Microlearning: A Faculty's Experience

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Context

The pandemic has pushed many higher education tutors and students to adopt online learning (Lee, Fanguy, et al., 2021). Online or remote learning could include uploading lesson materials such as PowerPoint slides, and e-resources to an institution's learning management system (LMS) and lessons are taught synchronously via video conferencing software such as Zoom or Teams or recorded for students' viewing asynchronously.

While many are familiar with online learning, microlearning is not as widely known. Khan in Corbeil et al. (2021) defined microlearning as 'a single objective-focused, outcome-based, stand-alone, meaningful, and interactive learning unit delivered in bite-sized snippets (i.e., a short modular format) either digitally (i.e., via computer, tablet, or mobile phone) or non-digitally (i.e., as via a flashcard or booklet)' (p. 6). In line with the focus of this book on online learning, this chapter will present the delivery of microlearning via digital means.

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17

Microlearning is not a new fad. Research shows that microlearning (without the prefix 'e') has been delivered to students via various online platforms such as social media platforms, web-based and e-learning platforms, smartphone applications and custom developed platforms (Shatte & Teague, 2020). The increased interest in microlearning in the digital age is fuelled by a few factors. The average attention span of humans in the digital age has fallen from 12 seconds to 8 seconds (Gausby, 2015) with 40% of users likely to leave a website if it does not load in less than 3 seconds (Wertz, 2017). This implies that students prefer learning to be chunked in bite-sizes and available to them whenever they need it (just-in-time). Torgerson (2021) further identified that microlearning is growing in usage as it integrates formal and informal learning and makes learning more accessible and personalized. Online learning platforms allow students to access microlearning as and when they want it. Gamification features such as progress tracking, badges for completion of microlearning units and leader boards further motivate students to engage with the learning materials. Tutors can also mine data from the online platforms to analyse areas in students' learning that need to be further supported in an efficient and easy manner.

There are many concepts and versions of microlearning due to differing interpretations regarding time, content, curriculum, form, process, modality and learning type (Hug, 2006). However, there are common characteristics in microlearning that differentiate it from e-learning per se.

A microlearning unit is performance-focused where the content aims to cover narrow and simple (but important) skills elements or to plug skills gaps (Torgerson, 2021). In practical terms, a microlearning unit is bite-sized (about six to ten minutes long) and focuses on honing one to two skills in any of the three contexts of use: to pre-assess students' knowledge of a concept, to introduce new concepts during instruction or to provide for reinforcement and review after instruction. Kapp and Defelice (2019) add that microlearning units should not be used as standalone units. Instead, the unit needs to be situated as part of a larger learning strategy (such as blended learning) to optimize its effectiveness. Thus, a face-to-face assessment on the learning outcomes of the unit could follow upon completion of the microlearning unit, after a spaced interval, to optimize its effectiveness.

A microlearning unit is also interactive in nature. According to Kapp and Defelice (2019), microlearning focuses on learner engagement where students need to interact with multimodal learning materials presented by

making choices, keying in inputs, or creating objects in response to multi-modal stimuli. In short, microlearning is more than a talking head.

As a software, a microlearning unit can be designed to provide students with control over when and how they would like to engage in spaced review of the learning content (Kohler et al., 2021). Students can choose to start the unit from the beginning, continue from where they stopped previously or go through the entire unit again, re-attempting the activities. The unit could also be designed so that students receive automated feedback for each attempt made on the activities in the unit.

A microlearning unit is also scalable. For example, once an online platform is identified (usually the university's learning management system is used), the unit can be utilized in cross-curricular instruction in foundation programs to maintain the quality and consistency of resources provided to students across similar programs (Kohler et al., 2021).

The Singapore Institute of Technology (SIT) is an applied learning university with most of its undergraduates coming from the polytechnics. The Centre for Communication Skills (CCS) offers regular modules (12-week seminars) and additional support via embedded workshops (3 hours) in classroom settings, and peer tutor-supported online communication help-desk feedback services on students' written and oral assignments. However, these support services occur at limited touch points in the students' undergraduate journey.

In 2017, CCS started developing communication skills micromodules from scratch to help us support students in their practice of effective communication skills in a consistent manner throughout their undergraduate journey. We developed our own micromodules as we knew our students' needs and wanted to cater to these needs in a targeted manner. Furthermore, the micromodules are scalable, accessible 24/7, and involve only a one-time development cost.

So far, CCS has developed and rolled out seven micromodules to its student cohort via the university's learning management system. They are used in a blended learning mode and/or as supplementary e-resources in regular modules. The micromodules are English Quest, Managing Meetings, Interpersonal Skills, Career and Professional Development, Email Writing, Academic and Technical Writing and Critical Reflection. As the faculty in charge of developing and implementing these online micromodules, this reflection aims to share the challenges I faced, lessons learned and recommendations for best practices in adopting microlearning in IHLs.

