Journal of Positive School Psychology http://journalppw.com
2023, Vol. 7, No. 2, 256-274

Impact Of Students' Ubiquitous Learning Through Web 2.0 Tool On Students' 21st Century Skills: Creativity

Dr. Safia Urooj[1] , Prof. Dr. Muhammad Shahid Farooq[2]

[1]Department of Education, University of Karachi Email: safiaurooj786@gmail.com
https://orcid.org/0000-0002-5848-5122
[2]Department of Advanced Studies in Education Institute of Education and Research, University of the Punjab, Lahore Email: shahid.ier@pu.edu.pk

Abstract
The higher education sector has entered a new era with the rise of ubiquitous learning environments. This form of learning, which offers seamless and personalized access to digital and authentic resources, is a return to traditional human learning. The study aimed to examine the impact of ubiquitous learning through Web 2.0 technology tools on the development of 21st century learning skills creativity among graduate-level students in public sector universities of Sindh and Punjab provinces in Pakistan. The research was conducted using a survey with 500 university teachers as participants. The findings showed a significant impact of ubiquitous learning on the development of creativity among students. The study suggests that both public and private sector universities should invest in ICT infrastructure and provide ICT-based trainings for teachers to promote ubiquitous learning among students. The results of this study can assist university teachers in developing a ubiquitous learning environment through Web 2.0 technology tools and provide students with the opportunity to develop 21st century learning skills efficiently.

Keywords: Ubiquitous learning, web 2.0, creativity skills, personalized learning, 21st century skill.

Introduction

The concept of "ubiquitous learning" describes a personalized learning environment that utilizes the characteristics of "web 2.0" and the concept of ubiquitous learning. In this scenario, the learning context is a network that allows for collaboration between participants with the help of intelligent resources. This shift from traditional, fixed curriculum and classroom-based teaching to individualized learning enables students to learn at their own pace and according to their own needs, anytime and anywhere. The advancement of technology has led to the "ubiquitous computing era" and the formation of a "ubiquitous network," which has been adopted in the field of education and embraced as the concept of ubiquitous learning. Currently, computing technology has advanced to the stage of "ubiquitous computing," following the era of personal computers, creating a "ubiquitous network." These technological advancements have made their way into the field of education, leading academia to adopt and promote the idea of "ubiquitous learning."

Web 2.0 refers to the current state of the internet, characterized by increased user-generated content and greater usefulness for end-users, compared to its earlier version, Web 1.0. It encompasses 21st century internet applications.

Web 2.0 does not pertain to specific technological advancements on the internet, but rather, it represents a change in internet usage in the 21st century. With increased information sharing and interaction among users, the internet

has become more interactive, allowing users to actively participate rather than just passively consume information.

Web 2.0 became a term in 1999, when the internet moved towards a more interactive platform for users. Instead of just being a source for information, users were encouraged to contribute content and create personal accounts on various websites. This led to a rise in web apps, self-publishing platforms like WIKI, and social media sites like Wikipedia, Facebook, Twitter, and blogs. This transformation has particularly impacted the social aspect of the internet, allowing users to engage and share thoughts, perspectives, and opinions with each other through tagging, sharing, tweeting, and liking.

The draft National Educational Technology Plan 2010 suggestions to the need for adopting new techniques of evaluation that gives detail about the evolving learner experience: The development of technology and information literacy frameworks at global, national and regional levels has resulted in benchmarking outcomes for educational reforms. In this section, we examine the education policy frameworks for 21st century digital skills that have been implemented globally. We also analyze the education reforms related to 21st century skills frameworks proposed by various organizations. The focus of these frameworks is future-oriented in terms of learning outcomes, meaning that they lack clear guidance on how to acquire these valuable skills. Policymakers who choose to incorporate 21st century skills education into their curricula need to have a well-planned implementation strategy to support the changes. By analyzing the current landscape of 21st century skills development, we can see an increased emphasis on these skills in curricula, highlighting the need for a comprehensive, well-researched approach to guide educators, schools and policymakers through the complex process of implementing 21st century skills education.

In this study, the researchers investigated the effect of ubiquitous learning on the enhancement of creativity skills, which are considered key 21st century learning abilities.

It means how can U-Learning helps teachers to provide technology integrated teaching learning process and develop creativity of 21st century skills among university students of Pakistan for the betterment of economy and society of Pakistan as well as globally.

Objectives of the Study:

1. To study the impact of using a web 2.0 technology tool in enhancing the environment for ubiquitous learning in higher education.
2. To examine the impact of ubiquitous learning environment at higher level on students creativity skills.
3. To analyze the creativity skill among students when engage in web 2.0 Tool.
4. To determine the effect of Web 2.0 tool-based ubiquitous learning on the development of students' 21st century skills.
5. To analyze the importance of creativity skill.
6. To evaluate the importance of web 2.0 Tool in education setting.

Research Hypothesis:

H0: There is not a significance effect of Web 2.0-facilitated ubiquitous learning on students' 21st century skills Creativity.

H1: There is a significance effect of Web 2.0-facilitated ubiquitous learning on students' 21st century skills Creativity.

Research Questions of the Study:

1. How effective is the use of Web 2.0 technology as a tool for promoting ubiquitous learning among students?
2. Why creativity is important skills for students?
3. How web 2.0 tool in education setting helps to develop Ubiquitous learning environment?

