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Learning Strategies and Effects of Distance Education in China

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Abstract: *Learning engagement is an important factor in ensuring the quality of learning and promoting deeper learning among students, and is increasingly valued in the quality assessment of higher education. A questionnaire survey is conducted among learners at Batangas State University in the Philippines to analyse their current level of learning engagement, and a detailed analysis is made of the differences in learning engagement levels among different categories of learners. The results indicate that the overall level of learning engagement among distance learners is relatively high, the dimensions, from high to low, are emotional engagement, cognitive engagement, and behavioural engagement. The items with the lowest level of learning engagement are distributed in four tertiary indicators of learners: interpersonal interaction, time management, emotional management, and sense of belonging. The study also indicates that there are significant differences in the level of different learning engagement (in terms of gender, age, and major); finally, it is proposed evaluation methods to enhance the learning engagement of distance learners.*

Keywords: *Distance Learning, Learning Engagement, Differential Analysis, Evaluation Method*

1. Introduction

Currently, researchers generally define the connotation of learning engagement as 3 independent dimensions: behavioural, cognitive and affective [1]. Behavioural engagement refers to learners adhering to learning rules, actively participating in learning activities, sharing learning experiences, and completing learning tasks; cognitive engagement is a form of "thinking training" in which students actively apply relevant learning methods during the learning process; these learning methods include metacognitive strategies, self-management strategies, and so on; affective engagement is the emotional response of learners during the learning process, such as sense of belonging to school, recognition of learning value, interest and preference, and so on.

Distance learners mainly rely on online self-directed learning, Aljedaani et al. (2023) suggest that online learning is mainly manifested in two aspects: first, it focuses on interactive behavioural activities[2]; second, it extends to various learning experiences of learners(Bough et al., 2023), this includes the perception, regulation and emotional support of learners on the learning process[3]. This study suggests that distance learners' engagement in learning is a positive state exhibited by learners in learning activities, this learning state is a combination of behavioural engagement, emotional engagement and cognitive engagement. Compared with traditional universities, research on distance learners' learning engagement starts relatively late, and there is insufficient attention to distance learners' engagement, this study mainly focuses on the following 2 aspects.

1.1. Research on Learning Engagement Survey

Mouffok, K., et al. developed a distance learning engagement assessment scale, this scale combined existing classical student engagement scales with the characteristics of distance learning[4], it included 3 dimensions: behaviour, cognition and emotion, taking the Medical Online Education School of Fatima University and Udemy online learners as an example for sampling survey research. Research has found that distance learners generally have a good level of learning engagement, they get the highest level of emotional engagement, and there are significant differences among learners in terms of gender, age, occupation, etc. Wang, C., et al. designed the structure of the learning engagement questionnaire into 4 dimensions[5]: academic demands, individual effort, interpersonal interaction, and

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institutional support. He took distance learners from the University of Illinois at Chicago as a sample, conducted a survey study, the results showed that distance learners have a higher overall level of learning engagement, they get the highest academic demands and the lowest level of interpersonal interaction.

1.2. Research on the Relationship between Learning Engagement and Other Variables

Vezne, R., et al. demonstrated through empirical research that perceived task value[6], that is, for online learners, implicit intellectual beliefs and motivational regulation can positively predict individual learning engagement. Cheng, S. L., based on social cognitive theory[7], confirmed that emotions in online learning are an important psychological factor affecting online learning engagement, and academic efficacy may play a mediating role. Ma, L., & She, L. used a questionnaire method to investigate the relationship between motivational beliefs-motivational regulation[8] and learning engagement among 336 college students in a blended learning environment. The results indicated a significant positive correlation among motivational beliefs, motivational regulation and learning engagement; self-efficacy perceptions and task value can positively predict learning engagement directly, or indirectly predict learning engagement through motivation regulation. Jin, X. et al. adopted an experimental research method to explore the impact of peer evaluation on learning engagement[9], research has shown that online peer evaluation based on metrics has a significant positive impact on students' cognitive engagement, peer evaluation can help improve learning outcomes.

Through the above literature analysis, it can be seen that there is no unified and standardised measurement tool in the empirical research on learning engagement of distance learners, the relationship between learner engagement and individual characteristic variables is mostly demonstrated from a psychological perspective, no targeted methods have been proposed to improve the learning engagement of distance learners from the perspective of teaching and learning support services. This study revises and tests existing learner engagement scales to explore the current status of learner engagement among distance learners, and proposes an assessment method to improve learner engagement in distance learning from a learning support perspective[10].

