Recent Trends in Blended Learning Methods

*Vimala Saravanan, M. Ramachandran, Chandrasekar Raja, Ashwini Murugan
REST Labs, Kaveripattinam, Krishnagiri, Tamil Nadu, India
*Corresponding author Email: vimala@restlabs.in

Abstract. Blended learning (also known as hybrid learning) is a teaching method that combines technology and digital media with traditional instructor-led classroom activities, giving students greater flexibility to personalize their learning experiences. Examples include learning centers, Labs, and the reverse classroom, where learners practice the lesson before practicing face-to-face Doing. Flex: Flex learning is learning that is intertwined when customized a word that can be used as an alternative. Two Much for mixed learning training Contexts suitable for meeting the growing needs of new age learners - traditional face-to-face learning and e-learning. By complementing live and online learning, mixed learning meets truly integrated classroom that can be completed. Teachers who keep students engaged, motivated, and motivated Helps to do more effectively and make more profit with their students. The main what is the difference between e-learning and mixed learning, e-learning is conducted entirely using the internet, at the same time mixed Learning uses both face-to-face classroom sessions. Rotation when it comes to attitude, students learn online in the classroom with the guidance of a teacher they work in groups through activities. In other words, Teacher-led instruction is reduced; more and more students are engaging in common tasks online. Mixed learning is short-lived and when students are a combination of traditional face-to-face instruction with aspects of online instruction with a teacher in the classroom. There is mixed learning Instructor-led brick and mortar is classroom training and online learning approach that integrates functions.
**Keywords:** Blended learning, Student success, Evaluation methodologies, Learning design, Course design, Quality of blended learning.

1. Introduction

Recent evidence suggests that many students work better with mixed learning programs Shows. In some studies, 94% of all students who complete a mixed learning program complete the curriculum successfully completed. Moreover, 62% of the participating students were their own Scored high on AP tests. It can promote deep learning, reduce stress and increase student satisfaction. Teachers can be more involved with their students. Mixed learning students with their professors and Provides more opportunity to interact with teachers. By providing digital opportunities for engagement, educators share live chats in front of their peers More engagement can be found online from students who are not comfortable taking. Mixed learning is mobile learning and online for teachers, coaches and students through the effective combination of traditional classroom teaching with activities Is an approach that provides innovative educational solutions. In general, study results (attendance, retention and student scores) are on the assessment criteria. And include a combination of data on student satisfaction and Levels of student involvement. "Mixed learning" A face-to-face learning process and an online learning approach to mix learning. Mixed arrangements for learning should be tailored to the needs of the students. Mixed learning courses are online resources with traditional classroom-based teaching methods and a training delivery system that combines opportunities. Structured with mixed learning thinking Integrates online activities into face-to-face courses. Students' quizzes and engage in online activities such as contributing to discussion forums, lectures, Interact with online course materials such as screen casts and simulations. And the Increases workload brings flexibility to students family responsibilities This includes; They are capabilities to improve modern communication and collaboration methods, Immediate access to increase knowledge in both disciplines, if used well and discipline Technology is Expensive. Inadequate Training Technology Issues Adapting Content for Blended Learning Decreased Motivation Weakened Relationships.
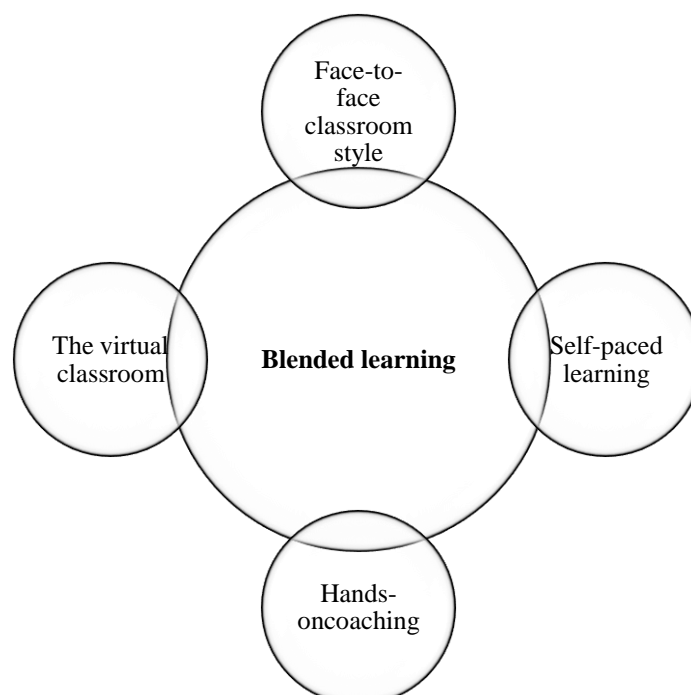
2. Blended Learning

