The Effectiveness of Microlearning in Skill Development and Knowledge Retention

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Abstract
In response to the growing demand for flexible and efficient learning methods, microlearning has emerged as a popular approach, delivering content in small, digestible units, typically ranging from a few minutes to 15 minutes. This study evaluates the effectiveness of microlearning in enhancing knowledge retention and skill development, comparing it with traditional learning methods. Microlearning has gained traction in both educational and corporate settings due to its flexibility, ease of access, and ability to accommodate modern learners' busy schedules. It aligns well with the cognitive principles of minimizing cognitive overload and promoting active recall, which enhances long-term retention. Through a mixed-methods approach, this study collects data from 200 participants, including students and corporate employees, using surveys, performance assessments, and interviews. The results show that microlearning significantly improves knowledge retention, with 50.5% of participants strongly agreeing that it enhances their ability to retain information. Additionally, microlearning proves effective in skill development, with over 75% of respondents reporting improvements in job performance and the ability to apply new skills to their work. Despite its effectiveness, microlearning faces some challenges, such as the perceived lack of depth for more complex topics and limited feedback during the learning process. These findings align with concerns raised in previous literature. The study concludes that while microlearning is highly effective for knowledge retention and skill acquisition, it may need to be integrated with other learning methods for complex topics to ensure comprehensive learning outcomes. Future research should explore hybrid models to optimize microlearning's long-term effectiveness.

Keywords: Microlearning, Knowledge Retention, Skill Development, Cognitive Load Theory, Corporate Training, Educational Technology, Active Recall, Learning Efficiency.

1. Introduction
In an era where attention spans are increasingly short, and learners are constantly pressed for time, traditional learning models are being reevaluated. Educational institutions and corporations alike are seeking innovative methods to provide effective learning experiences that cater to modern needs. One such method that has garnered attention is microlearning—learning in small, digestible chunks, typically lasting between a few minutes to 15 minutes.

This technique is seen as an effective way to engage learners, promote retention, and foster the continuous development of practical skills.

The proliferation of digital tools and mobile technology has made microlearning an accessible and flexible learning solution. In corporate training, for instance, organizations are leveraging microlearning modules to help employees enhance skills in areas such as software usage, customer service, and project management (Adeniji et al., 2022; Oteri et al., 2024a). Similarly, in educational environments, microlearning platforms are utilized to deliver specific educational content to students in a way that fits seamlessly into their busy schedules, enabling knowledge retention over time.

Despite its widespread use, the effectiveness of microlearning in terms of knowledge retention and skill acquisition is still under investigation. While some studies have demonstrated promising results (Samala et al., 2023), others have raised concerns about the oversimplification of complex topics (Nikkhoo et al., 2023). This paper aims to explore these concerns and offer a comprehensive analysis of microlearning's effectiveness. By gathering primary data from learners engaged in microlearning, this study seeks to assess how microlearning impacts both knowledge retention and skill development in real-world settings. Key questions guiding this research include:

- How does microlearning compare to traditional learning methods in terms of knowledge retention and skill development?
- What factors contribute to the success or failure of microlearning programs in various contexts?
- How can microlearning be optimized for long-term learning outcomes?

The study will utilize a combination of surveys, performance tests, and interviews to answer these questions, drawing from participants in educational institutions and corporate training environments.

This paper is structured as follows: the next section details the research methodology, followed by a presentation of the results derived from data collection. The discussion section will analyze the data in relation to existing literature, and the paper will conclude with recommendations for improving microlearning practices based on the findings.

2. Review of Literature

The review of the literature is divided into three main sections: an overview of microlearning, its cognitive basis, and its applications in knowledge retention and skill development. This review synthesizes key studies in each of these areas, drawing from existing research to lay a foundation for understanding the effectiveness of microlearning in various educational and corporate settings.

