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Digital Micro-Learning (DML) Based e-Training for Enhancing Digital Competence of Teacher Educators

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A B S T RA C T *--e-Training has gained potential enticement in this era of digitized educational networks. Countries like Pakistan have smaller trends of e-Training programs as teachers are not digitally competent enough. They take such programs as professional burden, wastage of time and cognitive load Digital Micro-Learning (DML) addresses these issues of as DML is a strategy of training through brief, digestible, and well-planned units of information which are consumed by the trainees via digital media. DML contains micro-content and micro-activities within digital training environment. For this research study, e-Training program was conducted on the concept of Digital Micro-Learning which was intended to enhance the digital competence of teacher educators focusing on enhancement of digital literacy and e-Teaching skills. Findings of the study revealed the higher engagement level during e-Training and enhanced digital literacy and e-Teaching skills. The study suggests using DML approach for continued professional development of teacher educators.*

Keywords--*e-Training; Digital Micro-learning (DML); digital competence; digital literacy*

I. INTRODUCTION

The utilization of new technologies in education has dramatically mounted in recent years. This rapid technological development has transferred the ways of knowledge delivery and students' learning as digital tools and technologies and web-based resources now pervade all spheres of teaching and learning and learning is transformed as being connecting, engaging and meaningful. (Courville, 2011). So these latest digital technological trends provide opportunities to the learners to acquire twenty-first century skills. (Wojcicki & Izumi, 2015; Aldridge, 2010; Silva, 2009; Brown, 2006; Schrier,2006).

This digital transformation in education creates challenges for the teachers to make over their teaching in accordance with the demanding digital patterns (Li, 2017; Tang, 2017; Singh & Hardecker, 2014; Agyei, 2014; Beetham & Sharpe, 2013; Laurilard, 2002) , as teachers are the main performers who can integrate latest technologies, digital resources and web tools in their teaching practices and ultimately modernize their teaching (Howard & Mozejko, 2015; Froese-Germain & McGahey, 2013; Boling, 2008). Teacher educators and teachers, themselves, are crucial part of educational change and development, states Vandenberghe (1984). They have to redefine their roles from deliverers of knowledge to co-creators and developers of digital competencies (Bates,

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2015; Caroll & Resta, 2010; Yengin, 2010; . The elevated development of digital technologies has mirrored the need of higher level of digital competencies and abilities among teachers. According to Gujjar et al. (2010), new inventions demand that teachers must be well trained having latest knowledge and skills and be able to apply new approaches with latest technologies.

Teacher training institutions in Pakistan lack the vision, strategies and capacities to promote innovative teaching methods with massive use of digital tools and technologies in pre-service and in-service teachers training programs with the online and digital learning environments. As a result, prospective teachers, being digital natives (Jones & Shao, 2011; Lei, 2009; Selwyn, 2009), also lack the competencies and expertise to integrate digital technologies in their future professional teaching because their digital learning needs are not met through traditional teaching practices. Prensky (2001) argues that Today's students are no longer the people our educational system was designed to teach. Also according to Collis & Jung (2003) those teachers are more inclined towards integrating technologies in their teaching who have utilized technologies in their professional learning as students. In this scenario, teacher education institutions and teacher training institutions are the main stake holders to amalgamate the digital vogue into the professional development programs (as argued by Vrasidas , Zembylas & Legaspi, 2004) so that teacher educators may to able to comfortably and competently utilize emerging digital technologies and tools in their teaching practices to teach the future teachers of digital age. Technology is continuously changing phenomenon these days so it becomes crucial to organize e-Training programs for teacher educators to enhance their digital literacy and e-Teaching skills to be digitally competent. Noreen and Hafeez (2016) also support by emphasizing, "teacher educators require access to resources and trainings to utilize digital tools and technologies in teaching". Byrd (2017) confers that in the era of digitization of education, it becomes crucial for teacher educators to seek expertise in e-Teaching skills and enhance their digital literacies.

