Microlearning through the Lens of Gagne’s Nine Events of Instruction: A Qualitative Study

Laura McNeill1 · Donna Fitch2

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Abstract
Microlearning provides a valuable and efficient strategy for delivering content to students. As online enrollments continue to increase, further research is needed to determine how students experience microlearning in an online learning format. In this qualitative study, a focus group was used to explore how learners experienced an online microlearning activity through the lens of Robert Gagné’s nine events of instruction. Gagné’s framework is designed to maximize cognitive processing and learner engagement. Using a hybrid process of deductive and inductive thematic analysis, learners’ experiences were used to determine if each of Gagné’s nine events were present during a selected online microlearning activity. This study revealed that eight of Gagné’s nine events were detected. The results provide faculty with a better understanding of how students experience online microlearning and will inform faculty and course designers of critical elements to consider in the development of future online microlearning instruction.

Keywords Microlearning · Higher education · Student engagement · Online learning · Teaching innovation · Cognition

Introduction
Online education has become mainstream after the COVID-19 pandemic forced educational institutions to adapt quickly to emergency remote teaching. Though the pandemic caused massive disruption of traditional instructional methods, the crisis allowed many opportunities for growth. More faculty now understand the challenges and benefits of teaching online and are working to incorporate innovative online strategies to boost learner engagement and student success. Microlearning is one strategy that is designed to be brief, focused, interactive, portable, and flexible (Polasek & Javorcik, 2019), and it can be easily integrated into curricula at various educational levels. While microlearning may be used as a strategy to improve the quality of remote learning, it is crucial to examine how students experience online microlearning.

The purpose of this study was to understand how learners experience an online microlearning activity through the lens of Gagné’s nine events of instruction. The nine events are a model of instructional design developed by Gagné and outlined in The Conditions of Learning (1965). Gagné’s work traces the internal cognitive events that occur when learners are presented with external instructional stimuli (Khadjooi et al., 2011). The nine events include gaining attention, stating objectives, stimulating recall of prior learning, presenting the content, providing guided learning, eliciting performance, providing feedback, assessing performance, and enhancing retention and transfer (University of Florida, 2018). As each event in Gagné’s process is completed, students are more likely to retain learning and remain engaged during the instruction. In the current research study, a hybrid process of deductive and inductive thematic analysis was used to focus on the research question: How do students experience microlearning through the lens of Gagné’s nine events of instruction?

Literature Review
Microlearning is an instructional strategy in which content is delivered in chunks of information relayed over a short period of time, ranging from two to fifteen minutes
The brevity of microlearning and its focus on a single idea or topic distinguishes it from other instructional methodologies. For educators, microlearning can be advantageous, as it can be created and delivered quickly and keeps learners engaged (Nettleton, 2021). Microlearning also offers convenience for learners, as courses are short, user-friendly, and easy to access from a tablet or smartphone (Andriotis, 2018). Academic research indicates there are many benefits ascribed to the microlearning method. Utilization of microlearning can enhance learner engagement (De Gagne et al., 2019a; Liao & Zhu, 2012; Nikou, 2019), as well as accommodate learners with short attention spans (Chadha & Kumar, 2018; Eldridge, 2017), and aid learner memory and recall (Kapp & Defelice, 2018).

Kapp and Defelice (2019) summarize microlearning as “an instructional unit that provides a short engagement in an activity intentionally designed to elicit a specific outcome from the participant” (p. 11). Kapp and Defelice elaborate on this definition, pointing out that microlearning modules are self-contained, engaging, and encourage active learning on the part of the student. According to Eldridge (2017), microlearning must also contain a brief, cohesive design with a definitive outcome, rather than simply breaking a longer lesson into smaller pieces.

Major and Calandrino (2018) discussed microlearning in the context of online learning and cognitive load. They argued that smaller bursts of information enhance the cognitive processing of the learner, and better serve the adult online student, who may be susceptible to cognitive overload. A decrease in cognitive load helps facilitate long-term retention of knowledge. Major and Calandrino’s (2018) exploration of delivery methods for microlearning, such as video, infographics, podcasts, and social media, provide ample information for readers unfamiliar with the breadth of technological possibilities.

Ghasia and Rutatola (2021) argued that dependence on social media and similar applications reduces the capacity of modern learners for retention and concentration. In that regard, the researchers recommended educators move toward the use of microlearning; they argued that its shorter instructional units and activities maximize students’ concentration and retention of knowledge.

Mohammed et al. (2018) examined the efficacy of microlearning among younger learners. The authors separated two groups of seventh-grade students in Sulaimani City, Iraq, teaching one group using microlearning methods and the other traditional teaching methods. After six weeks, the researchers tested the students without prior notification and compared testing results between the two groups. The average passing rate of the traditionally taught students was 64%, while that of the microlearning students was 84%. Moreover, the students’ rating of the microlearning tools ranged from 92 to 97%.

