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Web 2.0 Portals: A Rosetta Stone in the Development of Sustainable Learning Environment in Education System

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ABSTRACT

Education fosters meaningful engagement across all dimensions. Information and Communication Technology (ICT) possess the potential to extend its reach to remote regions, where its interventions can significantly enhance the quality of education by alleviating socio-economic barriers. It contributes to the establishment of digital stability and literacy in the educational sector—areas that were previously overlooked. ICT facilitates lifelong and flexible learning, shaping the educational landscape. The emergence of web platforms, largely influenced by the global pandemic, has paved the way for the development of online learning environments. These technologies, characterized by their persuasive nature, offer consistent accessibility, reliability, and trustworthiness. The article presents the exploration of various Web 2.0 tools, both regulated by the Government of India and

proprietary platforms from India, various proprietary platforms in India and foreign countries. It explores how Web 2.0 aids in fostering user engagement and academic accessibility, while promoting sustainable learning. The research underscores the importance of integrating Web 2.0 into the teaching and learning process, highlighting the feasibility and effectiveness of such technologies. Ultimately, the article contributes to the advancement of knowledge, advocating for the sustainable evolution of Web 2.0 in the digital era. To fully capitalize on its potential, a proactive approach from various stakeholders is essential to revolutionize Web 2.0 across different levels of education, thus shaping a promising future.

Introduction

"It would cost USD 1 billion per day to maintain connectivity for education in poor countries."

- (GEM Report UNESCO, 2023)

Information and communication technology (ICT) and education are the two facets of learning. Over the years, much work has been done for the subsequent elevation of the quality of education, for which data-driven approaches are being considered. ICT creates a distinct approach to educating global citizens through the rapid delivery of quality content to users at low cost (The Earth Institute & Ericsson, 2016). Technology helps in obtaining equity and inclusion; quality and efficiency. Notably, the Education industry has witnessed robust growth in terms of educational learning management systems programs, language digital applications, and augmented virtual reality. The use of ICT while drafting educational policies is a combination of hardware, software, human resources, digital materials, and applications that can enhance educational opportunities and help foster technological abilities among students (Guidelines for ICT in Education Policies and Masterplans, 2022). (GEM Report UNESCO, 2023) the report signifies the importance of School internet connectivity, a benchmark indicator [4.a.1] with a global initiative of digital transformation, which appears as one of the targets of the learning environment of SDG 4—education for all. (Transforming Our World: The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs) outlines the development of global interconnectivity and expansion of information and communication technology has immense potential to eliminate the digital divide, develop a knowledge society, and accelerate human development. Over the past years, society witnessed unprecedented growth in

the ed-tech world by creating a meaningful engagement in each domain. In recent years, countless students enrolled in massive open online courses which extended to 220 million in 2021 (Shah, 2021). COVID-19 is considered a natural experiment where the entire education system is shifted to online mode. In India, COVID-19 acts as a catalyst for colleges and universities to conduct online classes by the educational boards where technology-based solution emerges as a transformation in the educational system (Nambiar, 2020). Therefore, asynchronous learning paved the way for the integration of web tools and showed how useful they could be in the edtech world. Namely, ed-tech refers to the educational technology that can be used to administer digital and other connected technology that support and enhance education (Sancho-Gil et al). It is used as a tool for schools and colleges the improve effective teaching to consolidate knowledge and learning and explore the new worlds that have been long ignored by the decision-makers (Edtech Magazine_2021_FINAL.Pdf, n.d.). With the use of ed-tech teachers can envision a school as a place of personalized learning by rejecting the traditional system (Ideland, 2021).

