A Study of Learning Engagement and Its Influencing Factors Under E-Learning Platform: Based on Behavioral Event Analysis Model

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Abstract

During the COVID-19, the analysis of data on the use of e-learning platforms revealed that e-learning gradually became the main learning method for students. On the one hand, e-learning can solve the crisis of students' suspension from classes and schools. But on the other hand, the phenomenon of decreasing students' learning engagement level can occur in the process of e-learning, which is detrimental to students' learning development. Therefore, based on the behavioral event analysis model in big data analysis, this paper analyzes the usage data of e-learning platforms and collates and summarizes the existing literature studies, thus summarizing the main influencing factors of students' learning engagement and finally proposing corresponding countermeasures to improve the level of students' learning engagement during the COVID-19 and promote the sustainable development of the e-learning model.

Keywords: *online learning; learning engagement; behavioral event analysis model; data analysis; COVID-19*

1   INTRODUCTION

In early 2020, the sudden arrival of COVID-19 disrupted people's lives. In order to prevent the spread of the epidemic in schools, education departments around the world advocated "stopping classes without teaching, stopping classes without learning" and building a comprehensive online teaching system to ensure that students can carry out normal learning activities at home. According to the 47th Statistical Report on the Development Status of China's Internet (2020) released by the China Internet Network Information Center, as of December 2020, the number of online education users in China reached 342 million, accounting for 34.6% of all Internet users. As can be seen from Table 1, compared with the data in June 2019, the number of online education users in December 2020 increased by about 109 million. In addition to this, take online teaching platform software as an example.

Table 1: 2016.12-2020.12 Number of online education users and usage rate.

	Number of online education users (Unit: million people)	Online education usage rate (%)
2016.12	13764	18.8
2017.12	15518	20.1
2018.12	20123	24.3
2019.06	23246	27.2
2020.03	42296	46.8
2020.12	34171	34.6

Online learning, that is, refers to a kind of learning activity with electronic products and the Internet as the medium. Compared with traditional teaching activities, online learning has three main characteristics: firstly, the extensive sharing of online learning resources; secondly, it breaks the limitations of time and space; and thirdly, it takes the form of individual independent and negotiated learning. The development of online learning is both an

opportunity and a challenge. On the one hand, online learning solves the dilemma of students not being able to study at school and brings students a wealth of teaching resources. However, on the other hand, online learning has a strong virtual nature and less pedagogical interventions, and students are easily distracted by the lack of supervision and attracted to information on the Internet that is not relevant to their learning, which in turn affects their learning outcomes [20].

Therefore, this paper firstly summarizes the definition of concepts related to learning engagement, secondly, based on the behavioral event analysis model, analyzes the data of online learning platforms, and combines the existing literature studies to analyze and derive the influencing factors of students' learning engagement, and finally proposes suggestions to improve students' learning engagement, so as to promote the development of online learning system construction and promote students' mental health level in the online learning environment.

2 LEARNING ENGAGEMENT CONCEPT DEFINITION

There is no uniform definition of learning engagement among national and international scholars. In the 1930s, Tyler introduced the concept of 'time on task' and argued that the more time students devoted to learning, the more learning they would achieve. Schaufeli (2002) argues that engagement is a positive and fulfilling state of mind associated with learning, including energy, dedication and focus. Vitality refers to showing exceptional energy and resilience in learning, working hard and not being afraid of difficulties. Dedication refers to the strong sense of meaning, pride and enthusiasm for learning shown by individuals who are able to give their full attention to their studies and dare to take on challenges. Dedication is a state of mind that is completely immersed in pleasure, which puts all its attention on learning and enjoying the sensation of pleasure. [18]

Fredricks et al. (2004) [3] suggest that learning engagement includes three different dimensions: behavioural, affective and cognitive. Behavioural engagement is the degree to which an individual is highly engaged in school learning or non-learning. Emotional engagement, also known as affective engagement or psychological engagement, refers to positive emotional responses to learning tasks or others and a sense of belonging to the school. Cognitive engagement is a 'thinking exercise' that encompasses a high level of engagement with the cognitive strategies and psychological resources used by learners in the learning process. The Programme for International Student Assessment (PISA) considers learning engagement to be the overall perception of learning and the level of engagement in learning activities, and PISA 2009

considers learning engagement as an important measure of student literacy and quality of teaching and learning [14]. It has different values in different contexts. Subsequently, Fredricks et al. (2016) added the dimension of social engagement to the original three-dimensional framework, i.e. social interactions between teachers and students or students and peers. Bond et al. (2020) stated that learning engagement is the amount of energy and effort students expend in their studies and can be observed and evaluated in terms of behavioural, cognitive and affective aspects.