**Gagné’s Nine Events of Instruction Framework**

To maximize cognitive processing and learner engagement, it is necessary for faculty and course designers to focus on instruction, which requires steps that support the process of learning, rather than simply informing or talking to learners (Gagné, 1985). According to Gagné et al. (1992), the act of learning is influenced by a set or series of external events which trigger or activate internal cognitive processes in the learner. Table 1 lists the external nine events of instruction and the related internal cognitive processing triggered as a result.

The events do not always occur in this exact order (Gagné et al., 1992) and not all events must be present for learning to occur, as their purpose is to stimulate internal cognitive processes, not replace them. The following sections further define each of Gagné’s nine events.

**Gain Attention**

For learning to take place, the first event of instruction must include capturing learners’ attention (Khadjooi et al., 2011). This requires ensuring the learners are ready to learn and participate in activities by presenting a stimulus to capture their attention (Gagné, 1985) which can include stimulus change or appealing to learners’ interests (Gagné et al., 1992).

**Explain Objectives**

Informing learners of objectives initiates the cognitive process of expectancy and helps motivate learners to complete instructional tasks (Gagné et al., 1992). Explaining objectives and outcomes for a course, lesson, or activity helps learners understand what

| Instructional Event | Cognitive Process |
|---------------------|-------------------|
| 1. Gain attention   | Reception of pattern of neural impulses |
| 2. Explain objectives| Activating the process of executive control |
| 3. Stimulate recall  | Retrieval of prior learning to working memory |
| 4. Present content   | Emphasizing features for selective perception |
| 5. Provide guidance  | Semantic encoding; cues for retrieval |
| 6. Elicit performance| Activating response organization |
| 7. Provide feedback  | Establishing reinforcement |
| 8. Assess performance| Activating retrieval; making reinforcement possible |
| 9. Enhance retention | Providing cues and strategies for retrieval |

Table 1  Events of instruction and internal cognitive processes
they are expected to learn, demonstrate, or know at the conclusion of the instruction (Gagné, 1985).

**Stimulate Recall of Prior Knowledge**

This event helps students make sense of new information by associating the new information with prior knowledge or personal experience (Gagné et al., 1992). This can be achieved by asking students about their understanding of previous concepts, relating previous information to the current topic, and combining previous ideas with new knowledge (Gagné, 1985).

**Present the Content**

In this step, strategies are used to present and cue new content. Content should be organized and grouped in meaningful ways, with explanations provided after demonstrations using a variety of media (Khadjooi et al., 2011). Gagné et al. (1992) emphasized features that assist learners in perceiving information, such as bold print, underlining, and outlining.

**Provide Learning Guidance**

The instructional event recommends advising students on strategies to aid them in learning, including delivering hints or questions through direct or indirect prompts (Khadjooi et al., 2011). Case studies, graphics, examples, and mnemonics can assist learners in converting information for long-term storage (Gagné, 1985).

**Elicit Performance**

Following learning guidance, Gagné et al. (1992) held that learners should provide some evidence that learning has taken place. In this event, students apply or “practice” what they have learned to reinforce new skills and knowledge and to confirm correct understanding of instructional concepts (Gagné, 1985).

**Provide Feedback**

In this event, learners should be provided with an evaluation of their performance to identify and correct gaps in knowledge application and understanding (Gagné, 1985). Gagné et al. (1992) contend that providing individual and immediate feedback to learners is more important than the content of the feedback itself.

**Assess Performance**

During this event, students are evaluated as to whether the expected learning outcomes have been achieved on the previously stated course objectives (Gagné, 1985). Learners should demonstrate what they have learned without receiving additional coaching or hints (1985).

**Enhance Retention and Transfer**

This final event of instruction is achieved through long-term observation of the learners. Gagné et al. (1992) explained that retention and transfer of knowledge are verified by exposing learners to situations different from the original experience and by providing opportunities to connect course concepts to real-world situations. This determines if learners can apply previous knowledge to the new experience (Gagné, 1985).

**Methodology**

For this study, the researchers conducted a qualitative focus group to identify students’ experiences with an online microlearning activity through the lens of Gagné’s nine events of instruction. A focus group approach was used because participants can reflect and give feedback, in addition to generating explanatory or descriptive evidence (McDaniel & Bach, 1996). A focus group also allows freedom of expression (Tilford & Delaney, 1992) which a singular interview may not provide (Kingry, 1990). The following research question was designed to reflect learners’ authentic experiences with an online microlearning activity through the lens of Gagné’s nine events of instruction: How do students experience microlearning through the lens of Gagné’s nine events of instruction?

