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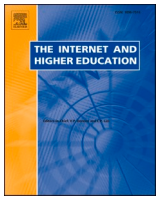

Exploring learner satisfaction and the effectiveness of microlearning in higher education

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ABSTRACT

The rise of microlearning both for professional training and in the field of education seems unstoppable. Nonetheless, there is a lack of evidence of its learning effectiveness and student satisfaction. The purpose of this paper is to uncover these two aspects of microlearning when taking part in a business education program. Its originality is that it analyses in depth a fast-growing EdTech startup that provides business training using microlearning methods, exploring the effect in terms of student satisfaction and learning effectiveness when combining a significant number of microlearning lessons to create a macro-learning course. Findings show that learning effectiveness is mainly explained by the reason for enrolling in this type of training and its applicability to the students' current jobs, resulting in four possible learning outcomes of increasing levels of effectiveness: entertainment, updating knowledge and skills, unexpected learning, and effective learning. This paper helps fill a gap in the research on learner satisfaction and microlearning effectiveness, finding that they are not necessarily guaranteed. It also has practical implications for designing, recruiting for, and implementing microlearning-based programs.

Keypoints: Empirical research into microlearning effectiveness and student satisfaction in postgraduate business education. Exploring the effectiveness of macro-learning, or the grouping of a significant number of microlearning lessons into a learning program. Uncovering different levels of learning effectiveness and their antecedent conditions.

1. Introduction

Mobile devices, social connectedness, and time scarcity are the main drivers of microlearning (Torgeson, 2021), a fast emerging learning option that allows learners to pull the knowledge and information they need when they need it (Taylor & Hung, 2022). Microlearning presents information in the most common way people learn today (Carter & Youssef-Morgan, 2022), allowing users to progressively and spontaneously integrate the consumption of informal microlearning into their daily lives.

In the education sector, the pandemic shifted the paradigm of what can be done digitally, although the urgent nature of the "digitalize now or stop operating" scenario meant implementing the fastest solutions, with traditional classes emulated synchronously through a videoconferencing platform (Rof, Bikfalvi, & Marques, 2022b) or the use of asynchronous macro-credential (Kumar, Richard, Osman, & Lowrence, 2022) or microlearning platforms (Wang, Towey, Ng, & Gill, 2021). Higher education is experimenting with asynchronous video-based online learning, offering a unique opportunity for students to re-watch video content, with more active learners- those with more frequent social interaction, and who search for information and have environment configuration- showing higher learning achievement than passive learners, who mainly browse (Yoon, Lee, & Jo, 2021). Another example is the use of instructional Twitter as a teaching tool, with findings showing increased intrinsic motivation and interest for learning and reduced demotivation, but limited benefits in terms of learning and academic results (Erhel, Michinov, Noël, & Gonthier, 2022).

In this context, microlearning is gaining interest and popularity, with growth in both its creation and demand, largely due to its expected potential to enhance worker performance and tackle some higher education challenges (Taylor & Hung, 2022) such as enhanced knowledge transfer (Compagnucci & Spigarelli, 2020), improved graduate

Abbreviations: MBA, Master in Business Administration; MM, MicroMaster; OER, Open Education Resources; SPOC, Small Private Online Courses; MOOC, Massive Open Online Course.

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employability (Maina, Guàrdia Ortiz, Mancini, & Martinez Melo, 2022), and the development of positive and inclusive learning experiences (Desmarchelier & Cary, 2022). On the demand side, research shows that a majority of microlearning participants foresee that universities will be affected negatively by microlearning, although there is trust in the capacity of higher education institutions to adopt this trend (Rof, Bikfalvi, & Marques, 2023b). This increasing interest in microlearning has also manifested in the research sphere, with a significantly growing number of articles, conference papers, and book chapters (Sankaranarayanan, Leung, Abramenka-Lachheb, Seo, & Lachheb, 2023).

Despite the great interest microlearning generates, especially among learners, there is a lack of evidence of its effectiveness in terms of improved learner performance in the workplace and in the academic realm (Taylor & Hung, 2022), and of learner satisfaction with it (Martin & Bolliger, 2022), requiring further exploration and research. Without a clear understanding of the effectiveness of this learning format, the education sector may unwittingly be heading for a microlearning bubble, potentially leading to deceptive results. This threat extends to the business sector, where microlearning is also widely adopted. Furthermore, significant numbers of microlearning lessons are often grouped to create comprehensive training courses, or "macro-learning" programs, and even masters degrees. The need to know more about the effectiveness of these macro-learning programs in terms of complex competency development has also been pointed out (Zhang & West, 2020). Learning effectiveness becomes even more critical in macro-learning programs, with recent research calls to explore this aspect over extended periods of 6 weeks or more to confirm the observed effectiveness in shorter learning cycles (Zhao, Li, & Su, 2023). Because macro-learning is assumed to offer greater learning in terms of quantity, and likely quality, the repercussions of any inefficacies in these comprehensive programs are potentially more serious than in individual microlearning units, impacting both learners and employers. Furthermore, macro-learnings are increasingly perceived by students as a valid alternative to traditional higher education programs, even at masters level (Rof et al., 2023b). Nonetheless, to our knowledge, learning effectiveness and satisfaction with fully online macro-learning programs has not been investigated.

The purpose of this paper is to address this knowledge gap, uncovering microlearning effectiveness and learner satisfaction when taking part in a macro-learning program by analyzing the strategy proposed by a pioneering EdTech startup, which we call MicroMaster (MM) to protect anonymity. To this effect, we propose the following research questions: (RQ1) *What are the sources of learner satisfaction in a macro-learning program in business education? (RQ2)*, and *When does macro-learning result in effective learning?*

To answer these questions, we carry out an in-depth case study of MM, a fast-growing EdTech startup in business-focused microlearning. The analysis addresses the reasons to enroll on a microlearning program, the perceived effectiveness of microlearning, and satisfaction with this learning option, contributing empirical research on microlearning effectiveness and student satisfaction in the field of business education, and responding to the call to understand the effectiveness of macro-learning. Understanding the circumstances under which macro-learning can be effective is crucial for designing efficient, engaging, and impactful learning experiences that meet the needs of learners and organizations.

2. Theoretical background

To answer the research questions, this section reviews the theoretical frameworks for online learning effectiveness and satisfaction with microlearning and macro-learning, the latter built on microlearning units, identifying the main remaining challenges for both according to extant research.

2.1. Online learning effectiveness and satisfaction

Even though an increasing number of university students are enrolling in online courses, programs with a full online experience are still a minority (O'Neill, Lopes, Nesbit, Reinhardt, & Jayasundera, 2021). Reasons for choosing an online course include university constraints (e.g., the face-to-face class is full), flexibility needs and learning modality preferences (McPartlan, Rutherford, Rodriguez, Shaffer, & Holton, 2021), and prior experience of online courses (O'Neill et al., 2021). University students vary in their main motivation to take part in MOOCs, with some students more intrinsically motivated (e.g., personal interest, to complement knowledge, self-development) and others more extrinsically motivated (e.g., earning credits, teacher requirements, ease of access) (Wei, Saab, & Admiraal, 2023). Online students appear to be slightly more individualistic, showing less social goal orientation and requesting less support when they need it (O'Neill et al., 2021).

