

Influencing Factors of Distance Learning Students' Support Services in a Smart Education Environment

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Abstract—This paper designed a questionnaire on influencing factors of distance students' support services under the smart education environment and analyzed influences of five aspects (course support, technical support, faculty support, emotional support and management support) of students' support services in distance education on the satisfaction of learners. Besides, differences in learners' satisfaction in terms of gender, age groups, profession, and distance learning period were analyzed. Research results demonstrate that the Cronbach's alpha, KMO, and p value of the designed questionnaire were 0.984, 0.855, and 0.000, respectively, indicating that the reliability and validity of this paper are good. Course support, technical support, faculty support, and management support have statistically significant influences on learners' satisfaction. However, emotional support does not promote learners' satisfaction significantly. Age and distance learning period have significant differences in influencing learners' satisfaction. Results can provide references to build a good learning support service system, promote the high-quality development of distance education and systematic construction of other types of students' support services.

Keywords—smart education, distance education, students' support services, influencing factors

1 Introduction

China has entered a new stage of education with highly developed educational informationization comprehensively. Educational informationization teaching has been applied extensively in various schools at different levels, which has promoted the skill improvement and knowledge accumulation of learners. The seamless transition from the traditional simple teaching informationization applications to the current high integration of information technology and curriculum resources requires comprehensive support and utilization of teachers and learners. To improve the overall teaching quality in China, different schools in China have accelerated their level of education information. Now, various schools have been comprehensively teaching informationization system at different levels by applying many novel

education informationization teaching means and modes. In particular, the new generation of learners are in the era of information explosion with the continuous technological innovation. They are trying innovative approaches everyday. The student-oriented teaching mode, which is proposed under the smart education environment, aims to promote individualized learning of learners by using teaching hardware and teaching resources. Teachers shall improve learning initiatives of students in all teaching links and provide students intuitive, rich, and diversified teaching contents to improve their intuitive perception ability. Under the smart education environment, teachers can prepare resources before classes, and these resources can be recommended to learners through different mobile terminals to allow learners to prepare for lessons before class. In class, many teachers use technological equipment to guide students to take task-oriented more intuitive learning, form learning groups to explore the learned knowledge system framework, and plot the learning mindmap. After class, the learning states of students can be diagnosed comprehensively, and their learning situations could be analyzed effectively through the intelligent monitoring system. Teachers can personalize tutorship to students. Therefore, learning motivation, learning psychology, and learning state can be diagnosed comprehensively and effectively by collecting data throughout the learning process by harnessing technology. In this process, common and individual problems in learning are identified, which help teachers adopt personalized teaching strategy and meet learners' individualized learning demands.

Modern distance education is an open, personalized, and zero-distance teaching mode. It breaks spatial - temporal limitations to make groups of learners diversified. The age span of learners is obvious. Based on the strong education informationization resources, it is more convenient to communicate knowledge and skills, thus meeting diversified learning demands of people. Under the traditional teaching mode, knowledge acquisition is based on the resources of teachers and textbooks. As society enters the informationization stage, knowledge content becomes richer and knowledge is represented in more diversified forms. Owing to the strong advantages of the Internet, distance education is becoming the mainstream mode of learning for adults, and it has become an indispensable component in the construction of a learning society in China. However, although distance education makes the teaching mode convenient and easy, it has disadvantages. Specifically, distance education does not offer face-to-face interaction between teachers and students. This set-up can cause emotional longing and thereby weaken the learning motivation of students. Students are trapped within the simple learning stage of accomplishing learning tasks, but they cannot engage in deep learning. Despite increasing groups of distance learners, no strong effective support has been formed to learning resources. The recessive learning resources, weak learning atmosphere, and disorderly learning knowledge system urge learners to seek good students' support services. Distance teaching brings obvious geological disconnection between teachers and students, but it also promotes free learning and brings many learners back to the learning environment, thus meeting their desire for knowledge. However, learners in distance learning cannot be supervised and guided by teachers in person. Inevitably, the difficulties of learners in studies cannot be solved in a timely manner and learners may develop negative

