Effect Of Micro-Learning On Students'academic Achievement At Higher Education Level

Hina Arshad[1], Dr. Bushra Naoreen[2], Hina Gull[3], Dr. Shumaila Shahzad (Corresponding author)[4]

ABSTRACT

Education is the key to success in life. Better education needs better teaching and learning practices. Now a days, it is a very challenging matter for teachers to engage students in learning. It is looked-for to work out on latest trends of education to capture students' attention towards learning. Technology is changing the mode of teaching and learning process at each level of education. Additionally, integration of technology is demanded for effective education. Micro-Learning is needed to meet today's challenges of education. This study was focused to find out the effect of micro-learning on students' academic achievements at higher education level. This study was experimental in nature. Government College University Faisalabad was selected to conduct the experimental research. The intact two Sections of B.Ed. (Hon) Elementary 6th Semester from the department of Education were indicated for intervention. Quasi Experimental Research Design was used to test the research hypothesis. The Pretest-Posttest None-Equivalent-Groups Design was selected. Experimental group was treated with Micro Learning and control group was treated with Traditional Learning. Micro-Learning contents, white board animated videos, short YouTube Lectures and info-graphs were used for Experimental group. 16 weeks course planning of educational psychology was implemented for one semester. Data were collected from the administration of pre-test before intervention and post-test after intervention and retention test after two weeks of post-test. The results of this experimental research exposed significant effect of micro-learning. On behalf of this study, futuristic researcher suggested to conduct the experimental studies on more micro- learning trends that enhance the students' interest and engagement and create the favorable learning environment to attain the educational objectives at each level of education.

Keywords: Micro Learning, Traditional Learning, White Board Animation, Info-graphs, Micro-App.

INTRODUCTION

Education is most important activity of human which include instruction or training and the acquisition of knowledge, skills, values, or competencies that enable them to meet the life challenges. It is very important to discuss about teaching because if teaching ways are effective then learning is take place affectively. In education system we always talk about teaching ways for effective learning at each level. Now a days, learning modes shift towards technology[1] mode. Mobile devices and network communication have revolutionized the way people access information and learn new things. The traditional model of learning, which relied on classrooms and textbooks, is no longer sufficient to meet the demands of modern learners. Instead, people are turning to more flexible and personalized learning modes that allow them to access knowledge anytime and anywhere (Fang, 2018b).

Additionally, the traditional model of learning, primarily based on classrooms and textbooks, has been unable to keep up with the increasing volume of knowledge and the

---

[1]Ph.D. Scholar, Department of Education, Government College University, Faisalabad.
[2]Associate Professor, Department of Education, Government College University, Faisalabad.
[3]Lecturer, Department of Education, Government College University, Faisalabad.
[4]Associate Professor, Department of Education, Government College University, Faisalabad.

demand for flexible and personalized learning experiences. As a result, alternative learning modes such as micro-learning have gained significant attention. Micro-learning, characterized by its focus on smaller units of study and shorter timeframes, has become increasingly popular among students. This approach, often facilitated through mobile handheld devices like smartphones, emphasizes brief and independent learning. This method allows learners to access information in small, manageable chunks, often tailored to their specific needs and preferences (Sankaranarayanan et al., 2023).

Micro-Learning is entitledas bite-sized learning. This learning mode is very newly introduced that's why it has much concerned in these days. The meaning of "micro-" is "very small". Shortly, micro-learning is having very short learning units as compared to usual learning. Micro-learning is becoming very useful for all type of learners. This mode of learning is very trending in this age of learning .Actually, It cover up the use of small learning contents rather large one with mobile friendly activities. All micro-learning activities overcome the cognitive load because they provide the friendly learning in very short contents and by focusing the one idea on one time. Shortly, micro-learning is an very effective way to learn and retain the information for long lasting (Dixit et al., 2021).

Indeed, micro-learning can be presented in various formats, catering to different learning preferences and styles. While video-based micro-learning has gained popularity for its efficiency and engagement, other types of content can also be effectively delivered in this manner. E-learning modules, interactive video games, educational blogs, podcasts, infographics, and various forms of visual content are all examples of how micro-learning can be presented. These diverse formats provide learners with options to engage with content in ways that best suit their individual learning styles and preferences. The flexibility of micro-learning, coupled with the variety of content formats available, allows for a more personalized and adaptable learning experience. This approach acknowledges that different learners may respond better to specific types of content and enables them to access information in the format that resonates most with them. As a result, micro-learning has the potential to enhance learner engagement and retention of information (Shail, 2019).