Review of Literature

The 21st century is moving towards digital spaces for education. (Danish et al., 2020) conducted a study where the objective was to find an effective method to assess the performance of students and their interest in e-learning. The result of the study revealed that 40% of the students found online learning courses more effective, creative, and accessible. (Lim, 2002) has analyzed the use of reusable learning objects, instructional design, and blended learning are the three interrelated trends. They are used within the context of education and their significance in education to implement such implications helps in redefining the roles of a student and teacher. It reevaluates the entire curriculum and mode of assessment which advocates the need for such a school that coordinates the entire system and collaborates in creating learning objects. (Dmytro Motornyi Tavria State Agrotechnological University et al., 2022) considers the integration of web technologies such as Google Classroom, blogs, and webinars for enhanced communication between students and teachers. (Yakel et al., 2011) emphasized the creation of a strong digital curation curriculum which consists of courses, internships, and technological tools for the holistic development of students which is maintained through Archival and record management in school. (Rodríguez-Loinaz et al., 2024) assessed how citizen science is helping to improve engagement in education and sustainable development. A developed CS-based education initiative was initiated in three schools across Greece, the UK, and, Spain. It is revealed that Citizen science helped students to develop skills and competencies related to sustainability and increased interest and motivation visible through ICT tools. Idleman (2022) investigates how the availability of asynchronous and mobile-friendly learning modules in Canvas impacts students' literacy skills at a college in California. It was found that Canvas was a pragmatic and effective approach to

extending information literacy beyond the physical classroom. (Malini & Rajkumar, 2021) in his study describe the use of distinct web tools that can be used for teaching and learning. It mainly explores how the integration of web-based tools is used in educational settings to improve the engagement and effectiveness of teaching methodologies (Sergii & Inna, 2022). It explores the use of web tools to support teachers by streamlining administrative tasks, enhancing classroom instruction, and establishing communication with students, parents, and colleagues. (Nedungadi et al., 2018) analyzed the impact of digital literacy in rural India for which the inclusive approach towards digital literacy is promoted. The solution for the digital divide in the study was the use of a mobile-based learning model, a curriculum that is context-enabled according to the needs of the target population, and the inclusion of a multi-stakeholder approach. After reviewing the above-related literature, the researcher concludes that Web 2.0 is beneficial and effective in developing a sustainable learning environment.

Research Methodology

This conceptual article draws upon an in-depth study of the related article and synthesizes insights from the previously conducted research to explore Web 2.0: A Rosetta stone in the development of a sustainable learning environment in education. After conducting an intensive study of secondary sources from different academic journal databases, policy documents, and other government reports and platforms. The study focuses on identifying such web 2.0 platforms that emerged after the pandemic which ensures easy accessibility and effective learning. The researcher has presented a clear view of how Web 2.0 features have an impact on creating user engagement and sustainable learning.

Objectives

The study aims to explore the following objectives:

1. To explore the various web tools 2.0 developed by the government of India and private sectors for academics.
2. To find out the various importance of web 2.0 tools in creating user engagement in academics and sustainable learning.

What is Web 2.0?

"The web is already so much a part of our lives that familiarity has clouded our perception of the web itself."

- Sir Tim Berners Lee (Berners-Lee & Fischetti, 1999)

Web 2.0 is a term that was originated by Tim O'Reilly. The transformation in the early 2000s led to the boom of dot-com services in Silicon Valley. It can be identified as the technical infrastructure that consists of Blogs, wikis, media-sharing sites, micro-blogging, and other web services which are the major components of web tools (web 2.0 and beyond) (Sergii & Inna, 2022). Literacy 2.0 is regarded as one of the influences of Web 2.0 in obtaining abilities and knowledge and means for developing lifelong learning (Penrod, 2008). It paved the way for digital-age literacy for the enhancement of critical thinking and to spark creativity among students. It contributes its effort to the user-generated content. In the context of learning, web tools are the tools that emphasize online interaction and knowledge sharing. (DePietro, 2013) web 2.0 is considered part of new media in creating Education 2.0 which brings evolution in the field of education that serves as a process of integration of curriculum development in the field of teaching through technology. To provide a user-rich experience, an easy-to-use feature helps in developing personalized learning among students. The 8 Cs of Web 2.0 is shown in Figure 1.

Figure 1. The 8 Cs of Web 2.0: Source – Created by author through Napkin.ai

Web 2.0 and sustainable learning

The Web evolved into a powerful, ubiquitous tool because it was built on egalitarian principles and because thousands of individuals, universities and companies have worked, both independently and together as part of the World Wide Web Consortium, to expand its capabilities based on those principles.