Figure 1
Conceptual Framework

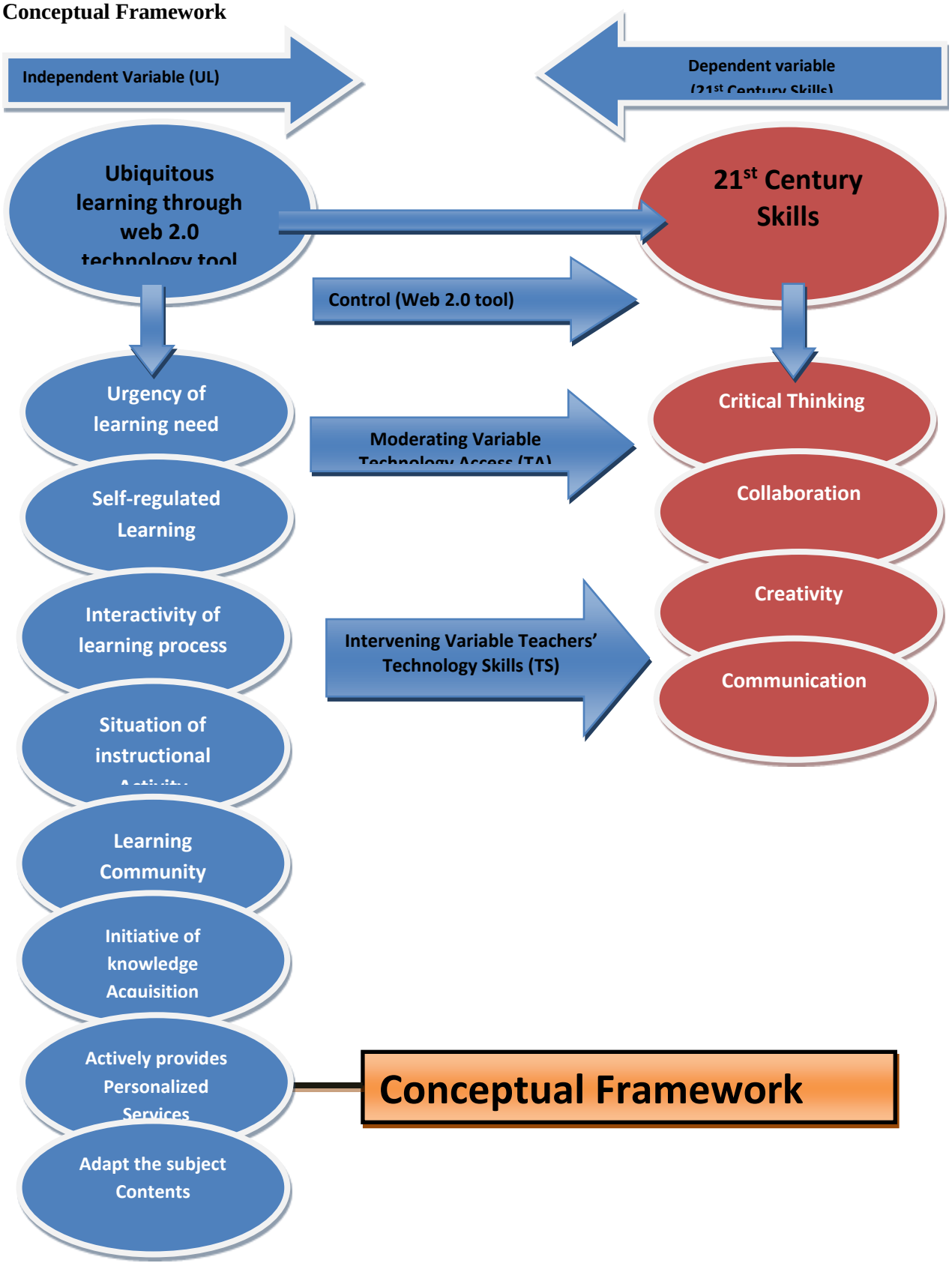
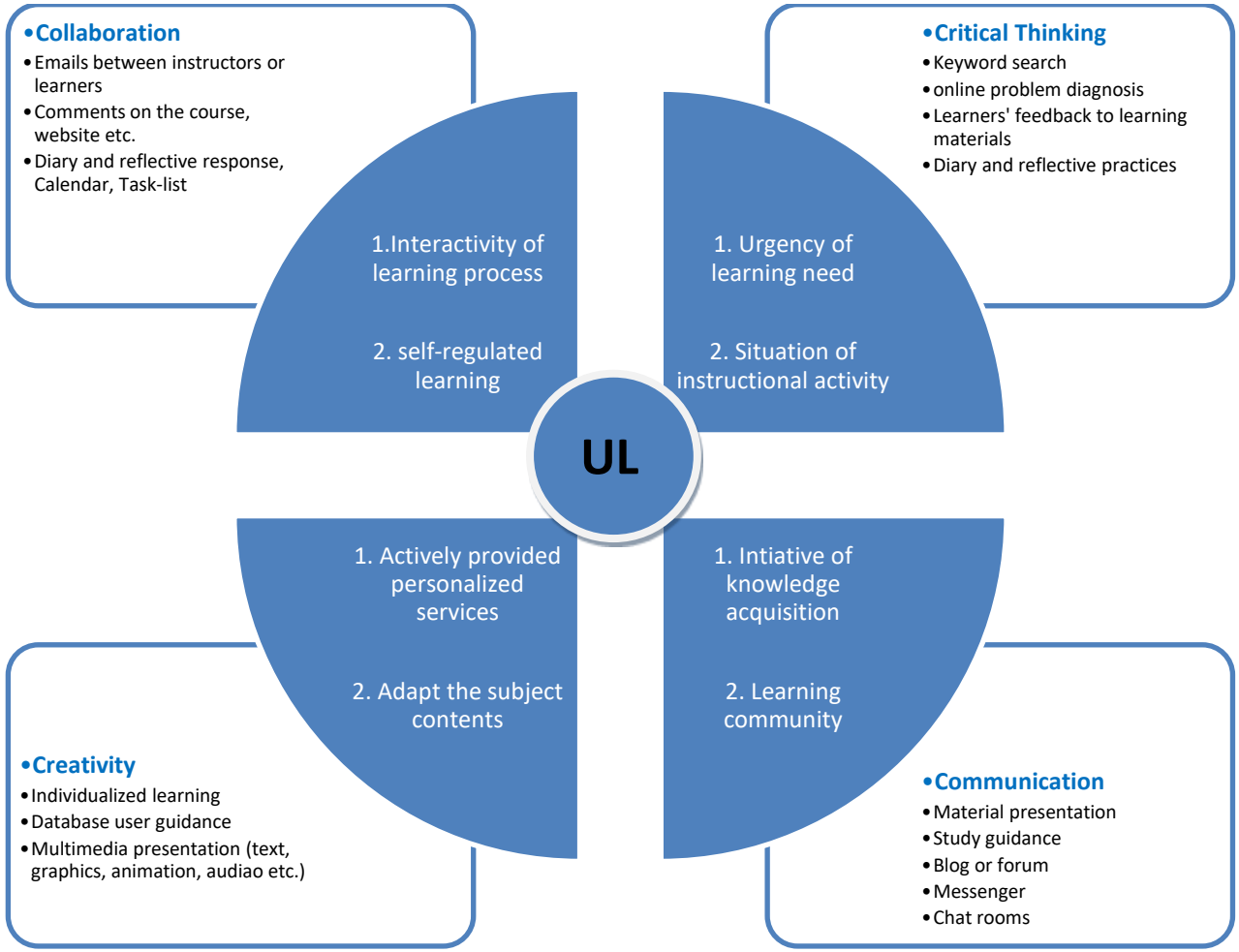