**Participants**

Participants were selected through convenience sampling. The authors gained access to this population by sending an email to several faculty members in the school of education. The instructor for the course titled Research in Special Education, contacted the authors, and indicated members of one section of the course were willing to participate.

A focus group was conducted with twelve female undergraduate students enrolled in one section of the course. Demographically, the participants represented a homogeneous population. Nine of the students were twenty years old; three were twenty-one. The researchers did not expose participants to Gagné’s nine events of instruction before the focus group.

**Setting**

The study took place on the campus of a private university in the Southeastern United States during the fall semester.
of 2019. The focus group discussion was held in a large classroom in the university’s college of education building. The institution, with a student population of 5,500, supports undergraduate programs in education, business, and natural and social sciences.

**Ethics**

Before data were collected, the researchers secured Institutional Review Board (IRB) approval. The focus group was conducted over the course of 60 min in one day after receiving participants’ written and oral consent. Participants were notified that their voices would be recorded and assured their information would be kept confidential. Participants were given the choice to withdraw from the study at any time.

**Data Collection**

During the focus group session, participants viewed a five-minute TED-Ed video entitled, “Should We Get Rid of Standardized Testing?” (Kempf, 2017, September 19). The video is considered an example of microlearning, allowing the participants to experience the concept and offer feedback on their experience during the focus group discussion. A five-question multiple-choice quiz followed the video. The quiz was used purely to expose participants to microlearning as a pedagogical tool. Following the viewing of the video and completion of the quiz, the researchers led a focus group discussion, which lasted 60 min, in which all participants were asked questions from a pre-established, researcher-developed questionnaire. The focus group discussion was audio recorded. The focus group audio recording was saved and transcribed in a non-verbatim process using Rev.com. Table 2 shows the frequency of participation and each participant’s pseudonym.

**Analysis**

The analysis method best suited for this study was a hybrid approach of qualitative thematic analysis. This approach utilized both deductive thematic analysis, as defined by Crabtree and Miller (1999), and a data-driven inductive approach as outlined by Boyatzis (1998), which allows for themes to emerge from the data using inductive coding. The data coding stages, adapted from Boyatzis (1998) and Crabtree and Miller (1999) are shown in Fig. 1.

It is important to note that although the research analysis for this study is presented in a linear, step-by-step method, the examination of data was a reflexive and iterative process. Applied through the process of qualitative inquiry, this interactivity achieves the overarching principle of “goodness” as described by Tobin and Begley (2004).

| Table 2 Participant contributions to the focus group |
|---------------------------------------------|
| Student No | Times Speaking | Pseudonym |
|------------|----------------|------------|
| 1          | 8              | Caroline   |
| 2          | 7              | Allie      |
| 3          | 6              | Haley      |
| 4          | 4              | Sarah      |
| 5          | 4              | Emily      |
| 6          | 4              | Molly      |
| 7          | 3              | Brooke     |
| 8          | 2              | Hannah     |
| 9          | 2              | Mia        |
| 10         | 1              | Jenna      |
| 11         | 1              | Ruth       |
| 12         | 0              | Alice      |

Stage 1: Crabtree and Miller’s (1999) template approach were used to create a codebook, which allows data to be organized for interpretation. The codebook used for this study appears in Appendix 1. The codebook for this study was developed a priori, based on Gagné’s nine events of instruction, before beginning an in-depth analysis of the data. The codebook included a label for each code, a definition, and an explanation of the qualifiers or exclusions that demonstrate when the code does or does not occur (Boyatzis, 1998; Fereday & Muir-Cochrane, 2006).

Stage 2: In the development of a useful codebook for data analysis, an essential step is verifying the applicability of the a priori codes to the raw information (Boyatzis, 1998). Several pages from the focus group transcript were selected as a test segment. Following an initial, high-level coding of the sample document by both researchers, a colleague coded the pages. After results were compared, no modifications were needed.

Stage 3: This stage of the process involves reading and summarizing the raw data for the purpose of entering information “into [the] unconscious, as well as consciously processing the information” (Boyatzis, 1998, p. 45). The researchers summarized the transcripts individu-
ally by outlining the participants’ key points in response to the questions asked during the focus group (see Appendix 2). The summary allowed initial processing of information by both researchers, as well as the opportunity to note any potential themes detected in the raw data. Potential themes at this stage included: History and origin; Design principles, Balanced and factual content; Engaging design; Title bias; Recall difficulty.