Literature Review: Theoretical Underpinnings for Microlearning

Dolasinski and Reynold's (2020) microlearning model form the theoretical underpinning for microlearning while Khan's e-learning framework visualized through the lens of microlearning (Corbeil et al., 2021) provides a multidimensional roadmap for the effective implementation of microlearning solutions. Both frameworks are mapped together to form a holistic picture of the development and design process of microlearning and explained in Table 2.1.

The first phase in the development and design of a microlearning unit is to evaluate and identify the students' learning needs and thereafter to define clear and specific skills-based objectives or learning outcomes and the corresponding assessment. It is noted that software development is expensive and time-consuming. Thus, tutors need to evaluate early whether the microlearning route is the best way to achieve the learning outcomes intended (Lee, Tan, et al., 2021).

Once the learning outcomes are confirmed, phase 2 starts. In this phase, the concept and content of a microlearning unit is elaborated on or scripted. The tutor needs to bear in mind that each microlearning unit is a complete and discrete learning activity and must be kept bite-sized to

Table 2.1 Frameworks underpinning the development and design of microlearning (mapped)

Dolansinski and Reynolds's microlearning model	Khan's microlearning framework
Phase 1: Identify students' needs	Evaluation (single learning outcome and its assessment) Institutional (cost effective, scalability)
Phase 2: Development, and design of the learning concept and content	Pedagogical (interactive, engaging, multimodal, bite-sized) Technological (device independent regardless of time or online platform) Ethical (diversity and digital equity)
Phase 3: Students' participation, practice, and demonstration of their learning	Interface design (user-friendly) Resource support (retention boosting just-in-time and on-demand)
Phase 4: Learning analytics to evaluate the effectiveness of the learning content to students' learning	Management (maintenance, security and quality control)

reduce students' cognitive load (Kirschner, 2002) and improve recall (Fountain & Doyle, 2012). This also implies that microlearning is more appropriate for the learning and practice of simple rather than complex skills like problem-solving. Furthermore, the content needs to reflect diversity in perspectives (should not be narrow or biased). The content is then designed for interactive and multi-modal delivery. This is meant to cater to students with different learning styles and to enhance comprehension, engagement and retention of the concepts learnt (Mason, 2018). The type of content developed is also subject to technological and ethical issues and should be considered early in the development stage. This is because tutors need to ensure that all students can access the microlearning materials regardless of device, time or platform.

Phase 3 involves students' participation, practice and demonstration of their learning. When learning a new skill, active learner participation (Martinez, 2010), spaced repetitive learning via practice over extended periods of time (Doyle & Zakrajsek, 2013) and performance feedback (Gaba & Joseph, 2013) are critical as these improve retention of concepts in long-term memory. Thus, tutors need to ensure that the interface design is user-friendly (intuitive to the students) and provide for software features like automated feedback or aids like infographics that boost students' retention on what they learnt in a unit. Providing students with control over what and when they learn also aids in improving students' online learning self-efficacy (Taipjutorus et al., 2019). Stary and Totter (2006) further found that putting learners in control of the learning process allows for context-sensitive interaction.

In phase 4, learning analytics can be used to evaluate the effectiveness of the learning content to students' learning. For example, data could be collected from the online platform to examine the frequency and duration of use, with the option of using surveys or various qualitative methods to form a more holistic picture of students' learning using the microlearning unit.

Studies have been conducted to investigate the effectiveness of microlearning on student learning outcomes. In terms of performance, Han's (2019) study on microlearning showed that the experimental group had a significant improvement in their English exam scores compared to the control group. The improvement was attributed to the brief and focused learning content, active learning activities (compared to PowerPoint and other passive e-learning resources), learner control over their pace of learning and multiple opportunities to review the microlearning material.

The interactive nature of microlearning with automated feedback also aids learner engagement with the material. Polasek and Javorcik (2019) found that there was a positive significant difference in students' knowledge in Computer Architecture and Operating System Basics when they converted their e-learning material in the form of pdf documents in the LMS to interactive microlearning materials using videos, interactive elements, and quizzes.

In terms of spaced review, students were reported to prefer watching microlearning videos with timeline-based text annotations as they were bite-sized and could be repeated for review (Van der Westhuizen & Golightly, 2015). Correa et al.'s (2018) study also showed that students who used the microlearning method (compared to the cookbook method) were able to develop small web applications quicker and completed more iterations as they could review the material repeatedly.

In summary, the development and design process for microlearning is similar to that of traditional materials development with the first step being the identification of students' learning needs. However, in the case of microlearning, the learning design is performance-focused on one to two simple skills as it is bite-sized. As student engagement is critical in microlearning, each unit consists of multimodal activities for students to practice the specific skills identified. However, it is noted that the user interaction is pre-designed (scripted) and the type of learner responses constrained to facilitate automated feedback.

