Abstract

The study aims to identify main learning factors that influence academic performance of first year students of the Faculty of Science and Technology, Universiti Kebangsaan Malaysia, who took Applied Statistic course. Out of 238 students who took the course, only 184 students returned completed survey forms. Principal Component Analysis method was used to identify the learning factors that most influence students’ academic performances. Results show that the factors (in order) are student’s interest, surroundings and supports, peers influence, self belief, good time management, student’s attitudes, satisfaction and interactions with lecturers. Several analyses using contingency tables as well as some descriptive statistics are presented to further support the identified factors. In addition, comparisons of mean levels of students’ satisfactions towards attributes in the study are made.

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Keywords: learning factors; principal component analysis; academic performance;

1. Introduction

A good learning style is one of the best means of achieving good academic performance. Worthy et al (1999) stated that learning is the basis to understanding and responding to one surrounding and environment. They also believe that learning objectives can be achieved given a good learning style or trend. According to Dunn (1980), in Gomez 2000 learning style is the way a student processes and retains new information. One’s learning style depends on one’s biological features and characters development, as well as influenced by his surroundings, emotions, social influence and feelings.

In his study, Ramsden (1992) found that a lecturer’s teaching style can also have an effect on a student’s learning style. Furthermore, not only should a lecturer a give clear and accurate information, he should also be able to make his teaching more interesting in order to gauge the students’ attention and interest towards his course. Ramsden
(1992) also stressed that a lecturer should also need to take on a role of a (second) parent to students by getting to know students better, trying to learn about the students’ problems, providing appropriate assistance and taking interest in students’ results and course requirements.

A study was conducted in Universiti Teknologi Malaysia (UTM) to determine common characteristics of excellent students (Kherun Nita & Zakaria, 1995). The respondents who were categorised as excellent students have clear goals and vision. Their results in Mathematics, Science and English subjects are excellent. They are very good at soft skills, such as note taking & time management. They have a positive learning attitude. These characteristics show that the students themselves must play a paramount role in achieving excellence.

As a unique individual, each student has a different learning style. Thus, a form of teaching may be effective for one student but not for others. This study was conducted to investigate how a student’s learning style, through learning factors, affect a student’s academic achievement. A total of 238 students from Year One, Faculty of Science and Technology (FST), Universiti Kebangsaan Malaysia (UKM) who took STQS1913 Applied Statistics during Semester II 2009/2010 session were asked to complete a questionnaire. However, only 184 students returned the completed form.

The results from this study are beneficial to both lecturers and students. As lecturers, they will be able to better understand students’ learning styles. With this understanding, lecturers can plan teaching methods that can attract and increase the students’ interests to achieve better results. On the other hand, for students, the findings are indicative of the relationship between learning style and academic achievement.

2. Methodology

A total of 238 questionnaires were given to students who took STQS1913 but only 184 (59 males and 125 females) returned the completed form. 53.6% were students from the School of Environmental Science and Natural Resources, 44.8% from the School of Applied Physics, 1.1% from the School of Chemical Science and Food Technology and 0.5% from the School of Bioscience and Biotechnology.

The questionnaire was divided into three parts, part A (demographics of respondents), part B (learning factors) and part C (encouragement/motivating factors). Sample questions in part A include students’ academic backgrounds such as programs and their latest Cumulative Grade Point Average (CGPA). Part B includes questions on factors that affect student’s learning style such as preferred revision time, learning environment, frequency of meetings with lecturers and revisions. Lastly, part C covers factors that lead to academic excellence. Questions in part C are constructed in accordance to five point Likert Scale (1: strongly disagree and 5: strongly agree).

Comparison of mean levels of students’ agreement (satisfaction) towards each attribute for each of the factors that affect/influence students’ learning styles or revision systems were conducted to determine, in general, the main learning variables and main attributes towards learning and academic achievement. Then, Principal Component Analysis (PCA) method was applied. An essential characteristic of PCA is that if most of the variances are explained by the first few principal components, the other principal components can be removed from the model and dimension reduction is achieved (Deluzio & Astephen 2007). Some descriptive statistics are also presented to support the results by PCA. The data was analysed using Statistical Package for the Social Science 16.0 (SPSS) software.