2.1 Microlearning Overview

Microlearning, as a learning methodology, involves the delivery of content in small, easily digestible units, typically lasting between a few minutes and 15 minutes. This method contrasts with traditional long-form courses, focusing on bite-sized learning modules designed to promote engagement and retention in a short period. Many researchers argue that microlearning aligns well with the natural cognitive processes of the brain by minimizing cognitive overload (Díaz Redondo et al., 2021). The versatility of microlearning—delivered through mobile apps, e-learning platforms, or even social media—makes it accessible to a broad range of learners, including those in professional development programs and academic courses (Samala et al., 2023). Microlearning's growing popularity can be attributed to several factors. It offers flexibility, allowing learners to access content at their convenience, which suits the needs of busy professionals and students alike. Moreover, it supports just-in-time learning, enabling

individuals to acquire knowledge as needed, rather than in advance of an event or task (Adeniji et al., 2022). The approach also aligns with the increasing use of mobile technologies, which has significantly contributed to microlearning's expansion (Oteri et al., 2024b).

2.2 Cognitive Basis of Microlearning

Cognitive psychology offers valuable insights into why microlearning can be an effective learning strategy. One key theory is Cognitive Load Theory (CLT), which posits that the brain has a limited capacity to process information at any given time (Dachner et al., 2021). Microlearning aligns with CLT by presenting information in small chunks, which reduces the cognitive load and helps learners focus on specific learning objectives. This is particularly important for learners who are already overwhelmed with large volumes of information, such as students in academic settings or employees undergoing training (Nikkhoo et al., 2023). Research has shown that the brain processes small pieces of information more effectively than large amounts, particularly when the content is engaging and interactive. As spaced repetition is integral to microlearning, the cognitive principle of active recall is also at play. Active recall, a technique that encourages learners to retrieve information from memory, has been proven to improve long-term retention (Samala et al., 2023). The repetition of small, focused learning sessions helps reinforce this process, making microlearning particularly powerful for knowledge retention (Sankaranarayanan et al., 2023).

2.3 Microlearning in Knowledge Retention and Skill Development

Microlearning's impact on knowledge retention and skill development has been widely studied, particularly in corporate and educational settings. Numerous studies demonstrate that learners who engage with microlearning modules retain information for longer periods compared to those who undergo traditional, long-form learning sessions (Odio et al., 2021). For example, one study found that employees who completed microlearning modules retained key concepts for up to 30% longer than those who participated in traditional training sessions (Dachner et al., 2021). Microlearning is especially effective in promoting skill development, particularly in fields where hands-on practice is crucial. It allows learners to focus on mastering one specific skill at a time, which helps reduce the overwhelm often experienced in more comprehensive training programs. As noted by Famoti et al. (2024b), microlearning facilitates incremental learning, enabling employees to develop competencies in areas such as software usage, project management, and customer service, often faster than through conventional methods. Additionally, microlearning's flexible delivery formats make it suitable for diverse skill levels and professional fields (Oteri et al., 2024a). However, there are also limitations to microlearning. Researchers have pointed out that while microlearning excels in facilitating short-term knowledge retention and skill acquisition, it may struggle to deliver in-depth understanding of more complex subjects (Nzeako et al., 2024). As noted by Nikkhoo et al. (2023), when topics require significant depth or conceptual understanding, microlearning might need to be integrated with other learning strategies, such as traditional lectures or in-depth courses, to ensure comprehensive learning outcomes.

3. Methodology

This study adopts a mixed-methods approach, combining both quantitative and qualitative research methods to explore the effectiveness of microlearning in skill development and knowledge retention. Primary data is collected through surveys, performance assessments, and interviews from participants in educational and corporate settings. The methodology is designed to capture a comprehensive understanding of how microlearning impacts learning

outcomes, particularly focusing on its role in enhancing knowledge retention and facilitating skill acquisition.

3.1 Research Design

The research design is both **descriptive** and **analytical**, aimed at gathering data that will allow for a detailed examination of the relationship between microlearning engagement and learning outcomes. The study is conducted in two phases: a quantitative survey phase and a qualitative interview phase. Data is collected from learners who have participated in microlearning modules in both educational institutions and corporate training programs.

• **Survey**: The survey collects quantitative data on learners' experiences with microlearning, including frequency of engagement, perceived improvements in skill development, and self-reported retention of knowledge.

• **Interviews/Focus Groups**: In-depth interviews and focus group discussions provide qualitative insights into the personal experiences of learners. These discussions explore participants' attitudes towards microlearning, including its advantages and challenges, and how it compares to traditional learning methods.

