THE ROLE OF FEEDBACK TO UNDERGRADUATE STUDENT’S ANXIETY AND PERFORMANCE IN STATISTICS

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Abstract

The study used the 10 item survey instrument adopted with modification from the existing research of Shaun Ng Kwee Bee and Berinderjeet Kaur and the first 23- item of the Statistical Anxiety Rating Scale (STARS) devised by Cruise & Wilkins in 1980. Forty students were assigned and participated in each group; the experimental and the control group. The Randomized Posttest Control Group Design, using Matched Subjects which is a type of true Experimental Design was also used in this study. The sample in each group was selected at random and matched with the other group. One group received the experimental treatment (the feedback) while the other group did not but both groups received the same posttest (the midterm exam). Participants’ responses were analyzed using the mean and Pearson correlation. Findings revealed that students from the experimental group have higher collective scores response on their perspective about feedback as compared to those students from the control group. They believed that feedback is helpful in their understanding of the lesson. The students from the experimental group have lower statistics anxiety compared to those from the control group. Teachers’ feedback either positive or negative, were correlated to the students’ performance in the course. It simply connotes that feedback reduces student’s statistics anxiety and improve their course performance.

Keywords: Feedback, Statistics Anxiety, Students’ Performance.

Introduction

Teaching and learning is a process which is always coupled with assessment. To determine whether the students understand the lesson or not they are assessed from the result of their written works such as formative and summative tests. In mathematics like statistics, students’ written outputs are often marked with ticks for correct answers or crosses for incorrect answers and sometimes with grades attached.

However, this type of feedback has less use or impact to the students, since it will not help them clarify their misconceptions and even correct their errors. To make teaching and learning more meaningful it is believed that feedback about students’ progress in the
classroom is paramount. Feedback should be a part of a classroom assessment environment in which students realized constructive criticisms as a good thing and understand that learning will not occur without practice (Brookhart, 2006). It is instrumental in the learning experience of the students. It is effective in promoting learning, reducing anxieties and serves a variety of purposes in the learning development of the students’ competencies and understanding, and elevates students’ motivation and confidence (Hyland, 2000). It does not only give students an idea of what went wrong with the task assigned to them but also boosts their confidence, reduce their apprehensions and keep them going with what they are doing.

Providing feedback can make or unmake the students and even shuttered their being. The students’ idea about their abilities of performing a particular task may be influenced positively or negatively by a feedback. However, when done well it can be very powerful. The power of feedback depends on a double-barreled approach, addressing both cognitive and motivational factors at the same time. For feedback to be effective on assessments, it should possess a number of qualities: it needs to be timely, constructive, motivational, personal, manageable and directly related to assessment criteria and learning outcomes (Irons, 2008)

The effectiveness of feedback depends on whether the feedback is about a task or product, process, self-regulation, or self (namely the learner). It was found out that feedback at self and task levels were not as effective as feedback at process or self-regulation levels in deepening students’ learning processes and their mastery of tasks. However, Hattie and Timperley (2007) did qualify that feedback at task level given in the form of written comments that serve to clarify student misconceptions has also been shown to be effective in improving students’ strategy processing hence, increasing their belief to do certain tasks and improving their performance in the course.

Wiliam (2004) described the key components of formative assessment as effective questioning, feedback, clear understanding of the criteria for success by learners as well as peer- and self-assessment. These components do not stand-alone as components. In fact, it can be viewed that effective questioning as a tool to help educators give feedback that could help learners have a clear understanding of the criteria for success. All these would work together to help learners regulate their learning. These fit in appropriately with the new education landscape of assessment, where formative assessment now takes center stage and one of the new educational goals is to develop the students to be self-regulated learners, where they could adapt to the 21st century.
This experimental study was conducted to know the effect of feedback in promoting students’ learning and reducing their anxiety towards statistics. Since mathematics is avoided by many students, it is just right to explore some strategies that would develop and improve their confidence and relatively increase learning in the course.

