Construction of the Model of Factors Affecting Chinese College and University Students' Learning Behavior during the COVID-19 Pandemic

Received: June 7, 2022
Revised: June 23, 2022
Accepted: June 26, 2022

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Abstract

This paper carries out a study on the changes in the learning behavior, academic performance, learning psychology, and development expectation of Chinese university and college students due to the online teaching method during the COVID-19 pandemic through criterion sampling. The model of factors affecting students' learning behavior during the COVID-19 pandemic was built based on grounded theory and iceberg theory through a semi-structured interview with 20 students from different universities and colleges in Guizhou, Guangxi, and Guangdong, China. This study obtained data by completing the determination of research direction, proposing interview outline, signing interview agreement with interviewees, simulating interview training and formal interview. This model includes the core coding of "explicit behavior and implicit behavior", the associative coding of "learning ability", "practical ability", "development capability", "learning feeling", and "personality and intrinsic motivation", and open coding of 21 items such as attention, observation power, and memory.

Keywords: COVID-19 Pandemic, Online Teaching, Students, Learning Behavior, Model of Factors

1. Problem Statement

NOVEL CORONAVIRUS PNEUMONIA, NCP, as a public health emergency, has caused serious impact and changes on the physical health, mental health, social adaptation, and moral health of people all over the world (Guo & Li, 2001). For this reason, all countries in the world introduce corresponding policies on health, economic construction, education development to cope effectively with the COVID-19 shocks. According to UNESCO statistics, by May 25, 2021, schools in 164 countries have been closed because of the COVID-19 pandemic, affecting 445 million students.

On February 4, 2020, the Ministry of Education of the People's Republic of China issued the Directive Opinions on the Organization and Management of Online Teaching for Colleges and Universities during the COVID-19 Prevention and Control Period, requiring adopting the "government-led, university-subject, and society-participated" method, to jointly implement and guarantee online teaching in colleges and universities during the pandemic prevention and control period, to realize "class suspended without stopping teaching and studying" in the social context of the whole nation under home quarantine.

Ma et al. (2020) believed that my country has ushered in the OMO era, and through the organic combination of online and offline teaching activities, blended teaching is carried out, but to improve the ability of Chinese universities and colleges to cope effectively with the

organizational behavior of teaching and reduce the impact of emergencies on the students' learning behavior and effectiveness in a large extremely passive closed situation, scholars have carried out the research on students' learning behavior and effectiveness during the pandemic and have not stopped now.

This research team found by literature collection that existing research results pay more attention to the analysis of students' online learning behavior, attitude, and motivation, instead of the research on the factors affecting students' learning behaviors during the pandemic and special period, failing to explain accurately the question of "the factors affecting the students' learning behavior during the pandemic" in detail. To improve the learning behavior and effectiveness of university and college students during the pandemic and cope with unknown risks in the natural development, the research team believes that it is necessary to carry out systematic and in-depth research on the factors affecting university and college students' learning behavior.

2. Basis of Preliminary Research

2.1 Preliminary Research on the Factors Affecting the Students' Learning Behaviors

Centering on the factors affecting the students' learning behaviors, scholars made in-depth research on the external factors such as learning environment and social environment and internal factors such as self-efficacy, learning attitude, and satisfaction by different research methods from multiple perspectives.

In terms of external factors, Govaerts et al. (2011) believed that the learning environment is also an important variable for students' learning behavior and there is a positive correlation between students' learning behavior and learning environment. However, Saenz et al. (1999) believed that students' learning behavior is related to the educational level of their parents. In addition, some studies also show that student performance depends on many factors such as learning facilities, and sex and age differences (Hansen, Joe B., 2000). Lillian Smyth et al. (2016) believed that students are driven, learning outcomes are affected not only by their character and learning environment but also by the social environment they perceive. Wan Kun (2021) found that the external influencing factors of students' online learning engagement are mainly reflected in the learning environment, the roles of teachers, and students' social interaction at present. In addition, some researchers pay attention to students' self-efficacy, learning attitude, learning satisfaction, and other personal internal factors. Roselainy Abdul Rahman (2012) believed that students' self-motivation and background knowledge are important factors affecting students' learning behavior. They found that students' self-efficacy can affect their choice of online learning activities and personal efforts and persistence in the activities.