As regards the effectiveness of online learning, extant literature presents mixed results. For example, one study finds that when an online course is chosen to overcome competing responsibilities (i.e., a job, incompatibility with other face-to-face courses, long commutes), students show less engagement and obtain worse results than face-to-face students, forcing online courses to improve their quality (McPartlan et al., 2021). In the context of analyzing 433 university summer courses taken by 23,610 students over four years, it was found that students perform approximately 10% worse in online courses than in face-to-face courses (Fischer, Xu, Rodriguez, Denaro, & Warschauer, 2020). Despite this apparent lower effectiveness, online learning may provide additional benefits that require further investigation such as accelerating progress towards completion of the degree, making taking the course a better option than not taking it (Fischer et al., 2020). What is clear is that university students, accustomed to interaction and solving their needs via social networks, are not limited to the technologies provided by their university institution, voluntarily using a wide range of non-institutional online technologies for learning, thereby contributing to improving their academic performance (Liu et al., 2023). In this vein, a recent study finds that empowering online learners positively impacts students' learning outcomes (Sun & Yang, 2023), as evidenced when online university students who voluntarily chose complementary self-paced eLearning practices with self-assessment improved their learning outcomes (Schwerter, Dimpfl, Bleher, & Murayama, 2022). These conflicting results uncover the need for a better understanding of the conditions that may influence the effectiveness of online learning.

2.2. Microlearning concept and challenges

Despite multiple attempts to define microlearning, there is as yet no consensus on its definition (Wang et al., 2021). Taylor and Hung (2022) review defines microlearning as "an instructional mode that targets a discrete, highly focused topic or skill, and provides small amounts of instruction that can be consumed in a short period of time and may be for immediate use" (Taylor & Hung, 2022, p.17). Other conceptions of microlearning include learning in small steps supported by small blocks of content or activities (Sun, Cui, Yong, Shen, & Chen, 2018); a form of eLearning focused on delivering skills-based and just-in-time knowledge in small blocks (Paul, 2016); and short-term "learning activities on small pieces of knowledge based on web resources" (Kovachev, Cao, Klamma, & Jarke, 2011, p.51). Microlearning is usually used as a complement to face-to-face or online learning, but it can also be implemented successfully as a primary activity (Taylor & Hung, 2022).

Microlearning can take many forms such as short lessons (5–10 min), just-in-time lessons (taken when the user needs to learn how to perform a task immediately), and flash lessons (using mobile text messaging formats in the form of questions and answers for participants' attention) (Taylor & Hung, 2022). There is also a wide variety of options in terms of instructional strategies (e.g. gamification), media for content delivery (e.g. videos), platforms and technologies for lesson delivery and

management (e.g. mobile devices), and content creation (e.g. either by learning professionals or by peers as user-generated content) (Taylor & Hung, 2022). Microlearning can be used for matching information the learner needs "just-in-time" (the purpose), with the delivery of "short bursts" of informational or instructional content (Corbeil & Corbeil, 2022) used as refreshers or opportunities for practice (Taylor & Hung, 2022).

With the ability of microlearning to space out and distribute the learning process over time, a longer period is often required to learn the same content (Carter & Youssef-Morgan, 2022), opening the possibility for this option to be consumed as a subscription model, thereby leveraging retrieval spacing effects to improve retention compared to traditional longer teaching sessions (Kelley & Whatson, 2013), and feeding perpetual, life-long learning (Kohnke, 2021).

The massive use of mobile devices is also contributing to the development of microlearning, increasing convenience and flexibility for learners, who can learn whenever they want, wherever they want (Sun et al., 2018). More recently, chatbots have been used as a microlearning resource, providing a type of conversational activity that facilitates interaction and any time, anywhere learning. This accessibility potentially increases students' motivation to learn (Vázquez-Cano, Mengual-Andrés, & López-Meneses, 2021), satisfaction and engagement (Yildiz Durak, 2023), with evidence suggesting that there is greater intrinsic motivation for this learning modality than for traditional learning modalities, with perceived choice and perceived value as the drivers, suggesting that an intrinsically motivated student performs an activity for its inherent satisfaction, fun or challenge (Yin, Goh, Yang, & Xiaobin, 2021). Microlearning therefore has the capacity to present information in the most common way people learn today (Carter & Youssef-Morgan, 2022), reinforcing two of the aims of microlearning, namely to reduce cognitive load on working memory (Taylor & Hung, 2022) and to adapt to the pressures of limited attention span (Sun et al., 2018).

The main factors driving microlearning are mobile devices, social connectedness and time scarcity (Torgeson, 2021), forming the basis of forceful social media marketing strategies from new microlearning platforms such as EdTech players (Mujica-Luna, Villanueba, & Lodeiros-Zubiria, 2021). The consumerism of learning flourishes in this environment, making microlearning the optimal learning strategy for satisfying the demands of the self-directed, self-improvement learner (King, 2021). Although the first microlearning publications appeared as long ago as 2005 (Hug, 2005), there has been a marked increase in peer reviewed publications of 32% annually over the past five years (Sankaranarayanan et al., 2023). Major research topics explored include design, implementation, evaluation, and mobile usage for microlearning (Sankaranarayanan et al., 2023).

As regards satisfaction, most research shows a high level of student acceptance of microlearning, receiving above average satisfaction ratings, especially when microlearning complements other learning methods (Taylor & Hung, 2022). This high acceptance is because microlearning fits with the growing informal learning culture based on information-seeking and consumption of YouTube-style videos (Taylor & Hung, 2022) characterized by brevity and immediacy, as was shown with nursing students who positively assessed the use of TikTok to promote microlearning (Conde-Caballero, Castillo-Sarmiento, Ballesteros-Yánez, Rivero-Jiménez, & Mariano-Juárez, 2023). Learners pull the knowledge and information they need when they need it, making them more in control of their learning and impacting their motivation and engagement, which may unconsciously influence preferences for microlearning (Taylor & Hung, 2022). In this line, extant research shows that microlearning improves student learning motivation due to the benefits of self-paced, any time, anywhere learning (Fidan, 2023), with microlearning considered to be flexible and stress-free (Kohnke, Foung, & Zou, 2023). At the same time, this learner autonomy and motivation can become drivers of microlearning adoption (Puah, Bin Mohmad Khalid, Looi, & Khor, 2022).

In the context of microlearning implementation in two post-secondary education institutions during the COVID-19 lockdown, research reports an overall student satisfaction rating of over 90% (Wang et al., 2021), in line with the high satisfaction obtained by a microlearning training in a hospital during the pandemic (Revuelta-Zamorano et al., 2022). In the context of psychiatry training for medical students, a microlearning mobile application has been associated with both increased knowledge and student satisfaction (Zolfaghari, Shirzadi, & Motamed, 2023). In the same line, a video-based microlearning for nurses resulted in increased satisfaction and greater knowledge (Román-Sánchez et al., 2023), as did a professional development for pharmacy technicians (Flornoy-Guédon et al., 2023). High levels of satisfaction with microlearning have also been reported in other studies, including the clinical training of postgraduate residents (Iqbal, Alaskar, Alahmadi, Alhwiesh, & Mahrous, 2021) and pharmacovigilance microlearning (Hegerius, Caduff-Janosa, Savage, & Ellenius, 2020).

Nonetheless, there are still many under-researched aspects of microlearning, such as learning effectiveness (Carter & Youssef-Morgan, 2022; McNeill & Fitch, 2023), or in other words its effects on student learning outcomes (Taylor & Hung, 2022). With a more causal objective, there are calls for research on the effect of learner intentions to take part in microlearning and post-microlearning usage behavior (Puah et al., 2022), and to find out whether learners' preferences and positive attitudes towards microlearning can impact learning outcomes and boost self-directed learning (Susilana, Dewi, Rullyana, Hadiapurwa, & Khaerunnisa, 2022). An additional aspect identified by extant research on microlearning is that most research on the topic has focused on a very small number of training fields, namely computing, medicine and healthcare (Sankaranarayanan et al., 2023; Taylor & Hung, 2022), uncovering the need for empirical studies on microlearning in other fields (Taylor & Hung, 2022).