**Conceptual Framework**

The study was anchored to the concept introduced by Hattie and Timperley (2007) where to them feedback is critically important to identify levels of learning and its effectiveness:

(1) Getting feedback can be about a task or product. It describes how well a task is done and find out whether answers are correct or incorrect, provided different information are obtained and knowledge are built. This may include directions to acquire more, different, or correct information. It is sometimes called as “corrective feedback” (Hattie and Timperley, 2007). Feedback on the task level is more powerful if it addresses learners’ misunderstandings rather than the lack of necessary knowledge (in which case further instruction is more effective than feedback). It is more effective to focus simple feedback rather than complex task performances. However, too much feedback at the task level may engage learners to focus on the immediate goal using trial-and-error methods instead of using important strategies to attain the goal which involves higher level responses (Hattie & Timperley 2007).

(2) Feedback can be aimed at the process used to complete a task. This kind of feedback is more directly aimed at the processing of information, or learning processes that requires understanding or completing the task. When information about the process is given through feedback then a task is being completed and may act as a cueing mechanism and lead to more effective information search and task strategy used, provided the cues assist learners in rejecting incorrect ideas and provide direction for searching and strategizing. Feedback at the process level appears to be more effective in enhancing deeper learning than at the task level. However, it is most effective when the two are combined.

(3) Feedback to students may include greater skill in self-evaluation or confidence to engage further on a task. Hattie and Timperley (2007) identify six aspects of feedback at the self-regulation level that affects the effectiveness of feedback: the capability to create internal feedback; the ability to self-assess; the willingness to invest effort into seeking and dealing with feedback information; the degree of confidence in the correctness of the response; the attributions about success or failure; and the ability to seek help.
With the information mentioned above the researcher conceptualizes that feedback can have direct effect to the students’ performance and anxiety in statistics.

The figure above explains that feedback may influence students’ anxiety and performance in statistics. The amount of learning that the students display may depend on the amount of feedback the students collect from what has been given by their teachers. Similarly, the type of feedbacks received by the students may give them understanding of their weakest and strongest points on the given task and therefore may increase their motivation and confidence thus, reducing anxiety in the course.

**Research Questions:**
This study is guided by the following research questions;

1. What is the students’ perception about feedback in statistics tasks?
2. What is the students’ level of statistics anxiety before and after feedback?
3. Is there a relationship between feedback and the students’ anxiety and performance in statistics?
4. Does feedback predicts student’s anxiety and performance in statistics?

**Literature Review**

For so many years teachers, educators and academicians were hooked into the idea of finding the best strategy that will facilitate effective learning. They benchmarked on the works of philosophers, psychologists and the likes to extend and perfect the craft of different...
learning strategies that would motivate students and improve their performance. Many researchers have even conducted studies about the effectiveness of certain learning strategies that would prove its effectiveness. However, of these many strategies most of the academicians have forgotten the value of an effective feedback. Mostly, give feedbacks without even wondering if it was understood by their students or were the students learning from these comments.

This paper was conducted to explore how feedback shapes students’ understanding of a particular topic. The objective is to show that feedback could be used as a catalyst in letting the students reflect from their own mistakes and thereby correct it.

The following ideas show how feedback can be effectively delivered to the students, enhance their performance and reduce their anxiety in statistics course.

Feedback

Feedback can be identified as information given by an agent like; teacher, peer, book, self and experience about one’s performance or task. A teacher or parent can provide corrective information, a peer can provide an alternative strategy, a book can provide information to clarify ideas, a parent can provide encouragement, and a learner can look up the answer to evaluate the correctness of a response. Feedback thus is a "consequence" of performance.

Feedback is an essential component in all learning contexts and serves a variety of purposes including evaluation of students’ achievements, development of students’ competences and understanding, and elevation of students’ motivation and confidence (Hyland, 2000). Within teaching and learning activities in a higher education setting, feedback can be perceived as any information communicated to the learner as a result of a learning-oriented action (Race, 2001). Nonetheless, formal feedback is provided in response to students’ work on formative assessment such as essays, assignments and projects. In order to be effective, feedback on formative assessment needs to possess a number of qualities: it needs to be timely, constructive, motivational, personal, manageable and directly related to assessment criteria and learning outcomes (Irons, 2008). A formative feedback strategy should address as many as possible of these attributes in order to promote learning. The term feedback strategy, however, actually encapsulates two components: the contents of feedback itself and the method(s) used to communicate the feedback to students.
Communication of formative feedback is very important since the method selected may discourage or draw students’ attention in the feedback process. In order to be effective, it should ensure that students engage with the content provided. Formative feedback can be communicated to students in a number of different ways. It can be traditional or electronic. Traditional method may include handwritten comments on students’ assessed work and printouts of word-processed feedback forms which are returned back to the students. These methods do not seem to be efficient since they suffer from the problem of not reaching the student. Feedback methods range from simple techniques such as verbal, oral or written comments to students. These are increasingly used by teachers since it allows delivery and communication (Race, 2001).

