ProScholar Insights (PSI)
Volume 3, Issue 1 (2024)
Pages: 1 – 9

PROSCHOLAR INSIGHTS

ISSN (Print): 3006-838X
ISSN (Online): 3006-7723
DOI: 10.62997/psi.2024a-31015

Research Article **Open Access Journal**

Understanding the Role of Technology in Shaping Students' Academic Success in Universities

Aqsa Abbas [1], Rabiah Mohyuddin [2], Marium Ansari [3] and Aneeqa Mohyuddin [4]

[1] M.Phil. Scholar, Department of Education, The Women University Multan, Punjab, Pakistan.
Email: aqsa.abbaas2050@gmail.com

[2] Lecturer, Department of Education, The Women University Multan, Punjab, Pakistan.
Email: rabiah.6531@wum.edu.pk

[3] Lecturer, Department of Education, The Women University Multan, Punjab, Pakistan.
Email: marium.6567@wum.edu.pk

[4] M.Phil. Scholar, Department of English, Bahauddin Zakariya University Multan, Punjab, Pakistan.
Email: aneeqamohyuddin@gmail.com

This article may be cited as Abbas, A., Mohyuddin, R., Ansari, M., Mohyuddin, A. (2024). Understanding the Role of Technology in Shaping Students' Academic Success in Universities. *ProScholar Insights, 3*(1), 1-9.
https://doi.org/10.62997/psi.2024a-31015

Abstract: The current descriptive study aimed to determine the role of digital technology on the academic performance of undergraduate students at public sector universities. The investigation focused on 7628 students studying at public sector universities in the district of Multan, South Punjab, Pakistan. Three hundred and fifty (350) undergraduate students made up the investigation's sample, selected using a simple random sampling approach. The data analysis procedure included descriptive statistics (mean and standard deviation), inferential statistics (Pearson correlation coefficients), and regression models. The findings revealed that the use of digital technologies had a significant impact on students' learning and performance in education. The study recommended that universities should conduct educational campaigns to foster appreciation of the benefits of using technology.

Keywords: Digital Technology, Students, Academic Success

Corresponding Author:
Rabiah Mohyuddin
Lecturer, Department of Education,
The Women University Multan,
Punjab, Pakistan.
rabiah.6531@wum.edu.pk

Introduction

The emergence of digital technology has facilitated learning through virtual learning platforms (Pires et al., 2022). In addition to this, the progress of augmented reality technology has revolutionized conventional notions of learning environments and locations (Kyza & Georgiou, 2019). Diverse digital technologies have facilitated the integration of learning as a standard practice in many environments, including the workplace (Sjoberg & Holmgren, 2021). Furthermore, digital technology has a substantial impact on student's academic pursuits, cognitive capabilities, and artistic expression while also offering a platform to implement the most effective teaching methods rooted in an education 4.0 framework (Sharlovych et al., 2023).

The advent of the use and or adoption of Information Communication Technologies (ICT) has drastically changed the face of education. Moreover, artificial intelligence, augmented reality, virtual reality, blockchain, and software applications have given new opportunities for the improvement of the procedures of teaching and learning, as stated by Gaol and Prasolova (2022) in their research investigation. For this reason, in the recent past, all over the world, financial investment in the process of integrating teaching and learning strategies Thus, in the course of the years, education systems of the world have increased their financial commitment to the adoption of information and communication technology (ICT) education (Fernández-Gutiérrez et al., 2020; Lawrence & Tar, 2018) as researchers as have paid a lot of attention on the ICT integration plans and policies in their educational systems.

Moreover, because of COVID-19, teaching has been done virtually and has encouraged reliance on the digital technological environment in educational organizations, which in turn raises questions on the process, nature, extent and efficiency of the implementation of digitalization in educational organizations (Cachia et al., 2021; König et al., 2020). Besides, it implies that in the technological environment of the present process of education, the institutions have understood that they should also incorporate students' attitudes toward technology while teaching them the curriculum. According to the view of Jing et al. (2024), knowledge acquisition and knowledge construction can be promoted through so-called digital instructional technologies. In the educational industry, technology has emerged to a very large extent as an instrument in teaching and learning and in research. Education has not been left behind by technological developments, for they have affected students' learning and teaching methods, that is, instructors, the ways and the development of exams.