In contrast, Chinese scholar Kong Qiping (2000) divides the study of student engagement into two parts, one part considers student engagement to be an active and individualised curriculum experience, while the other part considers student engagement to be a psychological activity carried out by students' behavioural input. [8] Qiao Xiaorong (2006) argues that learning engagement includes both behavioural and affective elements, and that learning engagement can be demonstrated through behavioural expressions such as starting, participating, making an effort, concentrating, and being brave enough to face difficulties without giving up, as well as positive affective experiences, all of which can be reflected in the process of working towards a goal. [15] According to Sun Weiwen (2009), learning engagement refers to the degree of behavioural involvement, the quality of affective experience and the level of cognitive strategies used by students in the process of learning activities. Liu Dongyan and Liu Jiawan (2014) considered learning engagement as a multivariate consisting of three elements: behavioural, cognitive and affective engagement. [11] Guo Yuanxiang (2016) proposed that learning engagement consists of individual factors and social factors, with individual factors including students' behaviour, emotional attitudes, thinking styles, quality of will, life experiences and learning strategies, while social factors include school and teachers. [5]

3 BEHAVIORAL EVENT ANALYSIS MODEL

In the study of students' learning inputs in the data analysis model of e-learning platform, the behavioral event analysis model in the user behavior analysis model is mainly applied. Behavioral event analysis is a method to analyze the behavior of users. An event is a professional description of a user's behavior towards a product, and all user feedback on the product can be extracted as an event. Mainly by studying the elements associated with the occurrence of an event such as user registration, browsing product detail page and fund withdrawal, we can discover the reasons and interactive influences behind the user's behavioral events.

The behavioral event analysis model has promising applications in screening, grouping, aggregation, etc. The behavioral event analysis model generally goes through

steps such as event definition and selection, drill-down analysis, interpretation and conclusion. The first step, event definition and selection, mainly refers to users accomplishing specific things at specific times and places, in specific ways. In the second step, event analysis dimensions are determined, and refined conditions are filtered, and drill-down analysis is performed after the discovery of patterns. In the third step, summarize and analyze, and rationalize the analysis results.

According to statistics, China's online education platform, Super Star Learning software which added 18 million new users during the COVID-19, reached 13.5 million active users and covered more than 4,000 schools. Rain Classroom software has grown by 26 million users, with an average monthly active population of over 30 million, covering over 6,000 institutions and agencies. And DingTalk software users have exceeded 300 million by the end of March 2020, and supported 140,000 schools, 3 million classes and 130 million students to attend classes online nationwide. Another example is Zoom, a commonly used online video software both at home and abroad, which was also one of the common software used by students for online learning activities during the epidemic. According to data, the number of people using Zoom in a single day had rapidly increased from 10 million to 300 million by March 2020, and by April, Zoom's usage had surged 30-fold. This shows how much demand there is for the use of online teaching platforms during the Newcastle Pneumonia epidemic, and that there is a large upside to the development of e-learning.

Moreover, as shown in Tables 2 and 3, during the COVID-19, students used cell phones and computers for long periods of time to attend classes, and those who used online teaching software for 30 to 45 minutes accounted for 38.7% and those who used it for 46 to 60 minutes accounted for 30.1%. Once an individual's online learning time increases, negative academic emotions begin to emerge, which in turn reduces the level of online learning engagement [1].

Table 2: The ratio of daily usage hours of e-learning software users in 2020.

Duration	The ratio of daily usage hours of e-learning software users (%)
Under 30 minutes	19.5
30-45 minutes	38.7
46-60 minutes	30.1
61-90 minutes	9.8
90 minutes or more	1.9

Table 3: The ratio of devices used by users of e-learning software.

Using equipment	Usage Rate (%)
Mobile Phone	36.2
Computer	48.6
Tablet	15.2

4 LEARNING ENGAGEMENT INFLUENCING FACTORS

Combined with the background of the COVID-19, this paper summarizes and summarizes the following three factors by analyzing the behavioral event data of users of online learning platforms and combing the existing literature.

4.1 Individual Factors

A large body of research now shows that individual student factors can influence the level of learning engagement, for example, individual factors such as individual resilience, emotion and motivation to learn can all influence the level of learning engagement.

According to Castro et al. (2017), students' adaptive capacity is positively proportional to their level of learning engagement, and the higher the students' ability to adapt to unexpected situations and learning environments, the higher the level of learning engagement. Especially during the COVID-19 and control period, when students need to face different learning environments or face unexpected arrangements for the mobilisation of some course tasks, students who have low adaptive capacity will not be able to devote their time and energy to learning, which in turn affects their level of engagement in learning [19].