emotions or even drop out. Hence, students' support services play a significant role in improving the quality of modern distance education. The effectiveness of students' support services determines the development of modern distance education. Therefore, various elements of students' support services in distance education must be recognized under the smart education environment and their relations from the perspectives of state, school, and learners must be explored. On this basis, it improves the good learning experiences and learning motivations of learners by perfecting students' support services, so that learners can adapt to remote schools in the intelligent environment and finally perfect their knowledge systems and skill levels.

2 Hypotheses

Many factors influence students' support services of distance education in the smart education environment. Various studies propose different influencing index systems from different perspectives. Sewart, D [1], a famous scholar from the Open University (UK) proposed the concept of students' support services, which became the key concept that influenced follow-up studies. He believed that students' support services, including learning institutions that provide comprehensive services to learners, are to guide and serve learners to adopt independent and personalized learning mode. He also stated that students' support services include elements that are mostly closely related with teaching in distance education and traditional education. Besides, he remarked on strategic planning and management of students' services in open education and distance education. Floyd, D. L et al. [2] described demonstrative services for students in community colleges and proposed a model to improve services for students. Ludwig-Hardman, S et al. [3] believed that the most important aspect of online teaching summary lies in the interaction and level of learning service support. Students in distance learning are prone to feeling lonely and lack self-guidance and management; thus, their motivation level is easily decreased. Cain, D. L et al. [4] investigated support demands, experiences, and expectations of a group of postgraduates of distance learning. Research results demonstrate that most students may not use students' support services and they hope that their tutors are a support resource. Zhang, J [5] believed that learners in learning support service subsystem use and experience distance learning resources in various forms. Moreover, results show that education institutions are mainly concerned with the development of curriculum packages, but they ignore the importance of providing efficient learning support and services. Nsamba, A et al. [6] pointed out that the quality of distance education services can be measured from six dimensions, including tangibility, reliability, response, delivery, guarantee, and students' attendance. Each dimension can be measured through many attributes. These dimensions could help distance education institutions evaluate the quality of support services from the perspective of students. In this way, the overall performance of services can be controlled. LaPadula, M [7] pointed out that students hoped to receive many extra support services that are similar with those in other schools, including reading clubs, students' newspapers, academic clubs, online tutoring, and other non-traditional teaching supports. Dzakiria, H [8]

conducted a case study in University of Utara, Malaysia and analyzed learning supports in distance learning, thus obtaining conclusions on the effect and guidelines of learning support to improve students' support services in the future. Zuhairi, A et al. [9] pointed out that learning support system of students included tutorship, academic suggestions and counseling, learning group activities, academic management services of students, and student organizations. In distance education, the goal of systematic learning support is to promote high-quality learning process, which is applicable to the learning demands and flexibility of students. Farajollahi, M et al. [10] analyzed the relations of students' support services and compositions in distance education with academic performance. He administered a questionnaire survey on 172 participants from the Payamnoor University, Tehran Governorate. Results demonstrated that learning students' support services and their compositions had statistically significant relations with academic performance. Krishnan, C [11] investigated the effectiveness of students' support services (SSS) provided by Indian education institutions and proposed suggestions for improvement. Research results demonstrated that Indian distance education institutions have few SSS and poor service quality and standards. Tipton, C. J [12] investigated postgraduates who took the initiative to apply for one or several courses on the interactive video network of the system on a distance learning website. Survey results provided insights to improve services in libraries. Frieden, S [13] believed that the construction and operation of infrastructures supporting distance education require the cooperation of almost all administrative departments and academic departments. Lumadi, R. I [14] pointed out that although students' support services are available, most students cannot access them. Other issues included improper application and registration process, delayed delivery and receiving of learning materials, and lack of effective homework feedback management system. He suggested to strengthen the construction of students' comprehensive support services. Agrawal, S. R et al. [15] believed that students' support services are the major characteristics of open distance learning. Budiman, R [16] believed that teachers and students in distance education could form direct relations in the virtual world, and he concluded that students kept a positive attitude toward Skype as a platform for distance learning. The author suggested to holding more training or seminars about distance learning and ICT for the purpose of education. These existing studies show that the concept and definition of students' support services have been widely accepted in various countries worldwide, especially by education workers. Studies on students' support services are becoming increasingly sophisticated, systematic, and professional. According to scholars' definitions of students' support services, students' support services refer to support and help activities that are related with students directly, mainly from different subjects like teachers, institutions and management, including hardware system and software uses of distance education, and even human emotional factors. Students' support services of distance education involve various aspects in distance education. Its composition requires an organic combination of software and hardware resources and teams. Specifically, hardware resources include learning resources, broadband networks, communication facilities, and multimedia equipment. Software resources include learning resources like courseware, guideline of distance education, and

