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Cyberlearning Model with Microlearning Strategies to Enhance Edutechpreneurship Skills for University Students

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Abstract

The rapid growth of the education technology (edutech) sector demands the development of entrepreneurial skills among university students to foster innovation and address educational challenges. This study employed the 4D instructional design model—Define, Design, Develop, and Disseminate—by creating an online platform that features personalized learning paths, interactive modules, collaborative tools, and real-time analytics. This research design was employed with 100 university students specializing in education and technology. Over eight weeks, participants engaged with microlearning modules focused on key entrepreneurial concepts and collaborated on projects simulating real-world Edutech scenarios. The findings show that online microlearning models prioritize technological accessibility, quality content, engagement, and flexibility, which are in high demand. Microlearning with short modules and interactive videos improves comprehension and engagement. Task and Concept Analyses frame learning and deepen understanding of key concepts, enabling students to apply learning outcomes. The cyberlearning model used criterion-referenced exams, evaluation tools, and interactive media like short movies, infographics, and gamification to increase edutechpreneurship. A Wilcoxon Signed Rank Test analysis revealed a significant difference between pre-test and post-test scores (p-value < 0.05), Evaluation with pre-test and post-test is effective in measuring improvements in student learning outcomes before and after implementing the model, because it can show changes in ability objectively. The cyber learning model boosted students' Edutechpreneurship skills. Edutechpreneurship, which combines educational technology and entrepreneurship, improves online learning and promotes entrepreneurship. This model requires entrepreneurship education in online learning platforms. This research offers valuable insights into innovative educational practices that prepare students to lead and innovate in the evolving EdTech industry. The model is effective and relevant to augment depth, readability, and personalization for an optimal learning experience.

Keywords: Cyberlearning model; edutechpreneurship skills; microlearning, strategies

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1. Introduction

Having seen amazing expansion recently, the education technology (Edu-tech) industry is now a major player in updating educational institutions all over (Nurhikmah et al., 2023). The urgent need to solve educational difficulties through creative ideas and the integration of technology into learning environments mostly drives this expansion (Shala & Grajcevci, 2023). In the Edutech industry, entrepreneurial abilities are vital since they enable people to spot possibilities, create ideas, and propel the transformation of the educational scene. Combining technology knowledge with pedagogical knowledge, entrepreneurs in this industry provide goods and services that improve learning opportunities (Nabi et al., 2017).

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However, conventional teaching approaches include lectures, standardized testing, and set courses meant to transmit theoretical knowledge, which have essentially dominated traditional education institutions (Nurhikmah et al., 2021). Although these approaches are good for providing fundamental education, they usually fall short of developing the practical skills and creative ideas needed for entrepreneurship. Emphasizing passive learning reduces chances for critical thinking, creativity, and problem-solving—key skills needed for business success (Freeman et al., 2014). Such restrictions draw attention to the need for creative teaching strategies supporting active learning, practical experience, and technological integration. Cyberlearning—also known as online learning or e-learning—is the application of digital technologies and internet resources to improve and ease the learning process. The emergence of cyberlearning has fundamentally changed the field of education by providing fresh chances for lifetime learning and skill improvement (Means et al., 2013). Cyberlearning environments provide numerous benefits, including flexibility and accessibility, personalized learning paths, interactive and engaging content, collaborative learning opportunities, immediate feedback, development of digital literacy, resource richness, and cost-effectiveness (Sarker, 2021).

Technology is crucial in modern entrepreneurship training. It offers tools and platforms that improve educational opportunities and replicate actual corporate environments (Pittaway et al., 2015). Through simulations, virtual reality, and gamified materials—which can increase engagement and skill acquisition—technology's inclusion helps to facilitate interactive learning (Lai & Bower, 2019). These settings provide useful tools and real-world simulations that reflect entrepreneurial difficulties, therefore facilitating experiential learning in fields including edutechpreneurship employing virtual labs, case studies, and project-based assignments (Kolb & Kolb, 2022).

Targeting a specific learning aim, microlearning is an instructional method whereby materials are presented in small, targeted pieces or modules. Using digital platforms and mobile devices, microlearning offers flexible, on-demand access to instructional materials, which makes it rather pertinent in the scene of higher education today. Microlearning lets students acquire knowledge at their own pace and helps them to engage in incremental learning by separating difficult topics into doable chunks (Giurgiu, 2017). Microlearning offers better knowledge retention, more engagement, flexibility, personalization, instant application of knowledge, cost-effectiveness, and support of several learning styles (Nikou & Economides, 2018).