2.2 Preliminary Research on Chinese Students' Learning Behavior in the Context of the Pandemic.

At present, the research on affecting students' learning behavior in the context of the pandemic mainly focuses on the analysis of learning effectiveness and learning behavior, the feeling of learning, and learning motivation. The more common research mode is the combination of theoretical and empirical research and the integration of multiple methods, and the method used is mainly questionnaire survey method and behavioral event interview.

In terms of learning effectiveness and behavior, Ma et al. (2020) analyzed the main reason for affecting the outcome of learning from online teaching, specifically, students' self-discipline ability, the efficiency to learn from videos and guidance, and the ability of teachers to solve problems and give feedback. Wu et al. (2020) found that what the research university

students are concerned about is teaching strategies and teaching contents of teachers, but the applied university students pay more attention to the functions and technical service support of online course platforms and teachers' energy in the class. In terms of research on students' self-regulated learning behavior, Li and Zhou (2020) studied the students' self-regulation in online courses based on the basic theory of self-regulated learning behavior and concluded that online learning platform for students and their self-regulation affect their learning effects. Zhu et al. (2020) believed that the students' intention to participate in an online course is directly affected by their attitude to online learning. Wang et al. (2020) believed that learning activities are the result of their learning motivation and there is a close relationship between the strength of students' learning motivation and learning effects.

3. Construction of the Model of Factors Affecting Students' Learning Behavior

3.1 Research Object

Considering the representativeness of research objects and the feasibility of carrying out the research, so "criterion sampling" for qualitative research is used to select interviewees. This study set the standards and conditions for sampling according to regions, schools, and grades. Finally, the interview research was conducted with junior students who experienced online teaching of COVID-19 in Guangdong Teachers College of Foreign Language and Arts, Guizhou Institute of Technology, and Guangxi Arts University, including 11 women and 9 men. According to Lincoln and Guba, (1985) showed that the sample size for the interview purpose should be more than 12. The number of valid interview samples in this research is 20, meeting the requirements of carrying out research.

3.2 Research Method

3.2.1 Grounded Theory Method

Grounded theory is a qualitative research method proposed by Anselm Strauss and Barney Glaser in 1967, a method of not setting up theoretical assumptions in advance, but summarizing, refining concepts and categories from the original data, and gradually building the corresponding theory. This method is perfect for the analysis of interview data.

The grounded theory emphasizes that theories come from data, researchers must go to the field in person and perform scenario analysis and textual analysis for data collected. Furthermore, this theory has a strict operating procedure, including the following steps: 1. record the data level by level; 2. ask generative theoretical questions related to concepts; 3. establish connections between concepts; 4. systematically encode data; 5. build a theory. There are no special provisions on the sample size in theoretical sampling. Once the theory reaches saturation, sampling will be stopped (Song & Fu, 2017).

The most important link of the grounded theory is to code data level by level, this study includes coding of three levels. Level 1: open record; level 2: associative (axial) record; Level 3: core record (Yu & Liu, 2019). In this study, the grounded theory guided the collection and analysis of 20 semi-structured interviews.

3.2.2 Iceberg Theory Method

Iceberg theory comes from psychology. Sigmund Freud compared the psyche to an iceberg, considered the conscious level and the subconscious level as the tip of the iceberg emerging from the water and a huge part hidden under the water respectively, emphasizing the individual level of consciousness. According to Satir iceberg theory, the part of an iceberg emerging from the water represents human behavior, namely, a coping model, and the part of the iceberg hidden under the water is the coping methods, feelings, views, expectations, desires, and self, analyzing the experience level, emphasizing what we have experienced (Wu, 2016).