Figure 2

Development of 21st century 4Cs learning skills through ubiquitous learning environment



21st CLSKI-U

Development of 21st Century 4Cs Learning Skills through Ubiquitous Learning Environment

Review of Literature

Theoretical Foundation:

George Siemens, in (2004) introduced the concept of connectivism, which recognizes changes in knowledge and information flow due to the growth of communication networks in the digital age. This new learning model highlights the shift from traditional individualistic learning to collaborative learning within groups, communities, and even crowds facilitated by internet technology. The theory of online collaborative learning (OCL) was proposed by Linda Harasim and focuses on utilizing the internet to create learning environments that promote collaboration and knowledge-building. Harasim views the Internet and networked education as a means to reshape education for the Knowledge Age. This study draws on both connectivism and the OCL theory.

Ubiquitous learning:

Ubiquitous learning is defined as learning that is adaptive to context and supports the individual needs of learners for "anytime, anywhere, and anyhow" learning (Ramaprasad, 2009). There are various definitions of ubiquitous learning, with a common theme of immersion in the learning environment. Jones and Jo (2004) believe that it enables full immersion for students in their learning environment. The interaction with ubiquitous tools and their use for learning purposes extends traditional e-learning into a new phenomenon called mobile learning (m-learning), or as a result, ubiquitous learning (u-learning). Motiwalla (2007) noted that the availability of mobile devices has influenced daily learning behavior in higher education.

Zhan and Jin (2005) defined u-learning as a function of five parameters: (Terry T. Kidd, 2011, P.138) **u-Learning = {u-Environment, u-Contents, u-Behavior, u-Interface, u-Service}**

A ULE refers to an environment where education is seamlessly integrated into daily life and learning occurs naturally, regardless of location or device, often without the learner being aware of it. It encompasses mobile and digital technologies to provide learners with the resources and support they need to learn anytime, anywhere. In a ULE, education occurs naturally through the presence of various devices and technology, without the need for conscious effort or active participation from the student. The learning takes place passively and automatically. (P.469). Cope & Kalantis, 2009, present an extended expertise of ubiquitous learning that includes knowledge creation & construction: The definition of ubiquitous computing encompasses the integration of technology to connect individuals bridge distance and time, blending physical and virtual spaces, and making computing accessible through wearable and handheld devices. In the context of learning, this means that learners have the opportunity to interact with information on any topic, and that this education can be accessed by anyone. The prevalence of knowledge creation and online learning environments further reinforces the notion of ubiquitous learning.

In simple terms, u-learning is a type of learning that is accessible anytime, anywhere, and on any device through the use of technology. It leverages the advancements in technology to make education and learning more flexible, convenient and accessible. While this declare is unrealistic at the moment, given the constraints of current implementing technology (computational, networking, and storage), some have revised the definition of u-learning to encompass the idea of personalized learning, where the right content is delivered to the learner at the right time and place based on their specific needs and preferences. Po-Sheng, Yen-Hung, Yueh-Ming, & Tzung-Shi (2008) developed the list of u-learning characteristics, after reviewing and synthesizing similar projects by different

researchers (e.g., Chen & Chang & Kao, 2002; Chen, Chang, & Wang, 2008; Hwang, 2006; Ogata & Yano, 2004; Yang, 2006). Note that these characteristics are presented in the framework of u-learning environments, though they have got applications throughout many instructional contexts:

- Anytime, anywhere access—u-learning allows students to access learning materials and resources at any time and from any place with the help of ubiquitous technology.
- Individualized and flexible—u-learning is customizable to fit the needs and preferences of individual learners. It offers the flexibility to learn at one's own pace and on their own terms.
- Collaboration and social interaction—u-learning can foster collaboration and social interaction between learners and teachers. It provides opportunities for learners to engage in knowledge sharing and co-creation.
- Interactivity of learning process—u-learning interfaces facilitate effective communications between learners and peers, teachers, and professionals.
- Situation of instructional activity—u-learning involves situated interaction. Learning system is embedded deeply into the natural phenomena of everyday activities.
- Context-awareness—learners' interplay with u-learning environment is managed by context—person, location, time, interest, activity, and so forth.
- Activity provides personalized services—learners are provided personalized learning activities by using the u-learning system based on surrounding context.
- Self-regulated learning—u-learning environment allows learner to actively control their learning progress and captures this behavior as learner context for future use.
- Seamless learning—learning activities can progress seamlessly as pupils move from place to place.
- Learning community—u-learning devices can access networked content and services to improve the learning interplay among pupils and instructors.
- Adapt the subject contents—learner interaction with the u-learning environment can take place the usage of numerous learning devices.

Ubiquitous learning can be characterized as a learning environment that integrates mobile and wireless technology, sensors, and location/tracking mechanisms to support students in their learning experiences. This technology enables students to learn anytime and anywhere, as they are seamlessly connected to the learning environment. Using Web 2.0 tools not only enhance innovative potential in designing classes, but help motivate scholar creativity. As an educator at an online higher stage allow students options for completing work. Not simplest has having these options helped students, but the tools spark creativity. Kukulska-Hulme's (2010) analysis of learner-centered education based on m-learning revealed that cross-cultural knowledge and language learning were the most popular topics, as stated by about 44 referenced works from 2005 to 2010. U-learning is a relatively new field but there are many existing perspectives that cover a wide range of topics or focus on specific subjects.

Web 2.0 Tools and Education

Social computing refers to the use of the internet for social interaction and sharing of information, knowledge and resources. The tools mentioned such as blogs, podcasts, wikis, social networks, multimedia sharing platforms and social gaming allow for easy collaboration and creation of virtual content by users. These tools have

provided new opportunities for lifelong learning and have helped in the vision of personalized future learning spaces. They allow individuals to easily create and share content, collaborate with others, and participate in social networks and online communities. Web 2.0 tools provide new opportunities for lifelong learning and support the idea of personalized learning spaces in the knowledge society. Web 2.0 tools are user-friendly and allow for easy creation and collaboration of digital content without the need for programming skills.