The term mixed learning is often used, but exists ambiguity as to what it means. What is Mixed Learning? What, how, and why do we mix? Different definitions, models and Concepts and their implications are discussed. Including definitions and models and variety Concepts, basically refer to all types of education, are some aspects of Includes Direct learning and online learning are described as mixed learning influential definitions, several different mixed learning models have been suggested. Mixed learning models generally focus on the body or surface-level characteristics rather than teaching or psychological characteristics. However, the first model described is an exception. Although not specifically developed for mixed learning, one of the most influential mixed learning models is the community of inquiry structure. It has been argued that the general nature of the structure and that it echoes well with Face-to-face and online learning; effectively understand and design mixed learning.
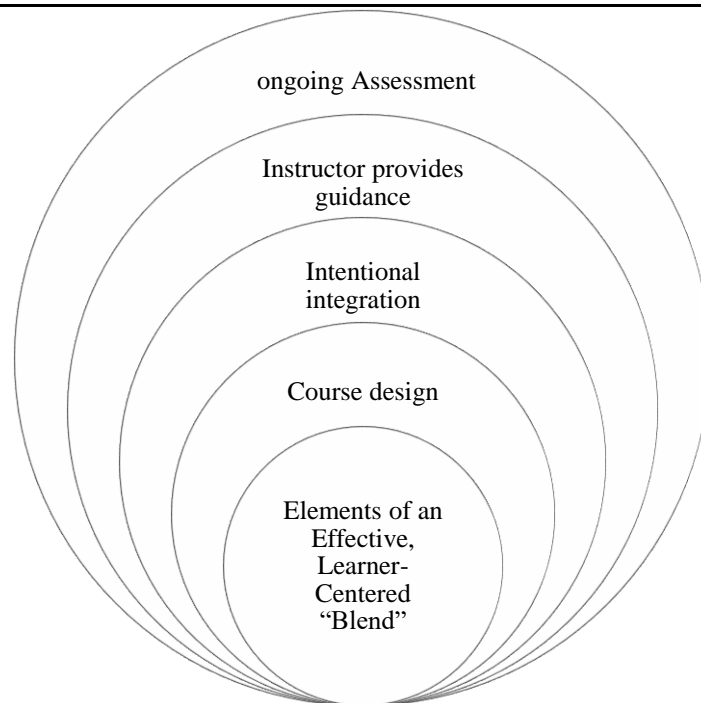
FIGURE 1. Elements of an Effective, Learner-Centered "Blend"

This is computer aided learning Applies to any learning environment involved. In the learning environment the same teaching and direct learning and BL is a combination Computer aided learning is defined as. The main purpose of most mixed learning design is individual learning subjects, contexts and two learning methods. Mixed Learning Some companies describe their mixed practices, Describe their own language, definitions or typology and their mixing practices, their own language, definitions or typography We recommend that you be part of it. Because of the lack of definition, companies need what they need Allows you to change and use the word and increase its ownership. The current emphasis is on distinguishing BL from traditional and online courses. However, future learning methods may differ less in how they integrate than in how they integrate. There may come a time when the term hybrid learning becomes obsolete because hybridization has become the new norm. However, at present a label is helpful to indicate these structurally different contexts. Traditional learning and from teaching Very Suitable for use in the transition process to learning. Teaching and Learning In this model, there are significant amounts of f2f components technically based are converted into teaching. Therefore, due to the high use of ICT, for the convenience of learning these days fewer f2f class sessions are conducted. The most effective teaching model is self-paced learning, direct is a hybrid approach that integrates e-learning and f2f classroom learning.

FIGURE 2. Blended learning

3. Student success

This may be because there are so many mixed learning models Is it more effective or more appropriate to select a particular company? The answer may Seems surprising or at least negative: nothing like the best and most Companies can succeed with any of them. With the success or perseverance of the students the delivery system has a very weak statistical relationship. In contrast, the set of organizational variables accepted as important Success factors for mixed learning and full online endeavors. These variables are from companies that have been successful in the online environment for over a decade Received. UCF Learning Impact Assessment System Distributed, by participating schools Adoption is not just about the level of learning mix, but also student success and return rates, student satisfaction And is used as a model to measure data on teacher satisfaction. Upon completion of the NGLC project, data were collected from more than 20 participating schools and their students. Understanding students 'success is as important as the withdrawal and learning environment it highlighted things in many course methods. This is how we learn about how mixed learning is structured in the new nature these are the key elements that make up the most effective decisions. Most students are partners and for minorities and non-minorities Maintain or improve access, the results reported here are advanced for students Indicates generating success rates. In addition, Learning is when students express confidence in the effectiveness of their learning environment, the learning program aims to improve students' success rates. Project Team Introduced changes to module layout, training support and many more online resources. Composition reflects a mix of traditional and innovative components, with new components often online Marked found in improvements. Results passed at both companies have shown significant improvements in fees. A comprehensive assessment of the students' use of the new environment was conducted. The main components of the composition and the results indicate a generally positive rating of widespread use new online features.