Furthermore, Brown (2015) has highlighted that digital technology has a big impact on the achievement of undergraduate students. By coordinating and scheduling their classes, the students also improved their chances of coming across teaching aids and learning facilities and getting an opportunity to learn or study methods that would cultivate their ways. A number of researchers have designed surveys to assess the extent and manner of using digital technology in learning environments; however, the prior research is dispersed because it focuses only on some facet of the technology. For instance, Pinto and Leite (2020) in their study focused on digital technology in the teaching-learning process in higher education, while Mustapha et al. (2021) in their study emphasized the role of and the importance of digital technology in education, particularly during the pandemic. In the frame of the contemporary educational process, the application of new technologies and tools for learning has predetermined changes in the learning and teaching process and offered new possibilities for the creation of effective and interesting experiences. However, as technology is progressing fast, especially in delivering digital resources and services, there are rising concerns about its impact on the performance of undergraduate students. Therefore, the researchers endeavoured to examine how this use of digital technology to teach, learn, communicate and collaborate affects the learning accomplishment, learning process and learning milieu of undergraduate students in the universities. Although it is asserted that digital technology improves access, participation and efficiency in education. Also, assessing the impacts of affiliation to digital technologies on the academic performance of undergraduate students assists in enhancing the understanding of how students are learning in the 21st century. The increasing undergraduate student population, commonly referred to as the digital natives, are people who have been brought up with technology. Moreover, this expansion of digital technology is further boosted by the integration of artificial intelligence technology in the education sector (Banerjee et al., 2021).

As a matter of fact, technology is helpful in practice, and it is perfect as a new method that has the potential to transform education in the future (Rospigliosi, 2023). Consequently, the manner in which they learn is influenced by the comparatively higher tendency of application of these tools and resources. It is thus important to know whether and how much students engage with and make use of digital resources. It is also relevant to examine how such disparities can impact accomplishment on academic tests and education equity. The overall research aim of this study is to explore the effects of technology on student's performance in their undergraduate studies. The study aims to unveil important insights that are likely to assist in the alteration of educational policies, practices, and teaching methods in the context of the digital environment.

Research Objectives

1. To examine the perspectives of students regarding the role of digital technology in education in Public Sector Universities.
2. To compare the students' perspectives on the role of digital technology on the basis of their gender in Public Sector Universities.
3. To investigate the relationship between digital technology and academic achievement of undergraduate students at Public Sector Universities.

Research Questions

1. What are the perspectives of students regarding the role of digital technology in education in Public Sector Universities?
2. What are the students' perspectives on the role of digital technology based on their gender in public sector universities?
3. What is the relationship between digital technology and the academic achievement of undergraduate students at Public Sector Universities?

Literature Review

Several empirical research investigations have been done in the past decades in an attempt to establish the impact of digital technology on the performance of undergraduate students. Over the last few decades, a lot of emphasis has been laid on the incorporation of technology in the learning domain. In view of this, Taşpınar et al. (2023) carried out an inquiry with the objective of determining the impact of technology-based mathematics training on achievement. Their study highlighted a strong relationship between teachability and student performance. Moreover, Ali et al. (2020) have reported a study that was conducted with the purpose of understanding how teachers can raise achievement and motivation through technology and revealed the fact that the real application of concepts such as digital technology leads to improvement of the student's attitude towards learning in effective ways. On the other hand, the digital learning environment can influence the learning process and students' capacities to interact successfully with the course materials (Zhang, 2021). Similarly, Johnson and Smith (2024) also highlighted the effects of the advancement in digital technology on the student's performance in their research pursuit. Further, in their findings, it was revealed that, indeed, technology, and especially learning applications, have a positive influence on the interest level of students.

To establish this, Wong and Lee (2024) sought to investigate the effects of the application of digital technologies on the learners' performance in the current learning system. In their research study, the researchers recognized many advantages of new digital technology, such as the availability of information, organisation of work, and motivation to work in an educational setting. Furthermore, technology makes it possible to deliver learning experiences for better mastery of challenging concepts while at the same time promoting cognition to obtain useful information to enhance and facilitate more precise and efficient instructional intervention.

Research Methodology

The current study employed a descriptive research design to meet its objectives. The population consisted of a total of 7628 students from the HEC list of public sector universities in the district Multan, South Panjab, Pakistan. Researchers utilized random sampling techniques to select the students for investigation. As a result, the study sample consisted of 145 male and 205 female students from the different faculties of social sciences at public sector universities: The Women University Multan, Bahauddin Zakariya University Multan, and Emerson University Multan. The main instrument for data collection was a comprehensive, structured questionnaire encompassing various components aimed at capturing the nuanced perspectives of students.