2.3. *From microlearning to macro-learning*

Theories of instructional design differentiate three levels of instruction: the micro level, representing an individual lesson; the *meso* level, relating to the course structure; and the macro level, which describes the overall curriculum (Kerres, 2007). The fact that microlearning enables complex topics to be broken down into smaller learning modules, spacing them out over time (Carter & Youssef-Morgan, 2022), opens the way for using microlearning also at the meso and macro levels of instruction (Kerres, 2007). The essence of microlearning is to focus on one learning concept or learning objective at a time (Torgeson, 2021), fitting with the micro level of instructional design (Kerres, 2007). While short lessons are the main descriptor of microlearning, it is much more than just that (Taylor & Hung, 2022), enabling a complete flow of instructional events organized around a key issue to be built (Zhang & West, 2020), and creating a learning experience equivalent to that of a course when microlearning elements are curated and designed as intentional and connected concepts (Kohler, Gamrat, Raish, & Gross, 2021). An accumulation of microlearning units can become a macro-learning program, providing a learning pathway (Zhang & West, 2020). If the microlearning participant has agency to plan their study pace, they can avoid becoming overwhelmed by a large quantity of microlearning units (Zhang & West, 2020).

While macro-learning shares with microlearning the previously mentioned unknown aspects that require further investigation, there is also a need to explore whether grouping microlearning lessons into macro-learning is effective, how this grouping affects the perception and ability of learners to form complex competencies (Zhang & West, 2020), and the effectiveness of microlearning in long learning cycles of several months (Zhao et al., 2023). Macro-learning could be a way to address one of the problems of microlearning, because when the latter is used as the only learning format as opposed to as a complement to face-to-face or online learning, user satisfaction tends to be lower, since the learning experience is less complete and limited to small and discrete topics (Taylor & Hung, 2022).

The fragmentation of knowledge and the difficulty the learner has to integrate microlearning lessons are two of the concerns that prevent microlearning from being effective in terms of topics that are systemic in nature (Taylor & Hung, 2022). This challenge could be met with macro-learning programs, if they are proven to be effective and satisfactory, as explored in this article. In this regard, while satisfaction with micro-learning among learners has been evidenced (e.g., Hegerius et al., 2020; Wang et al., 2021), the same has yet to be proven for macro-learning.

3. Method

A qualitative approach is recommended when the key point of the research is the subjective experience of individuals (Cohen, Manion, & Morrison, 2007), making it a suitable method to answer the research questions posited on learner satisfaction and perceived effectiveness of macro-learning. Since the study revolves around individuals' experiences and stories, the applicable methodology was a narrative inquiry using a case study (Groenland & Dana, 2019). Case studies allow contemporary management patterns to be explored (Yin, 2009) by analyzing unique contexts to understand the dynamic and complex interactions between different phenomena (Cohen et al., 2007). The aim of case studies is not generalization but transferability, which is how the results can be applied in similar contexts (Bloomberg & Volpe, 2016), helping to develop theory to aid researcher understanding of other similar cases (Robson, 2002).

3.1. Case selection

This paper is focused on a single case study of a pioneering micro-learning EdTech startup, MicroMaster (MM), headquartered in Spain and founded in 2017, and whose results in terms of reach - already with 90,000 alumni, 600 client companies, and a presence in 103 countries - confirm a certain level of success. In relative terms, in 6 years MM has achieved double the number of alumni that a similar program offered by a top business school took 66 years to attract.

The single case selected is a platform of Small Private Online Courses (SPOC) that group microlearning lessons into different macro-learning programs, the most high-profile ones being the flagship MBA-Business Management program (88 h of class time, almost 300 videos), the Digital Marketing and Business Management program (double program with 120 h of class time), and the Digital Marketing program (80 h of class time). The different MM programs have a common philosophy, all of them with more than 200 microlearning units sequenced in a logical and well-planned way to provide a recommended “pathway” for the learning experience. Students enroll on the program of their choice and begin following the sequence of microlearning units at their own pace but with a deadline to finish them, which is usually 12 months after enrolment, after which time the program expires and access to content is blocked. The program is organized in several modules, which are accessible progressively as the preceding module is completed and assessed, generally by means of a brief test. This sequence of micro-learning content acts as a guide to student learning. Once the entire program and all the tests have been completed, MM issues an academic certificate, which the student receives digitally. The credential-equivalence of an MM microlearning course is not advertised, but the MBA consists of a total of 88 h of videos plus additional readings and tests. The videos can be revisited several times and if students watch an estimated 200 h of content, this is equivalent to approximately 4 credits in the European Credit Transfer System. For comparison purposes, the number of credits to obtain a traditional European masters ranges from 60 to 120 credits.

The main research method was in-depth interviews, since this technique allows the participants' personal contexts to be explored in greater depth, including their perspectives and perceptions of the phenomena to be studied (Bloomberg & Volpe, 2016). To this end, semi-structured interviews were conducted, given that they provide “structure, a clear sequence and focus” (Cohen et al., 2007, p.321), facilitating the exploration of the topics to be discussed and enabling any new questions that arise from the interaction with the interviewee to be asked in a conversation type format (Bloomberg & Volpe, 2016).

Our primary source was in-depth interviews with 12 students who had previously followed an MM program, four experts, and two learning managers that have adopted MM for the professional development of their senior employees. To achieve triangulation (Bloomberg & Volpe, 2016), we relied on multiple interviews with several types of MM stakeholders and other sources of secondary data such as website information, news from multiple sources, social network opinions, and microlearning videos offered as demos. Table 1 contains a methodological summary and details of the participants.

3.2. Participants

Our study took place in Spain, and the main participant selection strategy was purposive sampling. Participants were chosen based on criteria defined by the researchers, namely heterogeneity by age, background, MM program followed and state of completeness of the program, obtaining a satisfactory sample of 12 participants for the needs and purpose of the research (Cohen et al., 2007). They were contacted via LinkedIn, varying in several dimensions, the first being educational background: one participant had no previous university education (S1), two were engineers (S2, S10), six had a degree in business (S3, S4, S5, S8, S9, S12), two had a degree in public relations and advertising (S7, S11), and one a degree in fine art (S6). The second dimension was their masters backgrounds, with three participants holding no previous masters. Of the remaining nine, one had an MBA, four held masters degrees in marketing, two in entrepreneurship, one in gamification, and one in user experience. The third dimension was the MM microlearning program chosen, with six participants enrolled in the MBA program, six in the Digital Marketing program, one in the Digital Marketing+Ecommerce double program, one in the Digital Transformation program, and two participants, S1 and S10, enrolled in a second program. The fourth difference was program status, with six participants already having finished the program, four not having finished the program due to not meeting the deadline for completion or having previously drop-out, and four participants currently studying the programs enrolled in. Nine participants were male and three were female.

The four experts were contacted via LinkedIn and included two human resources professionals who had studied an MM program, an expert with professional experience in microlearning design that had analyzed MM without taking a program, and an academic expert in macro-credentials and microlearning strategies. Last, the participating company, a user of MM services, was contacted via email, and was chosen for its status as one of the top five management consulting firms. The company's learning manager and the person responsible for microlearning were interviewed.