4. Evaluation methodologies

It is true that evaluation methods need to be categorized in order to assess the value of this new teaching medium as needed, the use of computer conferences in educational applications has grown over the past few years. The approaches to evaluation, which are relevant Drawing strategies and proposing unique techniques for its character. In this sense, this article aims to review the intrinsic characteristics of WUIs and key concepts about wildfire in WUI, provide evaluation methods used in WUI, and analyze the various risk mitigation and mitigation Projects created in WUI affected by various wildfires. Some parts of the world. In this case through our analysis we have found that the works created by researchers around the world are remarkable. Of this environmental problem considering the increasing relevance. However, to change knowledge and improve collaboration defining standardized algorithms is fundamental. Collective approach Implementation is essential, especially in developing strategies to prevent and reduce fire risk in these areas.

5. Learning design

A layer that breaks down the complexity in mixed learning design, introduces the systematic approach and emphasizes the socio-technical, method-based approach. Educational processes using learning technology. It has been argued that modeling such processes into forms allows a successful artificial visualization to be reused and thus enhanced. Definitely the performance of the design unlike other existing approaches, and methodological approaches to design according to the claim should not be pedagogically neutral; the approach presented here is based on the academic principles of the person-centered approach. Arranging patterns at different levels and granularities makes them reusable and stretchable so they can be easily modified to specific needs. This benefit is further confirmed when forms are implemented in a customized format, aimed at assisting Such as customizing WebPages, creating a team, commenting or evaluating Users in doing specific tasks, thus significantly reducing the effort spent on organizational issues. This Focusing on the elements of learning, which will preserve the learning mix learning systems. Self-reflection, of the learner the need and value of beliefs and attitudes. Ideology Interrelated and involves intermediate learning. Force those who have learned to add their previous experiences in problem solving. Use scaffolding to help learners think beyond what they already know. Because of this Learner control over learning. The learner results in self-mediated learning. Compound components are essential components Includes. Also, cooperation among students is essential. Learners their previous knowledge and They Their ideas, perspectives and / or attitudes based on experience reveal. Ideas, perspectives and among learners to develop new knowledge Many perspectives on attitudes are talked about socially

6. Course design

Introduced automated Creating Students across groups, peer-to-peer assessment and across groups based on various criteria fully file sharing function. Course management tools and implemented tools for automated standardization of programming tasks."Teaching Methods in Information Science" Course Undergraduate Program Mathematics and Designed for senior students in the fields of information science, information science, arts and sciences, University of Rijeka, Rijeka, Croatia. The academic year in Croatia is one winter and one summer, of course it is two seasons. The first year course on human development is all at the Regional Australian University One taken by undergraduate students as well. Previously, the course was confined to two campuses only Lectures were given and included This course at the university called Desk is for online learning The course is available online, however, through the management system also a repository for materials

offered in LMS course lectures and trainings Also used as a place for announcements. Graphic summary of the mixed learning curriculum. Course six equals Weighing blocks have lifetime levels. Questions that focus on each volume and There is a visual feedback map, which is the main content of each provided guidance to students regarding.

7. Quality of blended learning

Common features of the mix Learning and learning quality the concept of "mixed learning quality" was explained and an A sample was provided for the quality of mixed learning. The research effort above is now in establishing rankings Focuses. The quality of students' knowledge and skills is sound, in-depth and consistent knowledge and it is understood as practical application. Teacher assessment of students' knowledge and skills is a significant component of the integrated indicator of learning quality. Both approaches to evaluation learning - the effectiveness of the combination of teacher approach and student approach - is a common expert Allows Teacher to improve the learning process as a whole, resulting in evaluation. This condition Creates Ricky for rankings. Expressions are linear forms, the mathematical model of which is solved using the solution of MS Excel An integer programming model. The quality of mixed learning was assessed, to assess the quality of mixed learning a method for presenting the model and the identified objective was presented; many aspects that contribute to learning outcomes need to be carefully considered in A. to assess Quality environment of students' learning experiences. In which study, First-year engineering students take a semester-long course in a mixed curriculum to collaborate and explore. Because they collaborate in both class and online, investigation and this study explores their approaches to online learning technologies. In mixed learning when evaluating the quality of learning, teachers are also concerned about the quality of education of their courses. Teaching and learning models and how they are for learning experiences A clear understanding of what contributes is strategically and academically essential.

