



# Data Analysis and Precision Teaching

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**Abstract.** This paper takes IBM SPSS as a tool and the teaching data of the Basics Computer Application course as sample. Through data sampling, data extraction, data statistics and calculation, and then using the method of comparative analysis, we get valuable data analysis results. These data analysis results applied to the teaching reform of the course, and finally the purpose of precision teaching realized. “Precision teaching” is an important measure for colleges and universities to improve teaching quality and learning effect. The use of advanced mathematical analysis tools and scientific data analysis methods is the premise and necessary process to realize accurate teaching.

**Keywords:** IBM SPSS · data analysis · precision teaching · teaching reform · teaching reform of basic courses in colleges and universities

## 1 Introduction

“Precision teaching” is an important measure for colleges and universities to improve teaching quality and learning effect. It is another thing to be concerned after Audio-Visual teaching, distance teaching, multimedia teaching, online video teaching and autonomous learning. Precision Teaching is not only the renewal of teaching ideas, but also a major event that requires educators to have the courage to try, carefully analyse and objectively summarize in the teaching reform, so improve the teaching effect, promote and complete the overall teaching task and achieve the original talent training goal. Based on the problems and disadvantages existing in the current basic course teaching in Colleges and universities, taking the teaching of Basics of Computer Application as an example, we put forward that the concept of accurate teaching must be used to reconstruct the course design and planning of basic teaching and improve the course content and teaching methods. Only in this way can we improve the teaching effect and realize the original intention of setting up basic courses. The course Basics of Computer Application has a teaching history of decades in Colleges and universities. We take this course as an example to introduce how we carry out teaching reform.

## 2 Positions in Education System

In the era of rapid development of information technology, computer is no longer a simple high-tech product. It has become one of the necessities of people’s life. We

all rely on computers as a convenient tool for information exchange on the Internet, economic exchanges in real society, and even use it in daily life. In addition to the understanding of “computer application”, we should even master its basic skills as much as possible; otherwise we will become the laggards of the times. On the other hand, computer application technology has become one of the most basic tools for daily work in various disciplines. The integration and mutual penetration of various disciplines and academic breakthroughs are inseparable from computer application technology. This is why the course Basis of Computer Application has been set as a public course that all majors in Colleges and universities for decades, a compulsory course in Higher Vocational and secondary vocational schools, and an important course in the secondary education stage of junior middle school and senior high school. The implementation of universal education and step-by-step talent training plan in China, has made the course “Basis of Computer Application” occupy an unshakable position in China’s education system.

### **3 Analysis of Current Teaching Situation**

Taking higher vocational colleges as an example, the theoretical teaching mode of computer courses in schools is basically a one of many teaching modes with teachers as the main body and important contents of courses as the main line. The teacher first organizes and prepares the classroom content, then explains the knowledge points, finally demonstrates the operation to the students with multimedia equipment, and finally tutors the students on the computer. Therefore, at present, there is such a phenomenon in Teaching: when teachers teach theoretical knowledge, students feel boring and very tired; when the teacher demonstrates the operation, the students often have poor operation ability, and the whole learning process becomes the performance of the teacher alone. Students simply listen to the teacher and cannot give full play to their initiative. This teaching method ignores the main position of students in learning. The excessive dependence on teachers and the lack of interaction between teachers and students, this teaching method, have seriously affected the teaching effect. Another phenomenon is that students from secondary vocational schools or who have learned the teaching content before entering the school feel very bored, just because they are constrained by classroom discipline and don’t skip classes. Of course, there is no lack of excellent students studying hard in the classroom.

## **4 Analysis of Students’ Situation**

### **4.1 Analysis of Students’ Situation**

Whether in Colleges and universities or secondary vocational colleges, there are differences in the learning basis of students. Before entering the school, students come from different regions, different towns or rural areas and different schools in China; their learning foundation, especially the foundation of computer knowledge, is quite different. This may be due to the poor implementation of the teaching regulations of the Ministry of education in their school before entering school, or their teaching environment cannot meet the most basic requirements of teaching. Here, let’s not talk about

whether this situation is related to the current entrance examination system, we should admit is that at present, there are differences in the degree of economic development in various regions and between urban and rural areas. Of course, its impact will also be reflected in the imbalance between education and education conditions.

## 4.2 Students' Quality

There are differences in students' quality and literacy. Some students often use computers to surf the Internet for entertainment or deal with daily affairs. Although they have basic operation skills, they feel that it is not necessary to study the course "Basics of Computer Application". They either invest less time in learning, or their learning attitude is not serious enough. While the other part of the students have never been in contact with or have little contact with computers. They feel that the professional knowledge of this course is abstruse, abstract and difficult to understand, and even do not have the basic operation ability. For example, they will not be able to operate basic start up, shutdown and so on. In addition, a few students have unclear learning objectives, incorrect learning attitude and do nothing all day. They can get a diploma only after graduation. Of course, there are also many students with clear learning objectives, hard work and good grades.

