Micro-learning with instructional content in the teaching of scientific research: A qualitative study conducted in Peru

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Abstract– Micro-learning is a strategy used to improve student learning by using technological resources in a brief, specific and digital way. The objective was to understand and evaluate the use of micro-learning capsules in the development of the research course. The students, guided by the course teachers, elaborated learning microcapsules on scientific research topics. The time used was 8 minutes maximum and they were developed in the second unit of the course "thesis development". The microcapsules were reviewed and corrected. Subsequently, they were published in the Blackboard platform of the course to be shared. The "virtual discussion group" technique was used to explore the feelings of 10 key participants, who showed interest in the development of the strategy. The responses obtained were analyzed, and three subcategories emerged (a) socialization (b) type of learning and (c) emotions. The results showed that students learn or analyze better when they elaborate, research, propose and share content related to a selected topic.

Keywords— micro-learning, microlearning, e-learning, teaching, education.

I. INTRODUCTION

Micro-learning is a learning strategy that provides information to students in small fragments through short videos, podcasts, infographics, online games and mobile applications [1]–[4]. Although the use of micro-learning is booming (33.5%) annually in scientific production [5], there are reasons why they are not used in secondary and higher educational institutions. One of them is that teachers are not familiar with micro-learning methods and strategies or may have a preference for traditional teaching methods [6]–[8]. But, to develop activities using active micro-learning requires additional resources to create a class session. Technology and a sold research management system offers various technological options for teachers and students in developing digital research competencies [8]–[14].

Updated research on micro-learning indicates that through it, students were motivated in their learning process and teachers generated audiovisual resources for subsequent courses [15]. Likewise, in Iran, research was conducted on the best teaching method and among several options they concluded that it is necessary to use micro-learning, since it favors learning through any electronic media [16].

Through micro-learning the student body has greater retention of knowledge. The information obtained in small portions makes it easier to remember, according to the theory of Ebbinghaus who suggests that information is lost when no attempt is made to retain it, emerging the Forgetting Curve that argues that memory decreases over time [17].

Micro-learning allows students to choose the content they want to learn and the order in which they want to learn it, becoming a personalized learning process [18], [19]. Likewise, it is very useful for students who have difficulty concentrating for long periods of time. Therefore, micro-learning offers an active and interactive learning experience without changing the essence [20].

It is important to recognize the benefits of micro-learning, since favorable results such as knowledge retention and practical application are achieved. In this way, students can recommend the use of educational pills or modules to other people so that knowledge can be socialized [21], [22].

Micro-learning has evolved over time especially in the field of teaching, learning and technology [23]. The micro-learning strategy offers necessary innovative foundations as the student body is in permanent interaction with technology [24], [25].

In 1990, the teacher George Siemens put forward the idea of learning objects, considered as independent learning units, which focuses on providing learning content in small and accessible units [26]. Similar proposal is that of Curtis Bonk who promoted the idea of e-learning in bursts, which refers to the delivery of learning content in small doses [27]. Since then, micro-learning has evolved due to the increasing availability of online learning technologies, the increase of trainings and skills development with the aim of providing learning tailored to the needs of the student body. Furthermore, the use of this strategy is recommended because it pays attention to the different learning styles of students [28].

The term micro-learning is associated with e-Learning, followed by Micro-Learning, education, teaching, curriculum and students as central themes developed from 2019 to 2022, as seen in Figure 1, although a bit far from the word university. The information comes from the Scopus database, which was the source of the documentary review. Micro-learning is not used in all universities as a general strategy due to several causes, one of which is the lack of awareness of faculty and

students who are not at the forefront of the concept of micro-learning and how to apply it in the university space. Another cause is the magisterial teaching or academic tradition that is generally based on in-depth lectures [29], [30]. Another possible cause is the effective implementation of technological resources and inserting them in class sessions, generates costs that are assumed by the university and subsequently trainings to all faculty [31], [32].