On another hand, learning regulation provides the best way to learn and retain the information for long lasting. It is very important that teachers use that ways which provide the opportunities to the learners for learning in practice mode. But there is a big problem for learners in traditional learning which just provide the contents in large format. It is difficult to learn and retain all information, students can't revise it. They are stuck in traditional, rote memorization ways of learning. Furthermore, through traditional learning students forget the information in a very short time (TiraNurFitria, 2022). Long lasting learning always demanded so, for this purpose learning should be on self-regulated mode. Micro-learning one and only provide short term learning with lots of practices through friendly learning modalities that encourage the students towards understandable, interesting and memorable learning contents (Sirwan et al., 2018).

Importantly, today learning mode is continuing changing in online learning mode due to some worldwide issues. Sometimes physical learning is not possible. So, it is very difficult for students to sit on one place and consumed the subject matter knowledge in on sitting and in one lecture. Today learners have so much other duties along their education degree. Furthermore, learners of today are simultaneously involving multiple tasks. They have not enough time to absorb all information through traditional mode of learning. So, micro-learning grants self-regulation mode of learning. In micro-learning students get information through multiple channels and resources. They can easily access the contents whenever they need and whenever they have time to learn. Micro-learning provides mobile friendly learning that motivates the students towards learning (Alqurashi, 2017).

REVIEW OF LITERATURE

Education is highly important activity of human's life. Education system runs by its components including learners, teachers, curriculum, teaching methods and teaching-

learning environment. The learner is the most important component of the teaching-learning process. The learner's ability, motivation, and readiness to learn affect the learning process. The learner's background, prior knowledge, and experiences also play a crucial role in learning. The learner's interest, attention, and participation are also important. If the learner is not interested or motivated, learning will not be effective (Safaan, 2017).

The trainer or teacher is the second most important component of the teaching-learning process. The teacher's experience, knowledge, skills, and attitude affect the learning process. The teacher should be able to create a positive learning environment, motivate the learners, and use effective teaching methods. The teacher should also be able to assess the learners' progress and provide feedback. The materials to be taught or curriculum is the third component of the teaching-learning process. The curriculum should be relevant, up-to-date, and appropriate for the learners. The curriculum should be designed in such a way that it meets the learners' needs, interests, and abilities. The curriculum should also be flexible and adaptable to different learning styles and preferences(Bruck et al., n.d.).

Additionally, Teaching methods are the fourth component of the teaching-learning process. The teaching methods should be appropriate for the learners, the materials to be taught, and the learning objectives. The teaching methods should be varied and should cater to different learning styles and preferences. The teaching methods should also be interactive and engaging, and should encourage active participation and collaboration. The environment for teaching-learning is the fifth component of the teaching-learning process. The environment should be conducive to learning, and should be safe, comfortable, and free from distractions. The environment should also be equipped with the necessary resources and facilities, such as books, computers, and audio-visual aids (Shatte et al., 2019).

In conclusion, the teaching-learning process is a complex process that involves multiple factors. The factors related to the learner, trainer, materials to be taught, teaching methods, and environment for teaching-learning all affect the learning process. Therefore, it is important to maintain these five components properly in order to make the process of teaching-learning effective according to demanding education. Today learning is turning over in technology mode. Now, it is very important to use advance educational resources (Albalawi et al., 2020).

Educational stakeholders are always trying to improve the quality of students' learning. Now a day, it is very easy task due to technology. Because of technology teachers can engage the students in learning with easy mode. But it is the point that which ways of technology should be use for the students' learning that will appropriate for learning enhancement. Micro-learning modalities give answer towards all these queries because micro-learning provide multiple friendly learning activities which enable the learning very short, focused, interesting and understandable (Padhi, 2021).

Generally, the assimilation of technology in education has opened up new potentials for learning, allowing for greater flexibility, accessibility, and personalization. As technology continues to advance, it is likely that the educational landscape will continue to evolve, with new innovations and tools shaping the way knowledge is acquired and shared (Shatte et al., 2019).