The researcher developed a questionnaire consisting of 30 statements for the current investigation after a comprehensive study of the relevant literature and detailed discussions with various experts. The researchers consulted two experts in the discipline to review and analyze each item of the questionnaire to ensure its content validity. Moreover, the researchers refined and improved each of the identified limitations in the research instrument, considering the feedback from the experts. Ultimately, the researcher finalized the research instrument, which included 30 easily understandable statements for data collection among university students. The researcher chose a different sample for the pilot study than the main one. Following the data collection for the pilot study, the researcher entered all the data into the Statistical Package for Social Sciences (SPSS) to assess the instrument's reliability. The researcher found the recorded Cronbach Alpha value of 0.747 to be within the accepted range.

For data collection, the researcher distributed 350 questionnaires to male and female students from various selected departments. Following ethical protocol, the researcher approached both male and female students, and after providing assurances about the confidentiality of their responses, 350 of them participated in the study. Furthermore, the questionnaire clearly outlined all the instructions. The researchers clearly stated all the instructions on the questionnaire and also provided the necessary guidance orally to all the study participants. Before collecting data, the researchers explained the purpose of this study to all participants in order to gain their confidence. The researcher collaborated with the students to determine the most convenient time for data collection. The researchers in this investigation maintained the respondents' privacy.

Data Analysis

The researcher evaluated the acquired data using both inferential and descriptive statistics. The researcher utilized descriptive statistics to analyze the data, employing measures such as frequency, mean, percentage, and standard deviation and inferential statistics such as correlation coefficients and regression models. The data was analyzed using SPSS version 25, a statistical software package specifically designed for social sciences.

Table 1

Gender wise distribution

Gender	Frequency	Percent
Male	146	41.7
Female	204	58.3
Total	350	100.0

The data portrayed in Table 1 shows that 41.7% of the 350 individuals are male, while 58.3% are female. This indicates a higher representation of females in the population. The total number of individuals surveyed is 350.

Table 2

Department wise distribution

Department	Frequency	Percent
Education	87	24.9
Mass Communication	59	16.9
Political Science	79	22.6
Psychology	63	18.0
Sociology	62	17.7
Total	350	100.0

The data depicted in Table 2 indicates that out of 350 individuals, 24.9% are from the Education department, 16.9% from Mass Communication, 22.6% from Political Science, 18.0% from Psychology, and 17.7%.

Table 3

CGPA wise distribution

CGPA	Frequency	Percent
2.00-3.00	93	26.6
3.00-3.50	145	41.4
3.50-4.00	112	32.0
Total	350	100.0

The data provided in Table 3 shows that out of 350 individuals, 26.6% have a CGPA of 2.00-3.00, 41.4% have a CGPA of 3.00-3.50, and 32.0% have a CGPA of 3.50-4.00. This indicates that the largest group falls within the 3.00-3.50 CGPA range.

Table 4

Descriptive statistics for students' perspectives towards digital technologies in education

S#	Statements	N	Range	Minimum	Maximum	Mean	Std. Deviation
1.	Digital tools have enhanced my ability to access educational resources.	350	4.00	1.00	5.00	3.0800	1.14025
2.	Digital lectures and tutorials have positively impacted my learning experience.	350	4.00	1.00	5.00	2.9857	1.11377
3.	Interactive learning platforms have improved my understanding of course materials.	350	4.00	1.00	5.00	2.9771	1.14283
4.	Digital simulations have helped me grasp complex concepts more effectively.	350	4.00	1.00	5.00	2.8000	1.06790
5.	E-books and online resources have made studying more convenient for me.	350	4.00	1.00	5.00	2.5914	1.15127
6.	Collaborative online projects have enriched my learning experience.	350	4.00	1.00	5.00	2.8257	1.06570
7.	Virtual reality tools have enhanced my engagement in certain subjects.	350	4.00	1.00	5.00	2.6686	1.09119
8.	Digital forums and discussion boards have facilitated peer-to-peer learning.	350	4.00	1.00	5.00	2.6343	1.11153
9.	Mobile learning apps have made it easier for me to study on the go.	350	4.00	1.00	5.00	2.9171	1.15130
10.	Digital assessments have provided immediate feedback on my progress.	350	4.00	1.00	5.00	2.9343	1.18429