Fig. 1 Words associated with micro-learning.

In order to develop the programmed activities using the micro-learning strategy, the content, format and duration are taken into account.

Micro-learning contents are brief, specific and concrete, so that students can easily understand and apply them in the development of their learning. The content should be designed to respond to a specific need or problem, generally relevant and up-to-date [33], [34]. Likewise, students make fewer mistakes when developing specific content [35].

Micro-learning formats should be flexible, so that students can access at any time and from any device [36], [37]. The formats generally used are short videos, podcasts, online educational games and simulations [38].

The duration of micro-learning should be short, generally between three, five or eight minutes, so that students absorb information effectively. The duration of the content will depend on the complexity of the information [36].

The research arose to contribute, innovate and raise the quality of the educational process of the subject Thesis Development. In the learning-teaching process of the Thesis, it was found that students had difficulty with certain basic topics that are essential to successfully develop the approval and submission of the thesis. The main objective is that the students reach in a synergic way a better development in the development of the course in scientific research topics.

Therefore, the following questions were asked: How has their learning improved by using micro-learning in the scientific research course? What is the meaning of learning scientific research through micro-learning?

II. METHODOLOGY

The research was developed under the qualitative approach. The key participants were students enrolled in the "thesis development" course, from the tenth semester of an education program at a private university in Peru. The course comprised four months of learning from April to July 2022.

The topics with the greatest difficulty in the development of the thesis, according to the key participants, were analyzed. The contents were selected by the students, and the formats were of free choice. In relation to time, a maximum time of 8 minutes was established.

The use of the micro-learning strategy had two phases: The first phase has three moments (a) planning, (b) execution and (c) evaluation (see Fig. 2). The second phase consisted of applying the virtual focus group technique to analyze the meaning of learning through micro-learning.

First phase and its three moments: (a) planning, (b) execution and (c) evaluation:
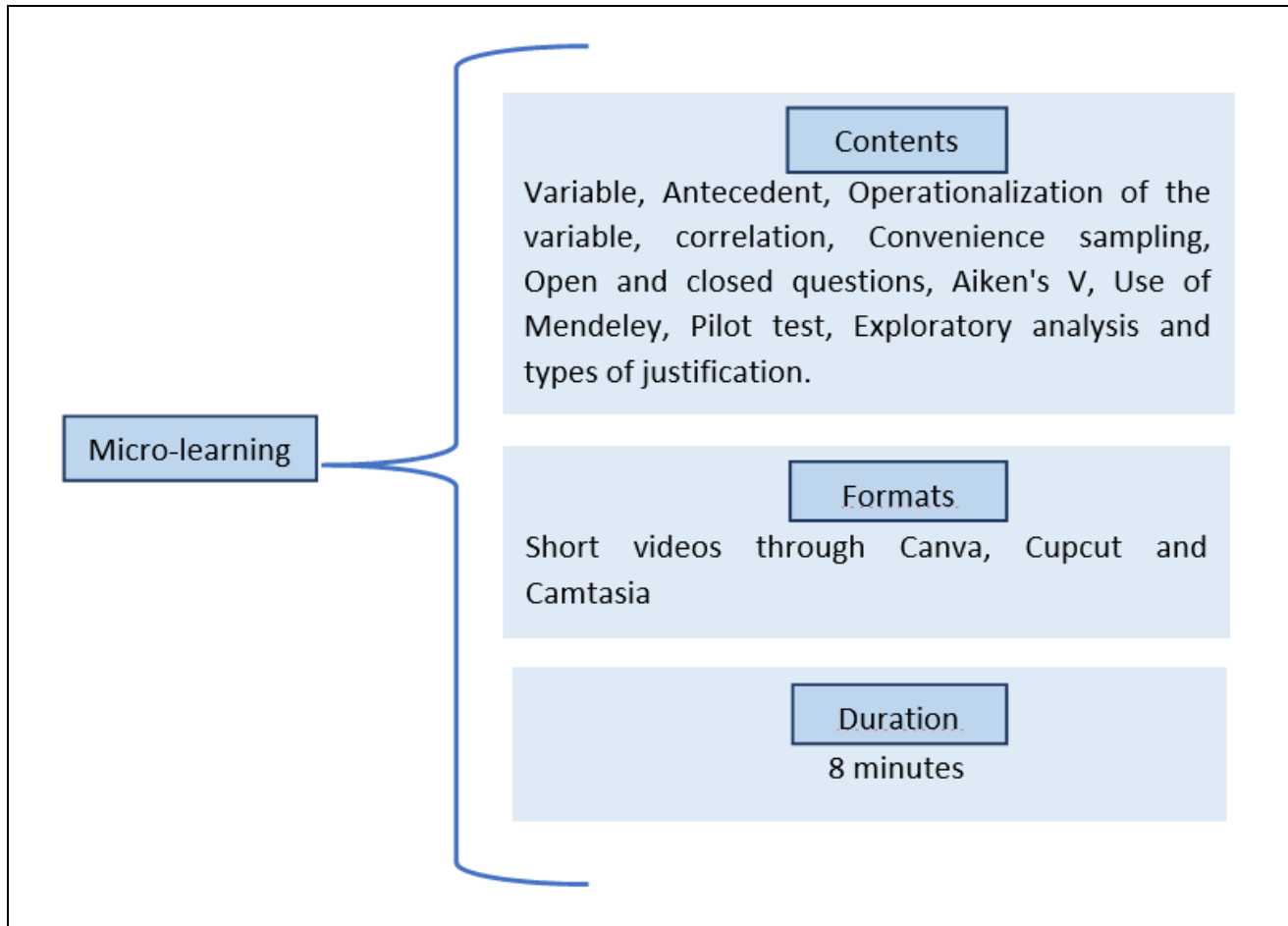
a) Planning:

Fig. 2 Moment 1: Planning.

b) Execution:

The second phase consisted of recording the selected topic and this material was uploaded to the Blackboard platform to be shared with classmates (see Fig. 3).
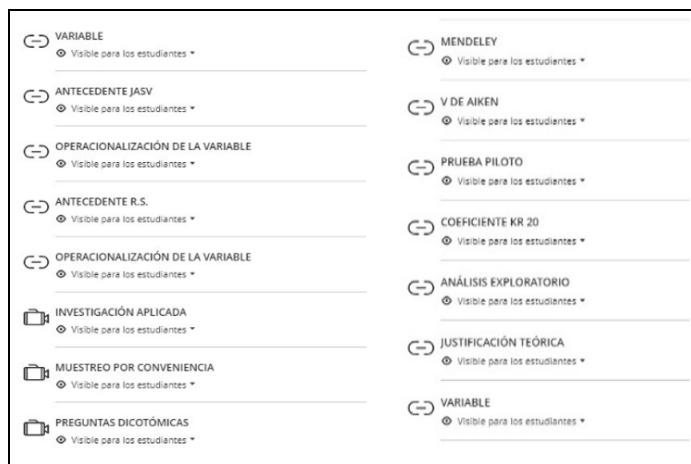

Fig. 3 Moment 2: Execution.

c) Evaluation

The third phase consisted of evaluating their classmates through constructive criticism. In some cases the explanation was very vague and in other cases the explanation was very detailed. Whatever the outcome, the students developed confidence.

Second phase: Virtual Focus Group

Ten key participants were invited to the virtual Focus Group Discussion. To select the sample it was necessary to identify two groups, those who had no observations before recording the video and those who had more than two opportunities to improve the wording of the content before recording the video.

The Zoom platform was used, in which they expressed their feelings when developing a topic that they did not know or was very difficult to understand at the time. The time used was 45 minutes. The key participants who did not answer were not considered as part of the research.