8. Conclusion

This Applies to any learning environment that includes computer aided learning. In a uniform teaching and learning environment Face-to-face and BL is defined as a combination of computer aided learning. Of mixed learning design the main structured in the new nature, for individual learning lessons, contexts and purposes these are the key elements of how we make the best decisions about. Most Maintains or enhances access to student partners and minority and non-minority Creates improved success rates for students the results reported here indicate. Because they collaborate in both class and online, inquiry and online learning this study explores their approaches to technologies. Regarding the quality of education in their courses Concerned teachers, the quality of learning in mixed learning Face many challenges when evaluating. A winter in the Croatian academic year and there is a summer, of course it is two seasons the first year course on human development is one taken by all undergraduate students at the Regional Australian University

References

[1]. Moskal, Patsy, Charles Dziuban, and Joel Hartman. "Blended learning: A dangerous idea?." The Internet and Higher Education 18 (2013): 15-23.

[2]. Hrastinski, Stefan. "What do we mean by blended learning?." TechTrends 63, no. 5 (2019): 564-569.

[3]. Garrison, D. Randy, and Heather Kanuka. "Blended learning: Uncovering its transformative potential in higher education." The internet and higher education 7, no. 2 (2004): 95-105.

[4]. Arya, Vishakha, Amit Kumar Mishra Mishra, and Alfonso González-Briones. "Analysis of sentiments on the onset of COVID-19 using machine learning techniques." *ADCAIJ: Advances in Distributed Computing and Artificial Intelligence Journal* 11, no. 1 (2022): 45-63.

[5]. Garg, Sheetal, Raman Singh, Mohammad S. Obaidat, Vinod Kumar Bhalla, and Bhisham Sharma. "Statistical vertical reduction-based data abridging technique for big network traffic dataset." *International Journal of Communication Systems* 33, no. 4 (2020): e4249.

[6]. Kaur, Manjot. "Blended learning-its challenges and future." Procedia-social and behavioral sciences 93 (2013): 612-617.

[7]. Dahiya, P., and D. K. Srivastva. "An efficient anomaly detection based on optimal deep belief network in big data." *Int. J. Eng. Adv. Technol.* 9, no. 1 (2019): 708-716.

[8]. A. Pasarkar and S. Balaguru, "Development on Fatigue Testing of Hardfaced Components in Sodium Cooled Fast Reactors," Engineering Failure Analysis, p. 106161, 2022.

[9]. Neumeier, Petra. "A closer look at blended learning—parameters for designing a blended learning environment for language teaching and learning." ReCALL 17, no. 2 (2005): 163-178.

[10]. Kshirsagar, Pravin, Akshay Pote, K. K. Paliwal, Vaibhav Hendre, Pranav Chippalkatti, and Nikhil Dhabekar. "A review on IOT based health care monitoring system." *ICCCE 2019* (2020): 95-100.

[11]. Farooqui, Nafees Akhter, Amit Kumar Mishra, and Ritika Mehra. "Automatic crop disease recognition by improved abnormality segmentation along with heuristic-based concatenated deep learning model." *Intelligent Decision Technologies* Preprint: 1-23.

[12]. López-Pérez, M. Victoria, M. Carmen Pérez-López, and Lázaro Rodríguez-Ariza. "Blended learning in higher education: Students' perceptions and their relation to outcomes." Computers & education 56, no. 3 (2011): 818-826.

[13]. Kumar, Ashish, Ketan Rathor, Snehit Vaddi, Devanshi Patel, Preethi Vanjarapu, and Manichandra Maddi. "ECG Based Early Heart Attack Prediction Using Neural Networks." In *2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC)*, pp. 1080-1083. IEEE, 2022.

[14]. Graham, Charles R. "Emerging practice and research in blended learning." In Handbook of distance education, pp. 351-368. Routledge, 2013.

[15]. Chaudhari, Rakesh, Praveen Kumar Loharkar, and Asha Ingle. "Medical Applications of Rapid Prototyping Technology." In *Recent Advances in Industrial Production*, pp. 241-250. Springer, Singapore, 2022.