Effective education is needed at each level of education like school education, college education and university education. At this modern age, educational stakeholders are taking steps for new technology mode education for better learning environment at all education levels. If we talk about university education level, modern technology based education is most demanding at this level because all university going students use mobile devices, internet resources, synchronous and asynchronous learning modes. That's why at this stage traditional methods of learning are not meet the needs of today learners (Aldosemani, 2019).

Micro learning is indeed a unique approach to education, offering benefits such as swift generation and distribution of learning resources, cost-effectiveness in producing educational materials, enhanced participatory learning, ease of recall for students, versatile use of learning resources, smaller participant groups, and time efficiency. These characteristics make micro learning a valuable tool for delivering concise and impactful educational content. Its ability to provide easily digestible information, adapt to various

learning styles, and cater to time constraints makes it a compelling method for modern education and training (Allela et al., 2020).

Yes, that's correct. The shortness of micro learning materials makes it easier for students to retain and recall information. Research has shown that shorter learning units are more effective in promoting long-term memory retention. Additionally, micro learning resources can be used in various ways, allowing students to manage their study time more efficiently. For instance, they can download video files and access them offline, which is particularly useful for learners who may not have constant access to the internet. By offering versatile and accessible learning resources, micro learning can help students optimize their learning experience and achieve their educational goals (TiraNurFitria, 2022).

Integrating various forms of media such as podcasts, animated videos, subject-matter expert videos, presentation slides, infographics, and audio clips can greatly enhance learning. Micro-learning approach is multi dimensioned that enhance the leaning through various form of learning modalities. It allows for a dynamic and interactive learning experience, capturing the attention of learners and facilitating better retention of information. By utilizing diverse media formats, we can create a more comprehensive and impactful learning contents (Fang, 2018a).

Micro-learning provides solutions are indeed an effective way to enhance the learning experience and improve retention, which involves distributing learning over time with intervals of rest or other activities, helps learners overcome the "Forgetting Curve" by reinforcing memory and knowledge retention. Additionally, incorporating learning prompts can serve as reminders for learners, reinforcing key concepts and aiding in long-term retention. This approach can significantly improve the overall impact of learning at all level of education (Shail, 2019).

Additionally, above mentioned research studies sported that micro-learning is highly demanded for latest educational trends. Due to advanced media and excessive use of social media all students are performing their activities through media devices. Now, it is needed to use media devices in education especially at higher education level. Many researchers reported that YouTube, Tiktok, Snackvideo, facebook, Instagram and twitter are replacing the traditional modes of learning (S. Safaan, 2017). The current study used mobile based app "kahoot" that definitely meet the needs and interest of the students as well as students remember the contents of the subjects whenever they want to need it.

MATERIALS AND METHODS

The current study was based on an experiment to find out the effectiveness of micro-learning. This experiment was conducted at Government College University Faisalabad. Department of Education was selected as population of the study and B.Ed. (Hon) Elementary 6th semester was considered as sample of the study. It was not possible to split the students in groups randomly due to administrative concerns. That's why intact groups were selected for experimental and control groups. The Pretest-Posttest None-Equivalent-Groups Design was selected because this design was best for intact groups. Pre-test was administered before intervention. The group with low mean score in pre-test was considered as experimental group and the other was considered as control group. Experimental group went through micro-learning and control group went through traditional learning. 16 weeks course plan of educational psychology was implemented for one semester. Micro-learning planning for experimental group and traditional planning for control group was ensured before starting the experiment through pilot testing. Achievement test was finalized after item analysis. Experimental threats were also controlled before and during experiment. After intervention, both groups took post-test. To check the retention level of the students, a retention test was also administered after two weeks of post-test. Figure 1 shows design of the study;

Procedure of Micro-learning (Experimental Group):