Stage 4: The entire focus group discussion transcription was read and reviewed several times by the researchers. The transcript was coded after entering the transcript into Delve, a data coding software program. Using Delve, the transcript was analyzed using the template analytic technique (Crabtree & Miller, 1999), by matching the a priori codes in the codebook with segments of data selected as representative of the code. The researchers reviewed the data line-by-line, using phrases, sentences, and paragraphs as primary units of analysis. Verbatim quotations were used to substantiate codes.

As the transcript analysis was guided, but not limited, by the codebook, inductive codes were then assigned to sections of data in the text that described a new theme (Boyatzis, 1998). The additional data-driven codes were independent from the a priori codes outlined in the codebook, which represented each of Gagné’s nine events of instruction. In total, six additional data-driven codes were identified in this stage of the analysis. For example, the use of examples concept was originally coded as part of the Present the Content code. However, as different participants made observations about the microlearning video’s use of examples, this concept became a separate data-driven code, as shown in Table 3.

### Table 3

| Data-driven Code 1 | Use of Examples |
|--------------------|-----------------|
| **Label**          | Examples in the microlearning activity are used to help learners visually and cognitively process and understand the new information |
| **Definition**     | • I liked how it gave legitimate examples for why it doesn't necessarily work for everyone at all times, that it might be dependent on the situation or the question. Like the example that had the ruler trying to get the circumference of the pomegranate |
|                    | • Often when you hear stuff about standardized testing it is very much like, “Oh, it is that,” or “it is beneficial,” but I think just the way that they create the video and they were just great examples |
| **Example**        | • Everyone has mentioned that they remembered the history, and the firefighter and the boat in the beginning |

Step 5: The process of uncovering themes and patterns in the data is done by the researchers connecting codes (Crabtree & Miller, 1999). Using headings that directly relate to the nine research questions, the researchers clustered the data by connecting codes and identifying themes. At this stage, similarities and differences emerged between individual data groups, which indicated participants’ agreement or incongruity in response to the research questions. Themes also began to cluster within each data group.

Step 6: The final stage involves further clustering the themes identified previously in the data. This step can be described as legitimizing, corroborating, or confirming the findings (Crabtree & Miller, 1999). This guards against unintentionally or unconsciously manufacturing evidence or seeing data a researcher anticipates finding. The researchers scrutinized the previous stages to confirm that the initial data analysis and assigned codes reflected the clustered themes. Several iterations of analysis were performed before the researchers moved to an interpretive phase in which the themes were linked into an explanatory framework. The researchers then further clustered the themes, assigning them concise phrases to describe the theme’s underlying meaning.

### Results

The purpose of this study was to understand how learners experience an online microlearning activity through the lens of Gagné’s nine events of instruction. The researchers sought to understand if each of Gagné’s nine events of
instruction were present during learners’ experience with the selected online microlearning activity and if additional themes would develop from analysis of the students’ experiences. Participants involved in this study used a variety of descriptions and examples to define their experiences. Their accounts, and the themes developed from this research, will inform instructors and course designers of critical elements to include in the design and development of future online microlearning activities or lessons.

In this study, eight of the nine events were present to some extent in the learners’ experiences with the online microlearning activity. As Gagné et al. (1992) explained, not all nine events will occur in every lesson. The following sections describe learners’ experiences with an online microlearning activity through the lens of Gagné’s nine events of instruction.

Gagné’s Nine Events Codes

Gain Attention

When researchers asked the first question of the focus group, “What was your first impression of the video? Why did you think that?” six of the 12 participants described elements that matched the researchers’ understanding of Gagné’s first event of instruction. The Gain Attention event presents a stimulus to capture learners’ attention (Gagné, 1985). Allie commented that she “…wanted to watch it because [she] liked illustration and like[d] the colors.” Sarah remarked that “The art, it was visually pleasing and entertaining, which made it easier to pay attention and listen to it.”

The video appealed to learners’ interests by its subject matter of standardized testing, a topic of interest to elementary education majors whose students are likely to face such testing in the future. Caroline observed, “I really liked that it gave…the history of standardized testing because I don’t think that’s widely known necessarily why or when it started.”

Explain Objectives

Our analysis demonstrated overlap between Gagné’s framework and the participants’ responses as related to four of the four objectives during the focus group discussion. The first objective, “Identify the era and purpose of the first standardized tests,” was mentioned by Brooke, who commented, “The [video] said [standardized testing] originated in China and that it was originally for the workforce and now that we use that for kids. That really, really stood out to me.” Four of the 12 participants recalled similar concepts. The second objective, “Describe the uses of modern standardized testing,” was mentioned by six of the 12 participants. Emily summarized that standardized testing can be used to determine “…how a student in particular compares to their peers, compared to the standard and compared to the qualifications for [a] job.” Caroline described the use of standardized testing as a “…tool to measure overall student progress.”