## 5 Teaching Environment and Teaching Condition

It should be said that at present, all schools have the hardware and software conditions for setting up this course, such as computer equipment, network environment, Internet access conditions, operating system and teaching software etc. The possible problems are in management, for example, whether the maintenance rate of daily equipment in the school can be maintained and reached 95% to 98% or more, whether the equipment can use on this service standard in 24 h all day. Teaching environment and teaching conditions are undoubtedly the necessary conditions to ensure daily teaching and improve teaching quality.

## 6 Personal Qualities of Teachers

The national reform and opening-up policy has been implemented for decades. With the development of the country and the progress of the times, the cultural quality of the whole people has been generally improved, and the teaching team of computer basic education is full of talents. Today, with the continuous improvement of the education system, some policies, such as the evaluation of professional titles and the determination of salary levels, need to be implemented in various schools. Otherwise, it will affect the enthusiasm of teachers engaged in basic teaching.

In addition, whether, teachers' personal quality and skills have reached the basic condition of qualification, especially, now we are in the era of knowledge and information development. If anyone does not have the desire and consciousness of "relearning", he will soon be eliminated from the teaching team because he lags behind the requirements of the times.

## 7 Our Attempt at Teaching Reform

In September 2021, we selected four classes from the new higher vocational classes as the pilot teaching classes, and took the “Basics of Computer Application” course as the research object of teaching reform. Through the statistical analysis of the teaching data at the end of the semester, some data are obtained. Through the multi item analysis of these data, we know that the teaching reform has achieved certain results, but there are still many aspects that need to be improved. This is our statistics.

### 7.1 Descriptive Statistics

The sample data comes from four classes: two of them are junior college students of Information College. The students in the other two classes are the junior college in other subjects. They are freshmen of the same term, and they are at the same starting point in the junior college education. Furthermore, the talent training plans and training objectives arranged by the school are different. Here, let’s not talk about the different learning significance of the course Basics of Computer Application for them in different academic plans at the same junior college education stage, we just hope that through their learning experience of this course, we can study the data to get make scientific analysis, so try to find out the most basic purpose of improving teaching quality.

Because the following data involves personal information, the names of students have been omitted from the statistical table and represented by symbols.

**Table 1.** This is one of the student’s data.

sign	grade	sign	grade	sign	grade
80101	75.5	80112	75.5	80122	65
80102	84	80113	65	80123	99.5
80103	74.5	80114	63.5	80124	61
80104	65	80115	77	80125	85
80105	76	80116	77	80126	81.5
80106	73	80117	92	80127	90
80107	87	80118	63.5	80128	81
80109	70	80119	63.5	80129	99
80110	65	80120	71.5	80130	75.5
80111	78	80121	83	80131	83
80401	70	80428	64.5	20308	84
80402	75.5	80430	71	20309	94
80405	52	70322	71	20310	88.5
80406	70	20301	79	20311	78.5

(continued)

**Table 1.** (continued)

sign	grade	sign	grade	sign	grade
80409	68	20302	91.5	20312	88
80413	66	20303	83	20313	88.5
80415	80	20304	96	20314	75
80419	89	20305	90.5	20315	94.5
80421	80	20306	82.5	20316	97
80424	77	20307	78.5	20317	92
80132	73	80423	81	80207	76.5
80403	67	80426	71.5	80208	67
80407	82	80429	82.5	80209	64.5
80408	74	20629	86	80210	78.5
80410	83	80201	88	80211	64.5
80412	71	80202	75.5	80212	69
80414	80	80203	76	80213	72
80416	73	80204	70.5	80214	75
80418	71.5	80205	69.5	80215	67.5
80422	72	80206	73	80216	70.5
20318	94.5	20328	65	20406	84.5
20319	65	20329	90	20407	96
20320	86	20330	84	20408	87
20321	97.5	20331	99.5	20409	85.5
20322	70	60201	72.5	20410	95
20323	83	20401	97	20411	93.5

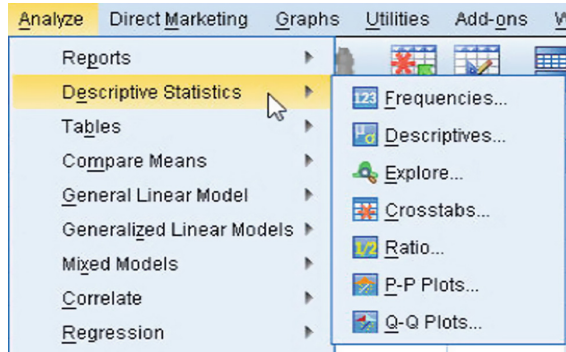
(The data in all the tables in this article are the original data of the author in the teaching and compiled by the author.)