- Tim Berners-Lee (Berners-Lee, 2010)

The emergence of several web platforms contributes to sustainable learning through knowledge building and sharing due to its easy adaptability, and low cost. It provides learning support and free educational materials to worldwide learners (Zhan et al., 2015). It is expected that the Indian edtech market value will expand to US$30 billion by 2031, from US$ 700-800 million in 2021(Education in India, n.d.). Over the past years, technology-based education has witnessed an upsurge in the Indian education system and that significant push is only because of COVID-19 (Seeds of Change, 2023). To complement sustainable learning and user engagement various web tools are initiated by the government platforms and some by private stakeholders of which some have been discussed that are extremely effective are shown in Figure 2.

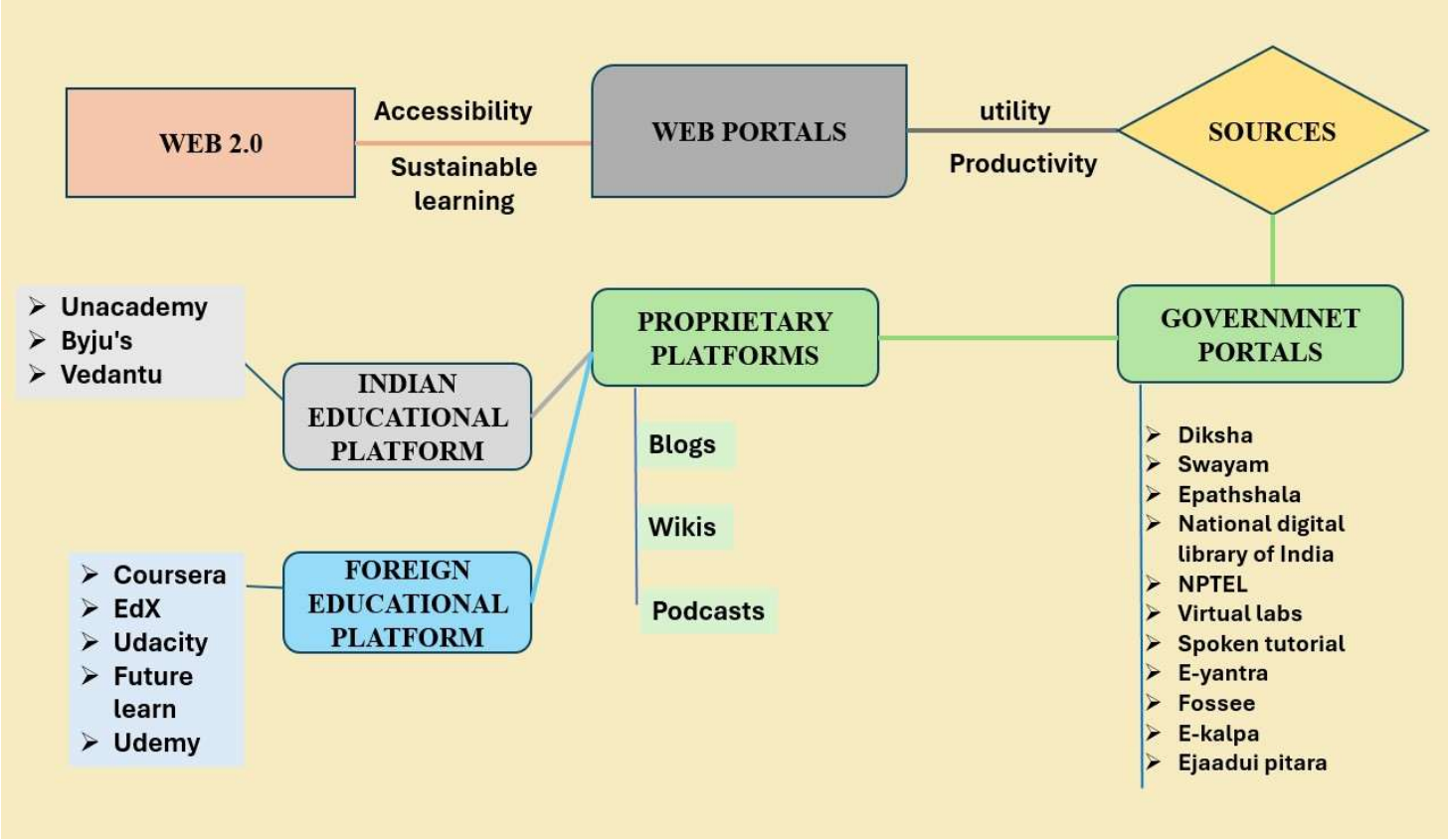

Figure 2. Web 2.0 platforms: Indian & Foreign

Government portals

Web platforms serve as a gateway as we venture into the 21st century, which is considered a digital era. The Ministry of Human and Resource Development has made an effort in the form of PM e-vidya, which was announced on 17 May 2020. It serves as an entrance for the digital/online/on-air education. As emphasized in NEP 2020 paragraph 24.1, due to the recent rise of epidemics, a digital platform can play a major role in creating high-quality education and connecting ICT-based education efforts. The planning and

implementation of digital education mentioned in the PRAGYATA guidelines for the safety and academic welfare of students are plan, review, arrange, guide, yak (talk), assign, track, and appreciate (GOI, 2020). Bharat Skills Portal was developed to support digital skill development, it provides access to a wide range of educational materials, which includes e-books, question banks, and e-learning videos supposedly available in 12 regional languages (GOI, 2024; Press Release: Press Information Bureau, n.d.). A detailed list of government portals has been summarized below –

1. **DIKSHA https://diksha.gov.in/ -** Digital infrastructure for knowledge sharing was formally launched in 2017. It provides support to educators to train themselves. The platform is equipped with interactive material created by teachers of India, benefiting the students to make the class interesting. It conducts digital assessments to check the progress of students. This Platform can be assessed in 101 Indian languages and 7 foreign languages. Potential users of the platform are students, teachers, parents, and HT & officials.