According to American psychologist McClelland (1973), the ability and quality also show a state similar to an iceberg. The explicit factors affecting students' learning behavior during the pandemic period can be highlighted and meantime the implicit factors can be discovered through the analysis of iceberg theory.

3.2.3 Semi-Structured Interview

Based on the purpose of this interview, the research team adopted the method of the semi-structured interview when designing the interview, and the interviews were conducted in three universities according to the convenient sampling method (see Table 1 for the interview sample). The interview time of each interviewee is about 60 min, except very few in-depth interviews take 80 min (Dunkerley, 2014). During the interview, the interview's alternative questions are changed in time according to the interview outline and the answers of the interviewees. The interview focused on students' learning in the context of the COVID-19 pandemic, and we understand the changes in students' learning behavior in the 2020 spring semester through the interview.

Table 1

Basic Information of Interview Samples

No.	Sex	Age	Grade	Interview location	Major	The only child or not	Family background	Length of interview (min)
A1	Female	20	Junior year	Guangdong	Environmental Art Design	Y	Parents are employees of public institutions	62:52
A2	Female	20	Junior year	Guangdong	Art Design	N	Parents are self-employed individuals	65:21
A3	Female	21	Junior year	Guangdong	Music Education	N	Parents are businessmen	68:53
A4	Male	20	Junior year	Guangdong	Product Art Design	N	Coming from rural areas, parents are farmers	63:34
A5	Male	21	Junior year	Guangdong	Preschool Education	Y	His father is a businessman and his mother is a teacher	66:58
A6	Male	20	Junior year	Guangdong	Digital Media Art	N	Parents are migrant workers	71:37
B1	Male	21	Junior year	Guizhou	Environmental Engineering	Y	His mother is an employee of a public institution and his father is a civil servant	68:21
B2	Female	20	Junior year	Guizhou	Biopharmaceutical	Y	Her father is a businessman and her mother is a civil servant	64:45
B3	Female	20	Junior year	Guizhou	Hydraulic and Hydro-Power Engineering	Y	Parents are civil servants	70:52

No.	Sex	Age	Grade	Interview location	Major	The only child or not	Family background	Length of interview (min)
B4	Female	20	Junior year	Guizhou	Mechatronic Engineering	Y	Her father is an engineer and her mother is a leader of a state-owned enterprise	63:45
B5	Male	20	Junior year	Guizhou	Brewing Engineering	N	Parents are distillery technicians	73:35
B6	Female	21	Junior year	Guizhou	Traffic Engineering	Y	Parents are civil servants	67:03
B7	Male	20	Junior year	Guizhou	Civil Engineering	Y	His father is a civil servant, and his mother is a teacher	62:48
C1	Male	20	Junior year	Guangxi	Sculpture	N	Parents are migrant workers	65:36
C2	Female	20	Junior year	Guangxi	Industrial Art	Y	Parents are employees of public institutions	65:12
C3	Male	21	Junior year	Guangxi	Musical Performance	Y	Parents are employees of state-owned enterprises	66:37
C4	Female	21	Junior year	Guangxi	Product Design	N	Her father is a businessman and her mother is an employee of a public institution	69:48
C5	Female	20	Junior year	Guangxi	Dance Performance	Y	Parents are businessmen	83:06
C6	Female	21	Junior year	Guangxi	Cultural Industry Management	Y	Her mother is a media and communication worker	63:44

3.3 Procedures

In the preliminary preparation stage of this study, a research direction is determined, an interview outline is proposed, an interview agreement is signed with interviewees, and interview training is simulated. In terms of the research direction, through a lot of literature, the research gradually focuses on the changes of university and college students in learning behavior, academic performance status, learning psychology, and even career expectations after the pandemic. Thus, a semi-structured interview outline is proposed, consisting of the following questions: What impact do you think the COVID-19 pandemic has had on learning? What impact do you think the COVID-19 pandemic has had on the learning in the practical course? “What impact do you think the COVID-19 pandemic has had on your academic development during the COVID-19 pandemic?” “What changes do you think you have in learning psychology during the COVID-19 pandemic?” “Do you think the COVID-19 pandemic will affect your career direction?” The interview training was simulated through the internal practice of the research team.