Academic emotions are also an important individual factor affecting engagement in learning, and it has been shown that positive emotions can increase learner effort and engagement in learning [2]. During the COVID-19, people experience many negative emotions such as anxiety, depression, nervousness and anxiety, depression, depression and other negative emotions, which in turn may impair people's mental health levels. Some students also experience negative academic emotions, with negative academic emotions decreasing learning engagement and positive academic emotions increasing learning engagement [19]. Motivation is also positively related to engagement in learning, and Sun Song et al. (2020) found that the stronger the motivation of students, the higher their level of engagement in learning. In addition, factors such as individual self-efficacy, personality and physiology all influence the level of learning engagement. [17]

4.2   Family Factors

Family factors include parents' education level, family parenting style and parental expectations. Studies have shown that there is a positive relationship between family socio-economic status and academic engagement, with the higher the family's socio-economic status, the higher the student's level of academic engagement. Parental occupation and education level can influence the level of engagement in learning through the mediation of family income and academic self-efficacy [16]. Parents' educational expectation levels are also correlated with students' academic engagement levels, with higher parental expectations associated with higher student engagement levels [12]. In addition, Li Yongzhan (2018) found that parenting styles also had an impact on students' learning engagement, with positive parenting styles enhancing learning engagement levels and negative parenting styles diminishing students' learning engagement levels. Parents may also work from home and accompany their children for online learning during the COVID-19, and if parents adopt a negative parenting style, it can influence students' tendency to spend less time and energy on learning activities. [10]

4.3   School Factors

The presence of school and teachers is inseparable from the online learning process, and the main factors that influence learning engagement on the school side are: teacher support, teacher-student relationship and school climate. Liu Zaihua (2018) found that school climate affects learning engagement, and in addition to this [13], He Min (2021) concluded that the personality qualities of university teachers positively predicted students' learning engagement. [6] Guo Wenbin and Su Meng (2021) found that the higher the level of teacher support, then the higher the learning engagement of college students. [4] Lang et al. (2022) showed a positive relationship between teacher-student interactivity and learning engagement in online learning, and the higher the quality of teacher-student interaction, then the higher the level of learning engagement. [9] In addition, classroom environment, classroom climate and peer relationships may also influence learning engagement [21].

5   MEASURES TO IMPROVE THE LEVEL OF LEARNING ENGAGEMENT IN AN ONLINE LEARNING ENVIRONMENT

Based on the influencing factors summarised above, the author gives the following three countermeasures and suggestions in order to improve the level of students' learning engagement in online learning.

5.1   Regulate Negative Emotions and Improve Self-efficacy

Students need to maintain positive emotions in order to be better engaged in academic life and can regularly self-monitor their own mental health status levels. When individuals have negative emotions, they learn to use methods such as exercise, drawing and singing to regulate their own negative emotions. During the COVID-19, students need to improve their self-efficacy to adapt to changes in their environment when they encounter some unexpected situations or difficulties in the online learning process. Students can gain a sense of self-efficacy from their own successes or the successes of others, and rise to the occasion without fear of difficulties.

5.2   Adopting A Reasonable Parenting Style and Creating a Harmonious Family Atmosphere

Parents need to adopt a positive parenting style, such as democratic parenting, to take an interest in their children's learning, regularly monitor the completion of their learning tasks, patiently answer any confusion that may arise during the learning process and accompany their children in their growth. Harmony within the family will enable children to devote more time and energy to their studies. If parents argue all day long, children will be distracted from their studies by resolving family conflicts. Therefore, it is important for parents to create a harmonious family atmosphere and a good learning environment for their children so that they can improve their level of commitment to learning.

5.3   Enriching the Content of Learning Activities and Strengthening The Interaction Between Teachers and Students

When teaching online, teachers can incorporate multimedia technology and use a variety of teaching techniques to attract students' attention, for example by showing videos and animations to demonstrate theoretical knowledge. Online interactive sessions can also be set up to allow students to actively participate in classroom interactions, so that teachers can be effectively informed of students' learning, thereby enhancing teacher-student interaction and thus further increasing students' engagement in learning. [7]

6   CONCLUSIONS

In summary, the behavioral event analysis model is the core and foundation of user behavior data analysis. The analysis of e-learning software data shows that the development of e-learning in the context of the COVID-19 is rapid, but it will also have its development limitations. Learning engagement as an evaluation

indicator of learning effectiveness can be influenced by three factors: the individual, the family and the school. Therefore, in order to improve learning engagement, countermeasures can be identified from the individual, family and school aspects. Students can reasonably regulate their negative emotions and improve their self-efficacy so that they can better adapt to changes in their surroundings, withstand stress and further enhance their engagement in learning. Parents should use appropriate family parenting styles to create a conducive learning environment for their children's learning, which helps them to concentrate on their studies. Schools should focus on the management of teachers and students. Teachers should teach in a fun way, enhance interaction and communication with students, provide timely feedback on teaching outcomes and help students improve their level of engagement in learning.