3.3. Interview procedure

The in-depth semi-structured interviews were conducted via video-conference. All the interviews were audio recorded and transcribed literally, later requesting any additional, missing, or incomplete information. The data were coded simultaneously but separately by two coders, who identified themes derived from the data with the aim of identifying meanings in the transcribed interviews (Corbin & Strauss, 2015). Sentences or groups of sentences were coded, compared (inter-rater agreement: 0.75), and discussed until agreement was reached on codification and analysis.

The average interview length for students was approximately 56 min, totaling 673 min for the 12 interviews. Participants first described their initial motivation and objectives for enrolling in the program, followed by the degree of achievement (RQ2). They then described overall attractiveness and aspects of the program they liked most and

Table 1
Methodological summary and interviewees.

Methodological orientation	Qualitative Narrative inquiry methodology
Technique	Case study
Number of cases	One
Field work	Interviews from Sep 2022 to Oct 2022. Secondary data: Sept 2022 to Oct 2022
Primary source of information	Individual interviews
Participant selection	Purposive sampling Students / experts: contacted through LinkedIn. Companies: contacted by email Criteria: heterogeneity by age, background and program they have taken part in
Instrument used	Semi-structured questionnaires
Main topics of the interview	Microlearning concept. Objectives pursued with the microlearning program and degree of achievement. Valuation of time and cost. Overall attractiveness and aspects of the program most and least liked. Contribution of the program to manage professional challenges. Impact of microlearning on higher education. Recommendation rate and intention to repeat.
Setting and data collection	Interviews conducted via videoconference. Audio recording. Field notes by authors during and after interviews. Additional/missing/incomplete information requested after the interviews. Administered questionnaire post-interview
Data analysis	2 coders Coding: Primary codes—Themes; Secondary codes—Sub-topics; Aggregate dimensions Themes derived from the data
Secondary sources of information	Public data: website, press news, Google, social networks

Profile of students	Gender	Age	MM Program	Year	Status	Background	Professional position	Interview Length
S1	M	40	MBA DIG. MK	2018–19 2019-	C E	Certificate in MK	Key account	51 min
S2	M	43	MBA	2019–20	E	Engin. / Master	Chief eLearning	1 h 21 min
S3	F	42	DIG. MK	2019–20	C	Degree business / Master MK	Entrepreneur	56 min
S4	M	45	DIG. MK	2019–20	C	Degree business / Master Entrep.	Local Dev.	58 min
S5	M	33	MBA	2019-	E	Degree business / Master Entrep.	Business Dev.	47 min
S6	M	55	MBA	2019-	E	Degree fine arts / Master UX.	General Manager	40 min
S7	M	40	MBA	2020	C	PR & Ad. Degree / Master Dig. MK	Business Dev.	1 h 08 min
S8	M	37	DIG. MK	2020	C	Degree business	Dig. Account	51 min
S9	F	44	MBA	2021	C	Degree business / Master MK	Project Manager	1 h 02 min
S10	M	46	DIG. MK DIG.TRANF	2021- 2022-	P P	Engin. / MBA	Innovation Dir.	1 h 02 min
S11	F	39	DIG. MK + *E*-COM. (double)	2022-	P	PR & Ad. Degree / Master Dig. MK	Business Dev.	56 min
S12	M	30	DIG. MK	2022-	P	Degree business	Sales Mger.	41 min
Profile of experts	**Gender**	**Age**	**Program**	**Year**	**Status**	**Background**	**Professional Position**	**Interview Length**
E1	F	33	No participation			Degree in Translation and Interpreting, Master in Tradumatics	Digital Learning Specialist	1 h 05 min
E2	F	29	MBA	2018–19	C	Degree in Pedagogy, Human Res. Master	Sales Manager	1 h 16 min
E3	F	30	MBA	2020	C	Degree in Business Ad., Human Res. Master	Human Resources Consultant	54 min
E4	M	45	No participation			PhD in entrepreneurship, MBA, Master Pr. Mg.	Senior Lecturer. Dev. of MOOC, Micro-Credentials	44’
Profile of companies	**Gender**	**Age**	**Background**	**Professional position**		**Length**		
C1	F F	48 30	H.R. H.R.	Learn.Mger Resp.Microl.		47 min		

Notes: F/M: female/male. Abbreviations: S (Student), E (Expert), C (Company). Status: C (completed), P (In progress), E (expired unfinished).

least (RQ1). Post the in-depth interview, all the interviewees were administered a questionnaire via email to assess on a 5-point Likert scale different items such as the importance of different reasons to enroll in the program (e.g., “*To improve professionally*”), level of satisfaction with pedagogical aspects (e.g., “*I have achieved my learning objectives*”), and other dimensions such as technology and support.

The average interview length for the experts was approximately 59 min, totaling 239 min for the four, and main topics researched included key success factors for microlearning to be effective and microlearning strengths, among others. The interview length for the company was approximately 47 min, and main topics researched included motivation and objectives to enroll employees in the program, their subsequent degree of achievement (RQ2), and perceived overall attractiveness of the program (RQ1).

3.4. Data analysis

Qualitative data analysis is an inductive process based on data, which aims to order, structure, and bring meaning to the data collected (Bloomberg & Volpe, 2016). The “raw data” of the present investigation included 959 min of in-depth audio-recorded interviews (students, experts and companies), 12 completed quantitative and qualitative questionnaires (students), and the documentary reviews and observations made in the different phases of the investigation, using triangulation to corroborate the evidence obtained from the data (Bloomberg & Volpe, 2016).

The analytical process was structured in four stages: organization of data, generation of categories, identification of patterns, and themes and coding of data (Bloomberg & Volpe, 2016). First, the data from the in-depth-interviews and the questionnaire data were organized by means

of full literal transcription Excel, respectively. Second, two broad categories were created from analyzing the data from the in-depth interviews, namely reasons for enrolling in the program and the learning outcomes. Third, by iteratively reviewing the categorized information, recurring patterns or themes emerged from the respondents' narrative (Bloomberg & Volpe, 2016), namely "seeking learning" and "curiosity" for the initial motivation to enroll category, and "insignificant learning" and "significant learning" for the outcomes category. Meanwhile, the process of coding, understood as identifiers or names assigned to groups of data (Bloomberg & Volpe, 2016), was carried out inductively as a response to the collected data (Cohen et al., 2007), resulting in four learning categories, namely effective learning, unexpected learning, updating knowledge and skills, and entertainment.

Two solutions were applied to resolve concerns regarding the coding of open-ended questions (Cohen et al., 2007). First, the data were coded simultaneously but separately by two coders, who identified themes derived from the data, with the aim of finding meanings in the transcribed interviews (Corbin & Strauss, 2015). And second, sentences and groups of sentences were coded, the results of which were compared (interrater agreement: 0.75) and discussed until agreement was reached.

3.5. Validity and reliability

The evaluation of qualitative research focuses on how well the researcher has provided evidence for the descriptions and analysis, representing the reality of the situations and people studied (Bloomberg & Volpe, 2016) as necessary verification of the validity and reliability of the interviews (Cohen et al., 2007). Validity refers to whether the researcher has accurately represented what the participants think, feel and do (Bloomberg & Volpe, 2016), and reliability refers to how the processes and procedures used to collect and interpret the data can be monitored (Bloomberg & Volpe, 2016). To achieve the first, different actions were taken to minimize the different biases (Silverman, 1993): (i) interviewer characteristics bias, where the research team combined research profiles, teaching and professional activity, ensuring as much objectivity as possible in the research process; (ii) respondent characteristics bias, ensuring the selection of participants with diverse backgrounds and professional profiles; and (iii) bias from the substantive content of the questions, with clearly formulated questions, ensuring that answers were not directed. Aside from the data analysis described above, to control reliability the interviews had a very structured format, which was used together with the same sequence of words and questions for each participating interviewee.