Pedagogical Approach Adopted in Teaching Using Microlearning

I have been teaching communication skills for close to three decades in institutes of higher learning and observed that not much have changed in terms of students' needs in communication skills coaching. The key changes are in students' attention span (which is getting shorter), a desire for a higher level of engagement, and immediacy in practice and feedback.

I would thus like to share my reflections in incorporating the use of a micromodule in my teaching of the Career and Professional Development (CPD) module. The CPD module was a regular six weeks, three hours module that was taught by CCS faculty across programs in SIT. It aimed to prepare students for their internship application. The online

micromodule was developed in collaboration with the Centre for Career Readiness, SIT.

The CPD module was delivered using the blended approach. In the physical classroom component, the students were taught how to write resumes, cover letters, and perform in interviews, with feedback provided. In the online micromodule component, students went through the micromodule independently and wrote a 10% graded reflection assignment based on what they have learnt from the micromodule at the end of the module.

The decision to adopt the microlearning approach was based on scalability, accessibility and consistency considerations as the module was taught across programs. Furthermore, when the CPD micromodule was being conceptualized, CCS had already developed and rolled out two micromodules to students via the LMS: English Quest in 2018 and Managing Meetings in 2019. Thus, CCS had the experience in developing micromodules. It was also felt that the microlearning approach which was multimodal and interactive in nature could engage students more (compared to a lecture) and provide for spaced review and reflection as students learnt how to manage their career.

The first step in our microlearning development and design process was to determine the career and communication skills that students needed support with prior to and during their internship. Thus, we gathered students' primary concerns through focus group discussions with students who have completed their internship. The units identified for development fell into two categories: 'Getting the Job' and 'Surviving the Job'. We also decided that the titles of the topics should reflect frequently asked questions by students so that students could relate with the content in the topics easily (Table 2.2).

Table 2.2 Titles of topics in the CPD micromodule (online component)

Topic	Getting the job	Topic	Surviving the job
1	How do I plan my career	7	I did not sign up for this
2	Is this job suitable for me	8	My boss hates my work
3	Should I join this company	9	I can't get along with my colleagues
4	I cannot find the job I want	10	Do I really have to work so hard
5	Help! I failed my interview		
6	How do I get hired		

Each microlearning topic was performance-focused with the title of each topic forming the learning outcome for the unit. The content for each topic was then scripted with interactivity in mind as it was important to keep students' engagement level high. Thus, each topic was divided into three segments: Readiness (an activity to prompt their prior knowledge), Discovery (the main content segment on the learning outcome) and Reinforcement (a quiz). This segmentation also reflects that each unit was a complete and discrete learning activity (Fig. 2.1).

For example, in topic 2 'Is this job suitable for me?' the Readiness segment had students attempt a quiz to help them find out their level of awareness regarding quirks in various industries and broaden their perspectives on jobs they might not know of or were unfamiliar with. In the Discovery segment, students watched an animated video (PowToon style) that helped them to manage their expectations in their job search. They were also urged to identify what they should research about the job they were applying for and the organization offering the job, and provided with credible resources to help them find out more about the job. In the Reinforcement segment, students had to answer a quiz to reinforce what they learnt in the Discovery segment.
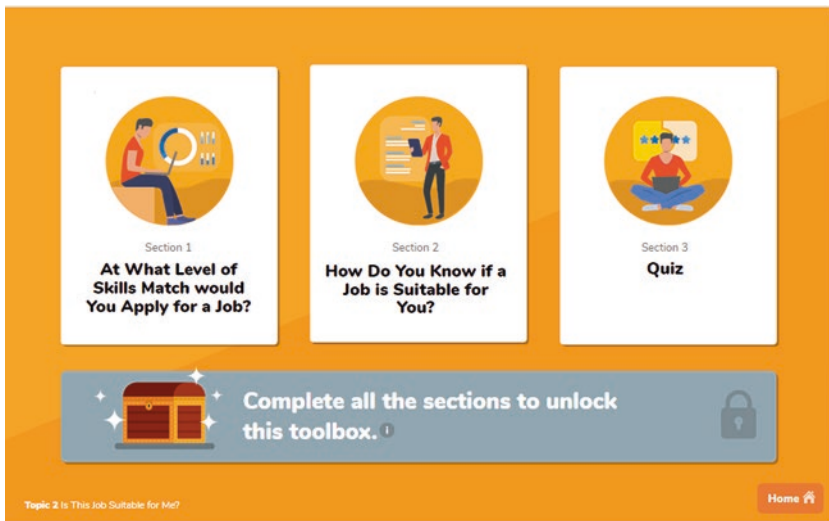