3. Results and Discussions

3.1 Comparison of mean levels of student’s agreement

The first analysis are compaire mean levels of student’s (respondent’s) agreement on each attribute for each encouragement/motivating factor (dimension) that influence students’ learning styles (part C of questionnaire). Some of the dimensions and attributes were drawn from a list of important characteristics that determine learning styles (Weinstein & Mayer 1986) but restructured to suit respondents. Table 1 is referred.
### Table 1. Descriptions of Dimensions and Attributes

| Dimension          | Attribute: Attribute Statement                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------|
| **Self-belief**    | B1: I believe in my ability to achieve excellent results.                                      |
|                    | B2: My decisions are influenced by my beliefs in God’s will and my compliance towards religious teachings |
|                    | B3: My learning style is influenced by my ability to adapt to my surroundings.               |
|                    | B4: Supports and encouragement from my parents motivate me to excel.                           |
| **Time Allocation**| T1: Tight class schedule influences my learning practices during class.                      |
|                    | T2: I allocate a lot of time searching for materials to complete my assignments.             |
|                    | T3: I spend too much time in non-academic activities.                                        |
|                    | T4: My college and/or club activities take a lot of my revision and study time.            |
| **Self-confidence**| C1: I believe in myself.                                                                      |
|                    | C2: I am satisfied with my current learning style.                                           |
|                    | C3: I need to improve my learning style.                                                      |
|                    | C4: I still study following my old learning style although my examination result is not good.|
|                    | C5: I am confident with my ability.                                                          |
| **Interest**       | I1: I am able to identify the effectiveness of learning through interest.                    |
|                    | I2: I am excited to go to class every day.                                                    |
|                    | I3: I prefer to complete all assignments by discussing with my friends.                      |
|                    | I4: I believe that my learning strategy is influenced by my interests.                       |
|                    | I5: I am capable of achieving excellent results in the courses that I like.                  |
| **Attitude**       | A1: I believe that attitudes influence my learning style.                                      |
|                    | A2: I seldom skip classes.                                                                    |
|                    | A3: I am always ready for my examinations.                                                    |
|                    | A4: I do not know how to calculate my CGPA or Grade Point Average (GPA)                      |
|                    | A5: I like to interact with my lecturer during class.                                         |
|                    | A6: I always give my opinions and ideas during class.                                        |
|                    | A7: Group discussions can increase my confidence.                                             |
|                    | A8: I like to revise a week before the examination.                                           |

Figure 1 shows the students’ mean levels of agreement towards each attribute for each dimension that affect learning styles. In Figure 1, the mean values in bold are the maximum mean level of agreement for each dimension.
Students feel that they need to improve their learning styles (C3 with a mean of 4.44 (C3: 4.44)). They also agree that support from parents can increase their confidence to achieve excellent results (B4: 4.38). Furthermore, they believe that attitudes towards subjects and courses (A1: 4.36) as well as passion (I4: 4.22) have influences on their learning strategies. However, a tight class schedule will also affect their learning practices during class (T1: 3.86). If all factors are taken collectively, the rank of factors that affect student’s learning is self-belief (the mean value of 4.08), interest (mean value 3.97), self-confidence (mean score 3.73), time allocation (mean value 3.62) and attitudes (the mean value 3.32).

3.2 Extraction of main learning motivating factors using Principal Component Analysis (PCA)

In general, the attributes with maximum min level of agreement for each dimension have been identified. For a more in-depth understanding of the study, a second analysis using Principal Component Analysis (PCA) was conducted. Table 2 illustrates the total variance explained by principal components of the attributes of interest. The main components are described with an eigenvalue greater than 1 (Deluzio & Astephen 2007) and become the main factors sought.

Table 2 shows eight components (in bold) with eigenvalues greater than 1. This means that there are eight main factors that motivate students’ learning. The eigenvalue of component 1 is 7.1 or 27.1% of total variance explained. Component 2 has an eigenvalue of 2.6 or is explained by 9.9% of the total variance. Components 3 and 4 have eigenvalues of 1.9 and 1.5, respectively, explaining 7.4% and 5.8% of the total variance. Meanwhile, components 5, 6, 7 and 8 each has eigenvalue of 1.4, 1.3, 1.1 and 1.0, respectively, explaining 5.2%, 4.9%, 4.1% and 3.9% of the total variance.
Table 2. Total variances explained