Despite the indisputable importance of feedback and the strong and consistent research outcomes on its effectiveness in the educational process and the promotion of learning, ample evidence in the literature (Bailey, 2009) suggests that students do not collect formative feedback, there is a large and persistent percentage of students that do not collect the accompanying feedback of marked assignments. Research (Carless, 2006) that has been conducted in order to determine why students are dissatisfied and do not collect formative feedback identified reasons that pertain not only to the quality and quantity of the feedback comments but also to students’ lack of motivation (in case of bad performance) and the suitability and aptness of the feedback’s communication method. The effectiveness of formative feedback could be maximized if it was communicated to the student’s learning space, an environment where all learning material and resources of a particular lesson reside and thus, it would be more effective if the feedback was delivered personally on the student.

Feedback given as part of formative assessment enables learners to consolidate their strengths, identify their weaknesses and guides them about the necessary actions in order to achieve the learning outcomes. However, in order to promote learning and lead to a higher level of achievement in cognitive and skill outcomes, formative feedback should have a range of qualities. (Shute 2008) discuss and review these key quality attributes and explain that feedback needs to be: timely, motivational, personal, manageable and directly related to assessment learning outcome.

Statistics Anxiety and Student’s Performance

Onwuegbuzie, DaRos, and Ryan, (1997), defined statistics anxiety as “a feeling or reaction to any situation in which a student is confronted with statistics in any form or doing
statistical analyses; that is, gathering, processing, and interpreting at any time. The reactions could include worry, tension and physiological symptoms of stress when students are faced with taking a statistical class (Zeidner, 1991). Statistics anxiety is a challenge to the students because they find statistics anxiety as negatively related to performance in the course (Macher, Paechter, Papousek, & Ruggeri, 2011; Zare, Rastegar, & Hosseini, 2011) and research courses (Williams, 2010). It is also significantly related to fear of failure (Onwuegbuzie, 2004). Similarly, (Blalock, 1987; Dillon, 1982; Onwuegbuzie & Seaman, 1995) have found negative effects of statistics anxiety on students’ learning and performance in statistics related courses. Furthermore, Mji (2009) noted that statistics anxiety may negatively affect acquisition of skills, knowledge, and strategies identified as necessary for students’ prospective careers. Research therefore indicates that students with statistics anxiety feel challenged in taking statistics courses. This in turn adds to their pressure and perpetuates poor performance. Research indicates that often students with high anxiety may delay enrolling in statistics courses until the end of their academic programs and this adds to the stress of taking these courses (Onwuegbuzie, 1997).

Researchers have also focused on factors that reduce statistics anxiety. Dillon (1982) demonstrated that students’ statistics anxiety can be decreased by encouraging them to talk about their fears, and suggested ways that they can cope with their statistics anxiety. Schacht and Stewart (1991) found that gathering data from the students themselves and having students perform simple calculations (obtaining the mean, etc.) reduces anxiety levels and increases motivation to become involved in the class. Pan and Tang (2005) found that when the instructor was sensitive to students’ concerns and used effective instructional strategies, their statistics anxiety was reduced and learning was enhanced. Research findings signify that it is important to have students share and discuss their experiences about statistics anxiety.

**Feedback and students’ performance**

The idea of constructive feedback will be completely ineffective if it is separated from good assessment tasks that measures student’s critical reasoning, solving complex problems and applying their knowledge in real world contexts (Shepard 1999). It implies that this philosophy should also be reflected in classroom routines and teaching methodologies. Hence, it is necessary to look at ways in which the intended learning outcomes, classroom instruction and assessment processes should be aligned to effective feedback strategies.
To enhance learning, teachers should ensure that learners receive constructive guidance about how to improve, in order to plan the next steps in their learning. Highlighting the learner’s strengths and advice on how to develop them, make them aware of the areas they need to concentrate their efforts and provide opportunities for learners to improve upon their work is very important. Stiggins (2007) supports this by referring to as “descriptive feedback”. He posits that in order to ensure universal student mastery of essential standards there are seven specific actions related to assessment which should be taken. One of these is that we should “rethink our feedback strategies”.