management systems. In addition, personnel resources cover teachers, technicians, and managers. Only when software and hardware resources are integrated with the personnel system can the system of students' support services be built effectively and develop its intended roles. On the basis of the literature review, students' support services for distance education cover five aspects: course support, technical support, faculty support, emotional support, and management support. Thus, five hypotheses are proposed.

H1: Course support in distance education can promote learners' satisfaction effectively.

H2: Technical support in distance education can promote learners' satisfaction effectively.

H3: Faculty support in distance education can promote learners' satisfaction effectively.

H4: Emotional support in distance education can promote learners' satisfaction effectively.

H5: Management support in distance education can promote learners' satisfaction effectively.

3 Research design

3.1 Questionnaire design

Based on existing studies, a questionnaire on Influencing Factors of Students' Support Services of Distance Education under Smart Education Environment was designed. The questionnaire was composed of three parts. The first part covers the basic demographic information of participants, including gender, major, age, and distance learning period. The second part covers five aspects of students' support services of distance education, including course support, technical support, resource support, emotional support, and management support. The five aspects have 5, 6, 4, 4, and 8 questions, respectively. This part is measured using a five-point Likert scale. The third part measures learners' satisfaction, and the questions are measured on a seven-point Likert scale.

3.2 Research objects

Henan Province, China is a large traditional agricultural province in Central China. Owing to the big population of farmers, Henan Province has been increasing its support to distance education development since 2010. The province has invested a significant amount of capital to construct perfect distance education platforms, which have attracted many adult learners. Students from the Distance Education School of an average provincial university in Zhengzhou City, Henan Province were investigated. The questionnaire survey used random sampling. To assure the universality of survey objects as well as authenticity and reliability of the collected data, the anonymity of participants was guaranteed. A total of 316 questionnaires

were sent, and 275 questionnaires were collected. After eliminating invalid questionnaires, 248 effective questionnaires were collected, showing an effective recovery rate of 78.48%. Table 1 shows the descriptive statistical results of the research objects.

Table 1. Descriptive statistical results of research objects

Name	Answers	Frequency	Percentage (%)	Cumulative percentage (%)
Gender	Female	93	37.5	37.5
	Male	155	62.5	100
Major	Computer Science and Technology	4	1.61	1.61
	Business Administration	7	2.82	4.44
	Public Administration	70	28.23	32.66
	Marketing	64	25.81	58.47
	Accounting	90	36.29	94.76
	Civil Engineering	13	5.24	100
Age	<18	36	14.52	14.52
	18–22	46	18.55	33.06
	23–25	70	28.23	61.29
	26–28	49	19.76	81.05
	29–35	9	3.63	84.68
	36–45	18	7.26	91.94
	45–60	17	6.85	98.79
	>60	3	1.21	100
Distance learning period	<1 month	29	11.69	11.69
	1–3 months	47	18.95	30.65
	4–6 months	90	36.29	66.94
	7–12 months	39	15.73	82.66
	1–3 years	31	12.5	95.16
	>3 years	12	4.84	100
Total		248	100	100

4 Results analysis

4.1 Reliability and validity analysis

Generally speaking, reliability of samples was tested by Cronbach's Alpha and validity of samples was tested by using KMO and Bartlett's Test. The KMO statistics and Bartlett's spherical test values have to exceed 0.6. If values are higher than 0.8, then the samples have high validity. The reliability test value of Cronbach's alpha must generally be higher than 0.8.