The third objective from the focus group video, “Explain the meaning of percentile as applied to test results,” was described by three of the 12 participants. Hannah commented she had never understood how percentiles operated in the context of testing before viewing the video. She said, “The percentile thing stuck out to me because it’s something that never gets said about standardized testing.”

The fourth objective, “Apply the concepts of reliability and validity to measurement situations,” was mentioned by three of the 12 participants. Caroline observed standardized testing “…has flaws because it’s a test made by humans and…it can be reliable but [there] needs to be some level of understanding that there’s going to be error.”

Stimulate Recall of Prior Learning

The researchers’ analysis demonstrated connections between Gagné’s framework and participant responses in the third event, Stimulate Recall of Prior Learning. Seven of the 12 focus group participants connected their previous knowledge of standardized testing with the information in the video when the researchers asked, “How knowledgeable were you about the concept and history of standardized testing as described in the video?” Haley referred to her prior knowledge about standardized testing when she mentioned, “I know how it started here, with ”No Child Left Behind” and the competition with Russia.” Mia remarked, “I mostly just hear about the implications of standardized testing.” Molly commented, “I know a lot of people are very against standardized testing.”

Present the Content

This event of instruction was perceived by nine of the 12 focus group participants, as those students’ described experiences matched the researchers’ understanding of Gagné’s fourth event of instruction. To determine learners experienced this event, the researchers asked, “How would you define the term ‘standardized testing’ to a friend?” Ruth described why standardized testing doesn’t work for every situation, “It might be dependent on the situation or the question. Like the example that had the ruler trying to get the circumference of the pomegranate.” Jenna described the video’s definition of standardized testing, “…as showing an individual’s progress in a certain area, not just your knowing
of anything.” Haley remarked that the video was not trying to tell “…everybody that standardized testing was bad; but give a constructive side to it. Yes, there [are] flaws but it’s not unfixable.” Two participants commented on situations in which standardized testing is not helpful, such as a mathematical word problem given to a student with a reading impairment.

**Provide Learning Guidance**

The researchers’ analysis demonstrated commonality between Gagné’s framework and participant responses in the fifth event of instruction. The *Provide Learning Guidance* event is achieved by providing strategies to aid students in learning content, particularly in the form of visual images, examples, and delivering hints through indirect prompts (Gagné, 1985). The researchers asked, “What did you find most compelling about the video content?” to determine the extent to which the participants experienced the provision of learning guidance.

Six participants remarked upon the use of animation in the video, emphasizing the importance of further assisting learners in processing new information. Caroline explained, “The visual example of the ruler and how they use a ruler to measure length but not the weight and time or volume… that was really beneficial to visually see.” Hannah discussed that the video’s diagrams helped illustrate how percentiles were used in standardized testing. She said, “It just stuck with me…I was watching it and trying to figure out how it worked.”

The quotation at the beginning of the video, “The hardest part of learning something new is not embracing new ideas, but letting go of old ones” (Rose, 2016), provided an indirect prompt to guide learners’ understanding of the material. During the discussion, Haley tied the meaning of the quotation to the subject of standardized testing. Haley commented, “Holding on to old ideas [prevents] you…going any further. [Standardized testing] could be revamped to be more beneficial…we can change it.”

**Elicit Performance**

In this event, students apply what they have learned to reinforce new skills and knowledge and to confirm the correct understanding of course concepts. This practice allows students to demonstrate their comprehension. Based on the researchers’ understanding of Gagné’s framework, all 12 participants experienced this event by participating in the five-question multiple-choice quiz that followed the video. The quiz was used purely to expose participants to micro-learning as a pedagogical tool. Figure 2 depicts the participants’ performance on the quiz.

Nine of the students scored 80% or higher. Two students achieved a 60% or lower score.

**Provide Feedback**

Individual and immediate feedback was provided to all 12 participants during the experience of completing the five-item quiz. As students completed each question, the Ted Ed quiz scored the answer and instantly offered feedback. Participants either received a message that the answer was correct, in which case, the student could proceed to the next question, or the feedback immediately detected an incorrect
answer and directed the student to try again. The feedback directed students to find the correct answer by including a prompt and direct link to the section of the Ted Ed video related to the question. This timely feedback assessed students’ performance and allowed students to identify and correct gaps in their understanding of the material.

**Assess Performance**

To gain an understanding of participants’ experiences with the Assess Performance event, the researchers asked students, “What is one thing you remember most about standardized testing from the video?” The researchers’ analysis of the focus group discussion indicated that learning had indeed occurred, as was evidenced by participants’ responses matching the researcher’s understanding of Gagné’s framework. Eight of the 12 participants described what they had learned without coaching or hints, which indicates that for those students, the previously stated objectives had been achieved. Many of the participants’ answers focused on the history and original purpose of standardized testing. Sarah remarked, “Everyone has mentioned that they remembered the history, and the firefighter and the boat in the beginning.” Brooke added, “They said [standardized testing] originated in China and that it was originally for the workforce and now that we use that for kids.” As the participants were not exposed to Gagné’s framework prior to the focus group, the conditions were free of distortion.

