Role of E-learning Platforms to Enhance Digital Education in Nepal: Exploring Opportunities, Challenges, Proposed Solutions and Necessary Improvements

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Krishna Dulal

Spring 2023

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

MC Forelle, Department of Engineering and Society

Introduction

The advancements in digital technology have led to remarkable transformations in the world that were once out of imagination for humans. These advancements have transformed communication, work, and daily lifestyle, establishing a new benchmark for contemporary society. The internet and digital devices have created a new era that has opened countless possibilities. Without them, many of these possibilities would have been unimaginable. One may ask oneself, what would the education landscape look like without such tools, particularly in underdeveloped nations like Nepal? The education system of Nepal faces a significant challenge due to its heavy reliance on traditional learning resources, such as books, pens, and paper, which are limited in supply. Geography, economy, language barriers, and technological divides limit educational opportunities and quality in Nepal. It is crucial to consider the potential effects of modern learning technologies, such as digital or distance education, on Nepal's educational system. Can the utilization of eLearning platforms assist in transforming Nepal's educational system, increasing the literacy rate, developing a skilled workforce, and shifting away from low-wage labor for jobs such as construction? Can Nepal become a tech hub like Israel or Nigeria by doing so? Can improving internet connectivity in rural areas unlock global learning resources for Nepalese students?

Integrating e-learning platforms has the potential to make education more accessible and equitable in Nepal, especially for those living in remote and underprivileged areas. This research suggests that such integration can significantly transform the country's education system. It hypothesizes that such integration will improve literacy rates and prepare a more skilled

workforce, thereby aiding Nepal's transformation into a knowledge-driven economy rather than a remittance and agricultural economy. The literature review examines the historical context and development of Nepal's education system, the role of e-learning in the current educational landscape, and the challenges of implementing digital education in remote areas. It discusses the impact of sociocultural factors and technological infrastructure on adopting e-learning platforms in Nepal. The review also addresses various governmental and private initiatives to support digital education and highlights the gap between urban and rural educational access. The study analyzes data from academic research papers, journals, and online platforms focusing on e-learning in Nepal. It includes examining case studies of existing e-learning implementations and surveys of students and educators to assess online education's current state and efficacy. The analysis investigates software requirements, usage patterns, and the barriers stakeholders face, particularly in rural areas. The findings suggest a significant digital divide in education between urban and rural areas, with a pronounced need for more infrastructure and resources in the latter. There is a potential for e-learning to bridge this gap due to increasing internet penetration and mobile connectivity. However, issues like language barriers, lack of suitable local content, and resistance from traditional educational frameworks pose substantial challenges.

The potential for e-learning platforms to revolutionize education in Nepal is significant, although it is yet to be fully realized. These platforms will only be successful if the government and community actors collaborate to improve technological capabilities, create content in local languages, and equip educators with effective digital teaching methods. To ensure the effective implementation of these platforms, it is essential to involve all stakeholders. These platforms can improve educational equality and produce a skilled workforce in Nepal.

Literature Review

Nepal's educational landscape has transformed dynamically since the 1950s, catalyzed by socio-demographic diversities and significant political transitions (MOE,2016). Historically rooted in face-to-face methodologies like the Gurukul system, digital technologies have prompted a gradual paradigm shift toward e-learning (Pangeni, 2016, p.32). This transition was initially spurred by initiatives such as radio-based distance education in 1958, which evolved significantly by establishing the Distance Education Center in 1994, further mainstreaming e-learning through radio broadcasts (Pangeni, 2016).

Nepal's digital education infrastructure is facing significant difficulties despite expanding internet connectivity, which reached 15.85 million users by the beginning of 2023, accounting for 51.6% of the population (Datareportal, 2023). These include severe financial constraints, a scarcity of qualified teachers, reliance on English for digital content, and markedly limited internet access in rural areas where 80% of the populace resides (Shakya et al., 2017, p.16). The COVID-19 pandemic exacerbated these issues, leading to an accelerated shift to online learning, supported partially by the National Information Technology Policy 2015. The government and academic institutions have taken significant measures to promote digital education, but there are still noticeable inequalities. Efforts to integrate educational materials and courses in Nepali and other regional languages are crucial to bridging the digital divide. This integration, alongside enhancements in technological infrastructure and translation capabilities in educational apps, is essential for a comprehensive digital education framework to ensure equitable access to quality education for all segments of Nepal's multilingual and multicultural population. Despite being

around for a long time, e-learning has not been extensively utilized in Nepal due to ongoing obstacles. Finally, technological access in rural areas should be improved, educational content in the local language should be expanded, and teacher training and resources should be reinforced to enhance the efficiency and reach of learning platforms across Nepal.