It is widely agreed that providing constructive feedback that focuses on the learner’s progress toward the desired standard, rather than on the learner self, is more productive. If learners are merely provided with a mark or grade, the assessment is mainly judgmental and learners are focused on comparing themselves to others rather than using the feedback to improve themselves. This becomes counterproductive when it results in learners feeling that they are not good enough, and impacts negatively on their confidence and enthusiasm to learn. Feedback is more constructive when it focuses on what the learner does well rather than highlighting failure. Learners’ mistakes and misconceptions can be addressed if the feedback is focused on their work, providing guidance on how they can improve (Hattie & Timperley 2007; Stiggins 2007).

Ball et al. (2010) identified negative feedback as erroneous responses where the teacher identifies what the student did wrong. However, some researchers concluded that students who received erroneous comments that focused on what they were doing wrong, actually improved on their reasoning abilities over the course of the study when compared to students who received positive feedback. In addition, the students showed a steady decrease in the use of incorrect strategies as a result of receiving negative feedback.

From the many literatures written, it can be concluded that feedback and assessment are inextricably linked (Brown, 2004). Effective feedback serves many purposes, but ultimately informs both the student and teacher of any gaps between a student’s current and desired understanding (Hattie, 2007). Given the difficulty teachers face with providing this information in a timely, comprehensive, and comprehensible fashion, it can be argued that self-regulated learning is one way to increase students’ access to meaningful feedback (Nicol and Macfarlane-Dick, 2006).
The Role of Feedback in reducing math Anxiety

Most of the researchers reported a general agreement that levels of math-anxiety negatively affect academic performance in mathematics. Fox (2007) have all pointed out that mathematics-anxiety contributes to mathematics avoidance and poor mathematics performance. The role of anxiety in the problem of mathematics avoidance and poor mathematics performance has been particularly emphasized for women (Ernest, 2006). But with the changing role of women in the society, math-anxiety is slowly moving in the direction of becoming an equal opportunity debility.

Besides the effects of math-anxiety on math achievement, researchers investigated the causes and developed some intervention strategies to overcome math-anxiety. Individual-teacher counseling, slower instructional approach, corrected feedback, instructional games, small group instruction, reinforcement, extra work and drill, remedial studies, programmed instruction, computer assisted instruction, increasing competence in mathematics and counseling are some examples.

Among those intervention strategies to overcome anxiety, feedback treatment is used in a few studies (Hawkins, 2008). In most of the studies reviewed, test anxiety is studied as a specific form of anxiety and the cognitive aspect of feedback and its relation to learning, achievement, and performance had been investigated mainly. Kulhavy 1989) concludes that corrective function is probably the most important dimension of feedback. Morris and Fulmer (2006) indicated that feedback to quiz papers has a powerful influence on the cognitive component of test-anxiety. Hawkins (2008), investigating the effects of different feedback techniques on the anxiety levels of students, found that feedback has a significant positive influence on anxiety levels of junior high school students.

Further, low expectations for a student’s competence can lead educators to provide feedback that communicates an acceptance of the student’s weakness which can backfire and discourage the student from performing well (Rattan, Good, & Dweck, 2012). Hence, educators and parents who interpret students’ struggle with math as a sign of incompetence may respond very differently from those who believe that the struggle is due to anxiety.

MATERIALS AND METHODS
Research Design

The Randomized Post test Control Group Design, Using Matched Subjects a type of True Experimental Design was used in this study. The sample in each group was selected at
random and matched with one another. One group received the experimental treatment (the feedback) while the other group does not and both groups received the same posttest (the midterm exam).

As explained by Fraenkel and Wallen (2010), randomized experiments are versatile in the sense that they allow the researcher to assess the program impact at several levels in addition to the overall impact. They also have a high internal validity, that is, the results are representative of the study at large and similar results are produced each time the program is evaluated. Fewer assumptions are also required because randomization produces equivalent treatment and control groups.