**Enhance Retention and Transfer**

The research design did not accommodate repeated interactions with this population. As such, it was not feasible for the researchers to perform long-term observation and assessment of participants’ retention and transfer of the new knowledge.

**Data-Driven Codes**

The following section describes the final data-driven codes developed through inductive analysis of the transcript of participants’ experiences with an online microlearning activity through the lens of Gagné’s nine events of instruction. The codes include Design Principles, Trust in the Content, and Purpose and Application.

**Design Principles**

From the researchers’ understanding of Gagné’s framework and analysis of the participants’ experiences, Design Principles became a separate data-driven code. The Design Principles code is defined as the use of time, animation, art, and content to help engage, entertain, and effectively deliver microlearning content to the participants.

In terms of design principles that worked well, Allie related her experience as “I liked that it was a short video because it will catch my attention.” Caroline commented, “The graphics I felt were very engaging; that was one of the draws to the video.” Nine of the 12 participants made similar statements.

Six participants who expressed an overall positive experience while viewing the microlearning also shared concerns related to content design and distracting graphics. Sarah shared, “And so I think it kind of just goes back to what Allie said about there being a lot of information condensed in the video because we all remember the stuff at the very beginning that we didn’t know.” Allie added, “It would’ve taken me watching this video at least two times to fully understand everything and the things I do remember because like I said there was just a lot in the video.” Caroline remarked, “There was a page, and it was flickering while text was appearing. I was like, ‘I can’t read that,’ because there’s just like a lot going on.” Allie added, “The head was distracting because every time it would come up, I would laugh, so I wasn’t fully grabbing what they were saying.”

**Trust in the Content**

Based on the researchers’ understanding of Gagné’s framework and the analysis of learners’ experiences, Trust in the Content was developed as a second data-driven code. This code is defined as gaining learners’ trust, the title of the microlearning and the content presented must be perceived as relevant, balanced, and factual.

Caroline explained, “I thought that they did a good job of staying pretty neutral about just giving facts.” Sarah commented, “It definitely showed both sides of [standardized testing] and did not seem biased necessarily.” Eight of the participants shared similar experiences.

Four of the 12 participants shared the experience of the microlearning video’s title seeming biased or misleading. Molly commented, “I think the title isn’t necessarily to inform, I think it’s to get people to click on the video.” Sarah expressed, “The title of the video is, ‘Should we get rid of standardized testing?’ So that alone kind of sets it up for the perspective of we’re looking at if we should get rid of this.”

**Purpose and Application**

Analysis of the participants’ experiences and the researchers’ understanding of Gagné’s framework led to Purpose and Application emerging as a third data-driven code. The Purpose and Application code is defined as in order to assist learners in retaining the new knowledge, microlearning’s content must clearly define the purpose of the content, offer
examples of the concept, and describe how the new information can be applied in the real world.

As participants discussed their experiences during the focus group, Allie expressed that “The main purpose of this video was to explain standardized testing in a positive way.” Sarah remarked, “The purpose of the video is to look at what the tests measure [and] looked at if they’re worthwhile.” Sarah relayed, “Everyone has mentioned that they remembered the history, and the firefighter and the boat in the beginning.” Five additional participants commented on the examples provided in the microlearning on standardized testing’s history and/or origin. Ruth commented specifically on the “example that had the ruler trying to get the circumference of the pomegranate.” Six of the participants relayed examples related to why and how standardized testing can be applied in the real world. Jenna remarked, “It can also be defined as showing an individual’s progress in a certain area.” Haley added, “It’s a generic test that assesses you not only on academics but your ability to take a test.”

Emily, however, despite the examples, had more difficulty in discerning how to apply standardized testing in the real world. She commented, “Yeah, [standardized testing] compares to other people how you’re doing, but what do we use that for? Do our employers [use] that data? Is it just for colleges to use that data?”.

Discussion

The results of this study highlight theoretical contributions to further the effective use of microlearning through the lens of Gagné’s nine events of instruction. Three core themes were identified. Table 4 illustrates the corroborated coded themes.

To engage and educate learners, effectively use principles of good design

Data indicated that the use of good design principles is central to engaging, entertaining, and educating learners. Design principles, defined earlier, include the use of time, animation, art, and content to help engage, entertain, and effectively deliver microlearning content to the participants. A combination of these elements was used to effectively deliver content to students in the study. As noted in Clustered Theme #1, it is important to quickly capture learners’ interest at the start of the microlearning to assist in stimulating interest and creating motivation to learn more about the topic. It was also clear, as interpreted by the experiences of students in the focus group and noted in Clustered Theme #2, that design elements can also interrupt the learning process. For example, learner engagement may be jeopardized if the animation or art contained distracting elements.