2. **Swayam https://swayam.gov.in/ -** This program was launched with the combined efforts of the Ministry of Education, GOI, AICTE, and NPTEL. It follows three major principles: access, equity, and quality, and is a massive open online course for class 9th to post-graduation, which offers students varied opportunities. Swayam follows the MOOC four quadrant approach (a) video lecture (b) Reading material downloaded/printed (c) Self-assessment through tests and quizzes (d) Online discussion forum.

3. **E-Pathshala https://epathshala.nic.in/-** This portal is jointly created by the Central Institute of Educational Technology and NCERT. It is the plethora of NCERT textbooks, audio-visual material, and training modules of teacher training. Content is available in Hindi, English, and Urdu. Potential user of the platform is student, teachers, educators, and parents.

4. **National Digital Library of India (NDLI) https://ndl.iitkgp.ac.in/ -** This project was launched by the Ministry of Education in July 2017. It is sponsored and funded under the National Mission on Education Through ICT. It is characterized as the digital repository and reservoir of textbooks, videos, articles, lectures, audiobooks, and all other types of media. NDLI provides support to 10 Indian languages which are widely used. The only drawback of the NDLI is it holds no responsibility for the originality, relevancy, or accuracy of the content.

5. **NPTEL https://nptel.ac.in/ -** National Programme on Technology Enhanced Learning, is jointly curated by IITs and IISc, launched in 2003. It offers 600+ courses in about 22 disciplines. It is the largest online repository of engineering, basic sciences, and management subjects. It Provides online

certification to make students employable in the industry. There is a Provision for offering internships and conducting workshops. It is authorized under Creative Commons Attribution-ShareAlike CC BY-NC- SA. It supports Initiatives such as laboratory workshops, Soft skills Workshops for improving employability, a Portal for GATE preparation; etc., & Maintenance of the SWAYAM portal.

6. **VIRTUAL LABS https://www.vlab.co.in/ -** An initiative of the Ministry of Education under the national mission on education through ICT. It creates a platform for simulation-based labs in which basic learning and refined understanding are developed in the disciplines of science and engineering. Learning is conducted through web resources, video lectures, animated demonstrations, and self-evaluations which serve as a complete learning management system. Nodal centers of the platform are 1531 in number.