• **Performance Testing**: Pre- and post-assessments measure learners' ability to apply the skills and knowledge they have gained through microlearning. These tests assess specific competencies in fields like technology, management, and customer service.

3.2 Data Collection Instruments

The study employs three primary data collection instruments: surveys, interviews, and performance tests.

1. **Surveys**: A structured questionnaire is administered to participants who have engaged in microlearning programs. The survey includes both closed and open-ended questions, allowing for both quantitative measurement and qualitative insights. The key focus areas of the survey include:

o **Engagement with microlearning**: How often participants engage with microlearning modules and for how long.

o **Effectiveness of microlearning**: Self-reported improvements in knowledge retention and skill development after engaging in microlearning sessions.

o **Learner satisfaction**: Participants' satisfaction with the format, content, and delivery method of the microlearning modules.

2. **Interviews/Focus Groups**: Semi-structured interviews or focus group discussions are conducted with a subset of survey participants. These discussions are guided by open-ended questions and aim to gather deeper insights into learners' personal experiences, including:

o **Perceived benefits of microlearning**: How participants feel microlearning has helped them improve their skills and retain knowledge.

o **Challenges faced**: Any difficulties participants face while engaging with microlearning, such as lack of interactivity or challenges with content complexity.

o **Comparison with traditional learning methods**: How participants perceive the effectiveness of microlearning compared to more traditional forms of learning, such as in-person training or long online courses.

3. **Performance Testing**: For a smaller group of participants, pre- and post-tests measure specific skill improvements related to the microlearning modules. These tests are designed to assess practical knowledge application in real-world tasks, such as software proficiency or customer interaction techniques.

3.3 Sample Selection

Participants are selected from two groups:

1.   **Educational Participants**: Students enrolled in online courses that utilize microlearning platforms. These students come from a variety of academic disciplines, including business, technology, and healthcare.

2.   **Corporate Participants**: Employees undergoing microlearning-based training programs designed to enhance job-specific skills. These employees work in fields such as customer service, software development, and leadership.

The total sample size is 200 participants.

3.4 Data Analysis

Data collected from the surveys, interviews, and performance tests is analyzed as follows:

•   **Quantitative Data**: Survey data is analyzed using **descriptive statistics** to summarize key trends in learner engagement, satisfaction, and effectiveness of microlearning. **Inferential statistics**, such as **correlation analysis** and **regression analysis**, are employed to determine the relationships between microlearning engagement and improvements in skill development and knowledge retention.

•   **Qualitative Data**: The interview and focus group data is analyzed using **thematic analysis**. This process involves coding the data to identify recurring themes and patterns related to the learners' experiences, challenges, and perceptions of microlearning. Key themes that emerge from the data include engagement levels, perceived effectiveness, and the comparison of microlearning with other learning formats.

•   **Performance Data**: The pre- and post-test data is analyzed using **paired sample t-tests** to evaluate the statistical significance of any improvements in skills or knowledge before and after the microlearning intervention.

3.5 Ethical Considerations

This study adheres to ethical guidelines for research involving human participants. All participants are fully informed about the purpose of the study, and their consent is obtained before data collection. Participation is voluntary, and participants are assured that their responses will be kept confidential and anonymous. The data collected is used exclusively for academic research purposes.

3.6 Limitations of the Study

While this study provides valuable insights into the effectiveness of microlearning, it has certain limitations:

•   **Sample Bias**: The study relies on participants who have already engaged with microlearning platforms, potentially limiting the diversity of experiences.

•   **Short-term Retention**: The study primarily measures short-term retention and immediate skill improvements, and it does not track long-term retention over an extended period.

•   **Generalizability**: The study focuses on specific industries and educational contexts, which may limit the generalizability of the findings to other sectors.

4. Analysis
4.1 Demographic Profile of the Respondents
Table 1: Demographic Profile

Demographic Variable	Number of Participants (N)	Percentage (%)
Educational Participants	120	60%
Corporate Participants	80	40%
Age Group		
18-24	50	25%
25-34	70	35%
35+	80	40%
Gender		
Male	100	50%
Female	100	50%

The demographic profile of the participants in this study is divided into several key categories: educational vs. corporate participants, age group, and gender. Among the 200 participants, 120 (60%) were from educational backgrounds, while 80 (40%) came from corporate environments. The age distribution revealed that 50 participants (25%) were aged 18-24, 70 (35%) were aged 25-34, and 80 (40%) were aged 35 and above. In terms of gender, 100 participants (50%) were male and 100 (50%) were female, reflecting a balanced sample across both genders.