[16]. Dahiya, Priyanka, and Alka Chaudhary. "FIDSM: Fuzzy based Intrusion Detection Systems in Mobile Ad Hoc Networks." *International Journal of Computer Applications* 975 (2014): 8887.

[17]. Hoic-Bozic, Natasa, Vedran Mornar, and Ivica Boticki. "A blended learning approach to course design and implementation." IEEE transactions on education 52, no. 1 (2008): 19-30.

[18]. S. Balaguru, V. Murali, P. Chellapandi and M. Gupta, "Effect of dilution on micro hardness of Ni-Cr-B-Si alloy hardfaced on austenitic stainless steel plate for sodium-cooled fast reactor applications," Nuclear Engineering and Technology, vol. 52, p. 589-596, 2020.

[19]. Derntl, Michael, and Renate Motschnig-Pitrik. "The role of structure, patterns, and people in blended learning." The Internet and Higher Education 8, no. 2 (2005): 111-130.

[20]. Mishra, Amit Kumar, and Shweta Paliwal. "Mitigating cyber threats through integration of feature selection and stacking ensemble learning: the LGBM and random forest intrusion detection perspective." *Cluster Computing* (2022): 1-12.

[21]. Dziuban, Charles, Charles R. Graham, Patsy D. Moskal, Anders Norberg, and Nicole Sicilia. "Blended learning: the new normal and emerging technologies." International journal of educational technology in Higher education 15, no. 1 (2018): 1-16.

[22]. Almomani, Omar, Mohammed Amin Almaiah, Adeeb Alsaaidah, Sami Smadi, Adel Hamdan Mohammad, and Ahmad Althunibat. "Machine learning classifiers for network intrusion detection system: comparative study." In *2021 International Conference on Information Technology (ICIT)*, pp. 440-445. IEEE, 2021.

[23]. Norberg, Anders, Charles D. Dziuban, and Patsy D. Moskal. "A time-based blended learning model." On the Horizon (2011).

[24]. Patil, Niteen, M. R. Patil, Rakesh Chaudhari, and Praveen Kumar Loharkar. "Investigation on the Machining of Inconel-718 Using EDM." In *Recent Advances in Smart Manufacturing and Materials*, pp. 129-136. Springer, Singapore, 2021.

[25]. S. Balaguru and M. Gupta, "Hardfacing studies of Ni alloys: A critical review," journal of materials research and technology, vol. 10, p. 1210-1242, 2021.

[26]. Rathor, Ketan, Sushant Lenka, Kartik A. Pandya, B. S. Gokulakrishna, Susheel Sriram Ananthan, and Zoheib Tufail Khan. "A Detailed View on industrial Safety and Health Analytics using Machine Learning Hybrid Ensemble Techniques." In *2022 International Conference on Edge Computing and Applications (ICECAA)*, pp. 1166-1169. IEEE, 2022.

[27]. Aspden, Liz, and Paul Helm. "Making the connection in a blended learning environment." Educational Media International 41, no. 3 (2004): 245-252.

[28]. Farooqui, Nafees Akhter, Amit Kumar Mishra, and Ritika Mehra. "Concatenated deep features with modified LSTM for enhanced crop disease classification." *International Journal of Intelligent Robotics and Applications* (2022): 1-25.

[29]. Mitchell, Anthony, and Sue Honore. "Criteria for successful blended learning." Industrial and commercial Training (2007).

[30]. Dahiya, Priyanka. "An Investigation into the Application of Bidirectional Associative Memory and Pseudorandom Number for Steganography." In *Emergent Converging Technologies and Biomedical Systems*, pp. 553-561. Springer, Singapore, 2022.

[31]. Rasheed, Rasheed Abubakar, Amirrudin Kamsin, and Nor Aniza Abdullah. "Challenges in the online component of blended learning: A systematic review." Computers & Education 144 (2020): 103701.

[32]. Tibadia, Rajkumar, Koustubh Patwardhan, Dhrumil Patel, Dinesh Shinde, and Rakesh Chaudhari. "Optimisation of drilling parameters for minimum circularity error in FRP composite." *International Journal of Materials Engineering Innovation* 10, no. 4 (2019): 271-285.

[33]. Okaz, Abeer Ali. "Integrating blended learning in higher education." Procedia-Social and Behavioral Sciences 186 (2015): 600-603.

[34]. S. Balaguru, M. Abid and M. Gupta, "Investigations on different hardfacing processes for High temperature applications of Ni-Cr-B-Si alloy hardfaced on austenitic stainless steel components," Journal of Materials Research and Technology, vol. 9, p. 10062-10072, 2020.