2. Materials and Methods

Undergraduate and junior college students enrolled in online education at Batangas State University in the Philippines in 2022 and 2023 were selected as research subjects, and the scope of the investigation was further extended to 26 other state universities in the Philippines. Students completed and submitted the questionnaire, and a total of 5600 questionnaires were collected, of which 4880 were valid questionnaires, with an effective rate of 87%. Based on the "Distance Learning Engagement Scale"[11] revised by Koçak, Ö., & Göksu, İ., and the "Distance Student Learning Engagement Evaluation Scale"[12] developed by Lin, W., the revision has been done, the formed measurement scale includes 3 dimensions: cognitive, emotional and behavioural, among them, cognitive engagement includes indicators such as "cognitive strategies", "time management", "resource management" and "emotional management", which is a total of 12 questions; emotional engagement includes indicators such as "interest", "self-efficacy" and "sense of belonging", which is a total of 6 questions; behavioural engagement includes 2 sub-dimensions: "interpersonal interaction" and "self-directed learning", with a total of 12 questions, as shown in Table 1.

Table 1: Structure of the Learning Engagement Scale for Distance Learners.

Dimension	Measurement indicators	Number of questions
Cognitive engagement	cognitive strategy	3
	time management	3
	resource management	3
	emotional management	3
Emotional engagement	interest	2
	self-efficacy	2
	sense of belonging	2
Behavioral engagement	interpersonal interaction	6
	self-directed learning	6

The question adopts the Likert scoring method, the score is 1-5 points (reverse scoring for some questions), The higher the score is, the higher the level of learning engagement of remote learners is.

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The internal reliability consistency (α coefficient) method is applied to test the reliability of the scale, the inspection results show that the reliability coefficient of the whole scale is α=0.885, and the reliability coefficients of the three factors are a1=0.826, a2＝0.741, a3＝0.769, respectively, all the values are greater than 0.7, which indicates that it has good consistency among the items of the questionnaire. In addition, to test the validity of the questionnaire, principal component analysis and maximum variance orthogonal rotation method are applied, the data analysis results show that the KMO value of the distance learner engagement questionnaire is 0.892, the P value of Bartlett's sphericity test is 0.000(P＜0.001), which indicates the structural validity of the questionnaire is good.

3. Results

3.1. Overall Level of Learning Engagement among Distance Learners

Table 2: Descriptive Statistics on Learning Engagement of Distance Learners.

Dimension	Person-time	Mean value	Standard deviation
Cognitive engagement	4880	3.736	0.817
Behavioral engagement	4880	3.483	0.936
Emotional engagement	4880	4.214	0.792
Overall engagement	4880	3.811	0.753

As shown in Table 2, the overall score of distance learners' learning engagement level is 3.811 points, on the 3 dimensions, emotional engagement is got the highest score, followed by cognitive engagement, and behavioral engagement is got the lowest score. Specifically for each dimension, the level of learning engagement is as follows.

The highest score for learners in the option "I find a way to clarify unclear problems" is 3.836 points, secondly there are options such as "I will try to complete learning tasks without external interference"(mean=3.688), "I will browse learning resources even if there are no learning tasks"(mean=3.716), the lowest scores are obtained in the options "I often organise effective learning methods"(mean=3.483) and "I can manage learning time well"(mean=3.486). The above results indicate that distance learners have a strong purpose for learning, a strong desire to learn, and try to avoid being disturbed by the external environment during the learning process as much as possible, but due to the lack of effective learning methods, coupled with factors such as family and work, it is difficult to ensure learning time.

The highest score for learners is 3.658 points on the option 'completing online learning activities and tasks on time', secondly on 'checking and verifying after completing homework to avoid mistakes' (mean=3.216), the lowest score (mean=2.9813) is on the option 'actively searching for learning resources or asking for help from teachers or peers when you encounter difficulties'. The above data indicate that learners are able to complete the learning of audio, video and text materials on the learning platform according to the learning rules, complete learning tasks on time, but there is still a lack of strategies in terms of learning interaction and diagnosing learning problems.

In the dimension of emotional engagement, the option of "having confidence in remote learning and being happy after completing learning tasks" is received the highest score, which is 4.436 points, secondly, testers get 3.985 and 3.976 respectively on the "I am interested in the course content" and "I enjoy sharing learning experiences with others" options, the options "When I am feeling low, I consciously adjust and actively engage in learning" and "I have a strong sense of school collective belonging in remote learning" are received the lowest scores, which are 3.765 and 3.723, respectively. The above data indicates that learners are full of expectations and confidence in the learning content and process after enrollment, and obtain a sense of satisfaction and fulfillment after completing course learning tasks, but due to the lack of effective learning monitoring and face-to-face emotional support, their sense of belonging to the school is not strong, when they feel emotionally down, it is difficult to express and support themself, it hard for them to adjust and maintain a positive learning attitude, which in turn affects learning outcomes.