Teachers have a role in promoting critical thinking and media literacy by teaching their students how to effectively use Web 2.0 tools for learning and evaluating online information. This can help students navigate the digital world and make informed decisions about the content they consume. Duffy & Bruns (2006) stated that, The use of Web 2.0 tools, such as blogs, can enhance students' critical thinking, creativity, risk-taking and language skills, as well as provide opportunities for creativity, communication and collaboration. These skills can be valuable both in educational and professional contexts. The use of Web 2.0 tools in education helps students develop skills that can be applied in both academic and professional contexts, including critical thinking, creativity, communication, and collaboration. These tools also allow students to demonstrate that the skills they have acquired in their education can be applied in new and different environments, fostering an open-mind and adaptable mindset.

21st century skills:

Definition of 21CS adapted from Binkley:

> Twenty-first-century skills are abilities and attributes that can be taught or learned in order to enhance ways of thinking, learning, working and living in the world. The skills include creativity and innovation, critical thinking/problem solving/decision making, learning to learn/metacognition, communication, collaboration (teamwork), information literacy, ICT literacy, citizenship (local and global), life and career skills, and personal and social responsibility (including cultural awareness and competence).

Learning and Innovation Skills:

Learning and Innovation skills include critical thinking, problem solving, creativity, communication, collaboration, and adaptability. These skills are crucial for success in the rapidly changing and complex world of the 21st century. It is important for students to develop these skills as they help them become more well-rounded individuals and better prepared for the future.

- **Critical Thinking and Problem Solving:** This definition describes critical thinking and problem-solving skills, which are the ability to analyze information, understand complex issues, and find solutions to problems using both traditional and creative approaches. These skills are essential for success in the 21st century and are seen as key attributes for individuals in the workforce.
- **Creativity and Innovation,** e.g., generate new ideas and develop unique solutions to challenges; identify new opportunities and convert them into valuable outcomes.
- **Collaboration and Communication,** e.g., effectively communicate and collaborate with people of diverse backgrounds; work effectively with others to achieve common goals.

- **Agility and Adaptability,** e.g., learn and grow in a fast-paced environment; quickly adapt to changing circumstances and shifting priorities.
- **Initiative and Entrepreneurialism,** e.g., take calculated risks to pursue new opportunities; demonstrate resourcefulness and determination in overcoming challenges.

Using Ubiquitous learning through web 2.0 technology tool to enhance creativity in teaching-learning process:

The four categories of critical thinking and problem solving defined by Treffinger, Young, Selby, & Shepardson (2002) are: generating ideas, digging deeper into thoughts, openness and courage to explore ideas, and paying attention to one's "inner voice." Craft (1996) concept of "little c creativity" refers to regular, everyday creativity that is expected of all students. It contrasts with the exceptional creative efforts of geniuses. Little c creativity can be individualized and subject-specific, or generalized and collective. It has been argued by several researchers such as Lucas & Claxton, (2010) Csikszentmihalyi, (1996) Deck, (2006) Perkins, (1995) and Torrance (1970) that creativity is a skill that can be learned and its development can be measured effectively, benefiting both learners and teachers.

The significance of creativity in learning and education has been widely recognized. Research shows that creativity is positively related to social and emotional factors (Robinson, 2001), improves well-being (Seligman & Csikzentmihalyi, 2000), enhances learning and student success (Office for Standards in Education, 2010; Hattie, 2009), and increases student attendance (Cooper, Benton, & Sharp, 2011). Additionally, non-cognitive skills associated with creativity, such as patience and openness, have been linked to improved education and labor market outcomes (Kautz et al., 2014). Despite its importance, creativity is not typically a statutory part of the school curriculum, although it is often mentioned as an aspiration in national curricula.

In England, the National Advisory Committee on Creative and Cultural Education (1999) produced an influential report that led to increased recognition of the importance of creativity in the curriculum. The Creative Partnerships initiative (2002-2011), led by Creativity, Culture, and Education and supported by the English government, further boosted interest in fostering creativity in schools. This initiative generated a wealth of valuable research (Thompson et al., n.d.). During this time, secondary schools in England were required to develop Personal, Learning, and Thinking Skills (PLTS), which included "being a creative thinker". However, creativity is not yet formally assessed in schools. In 2011, the Centre for Real-World Learning (CRL) evaluated creativity and developed a 5-dimensional model of creativity:

1. Identifying the core tendencies or habits of mind at the heart of creativity (Claxton, 2006; Feist, 2010; Kaufman & Sternberg, 2010);
2. Being comprehensive and up-to-date with existing research (Spencer et al., 2012);
3. Having coherence while maintaining distinct sub-elements (Sternberg, 1996, 2005);
4. Placing creativity in a broader social and contextual view of learning (Koestler, 1964; Lave & Wenger, 1991);
5. Focusing not only on fluidity of ideas but also on being "disciplined" in the technical and craft aspects of creativity (Berger, 2003; Ericsson, Krampe, & Tesch-Römer, 1993).

Studies have explored the use of technology in education. Andrew (2018) found a positive association between the use of PowerPoint and teacher-student interaction. San

Bolkan (2018) examined the impact of technology on student learning outcomes using test scores. Alan K. (2015) used the instructional humor processing theory to study the impact of teachers' humor on student learning outcomes, finding that learning alignment was a good predictor of cognitive learning. There is a common perception that mobile phones are a distraction from learning (Prensky, 2004), leading to their prohibition in some schools. However, research has explored the potential use of mobile phones for learning, such as in Japanese lessons from Enfour's TangoTown or for conducting pop quizzes, spelling tests, and math tests (Prensky, 2004). Mobile phones offer new opportunities for teaching and learning, including communication, multimedia, and internet access (Kukulska-Hulme & Traxler, 2005), as well as opportunities for learning outside the classroom (Naismith, Lonsdale, Vavoula, & Sharples, 2004) and bringing real-world examples into the classroom, such as in science lessons (Ekanayake & Wishart, 2010).