[35]. Precel, Karen, Yoram Eshet-Alkalai, and Yael Alberton. "Pedagogical and design aspects of a blended learning course." International Review of Research in Open and Distributed Learning 10, no. 2 (2009).

[36]. Rathor, Ketan, Keyur Patil, Mandiga Sahasra Sai Tarun, Shashwat Nikam, Devanshi Patel, and Sasanapuri Ranjit. "A Novel and Efficient Method to Detect the Face Coverings to Ensurethe Safety using Comparison Analysis." In *2022 International Conference on Edge Computing and Applications (ICECAA)*, pp. 1664-1667. IEEE, 2022.

[37]. Wong, Lily, Arthur Tatnall, and Stephen Burgess. "A framework for investigating blended learning effectiveness." Education+ Training (2014).

[38]. Chaudhari, Rakesh, and Asha Ingle. "Finite Element Analysis of Dissimilar Metal Weld of SA335 P11 and SA312 TP304 Formed By Transition Grading Technique." *Materials Today: Proceedings* 5, no. 2 (2018): 7972-7980.

[39]. Smith, Karen, and John Hill. "Defining the nature of blended learning through its depiction in current research." Higher Education Research & Development 38, no. 2 (2019): 383-397.

[40]. Talwar, Akshit, Alka Chaudhary, and Anil Kumar. "Encryption Policies of Social Media Apps and Its Effect on User's Privacy." In *2022 10th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO)*, pp. 1-4. IEEE, 2022.

[41]. Francis, Rebecca, and Susan J. Shannon. "Engaging with blended learning to improve students' learning outcomes." European Journal of Engineering Education 38, no. 4 (2013): 359-369.

[42]. Sukumaran, C., and P. J. Sebastian. "Effect of Inclusive Games and Physical Exercises on Selected Physical Variables among the Intellectually Challenged Children." *Annals of the Romanian Society for Cell Biology* 26, no. 01 (2022): 1442-1450.

[43]. P. R. Lokhande, S. Balaguru and D. Dayalan, "A comparative mircoleakage assessment in root canals obturated by three obturation techniques using fluid filtration system," Biomedical and Pharmacology Journal, vol. 12, p. 849-856, 2019.

[44]. Boyle, Tom, Claire Bradley, Peter Chalk, Ray Jones, and Poppy Pickard. "Using blended learning to improve student success rates in learning to program." Journal of educational Media 28, no. 2-3 (2003): 165-178.

[45]. Senkevich, Sergey, Vadim Bolshev, Ekaterina Ilchenko, Prasun Chakrabarti, Michał Jasiński, Zbigniew Leonowicz, and Mikhail Chaplygin. "Elastic Damping Mechanism Optimization by Indefinite Lagrange Multipliers." *IEEE Access* 9 (2021): 71784-71804.

[46]. Torrisi-Steele, Geraldine, and Steve Drew. "The literature landscape of blended learning in higher education: The need for better understanding of academic blended practice." International journal for academic development 18, no. 4 (2013): 371-383.

[47]. Manjunath, C. R., Ketan Rathor, Nandini Kulkarni, Prashant Pandurang Patil, Manoj S. Patil, and Jasdeep Singh. "Cloud Based DDOS Attack Detection Using Machine Learning Architectures: Understanding the Potential for Scientific Applications." *International Journal of Intelligent Systems and Applications in Engineering* 10, no. 2s (2022): 268-271.

[48]. George-Walker, Linda De, and Mary Keeffe. "Self-determined blended learning: a case study of blended learning design." Higher Education Research & Development 29, no. 1 (2010): 1-13.

[49]. Sukumaran, C., B. Karpagavalli, R. Hariharan, and V. Parthiban. "Preclusive Strategies of Obesity to Lead a Healthy Life-A Review‖." *Pharmaceutical Sciences and Research* 1, no. 1 (2022): 42-45.

[50]. Dheenadhayalan, V. "An Analysis of Financial Health of Select Indian Bulk Drugs and Formulations Companies* Mrs. R. Selvi."

[51]. Ahmerova, N. M., A. L. Fatykhova, F. M. Suleymanova, O. N. Russu, and I. I. Kokhanovskaya. "A mathematical blended learning model for university students." International Journal of Engineering and Technology (UAE) 7, no. 4.38 (2018): 34-36.

[52]. Kumar, Anil, Rajabov Sherzod Umurzoqovich, Nguyen Duc Duong, Pratik Kanani, Arulmani Kuppusamy, M. Praneesh, and Minh Ngyen Hieu. "An intrusion identification and prevention for cloud computing: From the perspective of deep learning." *Optik* 270 (2022): 170044.