The formal interview is divided into two stages. To ensure the internal consistency of coding in the follow-up study, the research team first conducted in-depth interviews with two interviewees based on the principle of proximity, and then conducted open precoding on the two interview materials, and took the high-frequency words in the original materials (or words with different expressions but similar meanings due to personal habits) as keywords to form the basic coding and extract concepts, and finally the Coding Dictionary was formed for this study. After that, we conducted one-on-one in-depth interviews with 18 formal interviewees to obtain rich basic data as much as possible.

In the two-stage interview, five team members for interview training generally give the interview outline to the interviewees one day before the interview, and interview with interviewees according to the prepared interview outline within the agreed time to ensure the research norms and obtain effective information as efficiently as possible. The length of the interview is generally controlled at about 1h, and the recorded data are transcribed into the text after the interview to form the main basic data source of this study.

In sorting out the interview results, it is found that the feedback of students mainly focuses on the changes in personal attention, understanding ability, practical operation ability and expectation for future development caused by the change of learning environment and learning method. The research team adopted grounded theory to present the text data in the form of three-level coding. Level 1 coding is open coding, the formal coding of 20 copies of text data according to the Coding Dictionary sorted out in the first stage (Liu, 2019). After sorting and merging, Level 1 coding of 21 items such as attention, observation power, memory, understanding ability, practical ability, executive ability, cooperation ability, and integration ability is formed, and the coding of Chinese college and university students' learning behavior is formed in the context of the COVID-19 pandemic. As associative coding, Level 2 coding compares and refines the concept of Level 1 coding, sorts out the correlation and dimensional relationship between Level 1 coding, and summarizes the dimensions of learning ability, practical ability, development capability, learning feeling, personality and intrinsic motivation. As core coding, Level 3 coding is a further induction and summary of associative coding, and a systematic theoretical construction is formed. At this stage, the research team summarizes two types of core coding, namely, explicit behavior and implicit behavior, according to the iceberg theory.

3.4 Findings

According to iceberg theory, the research team formed a code table of factors affecting the college and university students' learning behavior in the context of COVID-19 based on the three levels of coding, as shown in Table 2.

Table 2

Code of Factors Affecting University and College Students' Learning Behavior in the Context of the COVID-19 Pandemic

Core coding	Associative coding	Open coding	Number of persons referred	Number of times referred
Explicit Behavior	Learning Ability	Attention	18	68
		Observation power	19	73
		Memory	20	85
		Understanding ability	19	82
		Expressive ability	17	88

Core coding	Associative coding	Open coding	Number of persons referred	Number of times referred
Explicit behavior	Practical Ability	Practical ability	17	89
		Executive ability	15	67
		Cooperation ability	13	56
		Integration capability	12	48
Implicit behavior	Development Capacity	Innovation ability	16	65
		Imagination	14	57
		Logical thinking ability	15	46
	Learning Feeling	About schools	20	41
		About courses	20	65
		About teachers	20	33
		About environments	18	24
	Personality and Intrinsic Motivation	Independent consciousness	16	53
		Desire for knowledge	19	85
		Self-control ability	15	49
		Achievement needs	20	67
		Goal pursuit	19	96

3.4.1 Explicit Behavior

In this study, explicit behavior affecting university and college students' learning in the context of the COVID-19 pandemic can be summarized into two core elements, namely, learning ability and practical ability.