4.2 Descriptive Analysis
The following tables show data collected on a 5-point Likert scale, where participants rated their responses from 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 2: Learner Engagement with Microlearning
This table examines how often participants engage with microlearning modules.

Frequency of Engagement	Number of Participants (N)	Percentage (%)
Daily	40	20%
Several times a week	60	30%
Weekly	50	25%
Less than once a week	50	25%
Total	**200**	**100%**

This table examines how frequently participants engage with microlearning modules. Of the 200 participants, 40 (20%) engage with microlearning daily, 60 (30%) do so several times a week, and 50 (25%) engage weekly. The remaining 50 participants (25%) reported less frequent engagement, at less than once a week. These findings suggest that the majority of learners engage with microlearning multiple times per week, with a significant portion (50%) using the modules daily or several times a week.

Table 3: Effectiveness of Microlearning in Knowledge Retention
This table analyzes the perceived effectiveness of microlearning on knowledge retention.

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)

Microlearning improves my ability to retain knowledge.	6 (3%)	10 (5%)	28 (14%)	55 (27.5%)	101 (50.5%)
I remember what I learned in microlearning after one month.	8 (4%)	12 (6%)	29 (14.5%)	57 (28.5%)	94 (47%)
Microlearning content is memorable.	4 (2%)	8 (4%)	30 (15%)	50 (25%)	108 (54%)

This table evaluates participants' perceptions of the effectiveness of microlearning on knowledge retention. The responses suggest that microlearning positively impacts knowledge retention, especially in the short term. For example, 50.5% of participants strongly agreed that microlearning improved their ability to retain knowledge, while 47% remembered what they learned after one month. Additionally, 54% of respondents found the content of microlearning to be memorable. These results highlight the perceived success of microlearning in fostering knowledge retention.

Table 4: Improvement in Skill Acquisition through Microlearning
This table assesses whether microlearning contributes to improved skills.

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
Microlearning helped me develop new skills.	7 (3.5%)	9 (4.5%)	24 (12%)	58 (29%)	102 (51%)
My job performance has improved due to microlearning.	6 (3%)	8 (4%)	31 (15.5%)	49 (24.5%)	106 (53%)
I can apply the skills learned from microlearning directly to my work.	5 (2.5%)	10 (5%)	30 (15%)	52 (26%)	103 (51.5%)

This table focuses on the impact of microlearning on skill development. A significant portion of participants (51%) strongly agreed that microlearning helped them develop new skills, and 53% reported improved job performance due to microlearning. Additionally, 51.5% of respondents stated they could directly apply the skills learned through microlearning to their work. Over 75% of participants agreed or strongly agreed that microlearning contributed positively to skill acquisition and job performance, suggesting its effectiveness in practical learning.

Table 5: Learner Satisfaction with Microlearning Format
This table gauges learner satisfaction with the microlearning format.

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
I am satisfied with the microlearning format.	5 (2.5%)	10 (5%)	23 (11.5%)	58 (29%)	104 (52%)
The microlearning modules are easy to follow.	4 (2%)	9 (4.5%)	25 (12.5%)	53 (26.5%)	109 (54.5%)

The content is well-organized and clear in microlearning.	6 (3%)	8 (4%)	28 (14%)	51 (25.5%)	107 (53.5%)

This table assesses learner satisfaction with the microlearning format. The data reveals that a majority of participants expressed satisfaction with the microlearning modules. Specifically, 52% strongly agreed that they were satisfied with the format, while 54.5% felt the modules were easy to follow. Furthermore, 53.5% of respondents strongly agreed that the content was well-organized and clear. These findings reflect high satisfaction with the structure and clarity of the microlearning approach.

Table 6: Comparison of Microlearning and Traditional Learning
This table explores the comparison between microlearning and traditional learning methods in terms of knowledge retention.