The following are our calculation and processing steps with IBM SPSS as the tool [1] (Fig. 1).

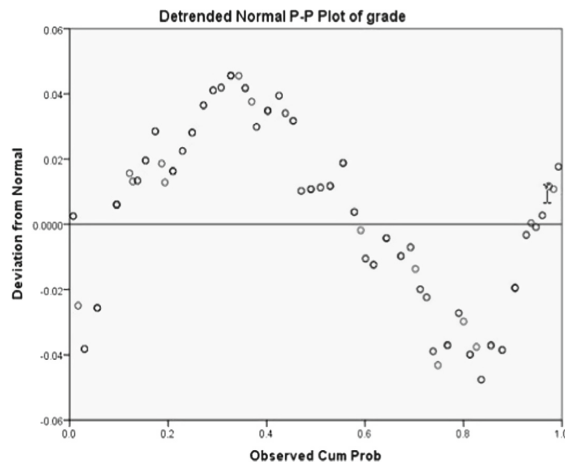
The calculation results are shown below, from Figs. 2, 3, 4, and Chart 1 [2].

By observing the curve shown in the Figs. 2, 3, and 4, we can get the following information: these distribution points are basically normal distribution, and a slight deviation in the distribution of individual points is also normal, because we focus on the distribution trend of all data points rather than the extreme situation of a single point [3].

We can also see in Figs. 2, 3, and 4 that there is a deviation between the curve representing students' grades and the standard normal distribution curve. These deviation data are distributed between 65–73 points. In the future teaching, we should pay attention to them, analyse them from many aspects, find out the reasons, and help them make greater progress in their future learning.



**Fig. 1.** This step is IBM SPSS processing.



**Fig. 2.** Detruded Normal P-P Grade

For the students who fail, we should pay more attention to them in future teaching and help them change their learning state as much as possible. After studying in school, they can become basically qualified graduates and complete their studies.

## 7.2 Analysis of Differences of Sample Data Items

Using IBM SPSS as a tool, we use the method of hypothesis testing to analyze the data in Table 1, to infer the causes of students' performance differences and provide a theoretical basis for improving teaching in the future. Of course, before analysis, we have sampled press for the data set to simplify the analysis process.