Participants

The participants in the study were sophomore students in the accountancy department of Rizal Technological University. These students were officially enrolled in Statistics 1 (Elementary Statistics). There are 112 students officially enrolled in the two blocks (55 and 57 students in each block) and only 40 students from each block were selected to be a sample. The selection of the participants was random and matched. They were matched based on their previous mathematics grade and the homogeneity of their schedules.

Materials

Two instruments were used in this study. The first instrument was a 10 item survey instrument adapted with modification from the existing research of Shaun Ng Kwee Bee and Berinderjeet Kaur. This instrument was used for the post-intervention survey data collection. The survey items sought the students’ perception about feedback given by their teachers in written and oral form on their written assignments and exams.

The second instrument was the first 23 items from the 51-item Statistical Anxiety Rating Scale (STARS) devised by Cruise & Wilkins in 1980. These items were measured on a 5 point Likert Scale format that range from 1 = no anxiety to 5 = very much anxiety.

Procedure

An experiment was conducted on the first semester of semester of school year 2015-2016. Two groups were considered, the experimental group (with feedback) and the control group (without feedback). Both groups were taught the same lessons and were given the same seat works. The experimental group was given written feedbacks on their paper while the
control group has only ticks (✓) on their paper for each correct answer and crosses (✗) for incorrect answer. After each seat works both groups were given summative quizzes and their scores were recorded. To have another data the result of the midterm exam from each group were also considered. These data were tabulated to determine the performance of the students in the course.

Consequently, the students’ perception about feedback and their anxiety in statistics were also obtained after the feedback. The mean was used to obtain information about the collective perceptions of the students on feedback and their anxiety to statistics. Pearson correlation on the other hand was used to measure the extent of relationship between feedback and the students’ anxiety and performance in statistics.

RESULTS AND DISCUSSIONS

After establishing certain categories and classifying data into groups, analysis were done using the mean and the pearson product of moment coefficient correlation r. Table 1 presented the perception of the students of feedback, both from the control group (without feedback) and the experimental group (with feedback).

<table>
<thead>
<tr>
<th>PERCEPTION ABOUT FEEDBACK</th>
<th>Control Group</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feedback provides me information I need to understand certain concept in the course.</td>
<td>2.78 A</td>
<td>3.44 A</td>
</tr>
<tr>
<td>2. Feedback encourages me to think deeply about the subject matter.</td>
<td>3.04 A</td>
<td>3.50 SA</td>
</tr>
<tr>
<td>3. Feedback gives me information how to approach a problem.</td>
<td>3.08 A</td>
<td>3.10 A</td>
</tr>
<tr>
<td>4. Feedback shows me the connection between what I did wrong and what I got.</td>
<td>2.44 A</td>
<td>3.68 SA</td>
</tr>
<tr>
<td>5. Feedback helps me figure out the reasons for the errors in each item I got wrong.</td>
<td>3.04 A</td>
<td>3.50 SA</td>
</tr>
<tr>
<td>6. Feedback promotes better learning.</td>
<td>2.98 A</td>
<td>3.48 A</td>
</tr>
<tr>
<td>7. Feedback helps me develop a feeling that I can do a task.</td>
<td>3.00 A</td>
<td>3.38 A</td>
</tr>
<tr>
<td>8. I am more motivated to study whenever I received good feedback.</td>
<td>3.10 A</td>
<td>3.78 SA</td>
</tr>
<tr>
<td>9. Feedback helps me improve my understanding about the given assignment.</td>
<td>3.10 A</td>
<td>3.78 SA</td>
</tr>
<tr>
<td>10. I find feedback to be helpful in improving my performance in the course.</td>
<td>3.00 A</td>
<td>3.80 SA</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.96 A</td>
<td>3.54 SA</td>
</tr>
</tbody>
</table>

Legend: SA Strongly Agree  A Agree  D Disagree  SD Strongly Disagree
Results show that feedback is helpful in the respondents’ way of learning their lessons. It can be observed from table 1 that the respondents’ from the experimental group have an expectedly higher appreciation of feedback ($F = 3.54$) as compared to the control group with a collective feedback perception of $F = 2.96$. The result further revealed that both groups were motivated to study whenever they received good feedback thus, improving their understanding and performance in the course.