7. **SPOKEN TUTORIAL https://spoken-tutorial.org/ -** It is a free and open-source software by IIT Bombay where one can learn at their own pace and launch diverse multilingual courses. All the content is authorized under a CC BY SA license. The platform is partnered with NASSCOM-http://futureskills.nasscom.in/ . It covers basic, intermediate, and advanced levels. The assessment is conducted in the form of end-of-course online tests and certificates that help in increasing their employability.

8. **e-YANTRA https://www.e-yantra.org/ -** This program was hosted at IIT Bombay and funded by the Ministry of Education. It is a robotics outreach program that emphasizes "learn by doing". It facilitates the environment of training and connectivity of students and teachers through the establishment of e-yantra labs in institutions.

9. **FOSSEE https://fossee.in/ -** National Mission on Education by the Ministry of Education (MoE), Government of India. It encourages the use of FLOSS tools for the quality enhancement of education. The Fossee team works on the principle of "adaptation and development of Open-source simulation packages equivalent to propriety software".

10. **e-Kalpa https://www.dsource.in/about/us -** D'source is part of the OPEN DESIGN initiative on "creating Digital-learning environment for design" which is also called e-Kalpa and is sponsored by the Ministry of Education, as a part of the National Mission in Education through Information and Communication Technology (NMEICT) and currently through the National initiative for design innovation. This initiative is a collaboration of IDC at IIT Bombay, NID at Bangalore, and DOD at IIT Guwahati along with another partner who joined this initiative. D'source content is licensed under CC

BY-NC-SA 4.0 (creative Commons Attribution-NonCommercial-ShareAlike 4.0) license. It creates a social networking environment and higher learning, a digital resource database, and lays out digital online content. It covers Sectors such as university, industry, government, and the informal sector.

11. **e - Jaadui Pitara https://ejaaduipitara.ncert.gov.in/ - This** initiative is launched by the National Council of Educational Research and Training (NCERT). This program has been developed for students who are in the Foundational stage (3 to 8 years). It is designed according to the needs of parents and teachers. This platform can be easily accessed via the Play Store app, WhatsApp, and Telegram. A toll-free- number is issued to listen to "story of the day", "song of the day" and "question of the day" in your language. It provides educational content in the form of cards, charts, dominoes, flashcards, etc.

Proprietary platform

Proprietary platforms are owned and operated by private ed-tech companies to help in maintaining exclusive content, and teaching methodologies. Such platforms offer live classes and self–paced learning programs and are generally focused on revenue generation. They retain intellectual property rights over their courses and materials. It is been reported that the language learning platform Duolingo had over and around 37.2 million daily active users in the third quarter of 2024 (Duolingo Global DAUs 2024, n.d.).

1. **Blogs -** Blogs are conferred as personal blogs or internet-based pages. These are generally text but also include videos, photos, charts, graphs, etc. (Solomon & Schrum, 2010). Blogs generally contain short articles known as posts. Such posts commonly comprised of hyperlinks to other websites and blogs are organized in reverse chronological order (Anderson, 2016). They help in developing analytical thinking and communication skills. It has a unique feature of consisting and stating every Idea clearly in a brief. Blogs can be stored online and can act as a portfolio for a student to write think and communicate. They help in developing classroom integration and critical thinking. Some of the educational blogging tools are EPals https://www.epals.com/ , Edublogs https://edublogs.org/ , Class Blogmeister http://cbmsite.com/ & Gaggle https://www.gaggle.net/blog .

2. **Wikis -** Wikis are defined as a web page that can write edit and add elements such as images or video. Wiki is a group of web pages that create hyperlinks for Wiki software by which a group of individuals can collaborate asynchronously on any idea and can synthesize the main concepts that can reprocessed (Mindel & Verma, 2006, 2006). It is based on several pillars such as (a) acting as an encyclopedia (b) from a natural point of view (c) as free content (d) not having firm rules. Several wikis tools that working for educational upliftment are Wiki Education https://wikiedu.org/ ,WikiEducator

https://www.wikieducator.org/ , and Wikimedia Foundation https://wikimediafoundation.org/our-work/education/ .