4. Results

4.1. Learner satisfaction with macro-learning

On its website, MM reports a program completion rate of 67.6% and a satisfaction level of 9.4/10. The MM program followed was valued as attractive by all the students interviewed for a wide variety of reasons, including acquiring knowledge, the flexibility of the method, the entertainment it provided, the clarity of the explanations, the short format of the videos, and the practical cases, among others: "*Being able to acquire knowledge more easily is an attractive thing.*" (S3); "*The program is attractive because of the flexibility, format, and content of the videos*" (S6); and "*The format is cool, because the video makes the content easy to digest. The videos are very well edited and short.*" (S10). Experts and companies also agree about the attractiveness of MM programs: "*It's well thought out and well put together, and if you're up for it, it's fun.*" (E3); "*I find MM accessible to everyone […] interesting, entertaining*" (E1); and "*I think that in general the MM program is quite highly valued.*" (C1).

Regarding the sources of learner satisfaction, the global assessments of the MM's pedagogical methodology based on the questionnaire (Fig. 1) showed that two thirds of the students thought that the knowledge acquired was adequate, and that their learning objectives had been met. Both experts, who had tried MM, and the representatives of the company agreed that this type of microlearning is effective for learning: "*You can learn a lot, and I think it is very well structured. […] Yes, it can help you meet goals, it can develop skills, but the student must […] be consistent, persevere.*" (E2); and "*I think the content is fine. […] For people who have not previously studied this type of degree or this business subject, they have done very well.*" (C1).

Three quarters of the students and the experts agreed that the design of the learning content (videos, materials, etc.) was adequate: "*You can do a block in 10 minutes. You go straight to something.*" (E2); and "*Each lesson was well designed, although some more than others.*" (E3). Furthermore, almost all the participants stated that they liked the short duration of each learning unit, the videos for which average 10–12 min. Some of the experts, however, considered that the videos should be shorter to reduce the cognitive load and optimize attention span: "*No more than 3 minutes would be the limit.*" (E3); and "*Short videos, 1-3 minutes maximum*

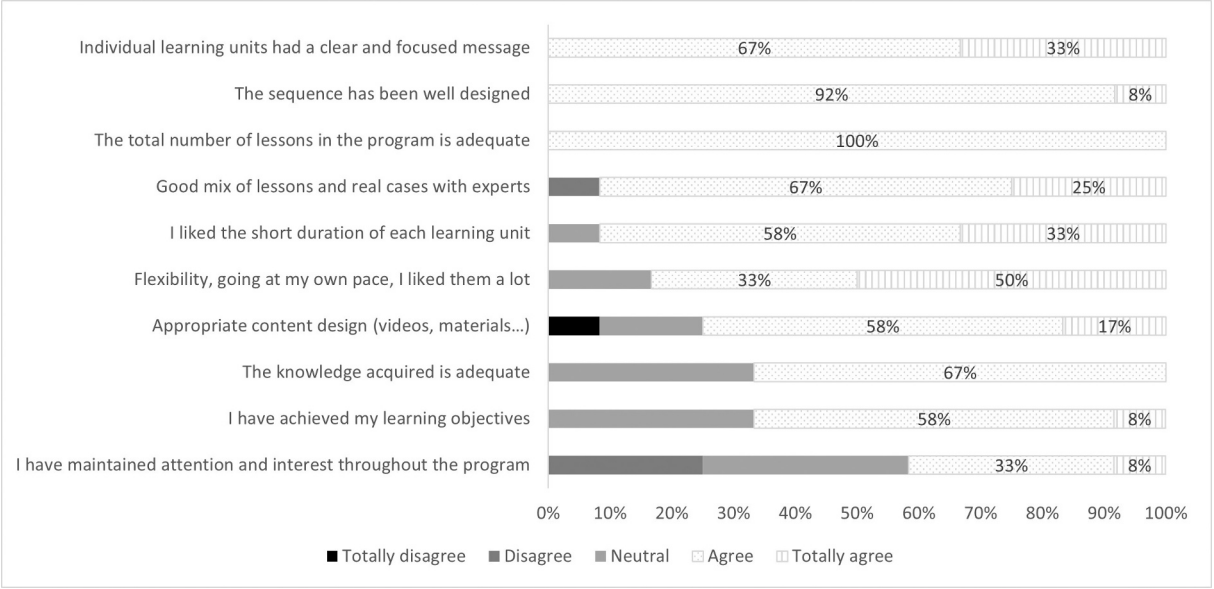

Fig. 1. Evaluation of the pedagogical method.

are key. They can be 5 minutes, but then they are almost too long." (E4). Other experts disagreed: "*Usually the standard is 10 minutes*" (E1).

All the students agreed that the individual learning units had a clear and focused message. This and the short duration of each learning unit are important factors in reducing students' cognitive load, something which students and experts agreed that MM achieves: "*They have condensed it well, just enough so that it can be understood.*" (E1). Clarity was also considered one of the great challenges of microlearning at a pedagogical level: "*Clarity on what to expect in this microlearning.*" (E4). It was considered that MM generally resolves this issue very well, although one expert felt that the conversational style of some of the videos lead to a certain improvisation, confusing the message: *"It seems that each video is based on a script, and the teachers show that they have experience. They do not specifically narrate the script, and sometimes I think some speakers are improvising, which is all a bit confusing for me.*" (E1).

All the students agreed that the sequence of individual learning units is well designed and effective as a full program: "*In MM the content is identical to a traditional MBA, but topics are covered in pills and not explored in depth. The content curation is very good. I could go at my own pace, and I had about a year and a half to complete a course of about 70-80 hours, meaning I had to spend little time on it, just watch the videos and answer some questions. They recommend that you spend 15 minutes on it a day, which is very good because in that time you can see the introductory explanation, the PDF with the material, and the video. You can spend as many hours on it as you want, and the next lesson is unlocked when you have watched the previous one.*" (S2). This strategy of building a complete program from the sequencing of a multitude of microlearning units, or macro-learning, fits very well with the opinion of the experts and satisfies a need of companies who have already undergone microlearning content curation themselves to train their employees: "*I think the biggest potential for microlearning is its stackability; small steps building up to something larger; flexible learning pathways.*" (E4); "*Seeing how many videos you've finished and how many you have pending can also help motivate you, [...] because MM has an audience that is very busy, an audience with a smaller attention span than other generations*" (E1); and "*At the firm [...] we do a content curation, and we mark a "pathway" with microlearning.*" (C1).

All the students also agreed that the total number of lessons in the program was adequate, whereas this was not the case when a company had developed the program to reward its senior employees, given their time scarcity: "*Results were regular, precisely because they are long programs. The truth is that people don't have time and they don't really take advantage of the program.*" (C1). To resolve this situation, the training manager suggested modularizing the content so that it could be selected in shorter duration formats, rather than having a deadline to complete the full program: "*Being able to choose different modules from the different programs and make your own course.*" (C1).

Despite students' positive view of the sequence and total number of lessons, less than half of them agreed that their attention and interest was maintained throughout the entire program, with a quarter disagreeing on this point. These figures increased for company employees, causing "*licenses [to be] changed because there were people who had not even completed 2% by the middle of the year"* (C1).

Almost all the students and the experts interviewed found the combination of lessons and real cases with experts interesting: "*They were very practical, always following the theory with many examples from real and very modern cases. [...] It brings you closer to the business reality and the labor market*" (E2); and "*the most interesting part of the program for me is the focus on real examples of companies*" (E3).