The responses given in Table 4 from 350 individuals regarding the impact of digital tools on their education exhibit varied perceptions, as indicated by the standard deviations across different statements. On average, respondents generally agreed that digital tools have enhanced their access to educational resources (Mean = 3.08, SD = 1.14), positively influenced their learning through lectures and tutorials (Mean = 2.99, SD = 1.11), and improved understanding via interactive platforms (Mean = 2.98, SD = 1.14). However, perceptions were more diverse regarding the effectiveness of digital simulations in grasping complex concepts (Mean = 2.80, SD = 1.07), the convenience of e-books and online resources (Mean = 2.59, SD = 1.15), and the facilitation of peer learning through digital forums and discussion boards (Mean = 2.63, SD = 1.11). Despite varying opinions, mobile learning apps were seen as aiding study on the go (Mean = 2.92, SD = 1.15), while digital assessments were valued for providing immediate feedback on progress (Mean = 2.93, SD = 1.18).

Table 5

T-test for gender-wise analysis of students' perception

S#	Factor	Gender	N	Mean	Std. Deviation	Std. Error Mean	T	df	Sig. (2tailed)	Mean Difference
1	Digital Technologies in Education	Male	146	27.938	6.8915	.57034	-1.119	348	.264	-.81655
		Female	204	28.754	6.6175	.46332				
2	Perception Towards Digital Learning	Male	146	30.712	5.2770	.43674	.389	348	.698	.22213
		Female	204	30.490	5.2630	.36849				
3	Academic Performance of Undergraduate Students	Male	146	35.095	6.6864	.55337	2.834	348	.005	2.10079
		Female	204	32.995	6.9448	.48624				

The statistics presented in Table 5 present gender differences in perceptions of digital technologies in education and academic performance among undergraduate students. While there seems to be no significant difference between males (M = 27.94, SD = 6.89) and females (M = 28.75, SD = 6.62) in digital technology perceptions (t (348) = -1.119, p = .264), males (M = 30.71, SD = 5.28) and females (M = 30.49, SD = 5.26) hold similar perceptions towards digital learning (t (348) = 0.389, p = .698). However, in terms of academic performance, there's a significant difference between male (M = 35.10, SD = 6.69) and female (M = 32.99, SD = 6.94) undergraduate students ((348) = 2.834, p = .005), with male students demonstrating higher performance by an average of 2.10 points.

Table 6

Correlation matrix of digital technology and academic achievement

S#	Factors	Digital Technologies in Education	Perceptions Towards Digital Learning	Academic Performance of Students
1	Digital Technologies in Education	Pearson Correlation	1	-.221**
		Sig. (2-tailed)		.000
		N	350	350
2	Perceptions Towards Digital Learning	Pearson Correlation	-.221**	1
		Sig. (2-tailed)	.000	
		N	350	350
3	Academic Performance of Undergraduate Students	Pearson Correlation	-.312**	.544**
		Sig. (2-tailed)	.000	.000
		N	350	350

**. Correlation is significant at the 0.01 level (2-tailed).

These correlation results provided in Table 6 indicate significant relationships between perceptions of digital technologies in education, perceptions towards digital learning, and academic performance among undergraduate students. There's a significant negative correlation between perceptions towards digital technologies in education and perceptions towards digital learning ($r = -0.221$, $p < 0.01$), meaning that individuals hold more positive perceptions towards digital technologies in education. Similarly, there's a significant negative correlation between perceptions towards digital technologies in education and academic performance ($r = -0.312$, $p < 0.01$), indicating that individuals with more positive perceptions towards digital technologies in education tend to have low academic performance. Conversely, there's a significant positive correlation between perceptions towards digital learning and academic performance ($r = 0.544$, $p < 0.01$), suggesting that individuals with more positive perceptions towards digital learning tend to have higher academic performance.

Table 7

Model summary for regression analysis of academic performance of undergraduate students

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.544[a]	.296	.294	5.80330

a. Predictors: (Constant), Perceptions towards Digital Learning

This model summary given in Table 7 presents the relationship between perceptions of digital learning and academic performance among undergraduate students. The predictor variable, perceptions towards digital learning, explains approximately 29.6% of the variance in academic performance (R Square = 0.296, Adjusted R Square = 0.294). The standard error of the estimate is 5.80330, indicating the average distance that the observed values fall from the regression line. The model includes a constant term.