This study is to create and evaluate a cyberlearning model, including microlearning techniques especially meant to improve edutechpreneurship skills among university students. The suggested strategy seeks to develop entrepreneurial competencies such as creativity, strategic thinking, risk management, and problem-solving by addressing the limits of conventional educational approaches and using the advantages of online learning and microlearning. The study aims to ascertain how well this model helps students acquire edutechpreneurship abilities and how it affects their entrepreneurial competency.

2. Literature Review

2.1. Edutechpreneurship in Higher Education

Aiming to inspire an entrepreneurial attitude and equip students with the tools required to start and run new businesses, entrepreneurship education has been increasingly common in higher education institutions all around (Nambisan, 2017). Conventional entrepreneurship courses sometimes center on business plan formulation, opportunity recognition, and the theoretical underpinnings of launching a company (Rideout & Gray, 2013). To meet the needs of the contemporary economy, though, there is increasing awareness of the necessity to include useful, technologically driven components into these initiatives (Neck & Corbett, 2018).

Emphasizing real-world application and hands-on experiences, experiential learning techniques in entrepreneurship education have been increasingly popular in recent years (Rideout & Gray, 2013). This change fits the requirements for edutechpreneurship, which combines technology knowledge with entrepreneurial ability to create innovations in the education industry (Maritz & Brown, 2013). Many initiatives nevertheless lack the incorporation of innovative technologies and approaches that mirror the present digital environment, notwithstanding this improvement (Brush, 2014). By enabling students to work across borders and cultures and access global markets and resources, educational technologies help them. Essential components of entrepreneurial success, networking, mentoring, and funding possibilities also present themselves on online platforms and social media (Rippa & Secundo, 2019). Online platforms and social media also offer avenues for networking, mentorship, and funding opportunities, which are essential components of entrepreneurial success (Nambisan, 2017). Including technology in entrepreneurship courses improves the learning process and helps students to be ready to use digital tools in their next businesses (Bacigalupo et al., 2016).

2.2. Cyber Learning Models

Cyberlearning models use digital technology to provide instruction via online platforms, therefore allowing a scalable and flexible learning environment (Means et al., 2014). Prominent systems include Massive Open Online Courses (MOOCs), which offer free or low-cost courses spanning a broad spectrum of topics accessible to anybody with an internet connection (Reich & Ruipérez-Valiente, 2019). Combining online components with conventional face-to-face training, blended learning provides a hybrid approach that best uses the advantages of both approaches. While classroom time is set for interactive activities and knowledge application, the flipped classroom allows students access to educational materials online outside of class (El-Hmoudova, 2015).

2.3. Adaptive Learning Systems

Apply data analytics and algorithms to customize learning routes depending on particular student performance and preferences (Johnson et al., 2016). By leveraging technology, these systems seek to increase accessibility, tailor learning, and improve instructional results (Picciano, A. G, 2021). Success stories of cyberlearning initiatives include increased enrolment rates, improved accessibility for remote learners, and enhanced student engagement by interactive content (Hew & Cheung, 2014). For example, by giving access to top-notch courses from esteemed universities all around, MOOCs have democratized education (El-Hmoudova, 2014).

Limitations exist, too, including high dropout rates in online courses, a lack of interpersonal interaction, and difficulties in upholding academic integrity (Reich & Ruipérez-Valiente, 2019). Furthermore, not all students have the self-regulation abilities needed for effective online learning, which results in differences in educational results (Kizilcec et al., 2017). Particularly in underdeveloped areas, technical problems such as restricted internet connectivity and poor digital infrastructure might also compromise the efficacy of cyber-learning models (Lai & Bower, 2019).

2.4. Microlearning Strategies

Based on cognitive learning theories that underline the need to dissect knowledge into doable parts to improve understanding and retention, microlearning fits the ideas of cognitive load theory, which holds that minimizing cognitive overload will help learning to be more successful (Giurgiu, 2017). By encouraging active participation and knowledge-building through interaction with content, constructivist learning theories can encourage microlearning. Microlearning lets students manage the speed and sequencing of their education and enables just-in-time learning by offering brief, targeted courses (Dolasinski & Reynolds, 2020). By encouraging active participation and knowledge production via contact with material, constructivist learning theories can facilitate microlearning. By providing concise, focused learning units, microlearning facilitates just-in-time learning and allows learners to control the pace and sequence of their education. Empirical studies have demonstrated the effectiveness of microlearning across various educational settings.