3.4.1.1 Learning Ability

In this study, the associative coding is mainly to explore students' behavior involved in learning professional theory. This item has been mentioned 396 times in total, and its open coding is arranged as follows in order of the number of persons and times referred: expressive ability (the number of persons and times of referring to students' ability to express and describe personal opinions in the process of theoretical learning is 17/88 respectively), memory (the number of persons and times of referring to the students' impression of the key knowledge or important links they have learned after a period of time is 20/85 respectively), understanding ability (the number of persons and times of referring to the students' understanding of key knowledge in the process of theoretical learning is 19/82 respectively), observation power (the number of persons and times of referring to the sensitivity of students to the detailed observation of theoretical knowledge in the learning process is 19/73 respectively), and attention (the number of persons and times of referring to whether students can concentrate better in the theoretical learning process is 18/68 respectively).

3.4.1.2 Practical Ability

This ability refers to the practical operation ability of university and college students in professional learning. This item has been mentioned 260 times in total, and its open coding is arranged as follows in order of the number of persons and times referred: practical ability (the number of persons and times of referring to students' practical operation ability in the

learning process is 17/89 respectively), executive ability (the number of persons and times of referring to students' implementation status of teaching tasks in the learning process is 15/67 respectively), cooperation ability (the number of persons and times of referring to cooperation between students for team cooperation projects in the learning process is 13/56 respectively), and integration capacity (the number of persons and times of referring to the ability to integrate different resources for relatively complex comprehensive practical projects in the learning process is 12/48 respectively).

3.4.2 Implicit Behavior

Implicit behavior is the characteristics of invisible behavior under the iceberg. These characteristics are generally not easy to detect, but they are the key factors affecting students' learning behavior to a certain extent. This study found that the implicit behavior affecting college students' learning mainly includes the core elements of development capability, learning feeling and intrinsic motivation.

3.4.2.1 Development Capability

The development potential will determine the width, breadth and speed of students' future growth and what is mainly observed in this project is students' thinking activity and logical thinking ability. The interviewees mentioned the content 170 times in total, and its open coding is arranged in order of the number of persons and times referred: innovation ability (the number of persons and times of referring to the ability to achieve breakthrough progress for a specific task goal in the learning process is 16/65 respectively), imagination (the number of persons and times of referring to the ability to connect different elements by jump thinking in the learning process is 14/57 respectively), and logical thinking ability (the number of persons and times of referring to the ability to think dialectically and solve complex tasks gradually and methodically in the learning process is 12/48 respectively).

3.4.2.2 Learning Feeling

What is mainly observed is students' subjective judgment on learning status, environment and harvest. In the research, the project team found that once the subjective feeling of learning is formed, it will solidify rapidly and has a directional impact on students' specific learning behavior in a period of time. The interviewees mentioned the content 163 times in total, and its open coding is arranged as follows in order of the number of persons and times referred: to courses (the number of persons and times of referring to students' learning feelings about the course is 20/65 respectively), to schools (the number of persons and times of referring to students' understanding and feeling about the school management system, curriculum, time and other arrangements is 20/41 respectively), and to teachers (the number of persons and times of referring to students' likes and dislikes of teachers' charm, teaching means, and means of knowledge dissemination is 20/33 respectively), and to the environment (the number of persons and times of referring to students' feelings about their learning atmosphere, network environment support, time arrangement, etc., is 18/24 respectively).