Education quality and excellence is an ongoing attempt to develop the new millennium technology, the technology with a purpose to maintain the reins of the future state. Thus, the USA's education system reflected in the focus on developing critical thinking, problem-solving, communication and collaboration skills, as well as creativity, innovation, and entrepreneurship in the education curriculum. The integration of technology in the learning process has also been emphasized as a means to prepare students for the demands of the digital age. The emphasis on these skills is aimed at preparing students to be active citizens and productive members of society in a rapidly changing world. Creativity is one of the essential desires of education. Debriefing creativity is crucial to win in global competition. Practicing creativity can be accomplished by utilizing the improvement of information and communication technology. Enhancing creativity-focused education can be achieved by implementing a learning management system (LMS). E-Learning can inspire and guide creativity simply as any class room instructor can, if you're developing an e-Learning course, try some of those seven approaches to tap into your learners' creativity.

Research Methodology

This study based on philosophical Positivism theory which promotes natural phenomena through sensory organs. This philosophy based on reasons and logic. Positivism based on genuine posterior knowledge. This study supports positivism and tries to decide the most affecting independent variable. For investigation of social sciences phenomenon research philosophy should play a vital role. Research philosophy helps to select research method and theoretical framework. Review of literature helps to find out the philosophy of research. Philosophical approaches guide a researcher to find out the solution of problem. An intermediate philosophical approach facilitates alignment of methodology, philosophy, and the research issue for the researcher.

Research Method:

By purpose it is an applied research. By Approach it is a quantitative research. Postpositive knowledge claim support quantitative research approach. This study has been describing the relationship of independent variables with dependent variable. In this research study random sampling has been used. Descriptive and inferential statistics applied. For analysis reliability, correlation and regression test has been used through SPSS latest version. Results have been showed the level of significance.

Research Design:

A research design framework is crucial for the success of a study, as it determines the choice of methods and techniques to be used by the researcher. By carefully selecting the research

design, the researcher can ensure that the methods used are appropriate for the subject matter and increase the chances of obtaining meaningful results. The current research is quantitative and descriptive in which researcher revealed statistical conclusions to collect actionable insights. The current research has regression model and through SPSS regression test has been run to test hypothesis. There are four hypothesis in the current research in which relationship of Students' Ubiquitous Learning and Students' 21st Century Skills has been analyzed. The sample of the current research focused only public university teachers of Sindh and Punjab Province of Pakistan. Lahore and Karachi city have been selected as target population. 05 public sector universities have been chosen for collecting data through simple random sampling as a target sample. The deductive approach has been used to analyse the data. This current research is quantitative and close ended questionnaire has been used for collecting data. The opinion of teachers has been taken through questionnaire. From 05 universities 500 teachers have been selected randomly. For Measurement of analysis a close ended questionnaire having 07 Likert scale has been used to collect the survey opinion. Regression, correlation and reliability test has been run through SPSS software for analyzing data in the current research. The study was conducted over a one-year period and involved a cross-sectional design. The natural setting of the study allowed for the use of real-world conditions, and there were no reported objections to the research methodology used.

Population, Sample and Sampling:

The study's target population was all public sector university teachers in Pakistan. The sample for this research was limited to only public sector university teachers in the Sindh and Punjab provinces of Pakistan. Lahore and Karachi city have been selected as target sample of 05 public sector universities have been chosen for collecting data through simple random sampling. From 05 public universities, 500 teachers have been chosen as a target sample. In current research simple random sampling has been chosen. 05 public sector universities have been chosen for collecting data through simple random sampling.

Research Tool:

In this study, Ubiquitous learning is an independent variable 21st century skills creativity are the dependent variable. There are 50 items in the close ended questionnaire to measure variable. All the items have 07 sub-scale such as e.g. 1 [strongly disagree] to 7 [strongly agree].

Data Collection and Data Analysis Procedure:

Online questionnaire has been floated among our social circle to gather the required responses through Google forms and other hand, physically fill up the questionnaire by respondent through survey method. To gather data for the study, a survey questionnaire was used. The collected data was then analyzed using statistical methods in SPSS v21. The primary data was evaluated by calculating various measures including frequency percentage, mean, and standard deviation.

Data Analysis and Interpretation

Frequency Table:

Frequency Table

Table 1:

University wise analysis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Benazir Bhutto Shaheed University Liyari	100	20.0	20.0	20.0
	Federal Urdu University of Arts, Science & Technology, Karachi	100	20.0	20.0	40.0
	Punjab University Lahore	100	20.0	20.0	60.0
	Sindh Madressatul Islam University Karachi	100	20.0	20.0	80.0
	University Of Karachi	100	20.0	20.0	100.0
	Total	500	100.0	100.0	

Analysis: as per the frequency table value "University" was found as Benazir Bhutto Shaheed University Liyari 20%, Federal Urdu University of Arts, Science & Technology, Karachi 20%, Punjab University Lahore 20%, Sindh Madressatul Islam University Karachi 20% and University Of Karachi 20%.

Table 2:

Religion wise analysis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Christian	9	1.8	1.8	1.8
	Hindu	8	1.6	1.6	3.4
	Islam	483	96.6	96.6	100.0
	Total	500	100.0	100.0	

Analysis: as per the frequency table value "Religion" was found as Christian 1.8%, Hindu 3.4%, and Muslims 96.6 %

Table 3:

Gender wise analysis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	206	41.2	41.2	41.2
	Male	294	58.8	58.8	100.0
	Total	500	100.0	100.0	

Analysis: as per the frequency table value "Gender" was found as Female 41.2%, and Males 58.8 %

Table 4:

Age wise analysis

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21 to 30 years	197	39.4	39.4	39.4
	31 to 40 years	303	60.6	60.6	100.0
	Total	500	100.0	100.0	

Analysis: as per the frequency table value "Age" both males and females were found as 21 to 30 years 39.4% and 31 to 40 years 60.6%.