3.2. Analysis of Differences in Learning Engagement among Distance Learners

To understand the individual differences of learning engagement levels among distance learners on gender, age, and profession, this study adopts independent sample t-test and one-way analysis of variance method.

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Comparison of the differences in learning engagement between distance learners of different genders. Independent samples t-test is used to compare the differences between boys and girls in 4 dimensions, as shown in Table 3. Boys achieve higher levels of learning engagement than girls in all 4 indicators. There is a significant difference in the level of behavioural engagement between males and females ($F=1.852$, $P<0.05$), the other 4 indicators do not show significant differences ($p>0.05$). The possible reason is that boys have less family burden than girls, have more time and energy for learning, can manage learning time more flexibly and effectively, and complete learning activities.

Table 3: Comparison of Differences in Learning Engagement among Students of Different Genders.

Dimension	Boy	Girl	F	P
Cognitive engagement	3.914	3.866	0.762	0.443
Behavioral engagement	3.926	3.639	1.852	0.016
Emotional engagement	3.829	3.726	0.896	0.327
Overall engagement	3.863	3.792	1.369	0.179

To compare the differences in learning engagement between distance learners from different disciplines. In terms of professional categories, it is divided into 2 main categories: "Humanities" (Cultural Industry Management, Administrative Management) and "Sciences" (Engineering Management, Environmental Engineering), a single factor analysis of variance is conducted on the differences in learning engagement among learners from different professional backgrounds. The research results indicate that the p-values of learners from 2 types of majors in the four dimensions of cognitive engagement, behavioural engagement, emotional engagement and overall engagement are 0.436, 0.361, 0.016 and 0. 788 respectively (as shown in Table 4), which indicates that there is no significant difference in cognitive engagement, behavioural engagement and overall engagement among the professional categories, but there is a significant difference in emotional engagement ($F=2.533$, $P<0.05$), the emotional engagement of science learners (Mean=3.912) is higher than that of humanities learners (Mean=3.449). The possible reason is that Engineering Management and Environmental Engineering are advantageous disciplines in the school, with abundant course resources, more interactive course activities, and higher educational level of teachers, which leads to stronger interest and preference for learning among science students.

Table 4: Comparison of Differences in Learning Engagement among Students of Different Majors.

Dimension	Sciences	Humanities	F	P
Cognitive engagement	4.058	3.947	0.847	0.436
Behavioral engagement	3.612	3.792	1.057	0.316
Emotional engagement	3.912	3.449	2.589	0.016
Overall engagement	3.928	3.698	1.183	0.788

Comparing differences in learning engagement between distance learners of different age groups We divide the research samples into four age groups: 17-20 years old, 21-30 years old, 31-40 years old, 41-50 years old, and compare their differences in four dimensions, and the results are shown in Table 5. In terms of overall engagement, it increases with age, with 17-20 year olds having the lowest level of engagement and 41-50 year olds having the highest level of engagement. In the dimensions of cognitive and affective engagement, students tend to become more engaged as they get older; in the dimension of behavioural engagement, engagement first decreases and then increases with age. The possible reason for this is that the older students are, the more committed they are to learning, the more effective their cognitive strategies and learning methods are, and the greater their willingness to learn. For learners aged 21-30 and 31-40, due to work and family reasons, the behavioural engagement score is lower, they are unable to successfully complete all the learning tasks and activities of the course, they are unable to engage in deep level interaction and self-management. The results also show that there are no significant differences in the indicators of all dimensions between learners of different age groups.

Table 5: Comparison of Differences in Learning Engagement among Students of Different Ages.

Dimension	17-20	21-30	31-40	41-50
Cognitive engagement	3.826	3.881	3.926	4.120
Behavioral engagement	3.775	3.692	3.816	4.067
Emotional engagement	3.827	3.893	3.917	4.139
Overall engagement	3.815	3.823	3.846	4.115

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4. Discussion

Distance learners are generally spatially dispersed [13], without a fixed learning location, learners' learning time/plans are in a non-synchronised and dispersed state. The relationship between online learning activities and learning engagement is interdependent, and learners' learning engagement in online environments is reflected in online learning activities. The learning effectiveness of learners in an online environment depends on their ability to adapt to the network environment[14], their ability to use online technology, their ability to self-control, the influence of learning motivation and so on. In the distance learning environment, learners can better express their learning needs and provide feedback on problems that arise in the learning process; at the same time, the lack of sufficient constraints in distance learning can lead to low learning efficiency among learners due to inadequate self-control.