[53]. Wang, Xin, Yuhao Zhou, Tingwen Huang, and Prasun Chakrabarti. "Event-triggered Adaptive Fault-tolerant Control for a Class of Nonlinear Multiagent Systems with Sensor and Actuator Faults." *IEEE Transactions on Circuits and Systems I: Regular Papers* 69, no. 10 (2022): 4203-4214.

[54]. Draffan, E. A., and Peter Rainger. "A model for the identification of challenges to blended learning." ALT-J 14, no. 1 (2006): 55-67.

[55]. P. R. Lokhande and S. Balaguru, "A mathematical model for root canal preparation using Endodontic file," Journal of Oral Biology and Craniofacial Research, vol. 10, p. 396-400, 2020.

[56]. Waha, Barbara, and Kate Davis. "University students' perspective on blended learning." Journal of Higher Education Policy and Management 36, no. 2 (2014): 172-182.

[57]. Stockwell, Brent R., Melissa S. Stockwell, Michael Cennamo, and Elise Jiang. "Blended learning improves science education." Cell 162, no. 5 (2015): 933-936.

[58]. Sukumaran, C., D. Selvam, M. Sankar, V. Parthiban, and C. Sugumar. "Application of Artificial Intelligence and Machine Learning to Predict Basketball Match Outcomes: A Systematic Review." *Computer Integrated Manufacturing Systems* 28, no. 11 (2022): 998-1009.

[59]. Boelens, Ruth, Bram De Wever, and Michiel Voet. "Four key challenges to the design of blended learning: A systematic literature review." Educational Research Review 22 (2017): 1-18.

[60]. Banana, K. R. I. S. H. N. A., and R. V. Chepuri. "Role of recovery channels in managing non-performing assets in scheduled commercial banks." *International Journal for Innovative Research in Multidisciplinary Field* 2, no. 10 (2016): 355-359.

[61]. Singh, Anuja, Tapan Behl, Aayush Sehgal, Sukhbir Singh, Neelam Sharma, Tanveer Naved, Saurabh Bhatia et al. "Mechanistic insights into the role of B cells in rheumatoid arthritis." *International Immunopharmacology* 99 (2021): 108078.

[62]. Kerres, Michael, and Claudia De Witt. "A didactical framework for the design of blended learning arrangements." Journal of educational media 28, no. 2-3 (2003): 101-113.

[63]. P. R. Lokhande and S. Balaguru, "A Mathematical Model for Root Canal Preparation Using Endodontic File: Part B," in Journal of Biomimetics, Biomaterials and Biomedical Engineering, 2019.

[64]. Porter, Wendy W., Charles R. Graham, Kristian A. Spring, and Kyle R. Welch. "Blended learning in higher education: Institutional adoption and implementation." Computers & Education 75 (2014): 185-195.

[65]. Kshirsagar, Pravin R., Anil N. Rakhonde, and Pranav Chippalkatti. "MRI image based brain tumor detection using machine learning." *Test Engineering and Management* 81 (2020): 3672-3680.

[66]. Kumar Pandey, Rakesh, Anil Kumar, Ajay Mandal, and Behzad Vaferi. "Employing deep learning neural networks for characterizing dual-porosity reservoirs based on pressure transient tests." *Journal of Energy Resources Technology* 144, no. 11 (2022): 113002.

[67]. Harris, Paul, John Connolly, and Luke Feeney. "Blended learning: Overview and recommendations for successful implementation." Industrial and commercial training (2009).

[68]. Sukumaran, C., and P. J. Sebastian. "Effect of Inclusive Games and Physical Exercises on Selected Physical Variables among the Intellectually Challenged Children." *Annals of the Romanian Society for Cell Biology* 26, no. 01 (2022): 1442-1450.

[69]. Ruokonen, Inkeri, and Heikki Ruismäki. "E-learning in music: A case study of learning group composing in a blended learning environment." Procedia-Social and Behavioral Sciences 217 (2016): 109-115.

[70]. Koohang, Alex. "A learner-centred model for blended learning design." International Journal of innovation and learning 6, no. 1 (2009): 76-91.

[71]. Koundal, Deepika, and Bhisham Sharma. "Advanced neutrosophic set-based ultrasound image analysis." In *Neutrosophic set in medical image analysis*, pp. 51-73. Academic Press, 2019.

[72]. Dheenadhayalan, V., and R. Devianbarasi. "Relationship between liquidity and profitability-a case study of NPKRR cooperative sugar mill ltd." *Indian Cooperative Review* 47, no. 1 (2009): 39-46.