To gain learners’ trust, the title and content must be perceived as relevant, balanced, and factual

According to the current study, learners’ trust in microlearning hinges on the title and content appearing relevant, balanced, and factual. The microlearning viewed before the focus group was perceived to contain facts, as noted by more than half of the participants who readily cited the history, origin, and current uses of standardized testing. Participants also indicated it was important that the microlearning content be presented in a manner that was neutral and balanced. Several participants remarked that microlearning showed both the advantages and disadvantages of standardized testing. Relevance was noted by more than half of the participants, who were familiar with the concept of standardized testing, but felt enlightened after learning when standardized testing is appropriate and not appropriate.

As noted in Clustered theme #3, relevance and credibility enhance learners’ comprehension and retention of new knowledge, while the opposite can negatively affect learners. This was expressed by four of the 12 participants, who remarked that the video’s title seemed biased and/or misleading, which distracted learners from digesting the microlearning content.

Table 4 Corroborated coded themes

| First-order theme                                           | Clustered themes                                                                 |
|-------------------------------------------------------------|----------------------------------------------------------------------------------|
| To engage and educate learners, effectively use principles of good design | Theme 1: Quickly capturing participants’ attention at the start of the microlearning assists in stimulating interest and creating motivation to learn more about the topic |
| To gain learners’ trust, the title and content must be perceived as relevant, balanced, and factual | Theme 2: The animation and artwork in microlearning must be used to enhance knowledge retention and not distract the learner from fully processing the content |
| To aid in learning retention, the content must offer a clear purpose, concise content, examples, and how to apply new knowledge in the real world | Theme 3: Relevance and credibility enhance learners’ comprehension and retention of new knowledge |
|                                                             | Theme 4: Objectives and content in microlearning must be limited to avoid cognitive overload |
To aid in learning retention, the content must offer a clear purpose, concise content, and how to apply new knowledge in the real world

Participants in the current study indicated that new knowledge was better retained when the content contains a clear purpose, includes concise content, examples, and specifically describes how new knowledge can be applied in the real world. In this study, more than half of the participants identified the purpose of microlearning. Six of the 12 participants cited standardized testing examples as “great” or “legitimate.”

However, participants also cited that the microlearning contained a dense amount of content, which can interrupt long-term retention of knowledge. Five of the 12 participants struggled to determine how to apply standardized testing in the real world. In addition, none of the learners could distinctly recall how to apply reliability and validity in real-world situations. As Allie mentioned, “Do one video with probably half of the material.” Major and Calandrino (2018) explain that smaller bursts of information enhance the cognitive processing of the learner, and better serve the adult online student, who may be susceptible to cognitive overload.

Limitations

Limitations of this study include that participants were recruited based on their enrollment in one course. The population is a small representation of undergraduate learners across the world. While the insight offered during the focus group provided a glimpse into how learners experience microlearning, more longitudinal work is needed to understand students' perceptions in-depth.

Conclusion

This study measured learners’ perceptions of microlearning through the lens of Gagné’s nine events of instruction. Undergraduate student participants engaged with a five-minute microlearning video. The participants were then asked a series of nine open-ended questions, designed to elicit responses to the video. The microlearning module used in this project showed that the focus group’s participants experienced eight of Gagné’s nine events of instruction. Participant quiz results indicated success in learning the content; however, due to the limitations of the study design, the researchers could not ascertain the long-term results of this microlearning exercise.

Few studies of this type appear in the literature examining instructional design in microlearning, despite the fact that short lessons which incorporate highly visual elements are an increasingly popular form of training. The scarcity of these studies, and the popularity of the format, make clear the importance of further investigation into the effectiveness of microlearning.

As the need for quality online instruction will continue to increase, this study stands as a robust starting point for other research in this area and should be repeated in an online learning environment with a range of types of microlearning media. Additional empirical evidence to evaluate the potential impact and effectiveness of microlearning could also be obtained by examining microlearning with larger sample sizes, drawn from various populations at multiple levels of higher education, as well as across academic disciplines. Further analysis of microlearning could help generate general principles to guide relevant instructional design. Scholarship along this trajectory could ultimately enhance the knowledge, possibilities, and opportunities associated with microlearning, thereby creating meaningful learning experiences that add value to online educational environments.