Theoretical Framework

This paper studies Nepal's educational system using the SCOT framework, "Social Construction of Technology." The study focuses on the technological devices and applications utilized in schools and the country's varied culture, encompassing its numerous languages, beliefs, and societal groups. This investigation aims to gain insights into how these factors influence the technology employed in the educational sector and how they impact teaching and learning methods.

The SCOT framework, introduced in 1984 by Bijker and colleagues, recognizes that society and technology have a bidirectional relationship. This means that both technology and society influence each other. In Nepal, the design and popularity of digital learning can be influenced by cultural values and beliefs, whereas educational practices can be modified by technology. I intend to use the SCOT framework to analyze Nepal's educational system, specifically focusing on the influence of high school and university students and their teachers on the country's future economy and workforce. I aim to discover methods to improve the learning journey for everyone, irrespective of their literacy level, background, language, or religion. I aim to acquire a deeper understanding of the link between technology and Nepali culture within the context of education. This includes examining how local traditions can influence the

4

development and use of technology and how technology can potentially transform societal norms in Nepal.

It is essential to acknowledge that technology is not only influenced by society. As per the SCOT framework, individual actions and decisions also play a significant role in technology/anticraft development and evolution. It is essential to consider the perspectives of students, teachers, and other education stakeholders when examining the role of online technology in Nepal's education system, particularly eLearning platforms. Understanding that technological advancement can take various and adaptable paths is also vital. Bijker et al. (1984) suggest that different social groups have varying perspectives on artifacts, which can lead to different challenges and solutions that influence the development of the artifact. The current online learning technology in Nepal requires modifications to better align with the needs of Nepali stakeholders. Rather than relying on existing eLearning platforms, I plan to explore alternative approaches that are more appropriate for Nepal's unique educational requirements and cultural background while considering the potential positive and negative impacts that may arise in Nepal's diverse society.

Method

As an individual with a deep interest in the evolution of Nepal's educational framework and its potential impact on the nation's economic advancement, I am currently undertaking a mixed-methods research study to address the central research query comprehensively and rigorously. This study will review academic literature, policy reports, and case studies focusing on e-learning platforms in Nepal's educational system and their societal impacts. To do this, I will gather evidence from secondary sources, such as academic journals, educational reports

from regional agencies, and Scholarly Documents. I will select sources based on their relevance to the development and impact of digital education in Nepal to capture the current educational landscape comprehensively. I will collect data from online databases like JSTOR, Google Scholar, governmental, educational repositories (UVA libraries libra repository, etc.), and international education databases.

After collecting all information from diverse online sources, I am conducting a comprehensive analysis of the data obtained through coding. My primary goal is to identify common challenges, trends, and gaps in the digital education infrastructure. I am focusing on identifying recurring themes about technological, linguistic, and socioeconomic obstacles faced by students in online learning environments. Once I complete the data collection and synthesis process, I will present potential solutions to address the issues identified. I have chosen a methodology best suited to examine the interplay between technology and society within Nepal's education context. I will use the Social Construction of Technology (SCOT) framework to provide a lens that highlights how educational technology is shaped by societal forces and how it can influence societal development, I will be using the Social Construction of Technology (SCOT) framework. My goal is to provide recommendations that are theoretically sound and practically viable; this will pave the way for an inclusive and effective digital education system in Nepal.

