Application of the Multiple Regression Analysis in the University Students’ Learning Disabilities

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Abstract—Whether the university students’ learning disabilities can be timely discovered and solved plays an important role in the rapid and steady development of the university education. In this paper, we use the method of multivariate statistical analysis, scientifically and systematically solving the following problems: whether there are prominent correlations and differences between the students’ learning anxiety, learning attitude, learning motivation and academic performance; whether the research mode pattern can get support; etc. Finally, we get the standardized regression equation and can realize the prediction of the students’ academic performance; besides, it is proved that the research mode pattern can get support. Conduct the digitization of the textual description in the scope of social sciences, The flexible use of the multivariate statistical analysis technique can provide effective methods for solving the university students’ learning disabilities and can effectively forecast the students’ academic performance.

Keywords—SPSS; multiple regression analysis; path analysis; learning disabilities; prediction

I. INTRODUCTION

Now we are entering the era of big data. As for the discovery and solving of problems, various industries have increasingly depended on the new methods brought about by the big data, and it has become an indispensable criterion to let figures speak [1]. On this basis, we introduce the data statistical analysis into the research of learning disabilities which originally belongs to the category of social sciences, and thus add the numerical value language and the scientific discussion to the research which originally belongs to the written narrative. By doing this, we provide new ways of thinking for policy makers and researchers and further provide guidance to improve the learning quality of the students in universities [2].

There are many factors affecting the college students’ academic performance, and there are a lot of related studies at home and abroad. In general, there are two major factors—intellectual and nonintellectual factors. As for the intellectual factors, the university students in colleges and universities have experienced fierce competition in the college entrance examinations, so intelligence is not the main factor that affects their learning. In contrast, many recent studies find that the nonintellectual factors are worth thinking [3]; a large number of domestic and overseas document studies show that the nonintellectual factors that affect the college students’ academic performance and have important influence on their learning disabilities can be divided into three major categories: learning anxiety, learning attitude and learning motivation. Janice, Mark and Todd think that examination anxiety has two components: concern (cognitive component) and emotion (physical component) [4, 5]. Motivation level and academic performance form an “inverted-U curve”: when the stimulation level is too high or too low, the learning effects will become worse; only when the stimulation level is at the middle level can the learning effects become better. In regard to the anxiety level, only when the degree of anxiety and the enthusiasm are moderate can the good learning effects be produced [6].

II. APPLICATION OF THE MULTIVARIATE STATISTICAL ANALYSIS METHOD TO THE UNIVERSITY STUDENTS’ LEARNING DISABILITIES

In this article, we take the non-intellectual factors as the objects of evaluation and research to analyze this case and pose some problems existing in the university students’ everyday learning; according to the effectiveness of the analytical method, we extend this case to other aspects of the higher education to provide reasonable suggestions and methods for the work of the university education.

A. Research Structure Chart

In order to facilitate the organic integration of research questions, hypothesis verification and statistical analysis, we plan a brief research structure chart according to the purpose of research and the research theory as shown in Fig.1.

![Fig. 1. Research structure chart](image-url)
In the research structure, we make the following explanation and definition of the properties of the correlated variables (in the parentheses, we have the variable codes in the statistical analysis), among which the continuous variables refer to the isometry/ratio variables.

1) Individual variables: student’s sex (sex); including two categories—boys and girls; the number 1 is used to represent boys and the number 2 is used to represent girls; these are binary variables.

2) Learning anxiety (anx)
   There are 20 selected questions in total, and the variable codes entered by the data are a1 ~ a20, including stress and fear (fea), emotional worry (wor), examination anxiety (exa) and classroom anxiety (cla); these four factors are continuous variables.

3) Learning attitude (att)
   There are 18 selected questions in total, and the variable codes entered by the data are b1 ~ b18, including learning confidence (con), usefulness (use), attitude for success (suc) and motivation for inquiry (mot); these four factors are continuous variables.

4) Motivation for learning involvement (inv)
   There are 12 selected questions, and the variable codes entered by the data are c1 ~ c14, including task involvement (tin) and ego involvement (ein); these two factors are continuous variables.