Table 5:
Analysis of U-Learning & 21st Century Learning Skills
Group Statistics

	Gender	n	Mean	Std. Deviation	Std. Error Mean
TotalCRUL	Male	294	23.663	8.8860	.5182
	Female	206	24.597	8.0096	.5581

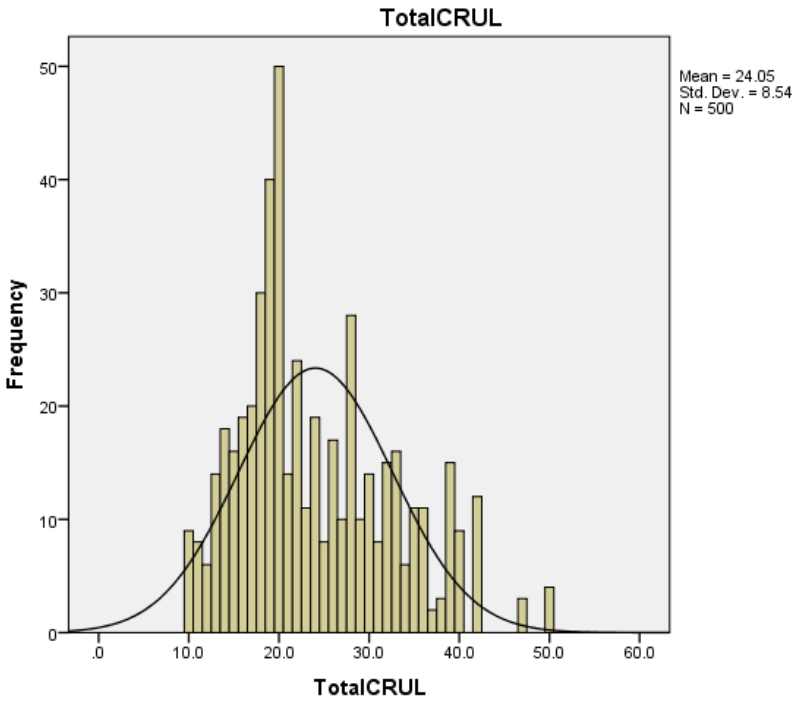
Analysis: From the calculated data it is clear that the entire male & female are strongly agree & agree. The mean and standard deviation of the data were calculated, and the results showed that the majority of the participants strongly agreed or agreed with the statements. So, it is accepted that the Ubiquitous learning is enhanced the 21st century skills, creativity among university students.

Table 6:
Independent Samples Test

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
TotalCRUL	-1.204	498	.229	-.9338	.7756	-2.4577	.5900

Analysis: The results of the t-test indicate that the null hypothesis were rejected and the research hypothesis were accepted, indicating a significant impact of students' ubiquitous learning through web 2.0 tools on their creativity skill. The findings reveal that U-learning has a significant impact on developing 21st century skills like creativity among university students.

Graph 1
Creativity and Ubiquitous Learning



Graph 1 shows that Mean=24.05, Std. Dev. = 8.54 regarding Creativity and Ubiquitous Learning.

Results and Discussion

The results indicate a significant effect of ubiquitous learning (UL) on the development of 21st century skills among university students. UL is propelled by crucial intrapersonal and psychosocial processes that lead to diverse levels of interactions. The processes of skill imitation (Frith & Wolpert, 2003) and negotiation and argumentation (Dillenbourg, Baker, Blaye, & O'Malley, 1996) give rise to task-oriented interactions that contribute to the development of abilities and skills in both domain and technology aspects. In addition, the processes of impression formation (Kreijns, Kirschner, & Jochems, 2003), mentalizing (Frith & Frith, 2003), social observation (Jost, Kruglanski, & Nelson, 1998), and social communication, which are psychosocial in nature, lead to the creation of categories of interactions that are person-focused and reflect the social and group dynamics in technology-mediated environments. The web-based learning community is capable of fostering reflection on the relationship between the individual's inner reality and external, technology-focused expertise. It is concluded that it is necessary to develop alternative perspectives on university learning and re-evaluate the notion of a university. This discourse should involve all relevant parties in the higher education sector, particularly the decision-makers WHO responsible for making institutional policies on teaching and learning. Miranda's narrative aims to inspire new ways of thinking. Social technologies are already influencing the personal and social lives of millennial students. Educators and policymakers must address the existing digital divide to prevent the loss of opportunities for a generation. (Barnes & Tynan, 2007, p. 198). The current study aligns with international research on this topic, but there is a lack of such work in Pakistan. So it is evident that it was great need of our country its finding are helpful for education and to improve standard and quality of education in Pakistan.

Recommendations

- To provide opportunities for Teachers and learners for U-learning.
- To enhance the 21st century skills among students for the survival in modern era.
- To arrange teacher's ICT based trainings.
- Management should prioritize the use of ICT to overcome challenges in the 21st century.
- It's crucial for management to understand the significance of incorporating ICT in education.
- Both public and private sector universities can enhance U-learning by providing ICT infrastructure.

Limitation of Study:

This study can benefit teachers in public sector universities in Pakistan. U-learning shifts from a traditional, uniform curriculum and mandatory in-class teaching to personalized and differentiated learning. This allows students with varying abilities and learning needs to learn at their own pace and achieve their own learning and life goals. With the advancement of technology into the "ubiquitous computing era," the idea of U-learning has emerged and is being adopted in academia.

Conclusions

In conclusion, the results of the research study indicate that the objectives of the study were successfully achieved. The findings indicate that U-learning has a significant impact on the development of 21st-century skills, such as creativity among university students. This highlights the benefits of incorporating ubiquitous learning in the education process, as it provides students with the opportunity to learn anytime, anywhere and at their own pace, thereby allowing for personalized learning and the achievement of individual learning goals. Furthermore, the study shows that implementing ubiquitous learning in the education process helps to improve the teaching and learning experience for both teachers and students, which is crucial for the development of future generations and the betterment of the economy and society, not only in Pakistan but also globally. Therefore, it is important that universities, teachers, and policy makers take into consideration the significance of incorporating ICT into education and the benefits of ubiquitous learning.

This study provides valuable insights into the impact of U-learning on the development of 21st century skills, including creativity among university students. The findings highlight the importance of integrating ICT into the teaching and learning process in order to provide students with personalized learning experiences and develop the skills that are necessary for success in the modern world. The results of this study will be valuable to educators, policy-makers, and researchers in the field of education as they consider new and innovative approaches to teaching and learning in the 21st century. Additionally, the findings can be used to inform the development of technology-based educational programs and initiatives aimed at improving the quality of education and preparing students for success in the modern world.

Availability of data and material:

All data generated or analysed during this study are included in this published article.

Funding:

Not Applicable.

Acknowledgements:

I am deeply grateful to wish to **Prof. Dr. M. Shahid Farooq** Chairman Advanced Studies in Education, Institute of Education & Research, University of the Punjab, Lahore, for his sincere and valuable guidance and encouragement extended to me throughout my whole research work as a supervisor and Mentor.