Analysis

Evolution and Opportunity

Nepal's evolution of education, the government's support of e-learning, and the ongoing adoption of e-learning showed an opportunity for Nepal to digitize its education. Nepal's

education system was relatively young but had experienced significant growth in school numbers

and enrollment since its expansion in the 1950s. Furthermore, Nepal had already begun

implementing distance learning as early as 1958. E-learning in Nepal historically involved

multimedia such as CDs and DVDs, with the College of Education initiating the first distance

education program via radio in 1958. Following the National Education Commission's 1993

provisions, the Distance Education Center was established in 1994, offering teacher training and

educational awareness through radio broadcasts. (Pangeni, 2016). The government has taken

steps to promote and support e-learning. For example, before establishing the Open University,

Nepal's Ministry of Education created an ICT Master Plan for 2013-2017 to develop ICT

infrastructure, human resources, content, and systems in education, including training teachers in

ICT and essential computer maintenance for schools. (Dhakal et al., 2019, p.30). Moreover,

some institutions in Nepal have already implemented the use of e-learning, hence encouraging its

uptake. "Kathmandu University School of Education (KUSOED) has been offering Master of

Education programs via online and distance education mode since 2011 (KUSOED, 2012), and

TU has been offering Bachelor and master's level courses on Information and Communication

Technology Education since 2013 (M.ICT.Ed, 2013).

Challenges in Remote Regions

Implementing e-learning in Nepal faces significant challenges due to various factors such

as remote settlement locations, lack of teachers, low adoption of e-learning, and the high cost of

developing digital educational infrastructure. Most of Nepal's population lives in rural areas,

making it difficult to digitize education. According to Shakya et al. (2017), 80% of the total

population of Nepal lives in rural areas, and there needs to be more educational institutions for

higher education. Furthermore, with more educators and teaching materials, students living in rural areas face education problems (p.16). This is further exacerbated by rural communities' financial hurdles, making it difficult to acquire quality education. Neupane (2014) argues that rural areas lack financial abundance and stability, crucial for imparting good science education. He further states that the lack of teachers in rural areas is not an isolated problem but a global one worldwide. (p.705). In addition, users' high online content consumption sometimes causes disruptions or slowing down due to internet overload. This is attributed to the fact that most people use the internet to work, socialize, and entertain themselves during the lockdown. While data packages on mobile networks are relatively faster, they are also far more expensive for students to afford regularly (Subedi et al., 2020, p. 70). This makes digitization disadvantageous compared to traditional teaching methods.

The high cost of building online education infrastructure, including hardware and software, adds to the financial burdens of many Nepalese citizens. Due to the high poverty rates in Nepal, implementing mobile learning in Nepal is a constraint to many, especially since the cost of smartphones, tablets, and other electronic gadgets is high. To operate these gadgets, one would also need expensive data- something most people in Nepal cannot afford. Other problems like frequent power outages, poor network coverage, and a lack of appropriate software and hardware prove that implementing digitization is an uphill task. Finally, the low uptake of e-learning by teachers hinders the progress of e-learning.

Innovative Use and Adaptation

Due to COVID-19, the utilization of online education has rapidly increased. As a result, more educational institutions, teachers, and government entities are taking initiatives to enhance the implementation of e-learning in Nepal. To begin with, some teachers in Nepal have adopted the standard Learning Management Systems (LMS) by creatively using Messenger groups as makeshift LMS for online teaching and learning, personalizing instruction with widely available tools. This innovative use includes establishing specific e-rules to maintain a focus on academic activities, highlighting their ability to identify and utilize the unique potential of social networking tools for educational purposes. (Shrestha, 2021, p.258-259). Additionally, universities and colleges should collaborate to provide online courses to make distance and online learning more common. For example, the Kathmandu University School of Education (KUSOED) has been offering Master of Education programs via online and distance education mode since 2011 (KUSOED, 2012), and TU has been offering Bachelor and master's level courses in Information and Communication Technology Education since 2013 (M.ICT.Ed, 2013). These two serve as examples of schools that should be emulated concerning e-learning. The Nepalese government has taken significant steps to promote digital education, including creating online platforms and digital learning. These efforts have been supported by policies such as the National Information Technology policy (2015), which aims to position information and technology as a tool for development and growth " (Gurung et al.,2023, p.6).

Critique of E-learning Platforms

Although e-learning has many advantages, it is not free from its disadvantages. Some critics argue that online learning environments can lead to learner fatigue and decreased

engagement, especially if video content is too long (Xie et al., 2022, sect 2, para. 2). Additionally, the lack of physical classroom structure, insufficient learning materials, and less interactive environments can hinder the effectiveness of digital education. As a result, students who participate in online learning may not perform as well as those in traditional classroom settings. However, advocates like Goyal (2012) point out the cost-effectiveness and convenience of e-learning, highlighting that it eliminates the need for travel and allows learning from various locations. Supporting this perspective, Paul and Jefferson (2019) found that with proper implementation, e-learning can produce outcomes comparable to traditional teaching methods. Their research suggests that the quality of content delivery and the strength of the underlying infrastructure are critical factors in the success of e-learning.