3. **Podcasts-** Podcast refers to the audio or video platform which are released occasionally. (Goldman, 2018) considers it has never been easier to create podcasts but it makes sense to those individuals who listen while working exercising are traveling. They are useful for creating collaborative learning spaces, Skill development, and Teaching and learning processes. Several podcasts web platform is Tinkercast https://tinkercast.com/teachers/ , Commonsense https://www.commonsense.org/education/lists/best-podcast-apps-and-websites-for-students , and Apple https://podcasts.apple.com/us/podcast/student-teacher/id1161044299 .

Indian educational proprietary platform

1. **Unacademy https://unacademy.com/ -** It is one of the largest online learning applications in India. This platform connects millions of learners with top educators across the nation. It generates study material in the fields of -UPSC, IIT JEE, SSC, CSIR UGC NET, and NEET UG. The platform has over 50 million users (Figure 3).

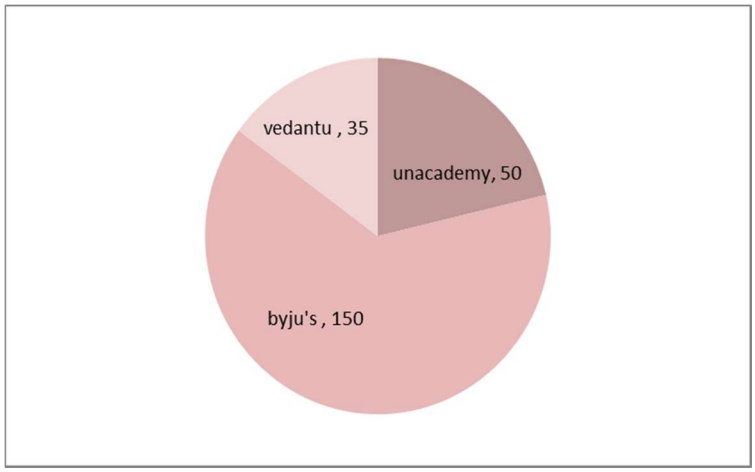

Figure 3. Users (million) of Indian educational platform

2. **Byju's https://byjus.com/ -** It is counted among the largest ed-tech companies in India, launched in 2015. This platform is extended over classes 1-12 and is registered with millions of students for personalized and effective learning. This learning platform extensively covers several teachers, students, technology, content, and media for seamless learning. It is amalgamated with animated videos and questions, fun quizzes, and flashcards. It also covers competitive exams like JEE, NEET, and IAS preparation courses. The platform has 150 million users (Figure 3).

3. **Vedantu https://www.vedantu.com/ -** Vedantu is a knowledge network platform that acts as a bridge for students and teachers to connect anytime and anywhere for personalized learning. It offers tutoring courses to students aged 3-18 years old. It also creates space for competitive exams such as IIT-JEE, NEET, and other state exams which are conducted in India. The platform has over 35 million users (Figure 3).

Foreign educational proprietary platform

1. **Coursera** https://www.coursera.org/ - Coursera is the largest online platform founded by Daphne Koller and Andrew Ng in 2012. It provides access to online courses and degrees from leading universities such as Yale or Duke University. It facilitates learning from the world's best experts from leading companies and universities. It provides affordable free courses for learning. It helps in imparting essential career skills. The platform consists of 162 million users (Figure 4).

2. **EdX** https://www.edx.org/ - One of the largest online learning platforms founded by Harvard and MIT to make education accessible to everyone. This platform Facilitates learning experiences through experts. Flexible adaptability to personal and professional development and provision of investment at all educational levels. The platform consists of 86 million users (Figure 4)

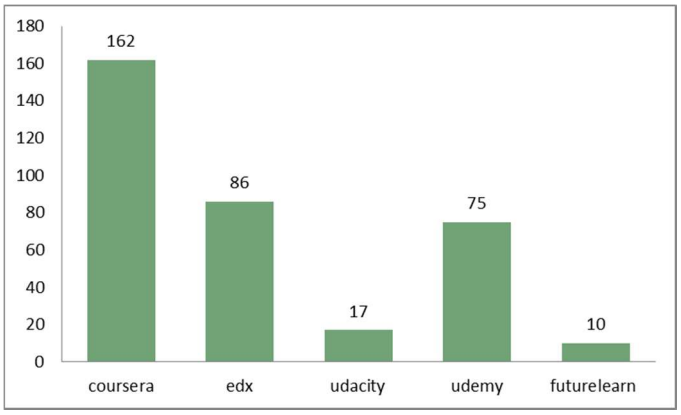

Figure 4. users (million) of foreign educational platform

3. **Udacity** https://www.udacity.com/ - This platform was started by Sebastian Thrun and Peter Norvig with the idea of “Introduction to Artificial Intelligence” courses online for everyone for free. It provides courses in varied subjects such as history, language, literature, etc. The platform consists of 17 million users (Figure 4).