- ➤ Micro Learning Contents were prepared as Micro Module, White Board Animation, Infographics, Short Lectures (YouTube) and Micro-App (Kahoot).
- ➤ **Kahoot** mobile-based application was used to practice and retain the contents.
- ➤ Firstly, micro- contents were presented in the classroom through multi-media.
- ➤ After contents presentation, all students practiced and retained the contents through Kahoot mobile-based application. It presented multiple choice questions related to the presented content. This application provides the opportunity for students to learn, retain and practice the subject matter content in the classroom and after the classroom.
- ➤ A 16 weeks of educational course planning was implemented through micro-learning plaining.
- ➤ Content was Divided into 4 halves.
- ➤ Content was delivered in just 5-10 minutes with interacted micro learning modalities
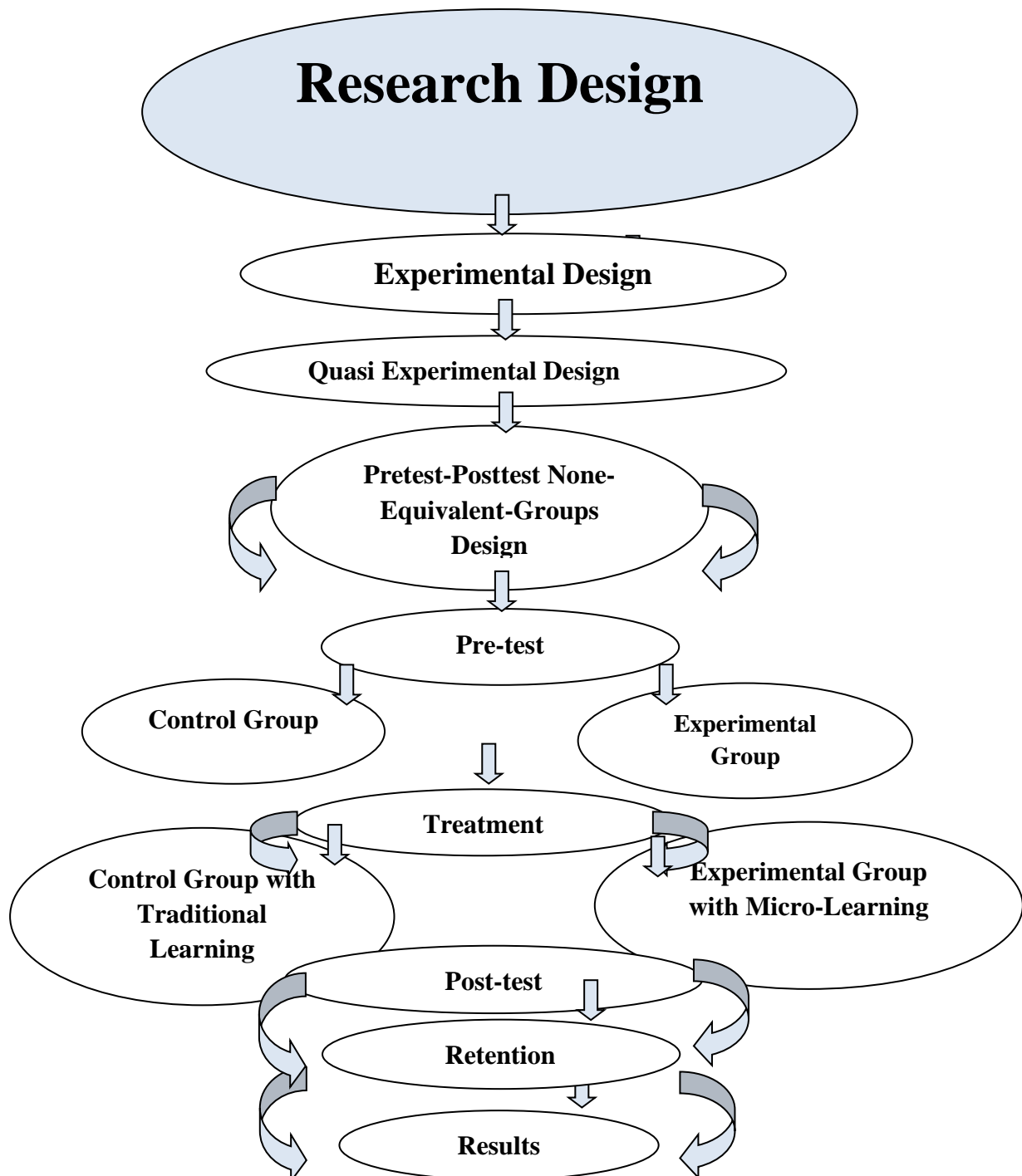- ➤ Practice activity was assigned after each half

