Non-Cognitive Student Evaluation Based on Multidimensional Library Data

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Abstract: Based on the behavioral data of college students in the library, this paper studies the characteristics and contents of college students' non-cognitive ability. Based on the core concept of non-cognitive ability, combined with the big five personality characteristics and the content characteristics of sample data, four quantitative behavioral indicators that can describe non-cognitive ability were developed, and 18 secondary indicators were developed by referring to the specific data content available, which can reflect the non-cognitive ability of students in detail.

1. Introduction

Cognitive ability and non-cognitive ability jointly dominate People's Daily behaviors, including learning activities and life activities. Many scholars believe that cognitive ability plays a fundamental role in People's Daily life, while non-cognitive ability acts as a catalyst in behavioral activities. The two kinds of behaviors promote and blend with each other in learning and living activities. Cognitive ability mainly undertakes the task of information processing, belongs to the category of people's cognitive activities, and helps people's logical thinking development; Non-cognitive ability plays a regulating role in learning and life activities. It belongs to the category of intention activities and is the psychological tendency in cognitive activities. Based on previous studies on non-cognitive ability, this paper attributes the influence factors of non-cognitive ability to four aspects: concentration, learning perseverance, learning motivation and open thinking, and then studies and discusses it. The study on the phenomenon of "reading fever" refers to the study on the reading behavior of students in university libraries, including the borrowing rate of readers in the library, readers' activeness and which books are more popular among students.

2. Research on evaluation indicators of non-cognitive ability

2.1. Library data required for non-cognitive ability evaluation

Data collection is the premise of data analysis. By quantifying the corresponding data of indicators, relevant analysis is carried out to evaluate the non-cognitive ability of college students. The data in this paper comes from the background data of the library management system, which mainly includes four modules, book borrowing data module, access control system data module, digital platform module and auxiliary facilities module. The details are shown in the following figure.[1]

The book borrowing data module contains information such as the number of books borrowed by students, borrowing time, return time, book name, book type, etc. The data module of access control system includes three access control subsystems, namely library access control system, computer room access control system and school history hall access control system. The system data covers the time and times of students entering and leaving the site. The digital platform module contains three major parts of data. The first part is the number of WIFI connection: the relevant data of students connecting to the library wireless network, including the time of logging in and out of the wireless network and the cumulative time of connecting to the network.[2] The second part of the electronic resources: various professional electronic databases, thesis websites, online courses. The

third part of online lecture: cloud lecture information release and students to watch the lecture information.The auxiliary facilities module includes three supporting facilities of the library. The first facility is the leisure area facility, which provides students with self-funded tea, snacks and rest areas. The second facility is the document printing facility, which provides library students with printing services for paper documents, photos and other content. The third facility is the Storage Service Facility, which provides storage cabinets for library students to store related items for short periods.The data can be obtained through the library backstage management system, the library online service system and the library borrowing data platform.[3] The original data initially obtained contains outliers, which need to be cleaned by data verification, audit, desensitization and other technical measures.
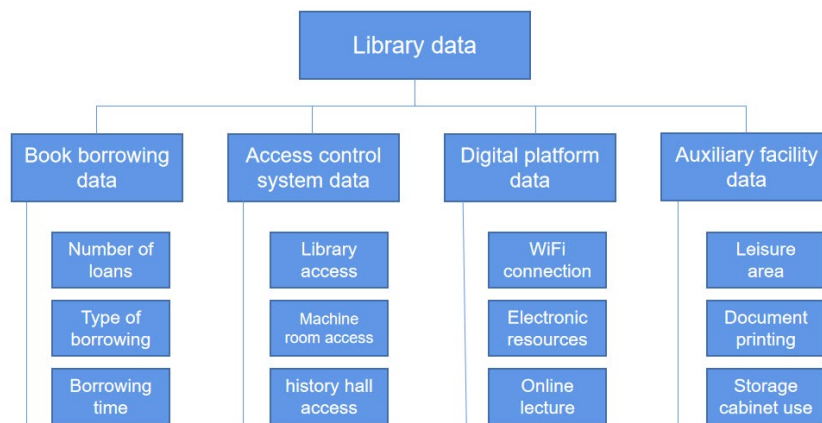
Figure 1 Library data architecture diagram.

2.2. Data processing

In order to unify the comparison benchmark of each indicator, this study made Min-Max normalized to the 18 second-level indicators in the quantitative behavioral indicators of non-cognitive ability. [4]Normalization processing scaled the data so that they fell into fixed specific intervals. The normalization purpose is to remove the unit limit of the data, converted to the pure values of the dimensions, to enable comparison and weighting.