Overtime, number of new technology-based strategies such as collaborative learning, communities of practice, connectivist learning etc. are introduced in professional training programs (European Commission-ET2020, 2015; Parkay, Stanford & Gougeon, 2010; Dede et al., 2009; Pianfetti, 2001). Particularly in the context of Pakistan, although e-Training programs enhancing digital competencies of teacher educators are rarely arranged but least interest of teacher educators is evidenced in such training programs (Aziz et al., 2014; Ahmed, 2012; Sarwar & Hussain, 2010; Hathaway, 2005). There are many reasons behind this reluctance which include resistance to use new technologies, lack of digital infrastructure, no departmental policies, professional relevance etc. (Touray, Salminen & Mursu, 2013; Oye et al., 2011; Al-Gaith, Sanzongni & Sandhu, 2010). Besides above described barriers, time, protracted content, cognitive load and work load of training are also major factors which hinder teacher educators to participate in e-Training programs. During training courses, extended time span for learning long content is considered as cognitive load which needs a compromise of professional working hours of teacher educators whereas most of the training content seems non-targeted and sometimes irrelevant (NIACE, 2013; Brownell & Tanner, 2012; Bacow et al. 2012; Lloyd, Byrne & McCoy, 2012; Sussman, 2002). Trainees see long training sessions, workshops, and huge manuals to read as outdated and tedious. To overcome this difficulty of dwindling attention towards e-Training of teacher educators, an innovative training strategy named Digital Micro-Learning (DML) provides sound foundation for e-Learning based training programs in the time of rapidly accelerating technologies.

Micro-Learning in online digital learning environments, that is Digital Micro-Learning (DML) is the concept of providing learners with small bite sized nuggets of knowledge or information, which serves all the necessary content in one bite. According to Fernandez (2015), "DML is a method of training through short, digestible, well-planned units that the learner consumes via digital media". It allows the learners to gain knowledge of the concerned topic in the best, short and effective manner, rather than pouring over them gallons of learning and training material, of which most of it is not required at all. This modern trend has emerged in the digital age which diminishes time allowable for both consuming and creating content termed as micro-content.

DML trains efficiently, practically and easily by moving at the trainees' pace and seeks to minimize their cognitive load (Rahim, 2017; Greany, 2017; Freeman, 2016; Grovo, 2015; Hartley, 2010). Mr. Allen Comm, an experienced instructional designer of Digital Micro-learning suggests that "Digital Micro-learning means more than just small. Micro-learning is not only compact, it's also focused, offering just the right amount of information necessary to help a learner achieve a specific, actionable objective. This makes micro-learning in training contexts especially valuable." The goal of DML is to deliver easily-digestible micro-content that the trainees retain for long, as human memory ingests information in small chunks and process them into larger more meaningful concepts. According to ATD (2016), the average time available per employee for training is just over 33 hours per year, factored out, that's less than one hour per week. So teacher educators look for ways to maximize precious training time which can be make feasible by serving up bite-sized chunks micro-content of training is one idea to successfully work for targeted and objective based e-Training programs.

e-Training through DML follows the modular approach where training activities include short-term lessons, projects, or assignments with smaller amounts of information. Zufic & Jurcan (2015) append that course material is broken into smaller lessons or modules, rather than teaching a broad topic all at once. Although the course may be broken down into smaller modules, hosted on digital training environments like training portals of organizations, e-Portal or LMS which are easily accessible through mobile devices too.

Cardoz (2017) in SwissVBS Guide points some of the promising benefits of DML for e-Training of teachers educators may include:

- Targeted and objective-based training
- Micro-content
- Shortened cognitive load
- Reduced training time
- Improved knowledge retention
- Performance gaps filled
- Accommodation of multiple learning styles
- Personalized and self-paced learning
- Digital devices/mobiles enabled learning

According to Job & Ogalo (2012), Digital Micro-Learning is a new research area aimed at exploring new strategies for its integration in teacher training, teacher education and online training of teachers and teacher educators. Literature does not provide sufficient evidences of DML to be utilized in teacher education or in the e-

Training of teacher educators whereas it is an advantageous strategy for said purpose. This research study is exclusively conducted to highlight the benefits of DML in the e-Training of teacher educators to enhance their digital competencies to coop with the trends of digital age and learning requirements of prospective teachers by integrating digital technologies in their teaching.

II. METHODOLOGY AND DATA COLLECTION

Sample of the study comprised of 29 teacher educators from education departments/ institutions of 10 public universities of Punjab province. The teacher educators were registered into a DML-based e-Training program titled "Digital Literacy and Contemporary e-Teaching". The duration of the e-Training course was 3-weeks.

The course was held through an e-Portal named "UTeT" which included a well-structured content management system (CMS). CMS organized the content into 7 modules and 16 lessons. Each lesson was a combination of different types of content (textual, graphical, videos, case studies, presentations, research studies, learning resources etc.) designed and developed according to the needs of teacher educators. For instance, a module of the course with title " Models and Perspectives of Digital Literacy" contained three lessons which are shown in figure.