Figure 1: Design of the study

Micro Learning Layout in the Classroom

Class: 1 hour Time		
	Activity	**Resources**
Learning= 5 mint Practice= 10 mint	**Part-1** Content presentation Practice:	✓ Internet ✓ Mobile Phone ✓ Multimedia ✓ Speakers ✓ Laptop
Learning= 5 mint Practice= 10 mint	**Part-2** Content presentation Practice:	
Learning= 5 mint Practice= 10 mint	**Part-3** Content presentation Practice:	
Learning= 5 mint Practice= 10 mint	**Part-4** Content presentation Practice:	

Procedure of Traditional Learning (Control Group)
- ➢ Control group was treated with traditional learning as lecture method
- ➢ Same contents were presented through lecture mode as traditional way to the students.
- ➢ In traditional learning, students just listened the lecture as passive learner and noted down the important information if they needed.
- ➢ A 16 weeks of educational course planning was implemented through traditional learning plaining.

RESULTS & DISCUSSION

Table 4.1 Difference between Mean Achievement Scores of Two Groups on the Pre-test

Group	N	M	SD	t	Df	Sig.
Group 1	30	16.83	4.01	-.862	58	.392
Group 2	30	17.73	4.06			

*P<0.005   Cohen's d=0.22>0.2.

Table 4.1 revealed that there was no significant difference in scores for two groups. Group 1 (M=16.83, SD=4.01) and group 2 (M=17.73, SD=4.06); t (58) = -.862, p= .392(two tailed). It is therefore interpreted that group 1 and group 2 both were not different before intervention. On behalf of their mean scores, group 1 was chosen as Experimental group and group 2 was considered as control group.

Table 4.2 Difference between Mean Achievement Scores of Experimental and Control Groups in Post-Test

Group	N	M	SD	t	Df	Sig.
Experimental	30	68.47	6.01	3.50	44.6	.001
Control	30	60.40	11.09			

* p>0.005   Cohen's d=0.90>0.8.

Table 4.2 revealed that there was a significant difference in scores of experimental

(M=68.47, SD=6.01) and control groups (M=60.40, SD=11.09); t (44.6) = 3.50, p= .001(two tailed) in post test. So, it is disclosed that experimental group that was taught trough micro-learning performed better as compared to control group that was taught through traditional learning.

Table 4.3 Difference between Mean Gain Scores of Experimental and Control Groups

Group	N	M	SD	t	Df	Sig.
Experimental	30	51.63	6.45	4.09	49.25	.000
Control	30	42.67	10.12			

* p>0.005   Cohen's d=1.05>0.2.

Table 4.3 exposed that there was a significant difference in mean gain scores of experimental (M=51.63, SD=6.45) and control groups (M=42.67, SD=10.12); t (49.25) = 4.09, p= .000(two tailed). So, it is computed that experimental group that was taught trough micro-learning gain more as compared to control group that was taught through traditional learning.

Table 4.4 Difference between Mean Achievement Scores of Experimental and Control Groups on Retention Test

Group	N	M	SD	T	Df	Sig.
Experimental	30	56.93	5.25	5.28	37.48	.000
Control	30	42.53	13.98			

* p>0.005   Cohen's d=1.36>0.2.

Table 4.4 revealed that there was a significant difference in mean scores of experimental (M=56.93, SD=5.25) and control groups on retention test (M=42.53, SD=13.98); t (37.48) = 5.28, p= .000(two tailed) administered after two weeks of post test. So, it is computed that experimental group that was taught trough micro-learning remembered the concepts of educational psychology better than the control group that was taught through traditional learning.

Table 4.5 Difference between Mean Reduction Scores of Experimental and Control Groups

Group	N	M	SD	t	df	Sig.
Experimental	30	11.53	3.56	-3.68	38.48	.001
Control	30	17.87	8.70			

* p>0.005   Cohen's d=0.95>0.8.

Table 4.5 exposed that there was a significant difference in mean reduction scores of experimental (M=11.53, SD=3.56) and control groups (M=17.87, SD=8.70); t (38.48) = -3.68, p= .001(two tailed). So, it is concluded that experimental group that was taught trough micro-learning forgot the concepts of educational psychology less as compared to the control group that was taught through traditional learning.