| Component | Total Variance | Percentage (%) | Cumulative Percentage (%) | Component | Total Variance | Percentage (%) | Cumulative Percentage (%) |
|-----------|----------------|----------------|---------------------------|-----------|----------------|----------------|---------------------------|
| 1         | 7.054          | 27.132         | 27.132                    | 14        | 0.542          | 2.085          | 85.418                    |
| 2         | 2.562          | 9.853          | 36.985                    | 15        | 0.539          | 2.072          | 87.491                    |
| 3         | 1.927          | 7.412          | 44.397                    | 16        | 0.436          | 1.679          | 89.169                    |
| 4         | 1.505          | 5.789          | 50.187                    | 17        | 0.416          | 1.598          | 90.767                    |
| 5         | 1.353          | 5.204          | 55.391                    | 18        | 0.392          | 1.508          | 92.276                    |
| 6         | 1.276          | 4.906          | 60.297                    | 19        | 0.338          | 1.300          | 93.576                    |
| 7         | 1.054          | 4.055          | 64.352                    | 20        | 0.321          | 1.233          | 94.809                    |
| 8         | 1.017          | 3.910          | 68.262                    | 21        | 0.296          | 1.137          | 95.972                    |
| 9         | 0.903          | 3.475          | 71.737                    | 22        | 0.267          | 1.026          | 96.972                    |
| 10        | 0.874          | 3.361          | 75.098                    | 23        | 0.229          | 0.881          | 97.853                    |
| 11        | 0.816          | 3.140          | 78.238                    | 24        | 0.210          | 0.808          | 98.661                    |
| 12        | 0.680          | 2.616          | 80.855                    | 25        | 0.178          | 0.685          | 99.346                    |
| 13        | 0.644          | 2.478          | 83.333                    | 26        | 0.170          | 0.654          | 100.000                   |

Next, attributes that make up the eight main components (factors) are extracted and the eight components are named as shown in Table 3.

Table 3. Factors and their attributes

| Component | Factors     | Attributes          |
|-----------|-------------|---------------------|
| 1         | Interest    | I1, I4, I5, A1, B1 and C3 |
| 2         | Surroundings/Support | B2, B3, B4 and T1   |
| 3         | Peers influence | A7 and I3            |
| 4         | Self-belief  | C1 and C5            |
| 5         | Time allocation | T2, T3, T4, A8, A4 and C4 |
| 6         | Attitude     | I2 and A2            |
| 7         | Satisfaction | C2 and A3            |
| 8         | Interactions with lecturers | A5 and A6        |

Based on Table 3, student’s interest plays an important role in achieving academic excellence, followed by support and the surrounding factor. These are consistent with the results obtained from the observed mean values in the first analysis.

3.3 Achievement and motivation on the students CGPA

The extracted factors from Table 3 can be more clearly understood through some descriptive analysis on data from part B of the questionnaire (third analysis). The data are divided into three groups based on their CGPA: 1:00 to 2:00 (3 students), 2:01 to 3:00 (103 students) and 3:01 to 4:00 (78 students). This was done to see if there exist different learning styles of students according to their academic achievements.

In this study, student’s interest is interpreted according to their understanding of course contents through exercises given by the lecturers. When a student has an interest in a course, he would normally also be keen to do extra exercises in order to increase his understanding and master the course, and vice versa. Figure 2 describes this situation.

It is rather interesting to see that 20.7% of students with good and excellent academic achievement (CGPA 3:01 to 4:00) responded that they can understand the course contents even without doing the exercises provided. Similarly for 14.7% of students with average and quite good result (CGPA 2:01 to 3:00), despite agreeing that it is
difficult to understand the course content, still did not do the exercises. Should these students take the time to do the exercises, it is believed that their understanding of the course content will be better, thus mastering the course and increasing their chance of achieving better results. As the saying goes, the more we practice, the more proficient we will become. One might wonder on the ignorance towards the exercises. On one hand, there might be some students who simply do not take the exercises serious. On the other hand, some students might not have sufficient or enough time to do the exercises due to their tight class schedule as well as college and clubs activities.

![Legend](image)

**Legend**

A : Able to understand course contents without doing the exercises, but do exercises
B : Difficult to understand course contents without doing the exercises, but did not do exercises
C : Difficult to understand course contents without doing the exercises, and do exercises
D : Able to understand course contents without doing the exercises, but not do exercises

Figure 2 Percentages of students in three CGPA groups with level of understanding of course contents with or without doing exercises

Although the majority of respondents (76.7%) did not do the exercises due to reasons mentioned earlier, they may use other learning modes, reference materials and support medium. Five learning modes listed in the questionnaire were discussions with friends, using reference materials, discussion with the lecturers, exercises, and Internet. Six reference materials listed were the Internet, reference books, lecture notes, textbooks and others. To see the number of teaching methods and reference materials used by students from the three CGPA groups, Figure 3 is referred.