References

1. Abraham. A. et al. (2014). Gender Differences in Creative Thinking: Behavioral and fMRI Findings. Brain Imaging Behavior. 8(1): 39-51.
2. Ary, D., Sorensen, C., & Jaco, L. C. (2010, February 12). Introduction to Research in Education (8th (eigth) Edition Hardcover ed.). Cengage Learning.
3. ATC21S (Assessment and Teach of 21st Century Skills). "About the Project." Accessed February 7, 2019. http://www.atc21s.org/about.html.
4. B. Ji, Y. Li, D. Cao, C. Li, S. Mumtaz, and D. Wang, (2020). "Secrecy performance analysis of UAV assisted relay transmission for cognitive network with energy harvesting," In IEEE Transactions on Vehicular Technology, vol. 69, no. 7, pp. 7404–7415.
5. Bapna, A., N. Sharma, A. Kaushik, and A. Kumar. (2017) Handbook on Measuring 21st Century Skills. New Delhi: Evaldesign.
6. Bhattacherjee, A. (2012). Social Science Research: Principles, Methods, and Practices (Second Edition ed.). (a. University of South Florida, Ed.) Florida, Tampa, Florida, USA: Global Text Project; Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License: doi:ISBN-13: 978-1475146127.
7. Bialik, M., J. Martin, M. Mayo, and B. Trilling. (2015). Evolving Assessments for a 21st Century Education. N.p.: Assessment Research Consortium.
8. Biao, I. (2018 April 25) "Supplying Basic Education and Learning to Sub-Saharan Africa in the Twenty-First Century." World Journal of Education 8, no. 2: 181-90.
9. Binkley, M., O. Erstad, J. Herman, S. Raizen, M. Ripley, M. Miller-Ricci, and M. Rumble. (2012) "Defining Twenty-First Century Skills." In Assessment and Teaching of 21st Century Skills, edited by P. Griffin, B. McGaw, and E. Care, 17-66. London: Springer.
10. Care, E., P. Griffin, and M. Wilson, eds. (2018). Assessment and Teaching of 21st Century Skills: Research and Applications. Dordrecht: Springer.
11. Carlile, O and Jordan, A. (2012). Approaches to Creativity: A Guide for Teachers. Maidenhead: Open University Press.
12. Cheng, K.-M. (2017). Advancing 21st Century Competencies in East Asian Education Systems. Hong Kong: Asia Society, https://asiasociety.org/education/advancing-21st-century-competencies.
13. Christensen, L.B., Johnson, R.B., & Turner, L.A (2014). Research methods, Deign, and Analysis (12th Ed.). S.Frail, ED). New Jerssy, USA: PEARSON
14. Creswell, J. W. (2012). Educational Research, Planning, Conducting, and Evaluating Quantative and Qualitative Research (4th Edition ed.). Boylstton Street, Boston, United States of America (USA): Pearson.com.
15. E. Tekinarslan, M. D. Gurer and R. K. Agca, (2013, May 12). A instructional design model for ubiquitous learning environments [Online]. Available: ietc2008.home.anadolu.edu.tr/ietc2008/57.doc
16. Education Scotland. (2013). Creativity across learning 3–18. Edinburgh: Education Scotland. Retrieved from http://www.educationscotland.gov.uk/Images/Creativity3to18_tcm4-814361.pdf

17. Fraillon, J., J. Ainley, W. Schulz, T. Friedman, and E. Gebhardt, (2014). Preparing for Life in a Digital Age: The IEA International Computer and Information Literacy Study International Report. IEA https://link.springer.com/content/pdf/10.1007%2F978-3-319-14222-7.pdf.
18. Gray, K., Thompson, C., Sheard, J., Clerehan, R., & Hamilton, M. (2010). Students as Web 2.0 authors: Implications for assessment design and conduct. Austral- asian Journal of Educational Technology, 26(1), 105–122.
19. Griffin, P., and E. Care, eds. (2015). Assessment and Teaching of 21st Century Skills: Methods and Approach. Dordrecht.
20. H. S. Gill, O. I. Khalaf, Y. Alotaibi, S. Alghamdi, and F. Alassery, (2022). "Multi-model CNN-RNN-LSTM based fruit recognition and classification," Intelligent Automation & Soft Computing, vol. 33, no. 1, pp. 637–650.
21. Hwang, G. J. (2006). Criteria and strategies of ubiquitous learning. The proceedings of the IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing. SUTC 2006, June 5–7, 2006, Taichung, Taiwan.
22. K. Sakamura and N. Koshizuka (2005). "Ubiquitous Computing Technologies for Ubiquitous Learning" in Proceedings of the 2005 IEEE International Workshop on Wireless and MobileTechnologies in Education (WMTE '05), pp.11-20.
23. Kaufman, J. C. and Sternberg, R. J. (eds.). (2010). Cambridge Handbook of Creativity. New York: Cambridge University Press.
24. Khatri, K. K. (2020). Research Paradigm: A Philosophy of Educational Research. International Journal of English Literature and Social Sciences, 5(5). Retrieved septumber- October 2020, from Sep-Oct 2020 | Available online: https://ijels.com/
25. Kidd, Terry T. II. Chen, Irene. (2011). Ubiquitous learning: strategies for pedagogy, course design, and technology, USA, Information Age Publishing Inc.
26. Kim, H., and E. Care. (2018, March 27). "Learning Progressions: Pathways for 21st Century Teaching and Learning." Education Plus Development (blog). Brookings Institution, https://www.brookings.edu/blog/education-plus-development/2018/03/27/learning-progressions.
27. Kozbelt, A., et al. (2010). Theories of Creativity. In Cambridge Handbook of Creativity. New York: Cambridge University Press: 20-47.
28. L. A. Cárdenas-Robledo and A. Peña-Ayala, "Ubiquitous learning: a systematic review," Telematics and Informatics, vol. 35, no. 5, pp. 1097–1132, 2018.
29. L. Xiao-Dong and C. Hong-Hui, (2020). "Research on VR-supported flipped classroom based on blended learning — a case study in "learning English through news"," International Journal of Information and Education Technology, vol. 10, no. 2, pp. 104–109.
30. Lara, F., K. Anderson, M. Henry, and S. Hegarty. (2016). "Examining Breadth of Learning Opportunities in 21st Century Education Systems." Education Plus Development (blog). Brookings Institution, https://www.brookings.edu/blog/educati

on-plus-development/2016/10/31/examining-breadth-of-learning-opportunities-in-21st-century-education-systems/.