Appendix 1

Gagne’s Nine Events of Instruction Codebook

| Code 1 | Label | Definition |
|--------|-------|------------|
|        | Gain attention (Gagne, R., 1985) | Ensure the learners are ready to learn and participate in activities by presenting a stimulus to capture their attention |
|        | Description/Example | Initiates the cognitive process of expectancy; Helps motivate learners to complete instructional tasks; Stimulates students with novelty, uncertainty, and surprise; Pose thought-provoking questions to students |

| Code 2 | Label | Definition |
|--------|-------|------------|
|        | Explain objectives (Gagne, R., 1985) | Inform students of the objectives or outcomes for the course and individual lessons to help them understand what they are expected to learn and do |

| Code 3 | Label | Definition |
|--------|-------|------------|
|        |        |            |
| Code 3 | Label | Description/Example |
|--------|-------|---------------------|
| Code 3 | Label | Stimulate recall of prior knowledge (Gagne, R., 1985) |
| Definition | Help students make sense of new information by relating it to something they already know or something they have already experienced |
| Description/Example | • Ask students about their understanding of previous concepts |
| • Relate previous course information to the current topic |
| • Critical for learning, as much of new learning is the combining of previous ideas and knowledge |

| Code 4 | Label | Present the content (Gagne, R., 1985) |
|--------|-------|-------------------------------------|
| Definition | Use strategies to present and cue lesson content to provide more effective instruction. Organize and group content in meaningful ways and provide explanations after demonstrations |
| Description/Example | • Present multiple versions of the same content (video, demonstration, lecture, podcast, group work, etc.) |
| • Use a variety of media to engage students in learning |

| Code 5 | Label | Provide learning guidance (Gagne, R., 1985) |
|--------|-------|---------------------------------------------|
| Definition | Advise students of strategies to aid them in learning content and of resources available. In other words, help students learn how to learn |
| Description/Example | • Use examples/non-examples. Examples help students see what to do. Non-examples illustrate what not to do |
| • Provide case studies, visual images, analogies, and metaphors |
| • Advising students of strategies to aid them in learning; delivering hints/questions through direct or indirect prompts |

| Code 6 | Label | Elicit performance (practice) (Gagne, R., 1985) |
|--------|-------|-----------------------------------------------|

| Code 7 | Label | Provide feedback (Gagne, R., 1985) |
|--------|-------|----------------------------------|
| Definition | Have students apply what they have learned to reinforce new skills and knowledge and to confirm correct understanding of course concepts |
| Description/Example | • Provide formative assessment opportunities |
| • Test students in ways that allow them to demonstrate their comprehension |
| • Students practice what they have learned to reinforce new skills and knowledge and to confirm correct understanding of instructional concepts |

| Code 8 | Label | Assess performance (Gagne, R., 1985) |
|--------|-------|-------------------------------------|
| Definition | Test whether the expected learning outcomes have been achieved on previously stated course objectives |
| Description/Example | • Embed formative assessment opportunities using oral questioning, short active learning activities, or quizzes |
| • Implement a variety of assessment methods to provide students with opportunities to demonstrate proficiency |
| • Learners should demonstrate what they have learned without receiving additional coaching or hints |
| • Determined through accuracy through reflection, not memorization or recall from a previous event |

| Code 9 | Label | Enhance retention and transfer (Gagne, R., 1985) |
|--------|-------|-----------------------------------------------|
Laura McNeill, Ph.D. is an assistant professor of instructional technology in the College of Education’s Department of Educational Leadership, Policy, and Technology Studies at The University of Alabama. She also serves as the program coordinator for the Instructional Technology master’s degree program. Dr. McNeill also teaches courses in the Instructional Leadership Ph.D. program. Her research interests include microlearning and teaching presence and student engagement in online, asynchronous courses.

Appendix 2

Focus Group Interview Questions

1. What was your first impression of the video? Why did you think that?
2. After watching the video, how would you define the term, “standardized testing,” to a friend?
3. Thinking about that same friend, how would you explain the main goal or purpose of this video?
4. On a scale from 1 to 10 (10 being the most knowledgeable), how knowledgeable were you about the concept and history of standardized testing as described in the video?
5. What did you find most compelling about the video content? Why?
6. What changes would you recommend making to this video?
7. What did you like least about the video? Why?
8. Think back to watching the entire video. What is one thing you remember most about standardized testing from the video?
9. Is there anything we missed?

Appendix 3

Laura McNeill, Ph.D. is an assistant professor of instructional technology in the College of Education’s Department of Educational Leadership, Policy, and Technology Studies at The University of Alabama. She also serves as the program coordinator for the Instructional Technology master’s degree program. Dr. McNeill also teaches courses in the Instructional Leadership Ph.D. program. Her research interests include microlearning and teaching presence and student engagement in online, asynchronous courses.

Declarations

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