Table 2 shows that the Cronbach's α of the whole questionnaire is 0.894, and the Cronbach's α of independent variables is generally higher than 0.7, indicating that the designed questionnaire has good reliability.

Table 2. Reliability test results

Variables	Questions	Corrected item total correlation (CITC)	Item deleted α coefficient	Cronbach's α	Cronbach's α
Course support (Factor1)	A1	0.593	0.959	0.931	0.894
	A2	0.896	0.901		
	A3	0.890	0.902		
	A4	0.871	0.906		
	A5	0.868	0.906		
Technical support (Factor2)	B1	0.444	0.946	0.915	
	B2	0.894	0.881		
	B3	0.781	0.897		
	B4	0.872	0.884		
	B5	0.842	0.889		
Resource support (Factor3)	C1	0.328	0.766	0.710	
	C2	0.604	0.589		
	C3	0.590	0.592		
	C4	0.515	0.637		
Emotional support (Factor4)	D1	0.588	0.846	0.847	
	D2	0.703	0.798		
	D3	0.789	0.760		
	D4	0.666	0.815		
Management support (Factor5)	E1	0.610	0.832	0.851	
	E2	0.553	0.838		
	E3	0.589	0.834		
	E4	0.525	0.841		
	E5	0.633	0.830		
	E6	0.540	0.842		
	E7	0.744	0.813		
	E8	0.564	0.837		
Learners' satisfaction (Factor6)	Y1	0.859	0.938	0.947	
	Y2	0.880	0.929		
	Y3	0.871	0.932		
	Y4	0.893	0.926		

Table 3 shows that the KMO value is 0.855, and the p value is 0.000, indicating that the designed questionnaire has good validity.

Table 3. KMO and Bartlett's tests

KMO value		0.855
Bartlett's spherical test	Approximate chi-square	5808.673
	df	465
	p value	0.000

Table 4 shows that the square roots of AVE of all variables are higher than the correlation coefficient, indicating that the designed questionnaire has high discriminative validity.

Table 4. Discriminative validity: Pearson correlation coefficient and square root value of AVE

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
Factor1	0.863	-	-	-	-	-
Factor2	0.685	0.818	-	-	-	-
Factor3	0.139	0.106	0.632	-	-	-
Factor4	0.054	0.032	0.159	0.771	-	-
Factor5	0.019	0.088	0.036	0.172	0.656	-
Factor6	0.405	0.531	0.165	0.048	0.171	0.905

Notes: the clinodiagonal numbers are square roots of AVE.

4.2 Results of structural equation model

Results of the structural equation model (SEM) were estimated using Stata17.0. Table 5 shows the major fitting indexes of the model.

Table 5. Fitting indexes of the model

Common indexes	χ^2	df	P	Chi-squared degree of freedom (DOF) Ratio χ^2/df	RMSEA	SRMR
Judgment criteria	-	-	>0.05	<3	<0.10	<0.1
Values	1085.616	419	0	2.591	0.08	0.072

Table 5 shows that the major fitting indexes of SEM estimation have relatively good. Table 6 shows the regression results on the influencing factors of the five aspects of learners' satisfaction.