The result only implies that feedback can be a powerful tool in the teaching and learning process. It is an essential component in all learning contexts and serves a variety of purposes including evaluation of students’ achievements, development of students’ competences and understanding, and elevation of students’ motivation and confidence (Hyland, 2000). Feedback is an important factor in the students’ understanding of certain concepts in the course. The effectiveness of feedback could be maximized if it was communicated to the student’s learning space, an environment where all learning material and resources of a particular lesson reside and thus, it would be more effective if the feedback was delivered personally to the student.

In order to determine if feedback reduces the students’ anxiety in statistics a modified statistics anxiety scale was used to measure the students’ level of anxiety in statistics. It can be seen from table 2 that the control group was reportedly have high level of anxiety ($F = 4.33$) while the experimental group has lower level of statistics anxiety ($F = 2.48$). The control group was further identified to have a very high test and class anxiety while the experimental group has moderate level of anxiousness on this dimension.

<table>
<thead>
<tr>
<th>STATISTICS ANXIETY</th>
<th>Control Group</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test and Class Anxiety</td>
<td>4.58 VHA</td>
<td>2.88 MA</td>
</tr>
<tr>
<td>Computational Self-Concept</td>
<td>4.12 HA</td>
<td>2.38 LA</td>
</tr>
<tr>
<td>Fear of Asking for Help</td>
<td>4.28 HA</td>
<td>2.18 LA</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4.33 HA</td>
<td>2.48 LA</td>
</tr>
</tbody>
</table>

Legend: LA Low Anxiety  MA Moderate Anxiety  HA High Anxiety  VHA Very High Anxiety

The result obtained, entails that feedback helps reduce the negative impact of math or statistics anxiety, which is limited in most courses (Núñez-Peña et al., 2015). Understanding the role of feedback in helping the students to develop a positive feeling about statistics
courses is a commendable achievement for teachers thus praising the students for finishing a particular task and providing them the information on where they were not able to do the task or find the right answer that would help them understand what to do on the next task.

As mentioned by Kotecha, M. (2015), using feedback in lectures enhanced students’ interaction, self-beliefs, and academic self-efficacy which contributed in reducing mathematics and Statistics Anxiety (MSA). Students liked the thrill of getting questions right and were pleasantly surprised to encounter questions they enjoyed working on. They showed greater commitment to the course and actively in class recitations. Their attendance, cooperation, and participation in the author's lectures were enhanced. They started associating mathematics and statistics questions with pleasant experiences and began to view the subjects, as well as their practical applications, enthusiastically. This positively contributed towards enhancing their confidence and academic self-efficacy. It was also identified that students who had unpleasant learning experiences during their pre-university years gradually began to perceive mathematics and statistics positively. They began to enjoy the interaction and became convinced of the accessibility of the subjects as the course progressed. Their confidence was enhanced as they participated in solving questions, which were reflected in their meaningful contributions to class discussions, improved participation in the questions they asked. The learning climate in the teaching rooms improved as students become more willing to work with their peers.

Table 3 shows the posttest scores of the students in the experimental and control groups. It is evident from the result that feedback enhances the performance of the students. From the three summative tests and the midterm exam scores, the students from the experimental group (with feedback) visibly outshined the scores of the students from the control group (without feedback).

<table>
<thead>
<tr>
<th>Table 3 Posttest scores of the students in the Control and Experimental Group</th>
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<tbody>
<tr>
<td><strong>Experimental Group</strong></td>
</tr>
<tr>
<td>Num. of Items</td>
</tr>
<tr>
<td>Summative Test 1</td>
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<tr>
<td>Summative Test 2</td>
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<tr>
<td>Summative Test 3</td>
</tr>
<tr>
<td>Midterm Exam</td>
</tr>
</tbody>
</table>

This result only implies that feedback is a very good motivating factor in the students’ learning because of the teacher’s feedbacks with what the students have done a particular
task, the students develop a belief that he is capable of successfully performing a task. The students develop a belief that he is capable of successfully performing a task. Several studies have shown that it may be related to good exam performance. Students need to accept that effort is needed to pass, get help from peers, or support if needed, and believe that they can pass (Perry, 2004). Further, feedback is one teaching strategy that could help students overcome task related problems hence, feedback, either positive or negative can have a direct effect on the students’ performance.