Discussion

The main purpose of this study was to explore the perception that undergraduate students hold towards the role of digital technology in their academic success. The results revealed that the students had a positive perception of the contribution of digital technology in their academic lives. These results align with the findings of studies carried out by Bernate et al. (2021), in which the same positive perspectives of students were observed in relation to the role of digital technology. The researchers also explored the relationship between students' perception towards technology and their academic performance. This was corroborated by the interpretation brought forth by Garcia and Jimenez (2019), which found that there is a positive correlation between students' perception towards technology and academics. Additionally, the same was brought out the correlation between digital competence and academic performance (Mehrvarz et al., 2021).

Furthermore, no difference was observed between male and female categories of students except in the dimension of academic improvement in the current study. These findings agreed with those of Usart et al. (2024), who observed that students hold similar perceptions towards the role of technology regardless of their gender. These results imply that educational institutions should support students so the pedagogical approaches can be well blended with the virtual environment of learning, possibly leading toward effective digital education as well.

Conclusions

The study results indicated that the pupils possess knowledge about internet usage and have the means to access it. Moreover, the research offers useful perspectives on the perceptions and attitudes toward digital technology in education and its influence on academic achievement. This emphasizes the significance of taking into account various viewpoints and dealing with gender disparities in the utilization of digital tools in education. The study also examined the impact of digital technologies on the academic achievement of undergraduate students.

The findings indicate that there are notable associations between these variables. Specifically, there is a positive link between positive attitudes toward digital learning and academic success, implying that persons who have more positive perceptions generally achieve higher academic performance. Moreover, this study discovered that digital learning platforms had a substantial impact on student's learning outcomes and their motivation to engage in learning. Additionally, the research revealed that frequent utilization of educational applications and virtual classrooms enhances students' learning outcomes and boosts their motivation to acquire knowledge.

Recommendations From Study

- It is necessary to implement awareness initiatives to educate pupils about the benefits obtained from utilizing digital technologies.
- The university administration should offer students the convenience of a digital library, as it is a crucial necessity in higher education.

References

Ali, M. S. B., Yasmeen, R., & Munawar, Z. (2023). The Impact of Technology Integration on Student Engagement and Achievement in Mathematics Education: A Systematic Review. *International journal of computer integrated manufacturing*, *6*(3), 222–232.https://journals.researchparks.org/index.php/IJIE

Banerjee, M., Chiew, D., Patel, K. T., Johns, I., Chappell, D., Linton, N., Cole, G. D., Francis, D. P., Szram, J., Ross, J., & Zaman, S. (2021a). The impact of artificial intelligence on clinical education: perceptions of postgraduate trainee doctors in London (UK) and recommendations for trainers. *BMC Medical Education*, *21*(1), 429. https://doi.org/10.1186/s12909-021-02870-x

Bernate, J., Fonseca, I., Guataquira, A., & Perilla, A. (2021). *Competencias Digitales en estudiantes de Licenciatura en Educación Física. Retos: nuevas tendencias en educación física, deporte y recreación*. 309–318.

Brown, J. P. (2015). Complexities of digital technology use and the teaching and learning of function. *Computers & Education*, *87*, 112–122. https://doi.org/10.1016/j.compedu.2015.03.022

Cachia, R., Velicu, A., Chaudron, S., Di Gioia, R., & Vuorikari, R. (2021). *Emergency remote schooling during COVID-19, EUR 30866 EN* (Vol. 22). EUR 30866 EN, Publications Office of the European Union.

Fernández-Gutiérrez, M., Gimenez, G., & Calero, J. (2020). Is the use of ICT in education leading to higher student outcomes? Analysis from the Spanish Autonomous Communities. *Computers & Education*, *157*(103969), 103969. https://doi.org/10.1016/j.compedu.2020.103969

Gaol, F. L., & Prasolova-Førland, E. (2022). Special section editorial: The frontiers of augmented and mixed reality in all levels of education. *Education and Information Technologies*, 27, 611-623. https://doi.org/10.1007/s10639-021-10746-2

García Perales, R., & Jiménez Fernández, C. (2018). Relación entre repetición de curso, rendimiento académico E igualdad en educación. Las aportaciones de PISA. *Revista Educación, Política y Sociedad*, *4*(1), 84-108. https://doi.org/10.15366/reps2019.4.1.004

Jing, Y., Wang, C., Chen, Y., Wang, H., Yu, T., & Shadiev, R. (2023). Bibliometric mapping techniques in educational technology research: A systematic literature review. *Education and Information Technologies*, *29*(8), 9283–9311. https://doi.org/10.1007/s10639-023-12178-6

Johnson, A., & Smith, R. (2024). The impact of digital technology on student achievement: Enhancing learning through innovation. *Journal of Educational Technology, 15*(1), 45–67.