Fig. 2.1   The three sections in a sample CPD topic

The activities that students performed in each topic were varied to keep students' engagement level high. For example, in topic 7, line managers from a few companies provided advice on how to react to changes in job scope during an internship while in topic 8, the students had to choose their responses pertaining to how to respond positively to negative feedback at various junctures in a comic strip. Similarly, quiz activities could take the form of a drag and drop activity to fill in the blanks or to complete a jigsaw puzzle. An 'unlock the toolbox' feature was also included to motivate students to complete all the sections in a topic. The toolbox contained more career resources to aid students in their career planning. Students' engagement level was also kept high by keeping each topic bite-sized. In topic 2, for example, the Readiness section was about 1.5 minutes long while the Discovery and Reinforcement sections were five minutes and two minutes long respectively.

Learner control with automated feedback and spaced review were built into each topic. We provided students with learner control as it increases students' engagement (Polasek & Javorcik, 2019). Students could decide on the sequence they wanted to cover the topics. Furthermore, we could provide automated feedback as the activities only allowed constrained responses such as filling in the appropriate blanks via options provided, true/false statements and multiple-choice questions. The activities were set to accept only correct answers with incorrect answers moving back to the answer options board. Spaced review was facilitated by allowing students to continue from where they stopped or to review the entire topic again. If they chose to review the entire topic again, the responses from the previous attempt were refreshed automatically and so they had a clean slate to practice and improve their skills, with fresh feedback.

DISCUSSION

A blended learning approach was used for the Career and Professional Development module with physical classroom and online microlearning components. The microlearning component offered efficiency in terms of scalability and accessibility to students across programs. However, was the microlearning component effective in helping students plan their career?

A study was conducted with 80 Bachelor of Information and Communications Technology students taking the CPD module to determine whether there was a difference in the students' pre- and post-training survey scores after completing the micromodule and whether this

difference was statistically significant (Lee, 2022). The pre-post training survey results showed a statistically significant difference in the students' self-efficacy scores on career readiness. Furthermore, their open-ended responses in the surveys reflected specific plans to navigate career opportunities, identify their strengths, build positive working relationships during their internship and to engage in lifelong learning.

These positive results are undergirded by the planning conducted using the mapped framework in Table 2.1. The time spent in identifying the challenges students faced prior to and during their internship was worthwhile. Students could relate to the scenarios in the micromodule because they reflected authentic challenges that students might face during an internship and practical tips to overcome them. Furthermore, the development and design of the learning concept and content were kept interactive and varied for the three segments in each unit. Thus, students had something interesting to look forward to in each segment. In terms of participation and practice, students mentioned that they liked that they had control over what material to go through and receiving immediate automated feedback on their performance.

Conclusion and Recommendations

This chapter presented the author's journey in developing the Career and Professional Development micromodule to provide a scalable and effective e-resource to teach students how to plan and manage their career. The micromodule was planned based on Dolaskinsi and Reynold's microlearning model and Khan's e-learning framework and delivered using the blended learning approach. The learning outcomes were positive, reflecting that microlearning is a promising supplementary learning e-resource.

I would thus like to recommend a few best practices in the design and implementation of microlearning:

1. Microlearning needs to be designed in a learner-centric manner as it is performance focused. Adequate time should be factored in to gather information on the students' needs so that targeted support could be designed into the micromodule in terms of learning concept and content.
2. Students engage in self-paced, self-directed learning when learning with microlearning materials. Thus, the attrition rate could be quite high. To enhance student engagement and to motivate students to persevere in their learning, design and delivery issues need to be

considered simultaneously from the beginning of the development process. This is because microlearning material, once developed, is not easily revised or updated. Gamification features could help increase students' motivation to engage with the learning material. Similarly, microcredentialing could be considered, upon student's completion of a micromodule, to enhance the students' employability (Kohler et al., 2021). The toolbox feature could also be used as an avenue for tutors to keep the material updated as it is a feature external to the design of each topic.

3. The future of learning is shifting from a focus on earning degrees to developing skills; from a push paradigm where content is assigned to a pull paradigm where students have control over what, how and when they learn (Hamilton et al., 2021). Learner control allows students to decide how much content they wish to go through in the micromodule and at what frequency. Forcing students to go through all the topics amidst their tight curricular and co-curricular schedules does not ensure greater retention of the learning materials as their interest level in those topics might be low. The critical consideration is to tag the micromodule to a graded assignment which is performance based. The students will then have a clear learning purpose when going through the micromodule.

Going forward, microlearning via online means could have a positive impact on upskilling students and employees in work-based learning contexts. I hope that the lessons shared in this chapter will help tutors interested in teaching using microlearning embark on this meaningful journey as we grow with our students in the digital age.

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