Table 6. Regression results

Factor	Coefficient	Std.err.	Z	P> z 	[95% conf.interval]	
Factor1	0.2626	0.1102	2.3800	0.0170	0.0467	0.4786
Factor2	0.7787	0.1615	4.8200	0.0000	0.4621	1.0953
Factor3	0.3419	0.2024	1.6900	0.0910	-0.0548	0.7386
Factor4	-0.0103	0.1339	-0.0800	0.9390	-0.2727	0.2521
Factor5	0.2825	0.1232	2.2900	0.0220	0.0410	0.5240

LR test of model vs. saturated: $\chi^2(429) = 1198.81$ Prob > $\chi^2 = 0.0000$

Table 6 shows that four of the five proposed hypotheses are true.

H1 is true. Thus, course support in distance education can improve learners' satisfaction effectively. Good course resources are the core content in the distance learning process of students, and they are very important learning resources. Quality of distance education is mainly determined by the quality of course resources to some extent. Good course resources are related with students' outcome in independent learning directly, and they indirectly influence the quality of distance learning. Currently, distance education in universities in China pay high attention to course development, invest significant efforts, and have a perfect course development system to guarantee a high quality of course resources. However, the varying levels of quality of several learning resources in the process of application may increase cognitive load on students. Therefore, universities must pay attention to the quality of course resources and avoid poor quality of course resources by constructing students' support service system.

H2 is true. Technical support in distance education can improve learners' satisfaction effectively. Good technical support can guarantee effective learning behaviors of learners in distance education. In particular, some learners in distance learning are relatively old, and they are not familiar in using distance education system and remote teaching resources. Hence, distance education institutions must provide technical training for learners to help them master various technical skills required in distance learning. Moreover, distance education institutions have to build learning platforms for high-efficiency communication among learners and introduce in cloud teachers as learners and teachers. Distance education is mainly different from other teaching modes because it offers individualization and accurate learning of students. Therefore, management departments of distance education have to increase applications of information technology (e.g., data) to conduct real-time analyses of learning conditions of students, help teachers master students' learning state and adjust learning planning in a timely manner, fully integrate learners into the distance education, and finally guarantee learning outcomes of distance teaching.

H3 is true. Faculty support in distance education can improve learners' satisfaction effectively. In distance education, good faculty support can significantly influence the learning motivation of learners. At present, most distance education programs in China employ many famous professors to teach or record videos. Hence, good faculty support can make learners understand the fundamentals of distance learning and the characteristics of schools comprehensively. Tenured teachers with rich teaching experiences can produce a "worship effect" among learners. In particular, teachers with rich experiences in distance education can stimulate learners to deconstruct knowledge points by group learning, mutual discussion and topic seminars, and forming mind maps. Moreover, such teachers can eliminate learning barriers. In distance education, aside from full-time teachers, part-time teachers and instructors with work experiences in enterprises can influence the learning process of learners significantly. This also reminds distance education institutions to improve faculty strengths and introduce good teachers in the development of curriculum resources. For example, these teachers can use a case study based on enterprises to enhance

learning. Good interaction teaching based on typical cases in textbook was performed, in which teachers guide learners in proactive learning.

H4 is false. Emotional support in distance education cannot improve learners' satisfaction effectively. Reasons can be introduced as follows. Although distance education can support asynchronous interaction between teachers and students, it does not offer "face-to-face" interaction unlike in traditional classrooms. As a result, emotions of teachers cannot be delivered to distance learners effectively, and the emotional support of teachers cannot promote learners' satisfaction effectively. Nowadays, most distance education programs in China are limited to one-way knowledge transfer to learners, and they do not focus on the psychological changes of learners. Therefore, the spatial - temporal separation of remote education leads to the lack of essential communication and information feedback between teachers and learners. Learners have difficulty expressing their learning ideals and suggestions in learning. Now, although abundant distance education programs can break spatial - temporal limitations of teaching, they do not have extensive two-way communication with respect to teaching - learning synchronism. Hence, learners' concerns cannot be addressed in a timely manner. Over time, such limitation will make distance learners unwilling to learn and provide feedback. Finally, emotional support in distance education cannot promote learners' satisfaction significantly.