The vast majority of students stated that they liked the flexibility of the online method and being able to go at their own pace, as did the experts and companies: "*I think its strengths are its flexibility and access at any time of the day; there is no fixed schedule, you set your times"* (E2); and "*Train when you want, at the time you want and with the time you have*" (C1).

The high attractiveness and satisfaction with the MM program expressed by all participants is outstanding, the majority stating that in their current personal and professional situation, they would never have considered taking a traditional masters: "*I was looking at traditional masters degrees and they are very expensive and also involve a lot of commitment, since you have to do a masters thesis... and I didn't see myself able to do it, because I have a little daughter*" (S11); "*I became interested in other courses, but they cost a lot of money and required a lot of dedication. [...] I wanted a training that was complete but with a flexible schedule, because I have rather a complicated life, I have two little girls, a demanding job...*" (S10); "*For many years I wanted to do a traditional MBA, but I wasn't entirely convinced, and I thought that MM was an easy and relatively cheap way to try it. The risk was relatively small because of the low cost in hours, and because of the economic cost involved, and I said... "I'll try it""* (S9); "*I thought about doing a traditional program, such as an MBA or a management development program, but it is pricey and the personal cost in hours is also high, and at that time it didn't suit me to do it*" (S7).

4.2. Learning effectiveness

The initial reasons to enroll in the MM program can be associated with learning effectiveness (Table 2). Eight students mainly expressed an interest in seeking learning, while four students mostly expressed curiosity. For the first group, the main reasons to enroll were to acquire new specialized knowledge (e.g., social media and management), develop a global vision of the company, and organize ideas. For the second group, the main reasons for enrolling were to discover what MM was doing, learn about real cases, refresh concepts, and invest in oneself to improve the CV, among others.

As regards the learning outcomes, the coding of results led to four categories. The first outcome type was entertainment, produced when no real learning is achieved but the participant has satisfied their curiosity in an entertaining way. Some drivers of this were that it presented very good and short content as "pills", with inspiring real company cases and influential people; it provided the possibility of exploring new topics to see if they were interesting enough to pursue; and it proposed a good sequence of learning content, while giving the student the flexibility to choose the pace. A second learning outcome was updating knowledge and skills, produced when learning falls short of expectations but is still perceived as positive for refreshing concepts: "*I would recommend MM to someone like me, to a person who wants to update certain knowledge, to see real cases and examples; in other words to a person who does not want to complicate his life with studies like traditional masters"* (S11). The third outcome type was unexpected learning, produced when the participant considers they have learned something, and this is perceived as positive since it was not expected: "*Initially, it seemed to me that MM would provide me with more theoretical knowledge, but I think that the practical application, the examples they give you, the interviews they conduct... are examples that can be useful to me in the future if I want to manage marketing projects"* (S12). And last, the fourth outcome was effective learning, produced when the participant considers they have learned, covering the initial objectives: "*I have recommended the program I did in MM, the Digital Marketing one, to two members of the management team of the company where I work. Digital marketing is essential training for the work we do; you must know the different concepts and technological tools of digital marketing. MM is a friendly training, easy to do, with well-developed content and a good platform"* (S10).

Fig. 2 shows the segmentation of students based on the outcome of their learning. Of the eight students who enrolled with the aim of seeking learning, six achieved effective learning and two the updating of knowledge and skills. Of the four students who enrolled out of curiosity, two achieved unexpected learning and two only entertainment. Therefore, of the 12 students interviewed, six of them achieved an effective learning level, and the rest were grouped into three segments (collectively referred to as "Other"), two of them with an insignificant level of learning (updating knowledge and skills, and entertainment), and two with significant learning (unexpected learning).

These results from the in-depth interviews were complemented with

Table 2
Reasons to enroll and effectiveness outcomes of the microlearning program.

Reasons to enroll	Reasons: example quotations	Learning type	Learning type: example quotations
Seeking learning	*"To acquire knowledge that was new for me"* (S1). *"My objective was clearly to strengthen what I knew about digital marketing"* (S3). *"I wanted to know how to work with social networks"* (S4). *"I wanted to organize and structure all the knowledge I have acquired over time but in a disorganized way* (S6). *"I simply needed the knowledge they could provide me with"* (S7). *"I was interested in the specializations, for example, Google Ads"* (S8). *"I wanted to do digital marketing training that was a little more advanced than a 10-h pill"* (S10). *"I was interested in doing a specialization program. […] "At the end of the day, I study as a hobby, not to get a certificate, so it's good for me to refresh concepts"* (S11).	Effective learning	*"I can now have different kinds of conversations with customers". […] "It is true that I now have somewhat different points of view on some aspects*" (S1). *"They teach you step-by-step how to run a Facebook campaign". […] "I have learned new things, and it has given me ideas*" (S4). *"I have completed my knowledge in less developed areas". […] "I have organized the knowledge I have acquired over time in practice*" (S6). *"You really learn to have a 360° view of a company". […] "I have a 360° vision of the company and a much wider strategic vision than before*" (S7). *"I have been able to deepen my knowledge" […] "To update it*" (S8). *"You're gaining insight and confidence you didn't have with certain topics […]; you can understand conversations with digital marketing specialists" […] "I have acquired knowledge in the area of digital marketing*" (S10).
		Updating knowledge and skills	*"It has helped me feel more comfortable in digital marketing. I saw that I already knew a lot" […] "It was a 'passive' learning. Yes, it has allowed me to see how other professionals from other sectors work*" (S3). *"There are a lot of things I already knew […] There are always some concepts you don't know […]. "It is another source of learning. The program has helped me review concepts and get up to date*" (S11).
Curiosity	*The main reason for signing up was out of curiosity, to see what they were doing"* (S2). *"What caught my attention was not studying for the sake of studying but learning from those who have been very successful in a particular sector and understanding how they have done it"* (S5). "*It's more like complementary learning than an apprenticeship*." (S5). *"My main goal was to refresh what I know and to see what they could show me on a business level* (S9). *"In short, investing in yourself is what matters most today; continuing to have that spirit of knowing and wanting to know more and being prepared in the world of work"* (S12).	Unexpected learning	*"There were content areas such as marketing which I already knew, thanks to the masters in marketing I did years ago and my professional experience. But there were other topics that were very useful for me since they were ones I knew nothing about […] "It is a course that I did with enthusiasm; it has helped me. I am even more open to carrying out training program of different formats"* (S9). *"On a theoretical level, it is a little shorter than I imagined, but the practical applications seem super useful" […] I feel like the MM-master will be another string to my bow on my resume that says I spent some of my time learning about marketing" […] "It has allowed me to gain specific knowledge and see practical real-life examples in scenarios that could be applied in the future*" (S12).
		Entertainment	*"The content is good, like a pill to know what I should deepen my knowledge on. […]. Content curation is very good […] It awakened in me the need to learn something, as opposed to the actual learning of something" […] "It is about tips. There is a very good table of content but the topics are not exhaustively developed. It is ideal to get started on a topic and see if you like it or not, but it's not for becoming an expert!*" (S2). *"I found the program very attractive, and they have a super-powerful image; they do all this seamlessly"* (S5).