The benefits of e-learning are evident in its flexibility, which allows students to study at their own pace and on their schedules. According to a study by Paul and Jefferson (2019), there were no significant differences in academic performance between online and traditional learners, indicating that the mode of instruction does not inherently disadvantage students. Though there have been criticisms regarding engagement and educational outcomes, enhancing digital infrastructure, content delivery, and access can make e-learning viable and even superior in certain situations. In Nepal, strategic digital integration holds great potential for overcoming geographical and socioeconomic barriers and transforming the educational landscape. Despite some opinions that online education is less effective than in-person learning, it remains the optimal solution for revolutionizing education in Nepal.

Result and Discussion

Although the government, leading universities, and other stakeholders continuously worked to improve Nepal's educational system, the literacy rate in Nepal remained low. As per the National Population and Housing Census 2021, only 76.2% of Nepalese people were literate. Of that, 83.6% of men and 69.4% of women were literate. Nepal has only nine universities, so more than 100 thousand students annually leave the country to study abroad. According to recent data, many individuals left Nepal for better opportunities to live, work, and fulfill other needs. Please note that the following text has been converted to past tense.

Additionally, approximately 30% of Nepali individuals had been found to leverage digital platforms for their academic needs or to learn new things. Even though Nepal had a significant level of internet and mobile phone usage. As per Datareportal, more than half of the population, i.e., 51.6%, were Internet users. Nepal had 42.78 million active cellular mobile connections, 139.2% of the population. Mobile devices were readily accessible throughout Nepal. We had a unique chance to enhance the inclusivity and accessibility of education. Offering free online platforms on these devices was possible, significantly reducing the financial and logistical barriers to education.

According to a study by Adhikari et al. (2020), Nepalese students faced difficulties accessing online learning due to technological obstacles. These challenges included adapting to technology, submitting assignments, and engaging with online courses. The study also highlighted the importance of access to computers and reliable internet connectivity in enhancing learning outcomes in various regions of Nepal. However, affordability and user-friendliness

issues, mainly due to language barriers, were identified when exploring multiple online education platforms, such as Neema Academy, Meroschool, Midas eClass, Kullabs, Fuse Classroom, and Sikai Chautari. Many researchers like Pradhan highlighted this problem. For exampleNepal's educational system, which integrated local languages like Newari and Maithili, demonstrated a commitment to catering to diverse learner needs, thereby bridging the digital gap and ensuring educational equity across the nation (Pradhan, 2011, p.312).

Neupane (2014) highlighted the difficulty of providing quality science education in rural areas due to limited financial resources and stability. The scarcity of teachers in rural regions, as noted by Neupane (2014), was a universal concern. E-learning platforms emerged as potential solutions for educational disparities, particularly in rural communities. In 2020, UNICEF reported that globally, one-third of children, approximately 463 million, lacked access to remote learning during the COVID-19 pandemic-induced school closures. In Nepal, this figure was higher, with around two-thirds, roughly 8.5 million children, unable to access remote learning opportunities. Addressing financial and geographic barriers to education was imperative, enabling every Nepali child to learn, even amidst every day and pandemic situations like COVID-19, through the development and implementation of tailored e-learning tools. Nepal faced educational challenges beyond digital platforms, with deficiencies evident in traditional education methods. Public schools grappled with inadequate library facilities and teaching materials, exacerbating the educational landscape (Bhatta, 2008, p.10). The shortage of teachers and insufficient parental support due to a lack of requisite academic backgrounds further hindered the educational process in public schools (Bhatta, 2008, p.9).