König, J., Jäger-Biela, D. J., & Glutsch, N. (2020). Adapting to online teaching during COVID-19 school closure: teacher education and teacher competence effects among early career teachers in Germany. *European Journal of Teacher Education*, *43*(4), 608–622. https://doi.org/10.1080/02619768.2020.1809650

Kyza, E. A., & Georgiou, Y. (2018). Scaffolding augmented reality inquiry learning: The design and investigation of the *TraceReaders* location-based, augmented reality platform. *Interactive Learning Environments*, *27*(2), 211–225. https://doi.org/10.1080/10494820.2018.1458039

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in the teaching/learning process. *Educational Media International*, *55*(1), 79–105. https://doi.org/10.1080/09523987.2018.1439712

Mehrvarz, M., Heidari, E., Farrokhnia, M., & Noroozi, O. (2021). The mediating role of digital informal learning is in the relationship between students' digital competence and their academic performance. *Computers & Education*, *167*, 104–184. https://doi.org/10.1016/j.compedu.2021.104184

Mustapha, I., Thuy Van, N., Shahverdi, M., Qureshi, M. I., & Khan, N. (2021). Effectiveness of digital technology in education during COVID-19 pandemic. A bibliometric analysis. *International Journal of Interactive Mobile Technologies (iJIM)*, *15*(08), 136. https://doi.org/10.3991/ijim.v15i08.20415

Pinto, M., & Leite, C. (2020). Digital technologies in support of students learning in Higher Education: literature review. *Digital Education Review*, *37*, 343–360. https://doi.org/10.1344/der.2020.37.343-360

Pires, F., Masanet, M.-J., Tomasena, J. M., & Scolari, C. A. (2022). Learning with YouTube: Beyond formal and informal through new actors, strategies and affordances. *Convergence The International Journal of Research into New*

Media Technologies, *28*(3), 838–853. https://doi.org/10.1177/13548565211020545

Rospigliosi, P. A. (2023). Artificial intelligence in teaching and learning: What questions should we ask of ChatGPT? *Interactive Learning Environments, 31*(1), 1-3. https://doi.org/10.1080/10494820.2023.2180191

Sharlovych, Z., Vilchynska, L., Danylyuk, S., Huba, B., & Zadilska, H. (2023). Digital technologies as a means of improving the efficiency of higher education. *International Journal of Information and Education Technology*, *13*(8), 1214-1221. https://doi.org/10.18178/ijiet.2023.13.8.1923

Sjöberg, D., & Holmgren, R. (2021). Informal workplace learning in Swedish police education– a teacher perspective. *Vocations and Learning*, *14*(2), 265-284. https://doi.org/10.1007/s12186-021-09267-3

Taşpınar Şener, Z. (2023). The impact of technology-mediated applications on mathematics achievement: A met. *International Journal of Education Technology and Scientific Researches*. https://doi.org/10.35826/ijetsar.624

Usart, M., Lázaro-Cantabrana, J.-L., Romeu, T., & Gisbert-Cervera, M. (2024). Digital competence profiles of first-year, pre-service teachers. Analysis in the Catalan university system. *Teachers and Teaching*, 1–18. https://doi.org/10.1080/13540602.2024.2313640

Wong, Y. K., Lau, K. L., & Lee, I. (2024). Young Chinese language learners' L2 motivational self system and learning achievement in Chinese literacy acquisition. *Journal of Language Identity & Education*, 1–17. https://doi.org/10.1080/15348458.2024.2379400

Zhang, P. (2021). Understanding digital learning behaviors: Moderating roles of goal setting behavior and social pressure in large-scale open online courses. *Frontiers in Psychology*, *12*, 783610. https://doi.org/10.3389/fpsyg.2021.783610