

# A Computer-aided Analysis of the Causes of College Students' Learning Disability

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**Abstract**—The problem of college students' learning disability is one of the problems that need to be solved in universities. This paper aims at the college students' learning disability and applies linear regression model to analyze the relationship between learning behavior and achievements of students. It concludes that learners' activeness, duration of study, self-discipline, etc., have a significant relationship with learning disability.

**Keywords**—learning disability; behavior logs; linear regression

## I. INTRODUCTION

The problem of learning disability began at the end of the 19th century. "Learning disability students" is a common term used in education in the former Soviet Union. In recent years, a great deal of research has been done on learning disability in the psychology and education fields in China. However, the concept of the term "learning disability" has not yet been determined. It was Kirk who first proposed learning disability. He pointed out that learning disability refers to the backwardness or delayed development of individuals in one or more processes. The domestic scholar, Qiquan Zhong, believes that learning disability mainly refers to the fact that the compare of students' intelligence and grades, and the intelligence is above the standard, but grades is significantly inferior[1-5]. On the basis of the above-mentioned concept research, this paper defines the concept of learning disability as: There are no major physical defects, and the psychological, social, background factors lead to the achievement of the scholastic ability test that does not reach the academic potential and requires special education and intervention to reach the standard level is called learning disability. The specific criterion is that the grades are still not up to a certain predetermined standard. It is a factual judgment on the results of a certain moment. This result is temporary, reversible, specific, and occurs under certain circumstances and with certain teaching goals. It is related, and it does not involve students' morality and moral character issues.

At present, most research on learning disability in China have focused more on theoretical aspects. Specifically, there are concerns about personality traits of college students with learning disability. For example, the paper of Haibo Tang, Analysis on Personality Traits of College Underachievers, has explored the relationship between learning disability and their related personalities from a medical perspective. These papers

have a detailed analysis of cause of learning disability and countermeasures. This paper attempts to combine the personality factors and the learning mode to research the causes of learning disability.

The learning mode has a direct impact on the learning effect. Analyzing different learners' learning modes and providing corresponding learning guidance is a feasible solution[6,7].Personality is a person's stable, habitual way of thinking and behavior. It permeates the whole person's psychology and is the overall portrayal of human uniqueness. Personality is important for learners that permeates all the activities of learners. Different learners have different learning modes and produce different learning effects.

Based on the above analysis, this paper adopts the recognition of learners' personality factors, analyzes their learning behavior patterns, and then analyzes the correlations with the learning effects, so as to provide learners with individualized guidance for poor learning patterns.

## II. AN ANALYSIS OF THE CAUSES OF LEARNING DISABILITY

The program first collects information on personality factors and learning behaviors of college students. The information of personality factors are obtained by filling Cattell 16PF questionnaire. Then preprocessing the learning behavior information, such as encoding, conversation recognition and separation, we get some useful information such as student learning duration, number of logs and program submissions. The students are divided into different levels according to their grades. We discover differences in groups, generate the analysis reports, and obtain the evidence for teachers to provide learning guidance.

The first step is to code, and the second step is to create the student's conversation sequence in the preprocessing step and provide data for the next sequence pattern mining.

The first step is to encode the Object. The Codes are different 2-digit integers.

In the second step, sequence identification and generation, at this step, the session is still identified using a 45-minute interval. The Action has been coded with a code value between 0 and 99, and the Object code is also a two-digit integer. Combining the two is the behavior of the student, the behavior can be expressed as Code(Action)\*100+Code(Object).The sequence of operations is named after the student number, and

each student generates a file. All student sequence sets are stored in a folder for easy processing.

In addition, some short noise sequences need to be removed. These are all mistakes or meaningless operations on the part of the learner. The threshold is taken as length 3, because only a length greater than 3 will have a login-browse-learning behavior sequence.

The step of preprocessing is to complete the user's every session recognition, clear the noise, encode the operation object, count the values of the related attributes, and generate the sequence set with the identified session. Each number corresponds to an action meaning, mainly in the following categories:

The first category is actions such as numbered 1 to 7, which means that the students browse and update the tasks assigned by the teacher.

The second major category is course registration, addition and deletion, and the action number is 9~19.

The third category is the forum operation. The action number is 20~28, which means the forum browsing, supplementary discussion, etc.

The fourth category is related to the survey questionnaire. The action number is 30~34.

The fifth category is resource access, which represents the students browsing and downloading courseware. The operation number is 35~37.

The only one in the sixth category is the upload, number 44.

The seventh category is the user information operation. The action number is 45 to 48.

The eighth category is wiki related operations, numbered 49-54.

Finally, the form is formed as in Table I, where USERID represents the student number, ACTION represents the behavior action, OBJECT represents the object, and START represents the start time.