[73]. Soler, Rebeca, Juan Ramon Soler, and Isabel Araya. "Subjects in the blended learning model design. Theoretical-methodological elements." Procedia-Social and Behavioral Sciences 237 (2017): 771-777.

[74]. P. R. Lokhande, S. S. Salunkhe and S. Balaguru, "Numerical simulation and experimentation of endodontic file using Taguchi DoE," International Journal for Simulation and Multidisciplinary Design Optimization, vol. 12, p. 32, 2021.

[75]. Mayisela, Tabisa. "The potential use of mobile technology: Enhancing accessibility and communication in a blended learning course." South African Journal of Education 33, no. 1 (2013): 1-18.

[76]. Kapoor, Nishant Raj, Ashok Kumar, Anuj Kumar, Anil Kumar, and Krishna Kumar. "Transmission Probability of SARS-CoV-2 in Office Environment Using Artificial Neural Network." *Ieee Access* 10 (2022): 121204-121229.

[77]. Sajid, Muhammad R., Abrar F. Laheji, Fayha Abothenain, Yezan Salam, Dina AlJayar, and Akef Obeidat. "Can blended learning and the flipped classroom improve student learning and satisfaction in Saudi Arabia?." International journal of medical education 7 (2016): 281.

[78]. Kshirsagar, Pravin R., and Sudhir G. Akojwar. "Prediction of neurological disorders using optimized neural network." In *2016 International Conference on Signal Processing, Communication, Power and Embedded System (SCOPES)*, pp. 1695-1699. IEEE, 2016.

[79]. Bhalla, Kanika, Deepika Koundal, Bhisham Sharma, Yu-Chen Hu, and Atef Zaguia. "A fuzzy convolutional neural network for enhancing multi-focus image fusion." *Journal of Visual Communication and Image Representation* 84 (2022): 103485.

[80]. P. R. Lokhande, S. Balaguru and G. Deenadayalan, "A review of contemporary fatigue analysis and biomaterials studies in endodontics," in Materials Science Forum, 2019.

[81]. Karat, John. "User-centered software evaluation methodologies." In Handbook of human-computer interaction, pp. 689-704. North-Holland, 1997.

[82]. Shahare, Padmakar, Manisha Jaiswal, Deepshikha Kalra, Vishal Srivastava, Rani Susmitha, and V. Dheenadhayalan. "Implementation of Innovative Strategies on Entrepreneurship Business as a Driver for Economic Development Among Emerging Economic." *Korea Review of International Studies* 15, no. 34 (2022).

[83]. Chowdhury, Faieza. "Blended learning: how to flip the classroom at HEIs in Bangladesh?." Journal of Research in Innovative Teaching & Learning 13, no. 2 (2019): 228-242.

[84]. P. R. Lokhande and S. Balaguru, "The quantification of percentage filling of gutta-percha in obturated root canal using image processing and analysis," Journal of Oral Biology and Craniofacial Research, vol. 10, p. 28-32, 2020.

[85]. Sajid, Muhammad R., Abrar F. Laheji, Fayha Abothenain, Yezan Salam, Dina AlJayar, and Akef Obeidat. "Can blended learning and the flipped classroom improve student learning and satisfaction in Saudi Arabia?." International journal of medical education 7 (2016): 281.

[86]. Siraj, Madiha, Anmol Sethi, Anil Kumar, and Priyanka Dahiya. "Haptic Feedback System for Differently Abled Using Their Inputs." In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO)*, pp. 1-4. IEEE, 2021.

[87]. Bajaj, Karan, Bhisham Sharma, and Raman Singh. "Implementation analysis of IoT-based offloading frameworks on cloud/edge computing for sensor generated big data." *Complex & Intelligent Systems* 8, no. 5 (2022): 3641-3658.

[88]. Ellis, Robert A., Abelardo Pardo, and Feifei Han. "Quality in blended learning environments–Significant differences in how students approach learning collaborations." Computers & Education 102 (2016): 90-102.

[89]. Kumar Pandey, Rakesh, Anil Kumar, Ajay Mandal, and Behzad Vaferi. "Genetic algorithm optimization of deep structured classifier-predictor models for pressure transient analysis." *Journal of Energy Resources Technology* 145, no. 2 (2023): 023003.

[90]. Kassab, Salah Eldin, Ahmad I. Al-Shafei, Abdel Halim Salem, and Sameer Otoom. "Relationships between the quality of blended learning experience, self-regulated learning, and academic achievement of medical students: a path analysis." Advances in medical education and practice 6 (2015): 27.