5) Ranking of school records (sr)
   Rank the school records of the students who solve the problems effectively.

B. Analysis of Research Questions and Statistical Methods

Research Question 1

Is there a significant correlation existing between the students’ learning anxiety, learning attitude, motivation for learning involvement and learning performance?

Analytical method: This research question is mainly about the study of the correlation between single variables. Here the variables are all continuous variables; this conforms to the test with K. Pearson “product-moment correlation” method.

Research Question 2:

In regard to the students with different genders, are there significant differences between their learning anxiety, learning attitude, motivation for learning involvement and learning performance?

Analytical method: In this research question, the independent variable is the students’ gender, which belongs to the nominal variable. There are two “levels”—boys and girls. The dependent variables are continuous variables, and each variable can be tested with the independent sample t-test.

Research Question 3:

Can the students’ gender, learning anxiety, learning attitude and motivation for learning involvement effectively predict their learning performance? How is the predictive power of these factors?

Analytical method: In the research question, there are 11 predictive variables—the students’ sex (sex), stress and fear (fea), emotional worry (wor), examination anxiety (exa), classroom anxiety (cla), learning confidence (con), usefulness (use), attitude for success (suc), motivation for inquiry (mot), task involvement (tin) and ego involvement (ein), and the dependent variable is a variable about learning performance, thus we can conduct analysis through using the multiple regression analysis.

Research Question 4:

Can the research mode pattern get support?

Analytical method: multiple regression analysis method—forcing-into method

C. Analysis Results

At the beginning of this chapter, we lay the groundwork for the basic structure of the multiple regression according to the reasonable research mode pattern. It can be seen from the reliability scale that the reliability coefficient values of the three secondary conceiving subscales are 0.913, 0.666 and 0.744 respectively, while the reliability coefficient value of the general scale is 0.834. Viewed from the three secondary conceiving subscales, except that the coefficients of the subscales at the level of learning attitude are slightly lower, the coefficients of the rest of the subscales are all above 0.7. In addition, the reliability coefficient value of the general scale is 0.834, which represents that the reliability value of the scale is very good.

In the questionnaire, we adopt the five-point Likert Scale to write the answers and recode the items of questions with reverse scoring. It can be easily seen from Statistical Scale 2.8 that because the unqualified elements have been screened out before the statistics is made, the effective response value of the questionnaires is 181: there are 53 boys (Number 1) and 128 girls (Number 2). Because of the structural proportion of gender distribution among the university students of the tested, there has appeared a case that girls outnumber boys.

With regard to the learning anxiety, the average score of each question is 2.6171, probably in the moderate category; among its four conceiving levels, the level of “classroom anxiety (cla)” has the highest score. As for the learning attitude, the score belongs to the moderate category; among its four conceiving levels, the level of “learn confidence (con)” has the lowest score (M = 3.075). This shows the now the university students hold a positive attitude toward the functionality of learning and the successful experience of learning, but their learning confidence needs to be strengthened. As for the motivation for learning involvement, the students’ scores at the level of “task involvement (tin)” motivation are less than their scores at the level of “ego involvement (ein)” motivation. It can be concluded from the product-moment correlation coefficient value that school result (sr) has a significant negative correlation with stress and fear (fea), emotional worry (wor), examination anxiety (exa), classroom anxiety (cla) and learning anxiety (anx); school result (sr) has a significant positive
correlation with learning confidence (con), usefulness (use), attitude for success (suc), motivation for inquiry (mot) and learning attitude (att), the correlation coefficients being .594,.551,.596,.755 and .867 respectively; and school result (sr) has a significant positive correlation with task involvement (tin), ego involvement (ein) and involved motivation (inv), the correlation coefficients being .316 and .669 respectively. There is a significant correlation existing between the students’ learning anxiety, learning attitude, learning motivation and learning performance.

It can be seen that for the students with different genders, there are significant differences between their learning anxiety, learning attitude, motivation for learning involvement and learning performance within several sections. Through the T-test results we can see that for the students of different genders, there are significant differences in the variables such as the level of learning confidence; among the university minority students, the boys significantly have more learning confidence than the girls in the same grade. In regard to other aspects of the boys and girls’ learning, although there are differences, these differences are not obvious. The girls’ attitude and motivation for success are better, but they haven’t achieved significant results.