4. **Future Learn** https://www.futurelearn.com/ - This platform offers diverse courses from the top universities. Courses on this platform can be accessible on mobile, tablet, and desktop. The platform consists of 10 million users (Figure 4).

5. **Udemy** https://www.udemy.com/ - Udemy is the largest online platform that provides courses in about 75 different languages. It contains above 250 courses in different disciplines. It empowers individuals to grow personally and professionally. It provides online courses for learning coding, python, etc. The platform consists of 75 million users (Figure 4).

Advantages of Web 2.0 portals

The advantages of Web 2.0 portals are numerous. It is considered that it helps in reducing the broad gap that exists between technology and education. The paper has shown multifarious initiatives of the government of India and the designing of such portals in creating an uninterrupted learning environment among students providing anytime, anywhere learning. The use of multimedia content such as audio, and videos helps in augmenting equity, flexible and effective learning improving the quality of education. Its potential users extend to several students, teachers, parents, etc. One of the major advantages is that it connects users globally and independently through its numerous platforms which helps in creating a rich learning experience.

Challenges associated with web tools

web 2.0 helps individuals to globally connect beyond textbooks and physical classrooms. However, several challenges persist in shaping of educational landscape through web portals. It makes sense to those learners who are extremely passionate and to those who have difficulty in traditional classroom settings, but some learning tasks are not appropriate for online learning (Kearsley, 2006). It has been reported that some students exhibit reduced engagement towards web-based conferencing. Students with weak academic backgrounds witnessed a higher risk of struggling to attend an online course which creates large social-economic gaps in the learning outcome of students. Though, hybrid learning models do not exhibit such problems; considerable skilled human interaction is needed to narrow the gap between educational opportunities and learning outcomes. (Baum & McPherson, 2019). (BROWN & KEEP, 2018) expected that digital innovation will influence educational and economic policies in the future when the labor market falls into labor scarcity, job scarcity, and the possibility of the end of work. Challenges such as feeble digital skills; lack of suitable content; limited access to basic infrastructure and digital devices; and unaffordability

of internet access are some of the core concerns that affect digital inclusion in education (Guidelines for ICT in Education Policies and Masterplans, 2022).

Educational Implications of Web Tools

1. Web 2.0 also paves the way for digital literacy which is crucial for skill development.
2. Accommodation of flipped and blended learning for more coordination and collaboration is required in the creation of digital learning spaces for personalized learning.
3. It results in enhanced collaboration and communication. Platforms such as wikis, blogs, etc. enable students and teachers to connect effectively.
4. Open educational resources such as NPTEL provide e-learning courses that allow easy sharing and excess to educational materials.
5. Multimedia integration with videos, and podcasts makes learning more dynamic and engaging.
6. Helps in combining traditional schools with online materials creating an atmosphere of a more holistic experience.

Conclusion

In conclusion, the exploration of Web 2.0 platforms posited that it could revolutionize the experience of teaching and learning in the field of education. It is noted that because of the influence of the pandemic, there exists a major shift from a teacher-centered approach to a student-centered approach. Government platform such as Swayam and NPTEL provides multifarious courses in varied fields. The rise of significant edtech companies opens the way for effective learning. However, some challenges exist that need to be addressed. The multiple stakeholders of the education industry should take the initiative to remove such redundancy. Web 2.0 has made education more engaging, flexible, and inclusive. It offers immense opportunities and helps eliminate the digital divide that previously existed. To fully harness the potential of Web 2.0 public and private stakeholders must invest in such platforms by which learning becomes more dynamic, participatory, and globally connected paving the way for continuous transformation and unimpeded lifelong learning.

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