Figure 1: Online module of Course uploaded on e-Portal "UTeT"

Lessons of all modules were properly titled as shown in figure 2, that is, " Digital Literacy : Theoretical Framework". The content of this lesson was very brief and bit-sized so that to minimize the time consumption and cognitive load of trainees. Other types of content were also provided to assist the learning needs and styles of trainees by making the learning self-paced, and independent.

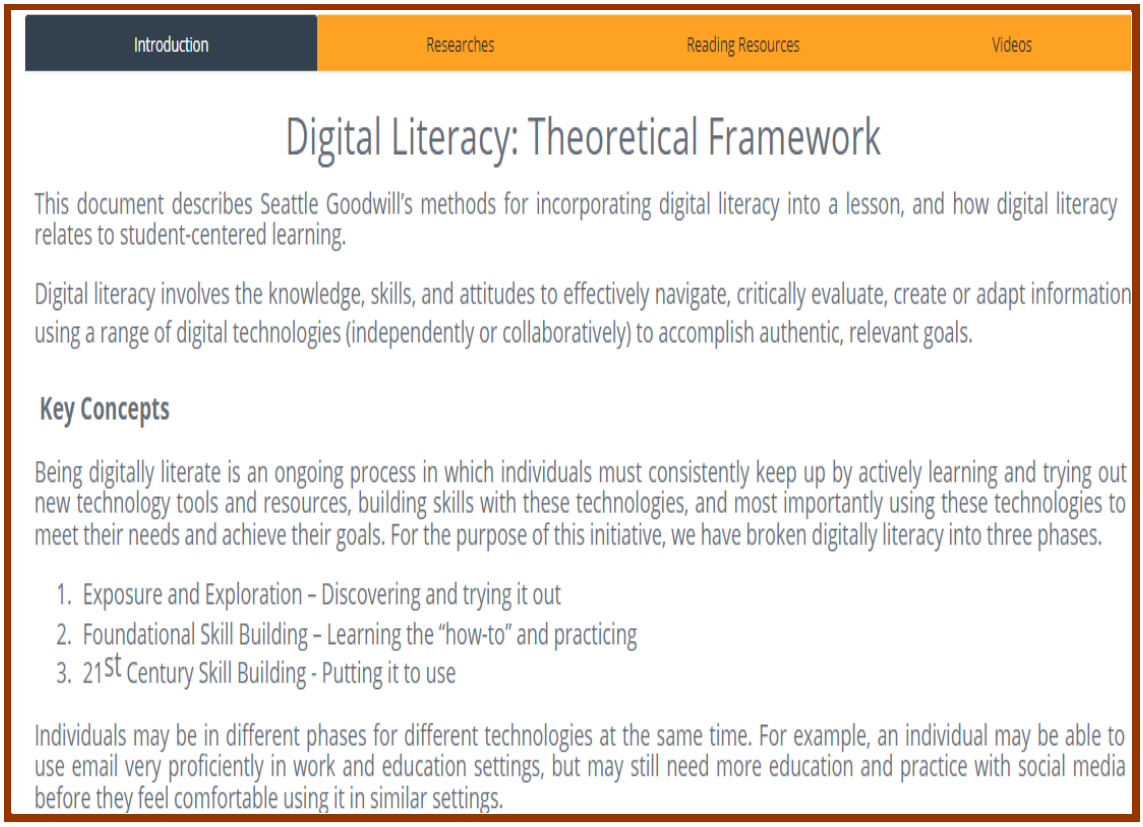

Figure 2: A lesson of relevant module with content

Figure 3: Videos uploaded as lesson content

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Before formal initiation of lessons, trainees were given introduction about the concept of DML being used in the e-Training course.

Figure 4: First Module of Course – Introduction to DML

The participants of the DML-base e-Training course were put into an e-Survey through a 14-items questionnaire which was intended to analyze their e-Readiness for taking this e-Training course. This survey also aimed to know about the digital competence (i.e. digital literacy & e-Teaching skills) before starting the e-Training. e-Engagement level of participants was measured during the course by launching another e-Survey through a 12-items questionnaire. At the end of e-Training, participants of the course were asked to take part in another e-survey with same questionnaire in which they had already participated before initiating the course. Purpose of administering the same questionnaire again was to analyze the digital competence of trainees at the end of e-Training course.