Consequently, Butler (1986) found that students who received individualized comments regarding their performance show higher mastery goals than those who received ego-involving feedback like praise that are not directly tied to actual performance.

Further, Shin, T.S. & Dickson, W.P., (2010), found that those students who received feedback were reportedly have higher gains in performance goal orientations than those who received self-referenced feedback. This is an encouraging finding because it indicates that the type of feedback the instructors provide to students have an impact on their motivation, specifically goal orientations and interest which are also determining factors of students’ academic performance.

In order to determine if the anxiety and performance of the students is correlated to how they perceive feedback, the pearson product moment of coefficient correlation (r- test) using the SPSS version 20 was used to analyze the data.

**Table 4 Relationship between Student’s perception on Feedback and their Performance and Anxiety in Statistics**

<table>
<thead>
<tr>
<th></th>
<th>Statistics Anxiety</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Test and</td>
<td>Class</td>
<td>Computational</td>
<td>Fear</td>
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<tr>
<td></td>
<td></td>
<td>anxiety</td>
<td>anxiety</td>
<td>Self-concept</td>
<td>of asking</td>
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<td></td>
<td></td>
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<td></td>
<td>for</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental Group</td>
<td>Perception on Feedback</td>
<td>Pearson</td>
<td>Correlation</td>
<td>0.849*</td>
<td>0.890**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(r)</td>
<td>Sig. (2-tailed)</td>
<td>N 40</td>
<td>40</td>
</tr>
<tr>
<td>Control Group</td>
<td>Perception on Feedback</td>
<td>Pearson</td>
<td>Correlation</td>
<td>0.756*</td>
<td>0.468</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(r)</td>
<td>Sig. (2-tailed)</td>
<td>N 40</td>
<td>40</td>
</tr>
</tbody>
</table>

**Correlation is significant at 0.01 level *Correlation is significant at 0.05 level**
Results show that the statistics performance and anxiety of the students in the experimental group is moderately to highly correlated with their perception of feedback while those in the control group shows a moderate correlation between the students’ anxiety and performance to statistics and their perception of feedback. Looking more closely at table 4, the computational self-concept dimension of statistics anxiety in the experimental group gives the highest correlation in the students’ perception of feedback (\( r = 0.490, p - value < 0.001 \)) and this correlation is significant at the 0.01 level. This result only explains that the students’ self-concept when doing computational task in statistics may depend on the amount and type of feedback they receive from their teachers.

As identified by Nunez-Peña (2015), feedback may have helped reduce the negative impact of math anxiety on the student’s academic achievement. Thus, providing feedback should be a part of the classroom assessment environment so the students could see that constructive criticism is an integral part of the learning process. It should be considered a positive reinforcement rather than a punishment to fully appreciate that feedback shows direction on what else the students can do with the given task.

Further, performance of the students in statistics from both groups is moderately correlated to how they perceive feedback in reducing their statistics anxiety and improving their performance in the course. This result proves that feedback can be an effective element in enhancing the students’ performance in statistics. However, it should be noted that not all types of feedback could help the students improve in the course but sometimes it does not motivate them to perform well in the given task. As the study shows, students who received evaluative grades as feedback performed well on the quantitative task but poorly on the divergent-thinking task and were less motivated (Brookhart, 2006). This is why some researchers suggest that when giving feedbacks, it could be more of descriptive because as Nissan and Butler (2006) found in their works, if paper is returned with both grades and a comment, many students will only pay attention to the grade and ignore the comment. The grade overshadow the comment sacrificing the purpose the comment has to do with the grade and therefore, the students will have the tendency to repeat the same mistakes since feedback misses its opportunity to explain how the grade was given.