Statement	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
Microlearning is more effective than traditional methods.	8 (4%)	11 (5.5%)	26 (13%)	55 (27.5%)	100 (50%)
I find microlearning to be more time-efficient than traditional learning.	6 (3%)	7 (3.5%)	27 (13.5%)	52 (26%)	108 (54%)
Microlearning keeps me more engaged than traditional learning.	5 (2.5%)	6 (3%)	29 (14.5%)	58 (29%)	102 (51%)

This table explores how microlearning compares to traditional learning methods in terms of knowledge retention. The majority of participants (50%) agreed or strongly agreed that microlearning was more effective than traditional methods, with 54% finding it more time-efficient and 51% reporting greater engagement with microlearning than with traditional learning. These results suggest that microlearning is perceived as a more efficient and engaging learning method compared to traditional learning formats.

Table 7: Challenges with Microlearning
This table examines the challenges that learners face while engaging in microlearning.

Challenge	Number of Participants (N)	Percentage (%)
Lack of interactivity	30	15%
Insufficient depth for complex topics	50	25%
Limited feedback or guidance during learning	40	20%
Difficulty with pacing or scheduling	40	20%
No challenges	40	20%

This table identifies the challenges learners face while engaging in microlearning. The most common challenges were perceived lack of depth for complex topics (25%) and limited feedback during learning (20%). Other challenges included difficulty with pacing or scheduling, reported by 20% of participants, and lack of interactivity, noted by 15%. However, 20% of participants reported experiencing no challenges with the microlearning format, indicating that the method works well for a portion of learners.

4.3 Hypothesis Testing

- **Null Hypothesis (H₀)**: There is no significant difference in knowledge retention before and after engaging in microlearning modules.
- **Alternative Hypothesis (H₁)**: There is a significant improvement in knowledge retention after engaging in microlearning modules.

Table 8: Knowledge Retention Improvement

Test	Pre-Test Mean	Post-Test Mean	t-Statistic	p-value
Knowledge Retention (Sample Group)	65%	85%	7.93	<0.001

The pre-test mean score for knowledge retention was 65%, while the post-test mean increased to 85%. The t-statistic was calculated to be 7.93, and the p-value was less than 0.001. Since the p-value is less than 0.05, we reject the null hypothesis. This result confirms that microlearning significantly improves knowledge retention.

- **Null Hypothesis (H₀)**: There is no significant difference in skill acquisition before and after engaging in microlearning modules.
- **Alternative Hypothesis (H₁)**: There is a significant improvement in skill acquisition after engaging in microlearning modules.

Table 9: Skill Acquisition Improvement

Test	Pre-Test Mean Skill Score	Post-Test Mean Skill Score	t-Statistic	p-value
Skill Acquisition (Sample Group)	70%	88%	6.12	<0.001

The pre-test mean skill score was 70%, and the post-test mean score was 88%. The t-statistic was 6.12, with a p-value less than 0.001. Given that the p-value is below 0.05, we reject the null hypothesis, confirming that microlearning significantly improves skill acquisition.

5. Discussion

The findings of this study provide compelling evidence supporting the effectiveness of microlearning in both knowledge retention and skill development across various contexts. A significant portion of the respondents, particularly in the educational and corporate sectors, indicated that microlearning contributed positively to their ability to retain knowledge. As evidenced by Table 3, a large number of participants (50.5%) strongly agreed that microlearning improved their ability to retain knowledge, while 47% remembered the information after one month. This is consistent with prior research by Samala et al. (2023), which highlighted the benefits of microlearning in fostering long-term retention due to its bite-sized learning approach that aligns well with cognitive load theory (Díaz Redondo et al., 2021). The short duration of microlearning sessions reduces cognitive overload, helping learners focus on specific learning objectives without feeling overwhelmed (Dachner et al., 2021).

Additionally, when comparing microlearning to traditional learning methods, the majority of respondents preferred microlearning for its time efficiency and increased engagement. Table 6 demonstrates that 54% of participants found microlearning more time-efficient and 51% more engaging than traditional methods, reinforcing findings from Odio et al. (2021), which noted that microlearning is particularly effective in work environments where time is limited, such as corporate training programs. This aligns with the assertion by Oteri et al. (2024b) that

microlearning's adaptability makes it especially attractive for busy professionals looking to acquire specific skills or knowledge without committing to lengthy sessions. Furthermore, Adeniji et al. (2022) noted that microlearning is an effective tool for continuous learning, which was also highlighted by the findings from this study, where learners reported improved job performance and skill application as a result of engaging with microlearning modules.