2.3. Quantitative behavioral indicators of non-cognitive ability

Based on the behavioral data of university users in the library, this study transforms the relevant behavioral data into quantitative behavioral indicators that can describe non-cognitive ability: four non-cognitive abilities as the first level indicators, which are concentration, learning perseverance, learning motivation and open thinking.[5] The specific analysis of the quantitative behavioral indicators of non-cognitive ability is as follows, Focus emphasizes the long time and effort required to achieve a goal, Therefore, it is necessary to consider the length of time students borrow each book and the time they enter the library; Learning perseverance emphasizes the enthusiasm and perseverance needed to achieve your goals, We need to consider the cumulative duration of students' learning activities in the library and the total number of books borrowed; Learning motivation emphasizes that students' learning value comes from the learning activities themselves, Students need to consider the type of learning content, the type of books borrowed, and the type of inquiry data; Open thinking emphasizes the diversity of learning activities carried out by students in the museum, Library provides rich hardware and software resources for students to study, It is necessary to consider whether students actively participate in various learning activities and use activity equipment.[6]

Figure 2 First-level indicators of non-cognitive ability evaluation.

Through the definition of first-level indicators, this paper then designed 18 second-level indicators. The second-level indicators of concentration include: single study time C1, the number of entry and out of the library in a single day C2, the reading time of each borrowed book C3, the number of consumption in the library in a single day C4. The second level indicators of learning perseverance include: the total length of the academic year P1, the total number of books borrowed in the academic year P2, the total length of books borrowed in the academic year P3, the total number of electronic resources downloaded P4. Learning motivation of secondary indicators include: the final exam cycle into the library number and usually into the library number ratio of M1, borrowing books belong to test books (such as four 6 preparation data, computer secondary test data) M2, electronic resources use type (web paper) M3, lecture type M4, library file printing data type M5. The second-level indicators of open thinking include: total number of lecture participation in the academic year O1, number of school history museum, museum visits O2, total duration of network connection in the academic year O3, total duration of computer room use in the academic year O4, total download of electronic resources O5. As shown in the figure below.

Table 1 Secondary indicators of non-cognitive ability evaluation.

Level 1 indicators	Secondary indicators	
Perseverance	P1	Total duration of the school year
	P2	Total number of books borrowed in the academic year
	P3	Total length of the books borrowed in the school year
	P4	Total downloads of electronic resources
Concentration	C1	Single entry and study time
	C2	Library visits in a single day
	C3	Each borrowed book lasts read long
	C4	Number of consumption times in a single day
openness	O1	Total number of academic year lecture participants
	O2	Number of visits to the school history museum and museum in the academic year
	O3	Total duration of school year
	O4	The total duration of machine room in school year
	O5	Total downloads of electronic resources
Motivation	M1	The ratio of the number of entries in the final examination period to the number of usual entries
	M2	The type of borrowed books is the examination books
	M3	Electronic resource use type, CNKI paper
	M4	Type of lecture participation
	M5	Data type of file printing in the library

3. Summary

This paper studies the non-cognitive ability characteristics of college students, and provides first-level and second-level index theories for evaluating non-cognitive ability to reflect students' non-cognitive ability. By dividing students into different groups, the overall characteristics of students can be quickly understood, and the common problems of different student groups can be explored, so as to provide a basis for exploring students' non-cognitive ability. As for the shortcomings of this paper, there are still some optimized content, the construction of university library system is not perfect, and the student behavior data collected is not comprehensive. And the data analysis algorithm is single, should use a variety of algorithms for comprehensive consideration. For these shortcomings, the follow-up research should continue to deepen and capture more detailed behavioral data as a research basis.

References

[1] Qin Yue, Xu Feng. Research on the Discipline Construction and Characteristics of Artificial Intelligence in Chinese Universities [J]. Science and Technology Management Research 2021,41 (3): 132-138.

[2] Gu Xiaoqing, Wang Chao (2021). Open a new window of technological innovation in classroom teaching: to depict the classroom application scenario of AIoT [J]. Research on Modern Distance Education, 33 (2): 3-12.

[3] Sun Bo, Liu Yongna, Chen Jiubing, Luo Jihong, Zhang Di (2015). Affective analysis based on facial expressions in an intelligent learning environment [J]. Research on modern distance education, (2): 96-103.

[4] Chen Binli, Bai Xiaoxi (2015). Family social and economic status, parental peers and urban primary school tutoring- -based on the primary school survey in Haidian District, Beijing [J]. Educational Research, Tsinghua University, 36 (5): 102-109.

[5] Feng Xiang, Qiu Longhui, Guo Xiaoran (2019). Based on LSTM model [J]. Open Education Research, 25 (2): 114-120.

[6] Wang Yiyan, Zheng Yonghe (2021). Educational situation perception for intelligent classroom: value positioning, characteristic model and practical framework [J]. Research on Audio-visual Education, 42 (11): 84-91.