TABLE I. FINAL FORMAT OF STUDENT DATA

USERID	ACTION	OBJECT	STARTIME
016	5	New programming learning website experience	2014/12/13 13:40
016	36	The first four chapters of the small exercise	2014/12/13 13:40
016	33	Solomon Learning Style Scale	2014/12/13 13:40
016	36	General Programming Review	2014/12/13 13:40
016	36	General Programming Review	2014/12/13 13:40
016	19	The basics of programming (Internet of Things 41, Telekom 41,41)	2014/12/13 13:39
016	44	/mnt/disk1/2140509016.docx	2014/12/13 11:17

### III. RESULTS AND DISCUSSION

In the following, information such as student learning duration, number of logs, and number of program submissions is analyzed. The statistical results obtained are shown in Table II.

TABLE II. STATISTICS SUCH AS LEARNING DURATION

Student ID	Duration of study	Number of logs	Submissions	Grade
001	1074	630	81	92
002	742	295	33	89
003	949	407	46	93
004	503	304	39	66
005	1498	712	84	83
006	978	545	57	92
007	629	463	59	93
008	782	475	36	68
009	820	283	29	77
010	964	409	42	83
011	1418	912	108	91
012	888	468	92	72
013	887	450	54	89
014	911	543	61	95
015	733	493	69	91
016	730	373	43	83
017	1733	781	75	90
018	910	617	73	91
019	469	268	32	50
020	677	540	83	68
022	1006	510	59	77
023	1042	542	70	84
024	528	366	43	83
025	1064	750	90	78
026	1011	724	66	66
027	354	369	51	60
028	1002	530	55	85
029	631	451	54	76

The relationship between number of logs and grade is shown in Figure I. It shows that the linear correlation coefficient is 0.04 and R2 is 0.29, indicating that the linear regression result is not good, but it shows that most of the points fall in a region that the grade is above 70 when the number of logs is greater than 400. This shows that there is a certain correlation between the activity of the learner and the grade.

The relationship between learning duration and grade is shown in Figure II. It shows that learning duration for excellent learners (with scores greater than 90 points) is at medium to longer lengths (except that the duration of the learning time for the three students is 1500 minutes), which shows that their learning efficiency is high, or part of them self-study after the class and homework has been completed, so the online time is not very long. Those who fail to pass the study have the least

time. This shows that those who fail will not spend much time in doing their homework, and their grade will not be high.

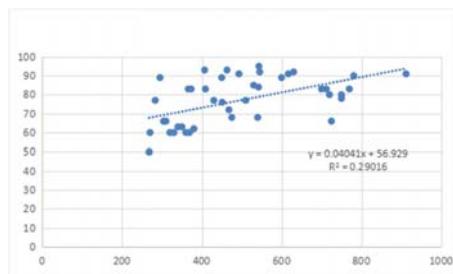


FIGURE I. RELATIONSHIP BETWEEN NUMBER OF LOGS AND GRADE

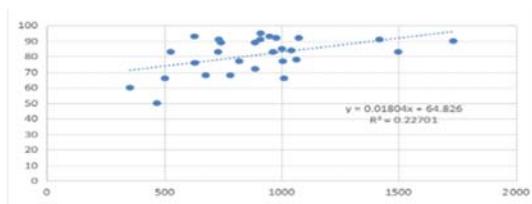


FIGURE II. RELATIONSHIP BETWEEN LEARNING DURATION AND GRADE

The relationship between the number of submissions and grade is shown in Figure III. It can be seen that the relationship between the number of submissions by the learners and grade is not very clear. The reasons for the analysis are as follows: Some students learn programming ahead so their numbers of submissions is not very high. However, some students who have basic knowledge, after many attempts to programming, will get good points. Only those, whose basic knowledge are not good, whose attitudes are not serious and whose number of submissions are few, will not get high points.

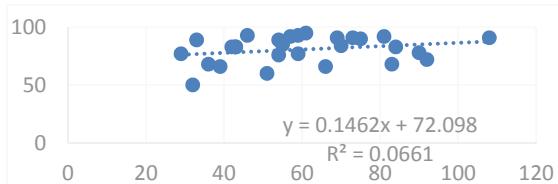


FIGURE III. RELATIONSHIP BETWEEN SUBMISSIONS AND GRADE

In terms of personality factors, the analysis found that students with lower intelligence indicators are more likely to experience learning disability, while those with higher intelligence indicators are less likely to experience learning disability. In addition, although outstanding students in academic excellence also have poor self-discipline, they account for only 25% of the total number of students in the higher mathematics course, and only 22.2% of the total number of credits statistics. Most students with excellent academic have self-discipline with high points. Among the learning disability students, 60% of the students have poor self-discipline with low points, so the indicator of self-discipline is representative.

#### IV. CONCLUSION

The paper pre-processes the log of collected personality factors and learning behaviors, including behavior coding, conversation recognition and separation, and statistics useful information such as online duration and the number of student program submissions. Based on this analysis, the results are analyzed. It shows that students have different performances in learning duration, the number of logs, and the number of program submissions. There is a significant relationship between self-discipline in personality factors and learning disability, which can be used to give guide to students with learning disability.

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