However, despite its benefits, microlearning does present some challenges. The most significant of these challenges, as outlined in Table 7, include the perceived lack of depth for complex topics (25%) and limited feedback during the learning process (20%). Nzeako et al. (2024) discussed the limitation of microlearning in delivering in-depth content, noting that it excels in short-term retention but may not be sufficient for complex subject matter that requires deeper conceptual understanding. This study corroborates that view, as several participants expressed concerns over microlearning's inability to adequately address intricate or nuanced topics. These concerns were also highlighted by Nikkhoo et al. (2023), who emphasized that while microlearning is effective for simple, task-oriented skills, it may need to be integrated with other learning strategies, such as traditional lectures or detailed modules, to ensure a more comprehensive grasp of complex subjects.

Moreover, learner satisfaction with the microlearning format was notably high, with 52% of participants reporting that they were satisfied with the format and 54.5% finding the modules easy to follow (see Table 5). This high level of satisfaction can be attributed to microlearning's clear structure and its suitability for today's learners who are often juggling multiple responsibilities. The findings echo Sankaranarayanan et al. (2023), who argued that the flexibility and accessibility of microlearning, particularly through mobile platforms, contribute to its growing popularity in both academic and corporate environments. The ease of access allows learners to engage in continuous, just-in-time learning, enhancing both engagement and retention.

In terms of skill development, the data supports the effectiveness of microlearning in helping learners acquire new skills and apply them in practical settings. Table 4 shows that over 75% of participants agreed that microlearning improved their skill development and job performance. These findings align with the work of Famoti et al. (2024b), who noted that microlearning facilitates incremental learning, allowing learners to focus on mastering one skill at a time, thus reducing overwhelm and accelerating competence development. This was particularly evident in the corporate participants, where microlearning modules designed to enhance job-specific skills, such as customer service and software usage, were deemed effective by most respondents.

Ultimately, the findings from this study contribute to the growing body of literature supporting microlearning as an effective learning methodology. While it has its challenges, such as limited depth for complex subjects and the need for more interactive features, its strengths in improving engagement, retention, and skill development are clear. Future research should explore hybrid models that combine microlearning with traditional learning strategies to address these limitations. By doing so, educators and organizations can create more holistic and impactful learning experiences, fostering continuous development and improved performance across various sectors.

6. Conclusion

Microlearning has demonstrated significant potential as an effective learning strategy, particularly in terms of knowledge retention and skill development. This study has shown that microlearning facilitates better engagement and more efficient knowledge retention compared to traditional learning methods. As evidenced by the high levels of learner satisfaction and engagement in the corporate and educational sectors, microlearning aligns well with modern

learning needs, offering a flexible, efficient, and focused learning approach. The positive impact on knowledge retention, particularly in the short-term, is supported by cognitive load theory, which suggests that breaking content into smaller, digestible chunks helps minimize cognitive overload and improves the brain's capacity to retain information (Díaz Redondo et al., 2021). The findings align with previous studies, such as those by Samala et al. (2023), who identified microlearning as an effective method for enhancing long-term retention through active recall and spaced repetition. Additionally, the study confirmed that microlearning improves skill acquisition, with over 75% of participants reporting enhanced job performance and the ability to apply learned skills directly to real-world tasks, supporting Famoti et al. (2024b)'s findings on the practical benefits of microlearning in skill development. However, microlearning does have its limitations. While it excels in improving short-term knowledge retention and practical skills, it may not provide in-depth understanding of complex topics. As noted by Nzeako et al. (2024), microlearning may need to be complemented with traditional methods for subjects requiring more extensive conceptual learning. Moving forward, integrating microlearning with other learning formats and optimizing its interactive elements could address these limitations, enhancing its applicability across various learning contexts. Future research should explore these hybrid models to maximize microlearning's potential for both short- and long-term educational outcomes.

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