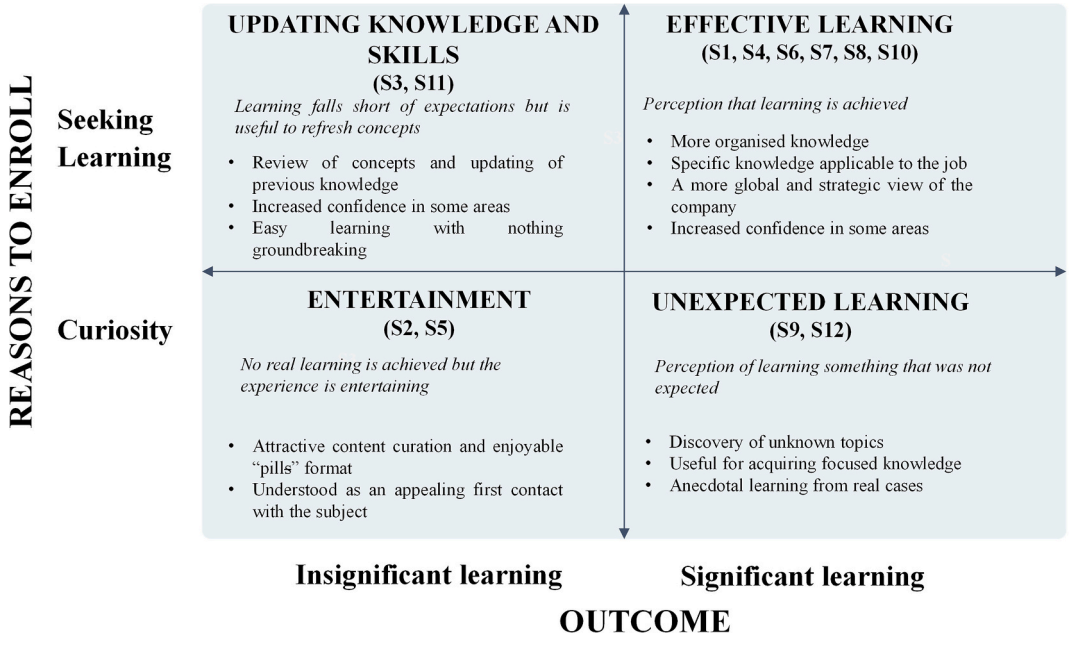

Fig. 2. Participant segmentation based on the reasons to enroll and impact of learning.

an online questionnaire about satisfaction with the MM program, with questions scored on a 5-point Likert-scale ranging from full disagreement to full agreement. All six participants of the effective learning group agreed with the affirmation "*The knowledge acquired is adequate*" (scoring 4 out of 5), while most of the students in the other group were "neutral" (scoring 3 out of 5); and in response to the statement "*I have achieved my learning objectives*", the participants of the effective learning group agreed or fully agreed (scoring 4 and 5 out of 5), while most of the participants of the other group were again "neutral" (scoring 3 out of 5).

4.3. Characteristics of the effective learning group

Most members of the effective learning group claimed to feel better prepared professionally after taking the program, versus one third of the other groups, also assessing that the knowledge acquired was adequate at a higher rate than the other groups. A first source of differentiation between the two groups derived from the level of application of the knowledge acquired in the current job, valued at four times higher for the effective learning group than for the other groups.

All members of the effective learning group applied the knowledge in their current jobs, although with different levels, categorized as high and medium. Statements from participants with high knowledge application in the current job include one from a participant who recommended the program to other digital marketing professionals to update their knowledge in their evolving discipline: "*I think it has helped me in my work, for example the mastering of Facebook ads. [...] What I liked most about MM is the content updates they make during the course, for example the new videos they uploaded for the Facebook learning unit. [...] I would recommend MM to a professional like me with experience in the sector, who wants to delve deeper into certain aspects*" (S8); and *"I have acquired a vision and confidence with topics that I didn't previously have, such as understanding conversations with digital marketing specialists*" (S10). Statements from participants with medium application in the current job include: "*I can have a different kind of conversation with customers, a little deeper, a business one*" (S1).

Three members of the other groups applied the knowledge in their current job at a lower level, while the other three participants did not apply it. Statements from participants with low application in the current job include one participant who expressed the following concern: *"You acquire the theoretical part, but not so much how to implement it" (S3)*. Another participant, who acquired specific knowledge in finance and felt that MM had helped her in her current and future professional challenges, stated: "*I think that what MM helped me with most is finance and accounting. There were concepts I didn't know, even though years before I had studied a degree in business administration. In certain aspects, it has helped me in the competence of having a global business vision" (S9)*. A second important source of differentiation between the effective learning group and the other groups was that none of the participants in the first group had previously taken a comparable study program.

5. Discussion

5.1. Contributions to research

This research makes several contributions. First, we contribute to research on microlearning by adding empirical evidence in a new training context, namely business, thereby responding to specific calls to expand the fields of knowledge where research had been conducted on microlearning, namely computing, medicine and healthcare (Taylor & Hung, 2022).

Second, we find that although learner satisfaction is systematically high, learning effectiveness is not always achieved. The results also show that the microlearning strategy followed by MM is a real alternative to existing traditional masters, with many students enrolling in an MM program after having previously studied different types of courses, thereby confirming that microlearning can also be implemented successfully as a primary activity (Taylor & Hung, 2022). However, as regards effectiveness, this research finds a range of learning levels: (i) entertainment, produced when no real learning is achieved, but the participant has satisfied their curiosity in an entertaining way; (ii) updating knowledge and skills, produced when learning falls short of expectations, but is still perceived as positive for refreshing concepts; (iii) unexpected learning, produced when the participant considers they have learned something, and it is perceived as positive since it was not expected; and (iv) effective learning, produced when the participant considers they have learned, meeting the initial objectives. These results contribute to specific calls for further research on the effects of microlearning on student learning outcomes (Taylor & Hung, 2022) and learner satisfaction when using microlearning (Martin & Bolliger, 2022), raising the question of whether the finding that effective learning was achieved by half the students suggest that further analysis is needed to find ways of improvement.

Third, MM is a platform with several SPOC programs, all of them with hundreds of microlearning units. The overall curriculum (macro level) is created (Kerres, 2007) by combining these units or modules (micro level) into short courses (*meso* level), and by combining these short courses. This analysis of the MM -Business Management program with its 88 h of class time and almost 300 videos contributes to the exploration of the perceived satisfaction and effectiveness of *macrolearning* by addressing whether grouping microlearning lessons affects the perception and ability of learners to form complex competencies (Zhang & West, 2020). The results confirm that it is possible to build a complete flow of instructional events organized around a key issue, such as being a business expert (Zhang & West, 2020), thereby creating a learning experience that is equivalent to that of a course where microlearning elements are designed as deliberate concepts (Kohler et al., 2021). However, both students and professionals state that while students learned, they did not become experts in the field. Furthermore, the results uncover different levels of learning, some of them more significant than others.

Fourth, we contribute to exploring and showing how when microlearning is used as the only learning format but with a clear sequence of individual learning units forming a macro-learning, user satisfaction can be positive and the learning experience complete and able to cover a broad topic such as business administration. This finding contradicts previous research that has expressed concerns about microlearning effectiveness due to possible fragmentation of knowledge and learner difficulty to integrate a large number of microlearning lessons (Taylor & Hung, 2022), but is consistent with other research that recommends developing a more complete curriculum covering varied topics to improve online teaching and learning outcomes (Zhou, Li, Xu, Li, & Fischer, 2023).

Fifth, the results show that the main reasons to enroll in a microlearning program are seeking learning and curiosity. The first appears to be based on both intrinsic and extrinsic motivations, and the second on a more intrinsic motivation. These results are consistent with previous research that found that the motivations of university students to take part in MOOCs were both intrinsic and extrinsic (Wei et al., 2023).