Discussion
Micro-Learning is demanded learning mode for future education because this fast going time requires learning in chunks, focused and bite-sized. So, the entire study was focused on micro-learning at higher education level. The results exposed that micro-learning went better as compared to traditional learning with reference to students' achievement in the course of Educational Psychology. Same results were found in the research study conducted by SiRwan Mohammed et al., 2018. This study was conducted on primary school students in the ICT subject. Results revealed that through micro-learning, knowledge,

understanding, remembering the lesson and retaining the information became very easy tasks for students as compared to traditional learning.

Rafli and Adri (2022) reported that lengthy contents and larger book materials decrease students' attention and interest towards learning outcomes. Study suggested that 1-2 minutes short video by focusing one objective at one time increase the students' attention span. Additionally, micro-learning contents like Short videos, info-graphs, Short lectures based on bite-sized helped retain the information very easily.

The entire study exposed micro-learning as interactive module and info-graphs and Kahoot App as gamification mode went best towards learning outcomes. This was also exposed by Nugraha et al., (2021). Researchers reported that multiple modalities like podcasts, PowerPoint slides, infographics, motion graphics, explainer videos and interactive video conferencing and gamification are highly effective and all these modalities can successfully overcome learning boredom.

In fact, Micro-learning strategy was found better than the traditional learning. Entire study exposed that through micro-learning, students' retention score was higher and their reduction score was very low. It means that students forget the information less through micro-learning modalities. Same results were also identified by Zarshenas et al., (2022). This Study revealed that Micro-learning is an excellent training strategy for enhancing nursing students' learning outcomes through micro-learning short videos.

In short, no doubt micro-learning have significant effect on students' academic achievement, interest and long lasting learning. Further, Yusnidar and Syahri (2022) exposed that there were significant results of case-based micro-learning that was conducted via blended learning mode. Students' learning outcomes were highly significant. This study highly recommended micro-learning for the betterment of the students' academic achievement and long lasting learning.

Findings

1. This study turned out that the experimental group taught with micro-learning performed better in the course of Educational Psychology than the control group taught with traditional learning.
2. This study revealed that experimental group better retained all educational psychology content as compared to control group.
3. This study proved that experimental group that was taught trough micro-learning forgot the concepts of educational psychology less as compared to the control group that was taught through traditional learning.

Conclusions

This experimental study revealed that micro-learning went better than traditional learning for improving students' achievement in the course of Educational Psychology. Students taught through micro-learning   performed better in their academics, retained the information longer, and forgot less as compared to control group. Kahoot mobile application was good source for micro-learners to improve their academic achievements through practice in and out of the classroom. Furthermore, micro-learning modalities as white board animated videos, YouTube short Video lectures and info-graphs proved to be focused, interesting and effective to present the information in chunks which helped students gain the information easily and retain the information longer.

Recommendation

1. This study revealed significant results at higher education level. It is recommended that futuristic study may also be conducted on school education level.
2. Micro-learning modalities as Kahoot mobile application, white board animated videos, YouTube short video lectures and info-graphs were used in this study that proved to be effective for students. So, it is recommended that futuristic study may use more micro-learning modalities.
3. HEC may plan educational courses as micro-learning mode.

4. Course instructors may be trained to develop short contents with latest technology as micro-learning. They may be trained to create LMS of their respective subjects and run educational mobile applications.

5. Course instructors may plan other educational courses as chunks, bite-sized and objective focused contents with interacted technology as like, white board animated videos, Short YouTube videos, TikTok, Snack videos etc.

References

Albalawi, R., Yeap, T. H., & Benyoucef, M. (2020).Using Topic Modeling Methods for Short-Text Data: A Comparative Analysis.Frontiers in Artificial Intelligence, 3, 42. https://doi.org/10.3389/frai.2020.00042

Aldosemani, T. I. (2019). Microlearning for Macro-outcomes: Students' Perceptions of Telegram as a Microlearning Tool. In T. Väljataga& M. Laanpere (Eds.), Digital Turn in Schools—Research, Policy, Practice. 189–201. Springer Singapore. https://doi.org/10.1007/978-981-13-7361-9_13

Allela, M. A., Ogange, B. O., Junaid, M. I., & Charles, P. B. (2020).Effectiveness of multimodal microlearning for in-service teacher training.Journal of Learning for Development, 7(3), 384–398. https://doi.org/10.56059/jl4d.v7i3.387

Alqurashi, E. (2017). Microlearning: A pedagogical approach for technology integration. The Turkish Online Journal of Educational Technology, 16, 942–947.