![Legend](image)

**Legend**

A : 1 : 1-2
B : 1 : 3-4
C : 2 : 1-2
D : 2 : 3-4
E : 3 : 1-2
F : 3 : 3-4
G : 4 : 1-2
H : 4 : 3-4
I : 5 : 3-6

* Number of modes of learning used : Number of reference materials used

Figure 3 Percentages of students in three CGPA groups using modes of learning and reference materials
Figure 3 clearly shows that students with low CGPA (less than 2.00) use only two modes of learning and between one and two types of reference materials, compared to the good and excellent students (CGPA greater than 3.00) who used more than two modes of learning and more of two types of reference materials. This shows that students with high CGPA feel that using more modes of learning and reference materials are important support systems to achieve academic excellence.

In addition to the modes and learning support materials, peers can also be a student’s motivating factor. However, how strong the peers influence a student’s academic achievement depends on the individual student’s own ability and the ability levels of the peers (Burke & Sass 2008). Based on our observation and study in classes, library and colleges, there are students who study alone, while the others in groups. Referring to Figure 4, a total of 70.1% of respondents prefer to study alone. This may be due to the high self-belief (attribute B1: mean value 3.88) and self-confidence (attribute C5: mean value 3.92) in achieving success as obtained in Figure 1. Nevertheless, the students agreed that discussions with peers are still relevant, especially in solving exercises, assignments and any activity that requires group discussions.

![Figure 4 Percentages of students in three CGPA groups studying alone or in a group of 2, 3, 4 and 5 students](image1)

![Figure 5 Percentages of students in three CGPA groups spending time to study in a day](image2)

Amount of time allocated for study and revision is directly related to a student’s academic achievement. The more time is allocated, the higher CGPA he or she will achieve. Figure 5 shows 23.4% of students with CGPA of between 3:01 and 4:00 spent between 3 to 4 hours a day to study and revise. So did 33.9% of students with CGPA of 2:01 and 3:00. These show that although they may be busy with the college and clubs activities, majority of students...
did not forget their responsibilities to study. However, questions may arise when a student with a CGPA of 2:01 to 3:00 who spent at least three hours a day to study did not get higher CGPA.

Answering the questions that may arise from the results of Figure 5 above, one possible contributing factor is the frequency of student interactions or meetings with the lecturers. Meeting or discussion with the course lecturer can clear any related problems or issues. However, only 3.2% of the students from the three CGPA groups regularly went to see the lecturers while some 39.5% of students had never have a meeting with the lecturers, (Figure 6 (a)). One reason why the students never had a meeting with the lecturers is that they might be more comfortable interacting with the lecturers during lectures. Respondents were also asked about meetings with their mentor. A total of 56% of them met with their mentor once a month (Figure 6 (b)). This is most likely due to the condition imposed on the students to meet mentor at least once a month prior to taking their examination slips.

A person will lose 70 – 80% of new or lessons if he or she does not apply or revise the knowledge or lessons within 24 hours of a class (Princeton 2010). Clearly students need to do consistent revisions and do the exercises to ensure better understanding of their courses. To see the existence of these practices, the three CGPA groups were broken into six groups as shown in Figure 7.

![Figure 6 Percentages of students in three CGPA groups meeting with (a) lecturers and (b) mentor in a month](image)

![Figure 7 Percentages of students in three CGPA groups who revised within 24 hours of class and did the exercises](image)
It was found that the percentage of students who did not do their revisions within 24 hours after a class is high. However, 54.3% did the exercises given by the lecturers. They comprised of 24.1% of excellent students with a CGPA (3:01 to 4:00), 21.7% of students with a CGPA between 2:51 and 3:00 and the rest of the lower CGPA.

4. Conclusion

The objective of the study to identify the encouragement/motivating factors that influence students’ learning in the case of First Year FST students who took Applied Statistics course STQS1913 in Semester II 2009/2010 session has been achieved. These factors are interest, surroundings and support, peers influence, self-belief, good time management, attitude, satisfaction, and interaction with lecturers.

Students should try to change their attitudes towards learning. They should also try to change their learning styles to include more revisions and more interactions with lecturers, to take advantage of the benefits of group discussions, and make full use of reference materials and supporting facilities that surround them. The statistical descriptive results can also be the catalyst for creativity and innovation of teaching by lecturers so as to attract student’s attention and interest to have more frequent interaction with the lecturers, like having more exercises and not being shy to voice out their opinions in class. We believe student’s excellent academic results can be achieved through the cooperation between them and lecturers.

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