REFERENCES

[1] Chen Chen, Qu Yanhong & Zhou Chunmiao. (2020). A review of research on college students' online learning engagement under the new crown pneumonia epidemic. Strait Science and Industry (08), 42-44.

[2] D'Errico, F., Paciello, M., & Cerniglia, L. (2016). When emotions enhance students' engagement in e-learning processes. Journal of E-Learning & Knowledge Society, 12(4), 9-23.

[3] Fredricks, J. A., Blumenfeld, P. C. , & Paris, A. H. . (2004). School engagement: potential of the concept, state of the evidence. review of Educational Research, 74(1), 59-109.

[4] Guo Wenbin & Su Meng. (2021). A study on the impact of teacher support in online learning spaces on college students' learning engagement: A mediating role based on academic self-efficacy. Educational Theory and Practice (30), 50-54.

[5] Guo Yuanxiang. (2016). "U-shaped learning" and learning engagement - Talking about deepening curriculum reform (7). New Teacher.

[6] He M. (2021). Research on the influence of higher education teachers' personality qualities on students' learning engagement (Master's thesis, Shanxi University of Finance and Economics). https://kns-cnki-net-443.webvpn.jxutcm.edu.cn/KCMS/detail/detail.aspx?dbname=CMFD202102& filename=1021045038.nh

[7] Jerry Chih-Yuan Sun and Robert Rueda. (2012). Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education. British Journal of Educational Technology, 43(2), pp. 191-204.

[8] Kong, Q. P.. (2000). The conceptual content and structure of "student engagement". Foreign Educational Materials (02), 72-76.

[9] Lang, Yueru, Gong, Shaoying, Cao, Yang & Wu, Yanan. (2022). The relationship between teacher-student interaction and college students' learning engagement in online learning: the serial mediating role of autonomous motivation and academic emotion. Psychological Development and Education (04), 530-537. doi:10.16187/j.cnki.issn1001-4918.2022.04.09.

[10] Li Yongzhan. (2018). The effect of parenting style on high school students' learning engagement:A chain mediated effect model. Psychological Development and Education (05), 576-585. doi:10.16187/j.cnki.issn1001-4918.2018.05.08.

[11] Liu, Dongyan, & Liu, Jia-wan. (2014). A review of the "engaged" learning framework in Singapore. Global Perspectives on Education, 43(8), 8.

[12] Liu, Z. Hua. (2015). A study on the mechanism of parental educational expectation's influence on secondary school students' learning engagement. Special Education in China (09), 83-89.

[13] Liu, Zaihua. (2018). The effect of school climate on the learning engagement of migrant children - The mediating role of school well-being. Special Education in China (01),52-57.

[14] Lu Jing. Evaluation of PISA Learning Engagement [J]. Shanghai Educational Research, 2009(12):4-9.

[15] Qiao Xiaorong. (2006). Secondary school students' self-determination in mathematics learning and its relationship with mathematics learning engagement (Master's thesis, Henan University). https://kns-cnki-net-443.webvpn.jxutcm.edu.cn/KCMS/detail/detail.aspx?dbname=CMFD0506& filename=2006108138.nh

[16] Shi Leshan, Chen Yingmin, Hou Xiu, Gao Fengqiang. The relationship between family socioeconomic status and learning engagement: The mediating role of academic self-efficacy[J]. Psychological Development and Education, 2013, 29(01):71-

[17] Sun Song, Liu Xiaochuan, Li Sijia & Song Meng. (2020). The mediating role of learning engagement between learning motivation and academic achievement of medical students in a university in Xinjiang. Reform and Opening (Z3), 87-92. doi:10.16653/j.cnki.32-1034/f.2020.005-006.023.

[18] Wilmar B. Schaufeli et al. (2002). The Measurement of Engagement and Burnout: A Two

Sample Confirmatory Factor Analytic Approach. Journal of Happiness Studies, 3(1), pp. 71-92.

[19] Wu, S. Z. & Sun, B. C.. (2021). The impact of students' adaptive capacity on learning engagement in the context of the epidemic: The mediating effect of academic emotions. Contemporary Educational Science (08), 87-95. 78. DOI:10.16187/j.cnki.issn1001-4918.2013.01.006.

[20] Xiao, A. P. & Jiang, C. F.. (2009). Research on the current situation, influencing factors and countermeasures of online learning for e-learners. Open Education Research (01), 75-80.

[21] Zhang Na. (2012). A review of research on learning engagement and its school influences at home and abroad... (eds.) Selected papers from the 2012 Annual Academic Conference of the Professional Committee of Basic Education Evaluation of the Chinese Education Society (pp. 28-39).