Bruck, P. A., Motiwalla, L., &Foerster, F. (n.d.).Mobile Learning with Micro-content: A Framework and Evaluation.

Dixit, R. K., Yalagi, P. S., &Nirgude, M. A. (2021).Breaking the walls of classroom through Micro learning: Short burst of learning.Journal of Physics: Conference Series, 1854(1). https://doi.org/10.1088/1742-6596/1854/1/012018

Fang, Q. (2018a). A Study of College English Teaching Mode in the Context of Micro-learning. 189(Mehss), 235–239. https://doi.org/10.2991/mehss-18.2018.50

Fang, Q. (2018b). A Study of College English Teaching Mode in the Context of Micro-learning. Proceedings of the 2018 International Conference on Management and Education, Humanities and Social Sciences (MEHSS 2018).2018 International Conference on Management and Education, Humanities and Social Sciences (MEHSS 2018), Hangzhou City, China. https://doi.org/10.2991/mehss-18.2018.50

ImplementasiMicrolearningBerbasis Case Study TerhadapHasilBelajarMahasiswaPendidikan Kimia | JurnalStudi Guru danPembelajaran.(n.d.). Retrieved January 19, 2024, from https://e-journal.my.id/jsgp/article/view/1530

Nugraha, H., Rusmana, A., Khadijah, U. L. S., &Gemiharto, I. (2021).MicrolearningSebagaiUpayadalamMenghadapiDampakPandemipada Proses Pembelajaran.JurnalInovasidanTeknologiPembelajaran, 8(3), Article 3. https://doi.org/10.17977/um031v8i32021p225

Padhi, G. (2021). Factors Affecting Teaching-Learning Process.International Journal of Creative Research Thoughts (IJCRT) ,9(4).

Rafli, M. A., & Adri, M. (2022).Pengembangan Micro-Learning pada Mata KuliahKewirausahaan di UniversitasNegeri Padang Berbasis Media.6.

Safaan, S. (2017). The Impact of Different Modes on Building learning objects when Designing E-lessons on Achievement, Attitude, and Time. Journal of Research in Curriculum Instruction and Educational Technology, 3(3), 45–68. https://doi.org/10.21608/jrciet.2017.24447

Safaan, S. A. (2017). The Impact of Different Modes on Building learning objects when Designing E-lessons on Achievement, Attitude, and Time. 3(3).

Sankaranarayanan, R., Leung, J., Abramenka-Lachheb, V., Seo, G., &Lachheb, A. (2023).Microlearning in Diverse Contexts: A Bibliometric Analysis. TechTrends, 67(2), 260–276. https://doi.org/10.1007/s11528-022-00794-x

Shail, M. S. (2019). Using Micro-learning on Mobile Applications to Increase Knowledge Retention and Work Performance: A Review of Literature. Cureus, 11(8). https://doi.org/10.7759/cureus.5307

Shatte, A. B. R., Teague, S. J., &Shatte, A. (2019).Microlearning for improved student outcomes in higher education: A scoping review. Osf.

SiRwan Mohammed, G., WakiL, K., &SiRwanNawroly, S. (2018). The Effectiveness of Microlearning to Improve Students' Learning Ability.International Journal of Educational Research Review, 3(3), 32–38. https://doi.org/10.24331/ijere.415824

TiraNurFitria. (2022). Microlearning in Teaching and Learning Process: A Review. CENDEKIA: JurnalIlmuSosial, Bahasa Dan Pendidikan, 2(4), 114–135. https://doi.org/10.55606/cendikia.v2i4.473

Yusnidar, Y., &Syahri, W. (2022).ImplementasiMicrolearningBerbasis Case Study TerhadapHasilBelajarMahasiswaPendidikan Kimia. JurnalStudi Guru Dan Pembelajaran, 5(1), Article 1. https://doi.org/10.30605/jsgp.5.1.2022.1530

Zarshenas, L., Mehrabi, M., karamdar, L., Keshavarzi, M. H., &keshtkaran, Z. (2022). The effect of micro-learning on learning and self-efficacy of nursing students: An interventional study. BMC Medical Education, 22(1), 664. https://doi.org/10.1186/s12909-022-03726-8