Last, the results show that at least half of the microlearning participants perceived an increase in confidence in performing skills (Lee, Jahnke, & Austin, 2021), thereby contributing to demonstrating the effectiveness of the MM microlearning instruction on learner performance improvement in the professional area. They also show that the main drivers of this effectiveness are participants' main reasons to enroll, which are seeking learning and the chance to apply the new knowledge in their current job, albeit to different degrees. These results contribute to the recent call for further research into microlearning effectiveness (Carter & Youssef-Morgan, 2022; Corbeil & Corbeil, 2022; Taylor & Hung, 2022).

5.2. Contribution to practice

This empirical research has several practical implications. The findings provide insights that encourage reflection on the future of education and professional development, potentially helping to design and implement microlearning programs. The analysis, serving as a benchmark, is of great value not only for the EdTech sector but also for the higher education and business school sector, given that microlearning has already begun to impact them in some way, especially at the postgraduate level.

Regarding satisfaction, it is notable that the impact of the Edtech MM is highly uncontested, our findings showing that the MM programs are valued as attractive by all students for many reasons including acquiring knowledge, flexibility, entertainment, the clarity of each microlearning unit, the short format of the videos, the practical cases, and the well-structured sequence.

Regarding learning effectiveness, our findings establish connections between participants' reasons to enroll and the achieved learning effectiveness. Most participants combine in varying degrees different elements of intrinsic and extrinsic motivations to enroll. Seeking learning stems from both intrinsic motivations (e.g., learning as a hobby) and extrinsic motivations (e.g., learning digital marketing to get a promotion), and these reasons to enroll are enough to achieve effective learning, or at least to update knowledge and skills. On the other hand, curiosity is mostly driven by intrinsic motivation, and this reason to enroll produces mixed results, since some of these participants achieved unexpected learning and others only entertainment.

MM was able to motivate students who would otherwise not have considered enrolling in a masters due to the required commitment of a traditional-type course in terms of time, effort, and money. This means that the value proposition of MM's sequenced macro-learnings appeals to a profile of student that does not consider themselves a target of higher education institutions' traditional postgraduate offerings. Furthermore, the price of MM adds to students' perception of there being a low risk associated with enrolment. With this new value proposition, MM manages to convert a higher education program, traditionally a sporadic purchase that involves reflection and comparison, into almost an impulse purchase product. The overall effect is positive, encouraging more students into lifelong learning, while posing a new challenge for universities that do not have similar offerings.

A first implication is for managers of higher education institutions and business schools, who should strongly consider how they can join the microlearning trend, for example by experimenting with hybrid models that combine the positive aspects of the traditional face-to-face/traditional online models and microlearning. These new models can provide the learner with the positive aspects of attendance, especially the interaction with teachers, tutors and other students, shared learning, and networking, and the main aspects of microlearning, which are flexibility, agency, and format. Higher education institutions could also complement their offer of traditional and online postgraduate programs by adding new 100% microlearning programs, competing directly with the value proposition of MM, but with the added value of the prestige of the university's brand. This strategy means reaching new target audiences and expanding their current business model. Higher education institutions, especially the public ones, could also consider the value of cooperation in developing a shared microlearning strategy. In this regard, by embracing open education resources (OER) principles, a repository of microlearning units could be co-built, acting as a strategic asset to be leveraged by microlearning designers and directly by students, who could "choose" and design their own learning journeys, and by professors, who could select the most appropriated microlearning resources from OERs (Aguilera-Hermida et al., 2021).

In the professional development field, corporate training managers could leverage the benefits of microlearning and macro-learning to create learning and discussion communities with other companies, increasing the attractiveness of professional development for their employees, who would learn from professionals from other companies and apply the learnings directly in their own.

6. Conclusions

Our study responds to the various calls for more research to better understand the impact of microlearning by empirically exploring the case of a pioneering microlearning EdTech player. We contribute to the limited academic literature on microlearning, and especially on macro-learning. First, we contribute by adding empirical research in this regard in the business field. Second, we explore the effects of microlearning on student satisfaction and learning effectiveness, finding that a well thought out microlearning sequence of a significant number of microlearning units can be successfully implemented as a primary learning activity, and that microlearning is appropriate for modern workplaces, although more flexibility should be offered to satisfy employees' time scarcity. Third, the results contribute to a better understanding of the drivers of the effectiveness of the MM microlearning instruction on the learner's effective learning, with the most significant elements being seeking learning as the reason to enroll in the program, the ability to apply the knowledge in the current job, and selecting the program that adds new skills to the student's CV. Fourth, the paper explores the satisfaction and effectiveness of *macro-learning* as the grouping of a significant number of microlearning lessons.

This paper is subject to some limitations regarding its methodology and findings. The contribution is limited due to the use of a single case study from the specific EdTech sector, making it exploratory and theory-grounding research. In this regard, case study research does not aim for generalization but for transferability, understood as how (if possible) the knowledge and understanding gained in the research can be applied to other contexts (Bloomberg & Volpe, 2016). This paper contributes to fill a gap in the research on learner satisfaction and microlearning effectiveness in the context of a macro-learning program perceived to be a substitute for traditional masters degrees. It argues that the MM value proposition fits students' needs, although there is still potential for improvement in the microlearning experience and its effectiveness. Further, microlearning in its current state successfully combines education and entertainment to produce "*edutainment*". The trend towards the consumerization of learning (King, 2021) seems unstoppable and fighting this trend seems unfruitful.

Future research should validate our findings and respond to unanswered questions such as the effect of learner intentions to take part in microlearning on post-microlearning usage behavior (Puah et al., 2022), and whether learners' preferences and positive attitudes towards microlearning can impact learning outcomes and boost self-directed learning (Susilana et al., 2022). Other lines of research could include the role of the student in the choice of methodological and technological solutions. Interesting initiatives are being offered such as Badgr, which promises unique personalized learning pathways, but the critical matter is *who decides what, how and why*. This connects with the debate on *personalized* versus *customized learning* (Rof, Bikfalvi, & Marques, 2023a), and with recent calls for further research on more-flexible learning methodologies in higher education that theorize that the focus of analysis should be flexible methodologies rather than educational technologies (Santoveña-Casal & López, 2023). Microlearning should likely be designed for both maximum flexibility and opportunity for student choice, even if this choice means delegating power to the instructor, the employer, or the algorithm.

In short, microlearning has become a relevant learning methodology for both education and professional development. Despite this, like all innovations, it may eventually be dethroned by emerging innovations such as nano-learning, metaverse learning, or AI-assisted learning, which promise opportunities to improve the quality and accessibility of higher education and to facilitate lifelong learning (Rawas, 2023). New EdTech players will no doubt appear, seeking to capture both the opportunity made tangible by companies like MM and business model

innovation to differentiate themselves. The shift in the professional and educational development models is underway, and a better strategy and business model innovation must be part of this process for higher education institutions (Rof, Bikfalvi, & Marques, 2022a).

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Compliance with ethical standards

Research involving Human Participants and/or Animals.

This study, which involved human participants, was in accordance with the ethical standards of the institutional research committee.

Informed consent

Informed consent was obtained from all the individual participants included in the study.

Author contributions

All authors contributed extensively to the work presented in this paper and approved the final manuscript.

CRediT authorship contribution statement

Albert Rof: Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Andrea Bikfalvi:** Writing – review & editing, Validation, Methodology, Investigation, Conceptualization. **Pilar Marques:** Writing – review & editing, Validation, Methodology, Investigation, Conceptualization.

Declaration of competing interest

The authors declare they have no competing interests.

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