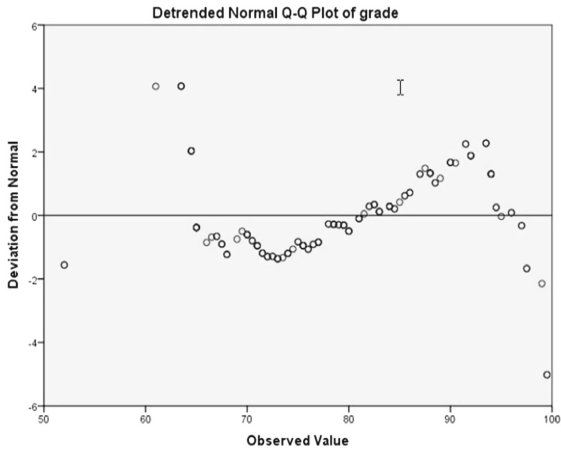


Fig. 3. Detruded Normal Q-Q Plot of grade

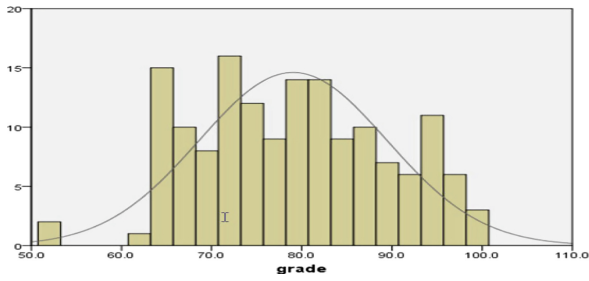


Fig. 4. Normal distribution diagram

Descriptives <sup>a</sup>		
	Statistic <sup>b</sup>	Std. Error <sup>c</sup>
wgrade <sup>d</sup> Mean <sup>e</sup>	79.039 <sup>f</sup>	.8441 <sup>g</sup>
95% Confidence Interval for Lower Bound <sup>h</sup>	77.371 <sup>i</sup>	<sup>j</sup>
Mean <sup>k</sup> Upper Bound <sup>l</sup>	80.707 <sup>m</sup>	<sup>n</sup>
5% Trimmed Mean <sup>o</sup>	79.025 <sup>p</sup>	<sup>q</sup>
Median <sup>r</sup>	78.500 <sup>s</sup>	<sup>t</sup>
Variance <sup>u</sup>	109.025 <sup>v</sup>	<sup>w</sup>
Std. Deviation <sup>x</sup>	10.4415 <sup>y</sup>	<sup>z</sup>
Minimum <sup>aa</sup>	52.0 <sup>ab</sup>	<sup>ac</sup>
Maximum <sup>ad</sup>	99.5 <sup>ae</sup>	<sup>af</sup>
Range <sup>ag</sup>	47.5 <sup>ah</sup>	<sup>ai</sup>
Interquartile Range <sup>aj</sup>	16.8 <sup>ak</sup>	<sup>al</sup>
Skewness <sup>am</sup>	.025 <sup>an</sup>	.196 <sup>ao</sup>
Kurtosis <sup>ap</sup>	-.684 <sup>aq</sup>	.390 <sup>ar</sup>

Chart 1. Descriptive Data

## **8 Some Suggestions on Teaching Reform**

### **8.1 Active Teaching**

The purpose of course teaching is not only the simple memory and accumulation of theoretical knowledge, but also to improve students' application ability. Take Basics of Computer Application as an example, it is a very practical and creative course. Therefore, we must reform the old traditions and methods in the past, but according to the students' practical ability, curiosity and creativity, flexible use of various teaching methods, give full play to the main role of students, and lay the foundation for learning other courses in the future.

### **8.2 Classified Teaching and Individualized Teaching**

The so-called classified teaching is to do the following work at two levels. First, find out whether students have studied a course before and how they study. Many schools conduct tests on individual subjects after freshmen enter the school, which is a better method. Then the school guides course. Classified training is necessary, which also includes compulsory basic courses and general courses in the whole school. This method seems troublesome, but it is actually a good way to make better use of teaching resources and improve students' quality. Another aspect of our work is that there should be differences in the arrangement of course contents, and different guidance and help should be given to students with different foundations.

### **8.3 Regular Teaching and Special Training**

Take the teaching of Basics of Computer Application as an example. While we pay attention to teaching computer application theory and practical teaching, the school actively carries out professional skill training and participate in professional skill competitions of teaching systems at all levels, which is a good way to improve students' practical skills. However, schools should also deal with the relationship between regular teaching and special training. The success of individual students can make the school famous in the society, while the regular teaching requires the school to devote enough energy and is a daily work that must be done well.

### **8.4 Selection of Teaching Content**

This is really a difficult thing to deal with. Take the course Basics of Computer Application as an example: This course is not only a compulsory basic course in the whole school, but also a professional basic course for information majors. However, the teaching contents of the two courses are different, and the learning requirements for students are also different. At present, there are many versions of textbooks for this course on the market, with different contents. This requires teachers to analyse and choose the content of teaching, keep the extraction of important knowledge, abandon and update old content, and impart the latest knowledge and technology to students.



### 8.5 Writing Textbooks

The compilation of any textbook, of course, focuses on practicality first. With the progress of society and the development of China's construction, more high-grade talents are needed to invest in the construction. Therefore, the content of teaching materials should have the characteristics of the times. For example, at present, the majors of big data in higher vocational colleges have been subdivided into two different application directions: big data application technology and big data management technology, while the corresponding perfect textbooks are very scarce.

### 8.6 Assessment Method of Students' Academic Performance

The last step in teaching is to test that students be familiar with the knowledge points of this course. Different courses can have different test methods. In this regard, school management departments should listen to teachers' opinions and give teachers more freedom of choice. On the other hand, educational managers should constantly improve their cultural quality and professional level in order to better complete their own work.

### 8.7 Criteria for Selecting Teacher

Every course set up by the school is to train qualified students to meet the needs of the society. Every teacher should be familiar with the relevant courses of his major. Proficient in professional courses is the basic condition for teaching tasks.

## 9 Conclusions

The content described in this paper is only one of the applications of IBM SPSS in teaching reform [4]. In fact, IBM SPSS can play a more important role in the field of educational research [5]. However, in teaching and research, we should avoid those troublesome things involving personal privacy, information security, trade secrets, morality and law, and so on. Harmonious development and common progress are our original intention.

**Acknowledgements.** This paper is one of the achievements of the research project of "Big Data Technology Professional Group" of Guangdong Provincial Education Department. (No. GSPZYQ2021052).

I would like to thank all the teachers and staffs who participated in this research work. Thank them for their hard work and selfless assistance. I would also like to thank the Department of Education of Guangdong Province for its strong support to our Guangdong NanFang Institute of Technology in carrying out this research work.

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