The results of this study show that the overall level of learning engagement among distance learners is above average (M=3.786, SD＝0.746), there is still significant room for improvement in certain dimensions, among the 3 dimensions, the level of cognitive engagement and emotional engagement is higher, while the level of learning engagement in interpersonal interaction and self-directed learning engagement in behavioural engagement is lower. The 5 questions with the lowest level of learning engagement include "When you encounter difficulties, do you actively search for learning resources or seek help from teachers or peers? "I manage my study time very well". "I often respond to learning platforms and exchange learning experiences with classmates". "When I feel down, I make a conscious effort and actively engage in learning". "I have a strong sense of belonging to the school in distance learning", these questions all arise in the third level dimension project of interpersonal interaction, time management, emotional management and sense of belonging. Furthermore, the results of individual differences in learning engagement among distance learners show that boys have a higher level of behavioural engagement than girls, while science students have a higher level of emotional engagement than humanities students, and students aged 21-30 and 31-40 have a lower level of behavioural engagement.

5. Conclusion

Based on the above research results, it is found that the level of learners' learning engagement is influenced by factors such as individual differences, interpersonal interaction, learning resources, learning platforms, etc. In response to the problems and shortcomings of distance learners' learning engagement, the following evaluation perspectives are proposed to enhance their learning engagement:

Focusing on learners' self-management awareness can help improve the efficiency of self-directed learning. The learning plans should be paid attention to formulated by students. In the early stages of student enrollment, cultivate the habit of students developing study plans, let students be able to develop semester plans based on their professional course learning plans and work needs, urge students to timely modify and adjust their learning plans according to their learning progress during the learning process.

Students' time management skills should be emphasised. In the process of self-directed online learning, students tend to get lost and deviate from their learning plans. At the same time, most distance learners are adults, so they often do not have enough time to study due to work and family commitments. In order to improve students' time management ability, guide them to make study records at the beginning of the semester, reflect and summarise the shortcomings of time use in time, and make corrections, time management mini-programs should be recommended to students, and encourage them to manage their study time scientifically and rationally.

Observe whether students have their own learning strategies and habits in their studies. Learning strategies should be applied to guide students to organise themselves individually, such as resource organisation strategies, knowledge processing strategies, memory strategies, etc., while cultivating good learning habits and completing various learning tasks on time.

Communication between students and other classmates during the learning process helps to improve their enthusiasm for learning. The research results indicate that learners have lower levels of interpersonal interaction, which is not conducive to deep understanding of course content and weakens their collective sense of belonging, all of which make learning difficult to sustain. In order to improve the level of interaction, learners should preview learning content, tasks, learning tools, etc. In advance during learning activities, consciously share learning difficulties and experiences with their peers, and promote deep participation in learning.

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The use and communication of online educational resources by students. In order to improve the learning engagement level of distance learners, the following 4 aspects are emphasised in the learning process to improve learning resources: ①enhancing the fun and practicality of the learning resources, communicating the learning content in a relaxed, humorous and networked language, presenting the course content in the form of stories and real-life situations, the explanation process should be lively and vivid; ②providing learners with challenging and varied learning activities and tasks, in addition to topic discussions and peer evaluation tasks, activities such as adding educational games and practical activities that can increase learners' interest in learning; ③updating learning resources in time and incorporating the latest knowledge into them, secondary filtering of complex learning content on the Internet and selectively providing it to students; ④providing learners with convenient and diverse learning content that can be easily downloaded and viewed offline.

Assessing the emotional experience of learning in distance education. The research results indicate that learners have a lower level of emotional management during the learning process and a weak sense of collective belonging to the school, they often experience loneliness during learning, in addition, there is a lack of effective learning monitoring, which makes it difficult for learners to complete the learning process effectively. During the learning process, teachers should create an interactive and relaxed learning atmosphere, pay attention to the learning progress and dynamics, continuously provide learners with emotional motivation during the learning process, encourage them to study hard, stimulate their enthusiasm for learning, and also provide learners with timely and targeted learning feedback, enable them to understand the problems that exist in learning in a timely manner. In addition, it is also important to strengthen the guidance of learners' negative learning emotions, learn to think from their views, understand the learning difficulties and burdens of adult learners, and alleviate their feeling of nervousness, anxiety and fear of difficulty.

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