she dislikes. Although her conception of statistics is in category C, she considered the course to be similar with mathematics with some formulas need to be memorized. Also, her low attitude level reflected her lack of interest, cognitive competence and behavior in learning the course.

The other students in the surface approach were also expressed identical view about statistics as containing formulas. Their dislike to the course and ignorance about the utility of it were also emerged from their responses, one of which is as follow:

"I don't like it (statistics) and so far, I haven't seen any benefit from learning it."

The above examples suggest a relationship between students' conceptions of statistics and their approach to learning it. However, one of students in this category showed high attitude scores while others are in the "around average" attitude level. This fact is rather contradictive from their written responses which stated their disinterest and low cognitive competence as well as their behaviour in learning the course.

Deep and deep-achieving approaches, in the other hand, are included into the second category, i.e., Deep Approach category. The deep-achieving is distinguished from the deep in the additional achieving motive and the way students organized their learning strategy. Students adopting deep motive and deep strategy in learning statistics expressed their intrinsic motivation, reading more resources and doing lots of practices due to their own interest to the topics. Whereas, deep-achieving students' learning was also driven by the desire to attain high grade or compete to be the best among their friends. To achieve this goal, they did lots of practices and read some additional resources which they considered would help them in examination.

One of student in this category mentioned that he was motivated and became enthusiastic in learning statistics after getting the highest score in the class at the first test of the course.

"I like statistics very much... At the beginning class I got the highest score in the class, and then I became enthusiastic in learning it."

However, high score was not his target in learning as he found afterward that only by understanding the contents would satisfy him. This indicated his motive in learning has

been shifted from achieving to deep motive. In accordance to his motive, he learned statistics by reading widely and trying to solve a lot of statistical problems he found from his reading. He also expressed his awareness about the need of statistics for his future profession and was eager to master the skill to do research, which led the researcher to assign his conception as D and E: statistics is a way to research and an applicative instrument.

"I want to apply my statistical skill when I become a teacher. We can analyse problems in students learning through research and the results can also show my capability in teaching."

The similar conceptions were also revealed from other students in this category. All of them was aware about the utility of statistics, as expressed in some quotes below:

"... for my undergraduate thesis and also for my future profession. We cannot assure what our profession will be in the future, might be not as a teacher, it might be any other profession...who knows I will need statistical skill there. At least, I already have some experiences in statistics and doing research, also know how to read statistical information and to criticize it."

This student showed her deep understanding about the usefulness of statistics and her conceptions of statistics are also in categories D and E. The similar conceptions were also found in students who applied deep-achieving approach to learning statistics.

"...so my primary target is at least I can apply this (statistics) in my undergraduate thesis writing and research. The second target is whenever I find statistical information outside, I can understand it...I have to be more comprehend in understanding it than other people."

This student exhibited to have strong achieving motive in learning in almost all responses, but did not show any objection for learning with her friends. However, she would try to be the best in her group so that she could be the one who teach others. These examples reveal that students' preference to adopt deep approach to learning statistics is related to their awareness about the utility of statistics (practical conception). All students who belong to this category, as expected, were found to perform better in their final examination.

The last empirical category from this study is deep motive – surface strategy, included two students. The inconsistency of their learning motive and learning strategy

they applied exhibit the lack of metalearning capability (Biggs, 1987b). While admitting the course to be interesting/challenging as well as setting their target to attain understanding, the two students said that they would easily give up at the difficult parts of the course. One of the students in this category perceived that statistics is required in her daily life as the reason for her to master the contents. In her survey she wrote:

"... to recognize and as a need in daily life. I want to be able to master it."

However, she found that it was not easy for her to understand the contents of the course which then made her gave up learning in a deep way.

"It took a long process to find the answer and made me bored and gave up, could not be focused anymore. My reason to study is for examination."

Her awareness of the importance of statistics could not direct her to apply the deep strategy in learning the course as she found that the contents to be so difficult. This finding is contradicted from the study of Biggs who argued that deep motive students tended to have congruent strategy whilst the incongruent strategy was most likely to be found in poorly motivated students (Biggs, 1987b, p.107).

More analysis about this discrepancy revealed that it is related to referential conception of statistics these students had. Both students had fragmented view on statistics as just comprising formulas and numbers, without grasping the big picture beyond it. They were motivated to learn and master the contents by the fact that they would need it in the future. What they thought to be important for them, however, was limited at something about counting, formulas and numbers. Thus, after being engaged in the learning processes, they became bored and easily gave up as they found neither the course to be interesting nor meaningful.

Consequently, awareness about the utility of statistics or utility conception is not sufficient to relate on students preference to adopt deep approach to learning. It is also connected to the referential conception of statistics they have, i.e., what statistics is in their understanding. This finding indicates that in teaching statistics course, teachers need to be aware of how students view of the course and how they go about learning it rather than just focusing on its content.

Furthermore, analysis on students' performance in statistics examination revealed that all students who adopted deep approach to learning statistics had the high grade in their statistics class. Most of these students together with others within the high grade group students admitted that their learning was also driven by the classroom environment, such as interesting teaching method used by the teacher and the learning situations in their classrooms.

4. Conclusion

This research indicates the relationship between students' approaches to learning statistics and their conceptions of statistics. Surface approach used in learning statistics correlated with the tendency to view statistics as a collection of numbers and formula. Students in this category were found to be unaware about the utility of statistics. While those who adopted deep approach were more likely to consider statistics as a useful tool and referred statistics as beyond the data and formulas. Despite attitudes toward statistics were not empirically related to deep approach, better performance on statistics exams was identified among the students adopting deep approach to learning. Students' responses also exhibited that learning environment was one major factor that encourages them in learning statistics.

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