H5 is true. Management support in distance education can improve learners' satisfaction effectively. Management support covers all links of distance education, such as application, exams, and graduation. Although management support is not a major aspect in daily distance education, management support focuses on the learning process of learners on the Internet or mobile terminals and intelligent supervision of learning outcomes in the background of "Internet+". The daily operation of distance learning requires high-efficiency management of teaching plans and obtaining feedback from different learners about the teaching quality. In processes like roll, exam, and certificate issuing, distance education institutions must adopt the philosophy of high-efficiency services, serve distance learners practically and effectively, and enhance their satisfaction.

4.3 Difference analysis

Table 7 shows the differences in learners' satisfaction in the distance learning period obtained through analysis of variance. Clearly, learners' satisfaction is significant throughout distance learning ($p < 0.05$), indicating that samples with different distance learning periods present different levels of satisfaction. Influences of learning time on learners' satisfaction are significant at the 0.05 level ($F = 2.818$, $p = 0.017$), mainly because learners who have experienced a longer period of distance learning easily accept distance teaching practices and have mastered various skills required in distance learning. With the increase of distance learning period, learners can determine keys and difficult points of distance teaching, master key points of learning, and have better academic performance, thus achieving higher satisfaction than learners who have short distance learning period. This finding reminds distance education management departments to pay more attention to beginners in distance

learning, supervise in real-time their use of distance teaching software and psychological changes in the learning process, and adjust teaching schemes in a timely manner. Besides, learners' satisfaction varies among different age groups. Learners above 60 years old present the highest satisfaction, perhaps because they are retired and have more time to choose distance learning. Considering that they have not received good education when they were young, they cherish such learning opportunities and devote themselves into learning. As a result, their learning satisfaction is higher than those of other age groups. This finding reminds various distance education management departments at different levels to pay attention to the learning motivations of different age groups as well as the relation between learning ability and learning outcome. Moreover, they should adopt personalized expansion of course capacity according to learning demand and allow learners to choose knowledge of one course that they are interested in according to class size for personalized learning, thus improving learners' satisfaction.

Table 7. Difference analysis

	<i>Age (mean±SD)</i>								<i>F</i>	<i>p</i>
	1.0 n=36	2.0 n=46	3.0 n=70	4.0 n=49	5.0 n=9	6.0 n=18	7.0 n=17	8.0 n=3		
Learners' satisfaction	4.11±1.39	4.83±1.45	4.44±1.50	4.35±1.33	3.4±1.33	4.50±1.42	4.94±1.25	5.67±0.58	2.071	0.047*
	<i>Distance learning period (mean±SD)</i>						<i>F</i>	<i>p</i>		
	1.0 (n=29)	2.0 (n=47)	3.0 (n=90)	4.0 (n=39)	5.0 (n=31)	6.0 (n=12)				
	3.97±1.21	4.19±1.31	4.58±1.07	4.33±1.24	4.45±1.18	5.25±0.87	2.818	0.017*		

* p<0.05 ** p<0.01

5 Conclusion

In the era of “Internet + education”, technology penetrates the education industry as various emerging information technologies develop maturity, thus bringing the education industry into the “smart” education field. Under the background of smart education, comprehensive use of leading information technology in the education industry, such as big data and VR and AR, can solve bottlenecks in traditional education. With respect to summary of distance education, the goal of students' support services is to promote distance learners to rebuild the knowledge concept, update knowledge system, enrich knowledge content and skill levels of learners, and train learners in using knowledge through diversified and personalized learning processes. The effects of the five aspects (course support, technical support, faculty support, emotional support, and management support) of students' support services in distance education on learners' satisfaction were analyzed. Moreover, differences in learners' satisfaction in terms of gender, age, major, and distance learning period were analyzed. The Cronbach's alpha and KMO of the designed questionnaire are 0.984 and 0.855, and the p value is 0.000. This result indicates that the reliability and

validity of the designed questionnaire are good. Course support, technical support, faculty support, and management support have statistically significant influences on learners' satisfaction. Influences of age and distance learning period on learners' satisfaction are significantly different. Future studies are suggested to investigate the building of students' support service system from the mixed perspective and learn about students' support service demands from the perspective of learning. The gap between China and foreign countries in terms of students' support services shall be discussed in depth in future studies.