Using SPSS version 20, the table 4 shows the association of feedback with the student’s performance in statistics (quizzes and midterm exam) and anxiety towards statistics. This table provides the regression coefficient (B), the Wald Statistics (to test the statistical significance) and the all important Odds Ratio (EXP. (B)) for each variable category.
Looking first at the influence of feedback to the result of the quizzes given to the students, it can be concluded that there is a significant effect \((\text{Wald} = 5.173, df = 1, p < 0.05)\). The B coefficient is significant and positive, indicating that feedback increases the odds of achieving higher quiz results. The EXP (B) column (the Odds Ratio) tells us that the students are 3.000 times more likely to achieve passing scores when given a feedback.

**Table 5 Influence of Feedback to Student’s Performance and Anxiety in Statistics**

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I.for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback-Quiz</td>
<td>1.099</td>
<td>0.483</td>
<td>5.173</td>
<td>1</td>
<td>.023</td>
<td>3.000</td>
<td>1.164, 7.732</td>
</tr>
<tr>
<td>Constant</td>
<td>0.000</td>
<td>0.316</td>
<td>0.000</td>
<td>1</td>
<td>1.000</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Feedback-Midterm</td>
<td>1.558</td>
<td>0.826</td>
<td>3.557</td>
<td>1</td>
<td>.049</td>
<td>4.750</td>
<td>.941, 22.98</td>
</tr>
<tr>
<td>Constant</td>
<td>1.386</td>
<td>0.395</td>
<td>12.30</td>
<td>1</td>
<td>1.000</td>
<td>4.000</td>
<td></td>
</tr>
<tr>
<td>Feedback-Anxiety</td>
<td>3.121</td>
<td>0.594</td>
<td>27.64</td>
<td>1</td>
<td>.000</td>
<td>22.66</td>
<td>7.082, 72.55</td>
</tr>
<tr>
<td>Constant</td>
<td>1.735</td>
<td>0.443</td>
<td>15.34</td>
<td>1</td>
<td>.000</td>
<td>.176</td>
<td></td>
</tr>
</tbody>
</table>

Similarly, when the effect of feedback to the midterm result was considered, a significant result was observed \((\text{Wald} = 3.577, df = 1, p < 0.05)\). The B coefficient is likewise positive indicating that feedback increases the chance of the students to pass the exam and there is a 4.750 (see EXP (B) column) times that the students are more likely to pass the exam when given feedback.

Further, feedback also influences students’ anxiety in statistics as shown by the result \((\text{Wald} = 27.64, df = 1, p < 0.05)\). The B coefficient \((B = 3.121)\) is positive indicating that feedback increases the student’s trust on himself and therefore reduces his anxiety towards the course. The EXP (B) value tells us that the students are 22.66 times likely to reduce statistics anxiety when they receive feedback.

As reported by Black & Wiliam (1998) and Stiggins (2007). Learning is enhanced when learners are encouraged to engage in self-reflection, to review their experiences of learning, and to apply what they have learned to their future learning. It is through developing their skills of self-assessment that teachers help learners to take charge of their own learning and to learn to recognize their own expertise. A continuous cycle of feedback and adjustment provides learners with the opportunities to assess their own work against a range of
understandable criteria and not to only depend on the teacher’s judgment about their abilities. It also serves cognitive processes as learners become more interested in the criteria and the substantive feedback than in the awarded grade or mark. When learners acquire these skills, they then want to learn and they want to engage in discussion with their teachers and peers about work, and this type of self-reflection is essential to good learning.

CONCLUSIONS

Providing feedback and making it sure that the students are engage with it facilitates and promotes quality learning. It provides the students with the information they need to determine the area where they are at their weakest and strongest. Feedback is so important that it motivates the students strive and to attain their goals. It needs to be timely, motivating and should have direct relation with the assessed tasks. When done properly it becomes a catalyst in reducing the students’ anxiety in the course and therefore improve their performance.

RECOMMENDATION

Based on the results of the study it is recommended that the students should take into consideration the feedback given to them by their teachers because it would help them identify areas in their learning that have to be improved. It should be taken as reinforcement and not a punishment so they would have the feeling that they can do and complete certain tasks. The parents need to assist their children by helping them understand that the purpose of feedback is to give them information of what has to be done in the succeeding tasks. It has to be clearly explained that it will help them improve their weakest and maintain their strongest points in the course. The teachers need to be careful in choosing the type of feedback that has to be given to the students. It has to be noted that it should be timely, manageable and must focus on the strengths and weaknesses of the students’ performance in the given task.

References