3.4.2.3 Personality and Intrinsic Motivation

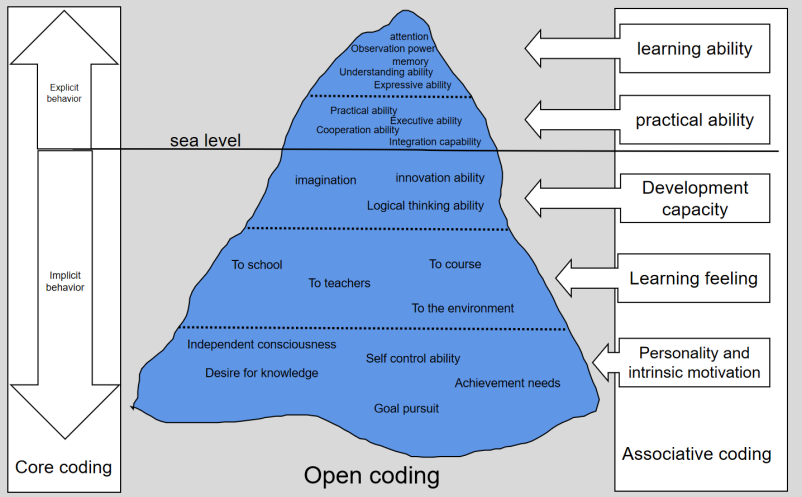
Personality is the generic term of individual thoughts, emotions, values, attitudes and other behavior. Internal motivation is the driving force inspired by an individual psychological tendency to move towards goals. It is similar to learning feeling. Once formed, it will solidify rapidly, and has a certain tendency and stability. The interviewees mentioned the content 350 times in total, and its open coding is arranged in order of the number of persons and times referred: goal pursuit (the number of persons and times of referring to students' goals for personal career development are 19/96 respectively), desire for knowledge (the number of persons and times of referring to students' desire for knowledge in unknown fields is 19/85 respectively), achievement needs (the number of persons and

times of referring to students' expectations of future achievements is 20/67 respectively), independent consciousness (the number of persons and times of referring to students' opinions on their personality expression, emotion and demeanor is 16/53 respectively), self-control ability (the number of persons and times of referring to students' self-management ability of study and life behavior is 15/49 respectively).

Based on the induction of three levels of coding, a model of factors affecting the university and college students' learning behavior in the context of the COVID-19 pandemic is formed, as shown in Fig. 1.

Figure 1

The Model of Factors Affecting University and College Students' Learning Behavior in the Context of the COVID-19 Pandemic



4. Verification of the Validity of the Model

To test and ensure the reliability and validity of this study, according to the research suggestions of Wu and Huang, (2012), the original data inspection method is adopted in this study, and the original data are continuously consulted for verification and comparison at all levels of coding. In addition, this study adopts the research suggestions of Mbengi (2016) and other scholars, and adopts the expert consultation method for inspection. Six experts in college and university education were successively consulted, including the vice chairman of the Chinese Society for Technical and Vocational Education (CSTVE), the committee member of the Guangdong Society of Higher Education and the member of the Guangdong Academy of Education for their comments and suggestions, to ensure the correctness of interpreting text and ensure the reliability and effectiveness of this study.

5. Conclusions and Follow-up Study

The construction of a model of factors affecting the college and university students' learning behavior in the context of the COVID-19 pandemic is a good answer to the question of "what factors affect the college and university students' learning behavior during the pandemic". The construction of this model not only provides reference and a basis for teachers to better provide teaching services for students and improve students' learning effect in the context of online teaching but also provides a reference for students to better adapt to the teaching methods of online teaching. Meantime, this model can provide a reference for colleges

and universities on how to improve management efficiency in the context of online teaching, and also provide a basis and standard for colleges and universities to stabilize students' learning behavior in response to public emergencies.

This study constructs a model of factors through interviews with college and university students of different majors in different provinces, but it is found that the sample size is small, that is, the scope of interviewees is not large enough within 31 provinces and cities. It is suggested that in future research, the research scale can be worked out based on the model of this study and samples can be taken in a larger range, to provide more convincing and reliable data for the study of students' learning behavior in the context of the pandemic.

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Appendix: Interview Outline

I. How do you feel you were affected in your study during the New Crown epidemic? For example, the environment, teaching methods, etc.

II. How do you think your learning in practical courses was affected during the New Crown epidemic?

Ⅲ. How do you feel your academic development has been affected during the NPS?

IV. What do you think has changed in your learning mindset during the New Crown epidemic?

V. Do you think the new crown epidemic will affect your career choice?