III. DATA ANALYSIS

Data collected through three e-Surveys was then analyzed to get the findings of research study and reach the conclusions. Tables below illustrate the findings of the study in accordance with objectives of the study.

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Table 1: e-Readiness of Teacher Educators to Participate in e-Training Course

e-Readiness	N	Mean	S.D.
Confidence with TMS	29	2.55	.686
Awareness of DML	29	1.41	.568
Motivation to participate in e-Training	29	4.17	.539

Table-1 illustrates that before starting e-Training course, participants were not confident enough to use training management system for this training. Also participants were not aware of the concept of Digital Micro-learning used in this e-Training. In contrary mean value 4.17 proves that teacher educators were highly motivated and interested in taking this e-Training course.

Table 2: Engagement level of Teacher Educators during e-Training Course

e-Engagement	Mean	%age	S.D.
Active Participation	2.72	90.8	.455
Time Devotion	2.21	73.6	.774
Interaction	3.00	100.0	.000
Compatible Learning style	2.52	83.9	.688
Relevance	2.72	90.8	.528
Any time access	3.00	100.0	.000
Confident for doing tasks	2.55	85.1	.632
Dedication	2.69	89.7	.541
Content Understanding	2.79	93.1	.412
Time saving lessons	2.59	86.2	.628
Interest	2.69	89.7	.541
Commitment	3.00	100.0	.000

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The mean values and percentages in above table show high engagement level of participants during e-Training course. It decodes that participants were actively participating, devoting time and learning according to their learning styles by confidently using different features of e-Training course and training management system. It is also clear that 100% participants were committed to complete the course.

Table 3: Means before and after taking e-Training

	Survey	**Mean**	**S.D.**
Digital Literacy	Pre-training	2.34	.54
	Post-training	3.95	.078
e-Teaching Skills	Pre-training	2.66	.780
	Post-training	3.76	.295

Table-3 depicts the digital literacy and e-Teaching skills of participants before and after taking e-Training course. As table shows that mean of digital literacy before and after course were 2.34 and 3.95 which are very farther from each other. Also the mean of e-Teaching skills before and after taking course were 2.66 and 3.76 simultaneously which also highly differentiate from each other.

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Table 4: t-test comparing digital literacy and e-Teaching skills

	Levene's Test for Equality of Variances		t-test for Equality of Means						
Digital Competencies	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Digital Literacy	9.504	.012	-7.24	28	.000	-1.6	.22	-2.11	-1.11
e-Teaching Skills	11.78	.009	-2.94	28	.019	-1.1	.37	-1.96	-.24

Independent sample t-test was applied to compare the means of digital literacy and e-Teaching skills of participants before and after participating in e-Training course. In the table above, as *p1*=0.00 (which is less than $\alpha = 0.05$) and t1=7.24, it is obvious that there was statistically significant difference between the digital literacy of teacher educators before and after taking DML-based e-Training course. Also as *p*2=0.019 (which is less than $\alpha = 0.05$), it is evident that there was statistically significant difference between the e-Teaching skills of teacher educators before and after taking DML-based e-Training course.

IV. DISCUSSION

Digital Micro-Learning (DML) is an ideal training solution and excellent tool to integrate into e-Training of modern professionals of teacher education offering multiple benefits to both the trainers and trainees (Job & Ogalo, 2012). DML provides bit-sized nuggets of information in the form of micro-content which eliminates the non-attentive attitude towards participation in e-Training courses, reduces learning time span and cognitive load by

providing more interaction, engagement and interest content and training tasks and activities organized on training management systems. The lessons are concise, short and focused, DML can be personalized and tailored along with being more affordable also through digital devices. One thing is certain, with attention spans shortening from one generation to the next, Digital Micro-Learning has a bright future to be integrated in the e-Learning based training programs organized by teacher education and teacher training institutions in Pakistan.

V. CONCLUSION

This research study makes it comprehensible that Digital Micro-Learning (DML) is a suitable approach to provide e-Training to the teacher educators as DML contains micro-content and micro-activities within digital training environment. Mean values from findings illustrate high level of motivation and engagement of participant during DML-based e-Training course. The study also proves that digital competencies of participants were enhanced as mean values of 'digital literacy' and 'e-Teaching skills' were more after training in comparison with the mean values before training. Simply It is concluded that there was statistically significant difference between the e-Teaching skills of teacher educators before and after taking DML-based e-Training course. Results of the study depict the suitability of DML for professional development of teacher educators for the enhancement of digital competencies.

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