Conclusion

Through this research, I now understand that e-learning platforms can significantly alter the educational landscape of Nepal, especially in remote and underprivileged areas. Initially, the discussion highlighted the traditional challenges and barriers within Nepal's education system, such as geographic isolation, economic constraints, and cultural diversity. During the argument, I concluded that e-learning is more than just an alternative form of education. Instead, it has the potential to transform education by making it more accessible, affordable, and adaptable to meet the needs of diverse linguistic and cultural communities. This understanding shifts my perspective from viewing technology as a mere facilitator to seeing it as a catalyst for educational reform and socio-economic development in developing nations like Nepal. Educators, policymakers, and educational technology developers in Nepal and similar developing countries could use the findings of this research to prioritize investments in digital infrastructure and e-learning platforms. Non-governmental organizations (NGOs) focusing on educational equity might leverage this study to advocate for more inclusive educational policies and practices. Additionally, investors and entrepreneurs could see this as an opportunity to support or create e-learning platforms that cater specifically to the needs of rural and marginalized populations.

Future researchers can expand on this project by conducting longitudinal studies to assess the long-term impact of e-learning interventions on literacy and employment rates in Nepal. They could also explore the psychological and social effects of transitioning from traditional to digital education systems. To better understand how e-learning solutions can be scaled and adapted, conducting studies comparing different regions within Nepal or other countries with

similar socio-economic profiles would be helpful. By doing so, researchers can gain deeper insights into the effectiveness of e-learning solutions. Future research should investigate the effectiveness of specific e-learning strategies and technologies tailored to Nepal's diverse cultural and linguistic landscape. It would also be beneficial to examine the role of government policy in facilitating or hindering the adoption of e-learning platforms.

Additionally, studies could focus on the training needs of teachers and educators to utilize digital tools effectively, ensuring they can support students through this transition. This research underscores a critical opportunity for transformative change in Nepal's educational sector through e-learning. By embracing digital education, Nepal can enhance educational accessibility and quality for all its citizens, paving the way towards a more educated and skilled workforce. This progress has the potential not only to improve individual lives but also to catalyze the overall socio-economic development of the country. With continued investment and innovative approaches, e-learning can make education a powerful tool for empowerment and change, inspiring optimism about the future of education in Nepal.

References

Acharya, A., Subedi, S., Gyawali, N., Poudyal, N., Lamichhane, G., Bastola, G., ... & Parajuli, N. (2021). Digital Learning Initiatives, Challenges and Achievement in Higher Education in Nepal Amidst COVID-19. *International Journal of Asian Education,* 2(3), 415-428. https://doi.org/10.46966/ijae.v2i3.224

Adhikari, B. P., Liu, C. H., Krishna Bahadur, K. C., & Kafle, S. The Impact of Covid Pandemic on Students' E-learning in the Higher-education Digital Pedagogy in Nepal. Eric. https://files.eric.ed.gov/fulltext/ED609894.pdf

Bhaskara, R. (2022). *Satori: A Course Management System; A Student-Centered Analysis of the Design of Virtual Learning Tools.* [Bachelor of Science thesis, University of Virginia]. 2022. Online Archive of University of Virginia Scholarship. https://doi.org/10.18130/bj0z-sw94

Bidari, S. (2021). Engaging learners in online classrooms: A case study from Nepal. *Journal of World Englishes and Educational Practices,* 3(7), 01–06. Neliti. https://media.neliti.com/media/publications/351848-engaging-learners-in-online-classrooms-a-71ef99e2.pdf

Dahal, N., Luitel, B. C., & Pant, B. P. (2023, July). Ensuring Higher Learning Outcomes Through E-Learning: An Example of Kathmandu University School of Education, Nepal. Paper presented at *17th International Conference on e-Learning and Digital Learning*, Porto, Portugal. College Sidekick. https://www.collegesidekick.com/study-docs/5662749

Dawadi, S., Giri, R. A., & Simkhada, P. (2020). Impact of COVID-19 on the Education Sector in

Nepal: Challenges and Coping Strategies. Sage Submissions. Preprint.

https://doi.org/10.31124/advance.12344336.v1

Dhakal, R. K., & Bhandari, B. (2019). Situation analysis of open and distance learning teacher

preparation in Nepal. *Jamia Journal of Education,* 5(2), 29-35. ResearchGate.

https://www.researchgate.net/publication/341926891_Situation_Analysis_of_Open_and_

Distance_eLearning_Teacher_Preparation_in_Nepal

Giri, S. (2021). Online Education in Nepal: Prospects and Challenges. *International Journal of*