31. Lucas, B. (2016). A Five-Dimensional Model of Creativity and its Assessment in Schools, Applied Measurement in Education, Routledge http://dx.doi.org/10.1080/08957347.2016.1209206
32. Lunenberg, F. (2010). Communication: The Process, Barriers, and Improving Effectiveness. Schooling. 1(1): 1-11.
33. M. A. Virtanen, E. Haavisto, E. Liikanen, and M. Kääriäinen, (2018). "Ubiquitous learning environments in higher education: a scoping literature review," Education and Information Technologies, vol. 23, no. 2, pp. 985–998.
34. M. Rath, (2018). "A methodical analysis of application of emerging ubiquitous computing technology with fog computing and IoT in diversified fields and challenges of cloud computing," International Journal of Information Communication Technologies and Human Development (IJICTHD), vol. 10, no. 2, pp. 15–27
35. Maker, C. J. (2004). Creativity and Multiple Intelligences: The Discover Project and Research. In Creativity: When East Meets West. World Scientific Publishing Co.: 341-392.
36. Ministries of Basic and Secondary Education and Higher Education Research Science and Technology – The Gambia. (2017). Education Sector Strategic Plan 2016-2030: Accessible, Equitable and Inclusive Quality Education for sustainable Development. Banjul.
37. Moran, S. (2010). The Roles of Creativity in Society. In Cambridge Handbook of Creativity. New York: Cambridge University Press: 74-90.
38. O. I. Khalaf and G. M. Abdulsahib, (2021). "Design and performance analysis of wireless IPv6 for data exchange," Journal of Information Science and Engineering, vol. 37, pp. 1335–1340.
39. P.21. "Framework for 21st Century Learning." (2018). P21 Partnership for 21st Century Learning. Accessed http://www.p21.org/our-work/p21-framework.
40. Partnership for 21st Century Learning. (2015). What We Know About Creativity? Part of the 4Cs Research Series, Washington DC, P.21.
41. Po-Sheng, C., Yen-Hung, K., Yueh-Ming, H., & Tzung-Shi, C. (2008). A meaningful learning based u-learning evaluation model. The proceedings of the Eighth IEEE International Conference on Advanced Learning Technologies. ICALT 2008, July 1–5, 2008, Santander, Spain.
42. Quereshi E., & Olla, P. (2009). Incorporating Web 2.0 into education: Instructional design and pedagogical issues. In T. Kidd & I. Chen (Eds.), Wired for learn- ing: An educator's guide to Web 2.0 (pp.43–58). Charlotte, NC: Information Age Publishing.
43. R. Xue, L. Wang and J. Chen, (2011). "Using the IOT to Construct Ubiquitous Learning Environment" in Second International Conference on Mechanic Automation and Control Engineering, pp. 7878-7880.
44. Richardson, W. (2010). Blogs, wikis, podcasts, and other powerful Web tools for classrooms.
45. Russ, S. W. and Fiorelli, J. A. (2010). Developmental Approaches to Creativity. In Cambridge Handbook of

Creativity. New York: Cambridge University Press: 233-249.
46. S. A. Aljawarneh, "Reviewing and exploring innovative ubiquitous learning tools in higher education," Journal of Computing in Higher Education, vol. 32, no. 1, pp. 57–73, 2020. View at: Publisher Site | Google Scholar
47. S. Cui, (2017). "Research on across-cultural communication in college English teaching based on cloud platform," Journal of Computational and Theoretical Nanoscience, vol. 14, no. 1, pp. 89–93.
48. S. Kanagarajan and S. Ramakrishnan, (2018). "Ubiquitous and ambient intelligence assisted learning environment infrastructures development-a review," Education and Information Technologies, vol. 23, no. 1, pp. 569–598.
49. S. Rajendran, O. I. Khalaf, Y. Alotaibi, and S. Alghamdi, (2021) "MapReduce-based big data classification model using feature subset selection and hyperparameter tuned deep belief network," Scientific Reports, vol. 11, no. 1, p. 24138.
50. Scott, C. L. (2015). "The Futures of Learning 3: What Kind of Pedagogies for the 21st Century." Education and Foresight Working Paper 15, UNESCO.
51. Sharon P. Kay, K. (2010). 21st century knowledge and skills in educator preparation, American Association of Colleges of Teacher Education and the Partnership for 21st century skills (P21). Pearson Robinson.
52. Solomon, G. & Schrum, L. (2010). Web 2.0: How to for educators. Washington, DC: International Society for Technology Education.
53. The 20th vs 21st Century Classroom, (2018). 21st Century Schools. Accessed http://www.21stcenturyschools.com/20th-vs-21st-century-classroom.html.
54. Tynan, B., & Barnes, C. (2010). Web 2.0 and professional development of academic staff. In M. Lee & C. McLoughlin (Eds.), Web 2.0-based e-learning: Applying social informatics for tertiary teaching (pp. 365–379). doi:10.4018/978-1-60566- 294-7.ch019
55. US Department of Education. (2010). National Education Technology Plan. Washington, D.C.: Office of Education Technology.
56. Use of Data from 21st Century Skills Assessments: Issues and Key Principles. Washington, DC: Brookings Institution, (2018). https://www.brookings.edu/wp-content/uploads/2018/10/EffectiveUse-Vista-Kim-Care-10-2018-FINALforwebsite.pdf.
57. V. Jones and J.H. Jo, (2004). "Ubiquitous Learning Environment: An Adaptive Teaching System Using Ubiquitous Technology" in Conference of the 21st ASCILITE, pp. 468-474.
58. V. Panich, (2012). Approach to student learning in the 21st century, Tathata Publication.
59. Van Tassel-Baska, J. and MacFarlane, B. (2009). Enhancing Creativity in Curriculum. International Handbook on Giftedness. New York: Springer.
60. W. Junqi, L. Yumei and L. Zhibin, (2010). "Study of Instructional design in Ubiquitous Learning" in Second International Workshop on Education Technology and Computer Science, pp. 518-523.
61. X. T. Kong, G. W. Chen, G. Q. Huang, and H. Luo, (2017). "Ubiquitous auction learning system with TELD (teaching by examples and learning by doing) approach: a quasi-experimental study,"

Computers & Education, vol. 111, pp. 144–157.

62. X. Wang, W. Zhang, and X. Yang, (2017). “Construction of course ubiquitous learning based on network,” EURASIA Journal of Mathematics, Science and Technology Education, vol. 13, no. 7, pp. 3315–3323.