At this stage, quality criteria were met, such as credibility, transferability, dependability and confirmability [39]. Students belonging to generation Z are sociable, capable of facing a technological activity with ease [40], [41]. However, reality showed that students enjoy the use of technology when developing programmed activities in the development of class sessions (credibility).

Likewise, the students who were evaluated are young people between 22 and 25 years old, who are taking the thesis development course for the first time, this course corresponds to the tenth cycle, but they have an academic training in research since the first cycle. The micro-learning strategy can be applied to any academic context, since it deepens the knowledge of the students in a specific topic in a certain time (transferability).

The relationship between the researcher and the key informants was teacher-student. The activities were developed with specific indications to avoid a dependency bias between both and to avoid answering with favoritism or that the strategy is the best they have experienced (dependency).

Likewise, the triangulation of methods and sources was performed. The results were analyzed and contrasted with the different micro-learning methods applied in other countries and to see the implications. Likewise, sources such as observation and focus group were analyzed to formulate conclusions avoiding researcher bias (confirmability).

III. RESULTS

To the question, how has your learning improved by using micro-learning in scientific research? And what is the meaning of learning through micro-learning? The following answers were obtained (see Table I):

TABLE I
RESPONSE FROM KEY PARTICIPANTS

Subject number	Subject code	Answer	Inference
1	S1G1	"The experience was to my liking as it allowed me to reach out to all my classmates, otherwise I would not have conversed with anyone."	Socialization
2	S2G1	"As a student it is up to me to get better at handling technology, but I have learned and feel confident"	Security
3	S3G1	"I feel I have learned, but I still have positive and negative emotions"	Emotions
4	S4G1	"I have learned in another way, different from the traditional method"	Different learning
5	S5G1	"I have learned because I have repeated many times the same information to adjust to the times"	Types of learning
6	S1G2	"I learned, but I felt stressed and nervous about the results"	Emotions
7	S2G2	"I learned in depth, but it generated a lot of anxiety, nerves and embarrassment"	Emotions
8	S3G2	"I learned that there is a lot of information on the same topic, there are many versions and choosing the right one was not easy"	Type of learning
9	S4G2	"It is very stressful, researching, selecting relevant information and then recording yourself to be seen by colleagues was not to my liking"	Socialization and emotions
10	S5G2	"You learn, but the design of the content took me a lot of time and the times I have repeated the recording, it made me learn and understand the topic better"	Content design and learning type

Table I identifies the number of key participants from 1 to 10. The coding varies according to the groups they belong to, in this case S1G1, corresponds to subject 1 of Group 1, and S1G2, corresponds to subject 1 of Group 2.

The responses were analyzed and the emerging subcategories of each response were identified. The new subcategories were grouped into (a) socialization (b) type of learning and (c) emotions, which was valid for both groups, but from a different approach.

IV. DISCUSSION AND CONCLUSION

Short research videos are important because they are an effective way to communicate complex information in accessible and easy-to-understand formats [37].

Short videos can be shared online, are useful for presenting research, and results can be communicated effectively [21], [38].

Micro-learning is a strategy that uses virtual media to communicate, disseminate research in an effective, accessible way and that can be used in various contexts such as lectures, exhibitions, classes not only of scientific research but of any discipline [31], [32]. In this way they reinforce what has been learned and the number of errors is reduced [35].

Socialization is one of the emerging categories, where the students were able to develop their personality and feel confident in front of others. Although for the second group it was stressful, uncomfortable and embarrassing.

It should be noted that each student has his or her own pace and learning style, which when combined with technology offers a range of possibilities to promote learning. Finally, it is necessary to control emotions in order to develop the proposed activities. Constant repetition strengthens or fixes learning if it has a reduced time is better, according to the expressions of the student body that are contrasted with the theory of the forgetting curve [17].

The use of micro-learning generates effective learning in the student body, which has positive effects such as security, emotions and recognizes a learning rhythm. Therefore, university professors should incorporate it in the development of their class sessions and encourage the use of technologies, which came to transform society.

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