Science and Research (IJSR). Volume 10. 1368–1375. IJSR

DOI: 10.21275/SR21318103310. https://www.ijsr.net/archive/v10i6/SR21318103310.pdf

Goyal, S. (2012). E-Learning: Future of education. *Journal of Education and Learning*

(EduLearn), 6(4), 239-242. DOI:10.11591/edulearn.v6i4.168

Gurung, N., & Shrestha, R. (2023). The Digitalization of Education in Nepal: A Critical

Discussion of the Affordances of Digital Commons. [Master's Thesis, Arcada University

of Applied Sciences]. Theseus.

https://www.theseus.fi/bitstream/handle/10024/799457/gurung_shrestha.pdf?sequence=2

Jha, A. (2020). ICT with Open and Distance Learning for Capability Enhancement: Practices of

Higher Education Institutions of Nepal. *Journal of Training and Development*, 5, 60–70.

DOI: https://doi.org/10.3126/jtd.v5i0.33895

Khanal, J., Gaulee, U., & Simpson, O. (2023). Higher education initiative challenges based on

multiple frames of leadership: The case of Nepal Open University. *Open Learning: The*

Journal of Open, Distance and e-Learning, 38(4), 366-383.

DOI: https://doi.org/10.1080/02680513.2021.1882296

Kemp, S. (2023, February 13). *Digital 2023: Nepal - datareportal – global digital insights*.

DataReportal. https://datareportal.com/reports/digital-2023-

nepal#:~:text=The%20state%20of%20digital%20in%20Nepal%20in%202023&text=Nep

al%20was%20home%20to%2012.60,percent%20of%20the%20total%20population.

Neupane, S. (2014). Using inexpensive technology and multimedia to improve science education

in rural communities of Nepal. *McGill Journal of Education,* 49(3), 697–706.

DOI: https://doi.org/10.7202/1033554ar

Pangeni, S. K. (2016). Open and distance learning: Cultural practices in Nepal. *European*

Journal of Open, Distance and E-Learning (EURODL), 19(2), 32-45. EURODL.

https://intapi.sciendo.com/pdf/10.1515/eurodl-2016-0006

Parajuli, K. (2016). Mobile learning practice in higher education in Nepal. *Open Praxis*, 8(1), 41-

54. Eric. https://files.eric.ed.gov/fulltext/EJ1093429.pdf

Pinch, T. J., & Bijker, W. E. (1984). The social construction of facts and artefacts: Or how the

sociology of science and the sociology of technology might benefit each other. *Social*

studies of science, 14(3), 399–441.

https://canvas.its.virginia.edu/courses/74039/files/folder/STS%20readings?preview=2617

698

Pradhan, L. (2011, September). Distance education in Nepal. In *1st International Technology,*

Education and Environment Conference,310-313. Richtmann

https://www.richtmann.org/journal/index.php/jesr/article/view/11912/11517

Shakya, S., Sharma, G., & Thapa, K. B. (2017). State education system with E-learning in Nepal:

Impact and challenges. *Journal of the Institute of Engineering*, 13(1), 10-19. Nepal

Journal Online. DOI: https://doi.org/10.3126/jie.v13i1.20344

Shrestha, S., Haque, S., Dawadi, S., & Giri, R. A. (2022). Preparations for and practices of online

    education during the Covid-19 pandemic: A study of Bangladesh and Nepal. *Education*

    and information technologies, pp. 1–23. Springer Link.

    https://link.springer.com/article/10.1007/s10639-021-10659-0

Subedi, S., Nayaju, S., Subedi, S., Shah, S. K., & Shah, J. M. (2020). Impact of E-learning during

    COVID-19 pandemic among nursing students and teachers of Nepal. *International*

    Journal of Science and Healthcare Research, *5*(3), 68-76. IJSHR.

    https://ijshr.com/IJSHR_Vol.5_Issue.3_July2020/IJSHR0012.pdf

Xia, Y., Hu, Y., Wu, C., Yang, L., & Lei, M. (2022). Challenges of online learning amid the

    COVID-19: College students' perspective. *Frontiers in Psychology*, 13, 1037311.

    Frontiers. DOI: https://doi.org/10.3389/fpsyg.2022.1037311