Through the reasonable statistical analysis, we finally conclude the multiple regression equation that predicts the students’ school results: School results = 166.329 + 3.345 * learning attitude - 1.317 * learning anxiety + 2.507 * motivation for learning involvement + 1.547 * learning confidence + 6.036 * gender.

As for whether the research mode pattern can be effectively supported, we will make confirmation through path analysis in the next chapter.

D. Suggestions

Through the research we can find that the university students’ learning anxiety belongs to the category of moderate level and that they need the help of the leaders and teachers so that they can reduce anxiety and show enthusiasm for school life. Concrete suggestions:

(1) Assertiveness training. We should let the students understand the importance of learning and correct their learning attitude.

(2) When encountering the students with serious learning anxiety, the educators should also conduct the proper relaxation training aiming at the physiological factors that compose learning anxiety.

(3) The educators can also choose the method of systematic desensitization to reduce the students’ anxiety. In general, the steps and methods are as follows: for the first step, ask the students with learning anxiety to list the stimulating scenes and factors causing anxiety reaction; for the second step, sort the above stimulating scenes properly according to the order from weak to strong and rank the “anxiety levels”; for the third step, we can also make the students with anxiety have the relaxation response through relaxation training, the purpose of which is to make the body of the students with anxiety achieve a state of complete relaxation; for the fourth step, in regard to the anxiety levels ranked according to the order from weak to strong, the educators can let the students with anxiety advance gradually in their imagination so that the relaxation response can restrain the anxiety reaction. The university minority students hold a positive attitude toward the functionality of learning and the successful experience of learning, but their learning confidence needs to be strengthened. Their scores at the level of the “task involvement” motivation are lower than the scores at the level of the “ego involvement” learning motivation. This shows that the colleges should strengthen the management of the students’ task involvement and cultivate their active learning consciousness and attitude. In the regression equation predicting the students’ school results, we can see that the students’ learning attitude is important and that the reasonable cultivation of the students’ positive learning attitude is the key to improve the university students’ learning performance.

III. PATH ANALYSIS

Multiple regression analysis

The study of Path Diagram 2 needs three multiple regression analyses:

The first multiple regression analysis: the criterion variable is school result, and the predictive variables are learning anxiety, learning attitude and learning involved motivation.

The second multiple regression analysis: the criterion variable is learning attitude, and the predictive variables are learning anxiety and learning involved motivation.

The third multiple regression analysis: the criterion variable is learning involved motivation and the predictive variable is learning anxiety.

It can be seen from Fig.2 that: among the paths which influence the university students’ school results, there are six significant paths.

First: learning anxiety→school results;

Second: learning anxiety→learning attitude→school results;

Third: learning anxiety→involved motivation→school results;
Fourth: involved motivation→learning attitude→school results;
Fifth: involved motivation→school results;
Sixth: learning attitude→school results;

We can see that among the various paths influencing the school results, learning attitude plays an important role as an intermediate variable, and we cannot neglect its fundamental role in controlling learning anxiety.

IV. CONCLUSION

We start from the university students in colleges and universities as the subjects, aim at the three main factors affecting the university students’ academic record—learning anxiety, learning attitude and motivation for learning involvement, and carry out research of these students by adopting the questionnaire method. Besides, we comprehensively apply various statistical methods to the study of the university students’ learning disabilities, explaining the validity and the scientific nature of the specific methods that are applied and popularizing the advantage of integrated application.

Basing on the data of 181 university students, we get the standardized regression equation: school results=-166.329+3.345*learning attitude-1.317* learning anxiety+2.507* motivation for learning involvement +1.547* learning confidence+6.036* gender. If we give specific values to these five independent variables respectively, we can get the predicted value of a student’ ranking of grades. This has a positive and scientific reference value for predicting a student’s integrated results and the factors that affect the student’s integrated results. Moreover, we make a path analysis of the structure chart and the standardized regression equation of the research, and prove the scientific nature of the methods as well as the correctness of the conclusion.

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