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7 References

- [1] Sewart, D. (1993). Student support systems in distance education. *Open Learning: The Journal of Open, Distance and e-Learning*, 8(3), 3-12. <https://doi.org/10.1080/0268051930080302>
- [2] Floyd, D. L., & Casey-Powell, D. (2004). New roles for student support services in distance learning. *New directions for community colleges*, 2004(128), 55-64. <https://doi.org/10.1002/cc.175>
- [3] Ludwig-Hardman, S., & Dunlap, J. C. (2003). Learner support services for online students: Scaffolding for success. *International Review of Research in Open and Distributed Learning*, 4(1), 1-15. <https://doi.org/10.19173/irrodl.v4i1.131>
- [4] Cain, D. L., Marrara, C., Pitre, P. E., & Armour, S. (2007). Support services that matter: An exploration of the experiences and needs of graduate students in a distance learning environment. *International Journal of E-Learning & Distance Education/Revue internationale du e-learning et la formation à distance*, 18(1), 42-56.
- [5] Zhang, J. (2003). How do learners utilize the course package and students' support services in distance learning: A survey on the learning processes. *International Journal on E-Learning*, 2(4), 17-23.
- [6] Nsamba, A., & Makoe, M. (2017). Evaluating quality of students' support services in open distance learning. *Turkish Online Journal of Distance Education*, 18(4), 91-103. <https://doi.org/10.17718/tojde.340391>
- [7] LaPadula, M. (2003). A comprehensive look at online student support services for distance learners. *American Journal of Distance Education*, 17(2), 119-128. https://doi.org/10.1207/S15389286AJDE1702_4
- [8] Dzakiria, H. (2005). The role of learning support in open & distance learning: learners' experiences and perspectives. *Turkish Online Journal of Distance Education*, 6(2), 95-109.
- [9] Zuhairi, A., Adnan, I., & Thaib, D. (2007). Provision of student learning support services in a large-scale distance education system at universitas terbuka, Indonesia. *Turkish Online Journal of Distance Education*, 8(4), 44-64. <https://doi.org/10.14507/epaa.v7n7.1999>

- [10] Farajollahi, M., & Moenikia, M. (2010). The study of relation between students support services and distance students' academic achievement. *Procedia-Social and Behavioral Sciences*, 2(2), 4451-4456. <https://doi.org/10.1016/j.sbspro.2010.03.710>
- [11] Krishnan, C. (2012). Student support services in distance higher education in India: A critical appraisal. *International Journal of Research in Economics & Social Sciences*, 2(2), 459-472.
- [12] Tipton, C. J. (2001). Graduate students' perceptions of library support services for distance learners: a university system-wide study. *Journal of Library Administration*, 32(1-2), 393-408. https://doi.org/10.1300/J111v32n01_14
- [13] Frieden, S. (1999). Support services for distance education. *Journal of Educational Technology & Society*, 2(3), 48-54.
- [14] Lumadi, R. I. (2021). Enhancing student development through support services in an open distance learning institution: a case study in South Africa. *South African Journal of Higher Education*, 35(1), 113-126. <https://doi.org/10.20853/35-1-4422>
- [15] Agrawal, S. R., & Ghosh, C. K. (2014). Inculcation of values for best practices in student support services in open and distance Learning—The IGNOU experience. *Journal of Human Values*, 20(1), 95-111. <https://doi.org/10.1177/0971685813515596>
- [16] Budiman, R. (2013). Utilizing Skype for providing learning support for Indonesian distance learning students: A lesson learnt. *Procedia-Social and Behavioral Sciences*, 83, 5-10. <https://doi.org/10.1016/j.sbspro.2013.06.002>

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