2.5. Integrating Cyber Learning with Microlearning

Integrating microlearning strategies within cyberlearning models creates a synergistic effect that enhances the learning experience. Online platforms provide the infrastructure to deliver microlearning content efficiently, utilizing multimedia elements such as videos, quizzes, and interactive simulations (Khong & Kabilan, 2022). This integration allows for personalized learning experiences, as learners can select modules that align with their interests and needs (Shail, 2019). It also supports mobile learning, enabling access to educational content on the go, which increases flexibility and convenience (Crompton & Burke, 2018).

2.6. Lack of Studies Combining Cyber Learning and Microlearning for Entrepreneurship

While there is extensive research on cyberlearning and microlearning independently, few studies have explored their combined application in entrepreneurship education. The existing literature often addresses general educational outcomes without focusing on the specific competencies required for entrepreneurship, particularly in the edutech sector (El-Hmoudova, 2014).

This gap indicates a need for empirical research investigating how integrated cyberlearning and microlearning strategies can effectively develop entrepreneurial skills. Such studies would provide valuable insights into optimizing educational practices to meet the demands of the modern entrepreneurial landscape (Nambisan, 2017). Despite the growing importance of edutechpreneurship, there is limited empirical evidence on effective pedagogical approaches to enhance these skills among university students (Maritz & Brown, 2013). Most studies focus on traditional entrepreneurship education without considering the unique intersection of education technology and entrepreneurial competencies (Rippa & Secundo, 2019).

3. Methods

3.1. Research Design

This study used research and development, combining qualitative and quantitative methods to fully assess the performance of the suggested cyberlearning model using microlearning techniques. While the qualitative component gathered in-depth insights on participants' experiences and perceptions using interviews and focus groups, the quantitative component comprised pre- and post-intervention assessments to quantify changes in students' edutechpreneurship skills (Creswell, 2014).

The capacity of a mixed-method approach to offer a more comprehensive knowledge of the study subject than only quantitative or qualitative approaches makes it justified (Leavy, 2017). While qualitative data gave contextual knowledge of how and why the model affected learning outcomes, quantitative data presented observable proof of skill growth. This mix enables the triangulation of data sources (Creswell, 2013), therefore improving the validity and dependability of the results.

3.2. Participants

To guarantee relevance to the subject of edutechpreneurship, the study sought university students who specialized in education and technology. Using purposive sampling, participants—who focused on those participating in undergraduate or graduate programs linked to educational technology, instructional design, or entrepreneurship—were chosen (Creswell, 2014). There were 120 invited students; 100 of them agreed and finished the study (n = 100). Comprising 55% female and 45% male students aged 20 to 25 years (Mean age = 23.4 years), the sample Participants had to be generally competent in using digital learning tools and show an enthusiasm in entrepreneurship in the field of education. This group was selected to depict the following generation of professionals ready to impact the edutech sector.

3.3. Development of the Cyber Learning Model

Built on constructivist learning ideas and the 4D instructional design paradigm—four phases: Define, Design, Develop, and Disseminate (Thiagarajan et al., 1974)—the cyberlearning model was established. This paradigm provides a methodical way for designing instructional interventions, therefore guaranteeing that instructional resources are efficiently planned, developed, and applied to satisfy the demands of the learners.

3.4. Define Phase

The goals of the cyber learning model were found in the first phase, which concentrated on improving edutechpreneurship abilities among university students. To ascertain the particular competencies needed and to know the learners' present knowledge and ability, a comprehensive requirements analysis was carried out. Finding the content scope and the learning objectives to be reached also fell under this stage.

3.5. Design Phase

Instructional strategies and learning activities were painstakingly scheduled depending on the goals and requirements noted. Designing the microlearning modules, choosing suitable multimedia components, and planning interactive activities consistent with the learning goals comprised part of this. The design stressed the need to produce interesting materials that support active learning and the practical application of entrepreneurial ideas. Development: The real production of the learning resources occurred in this phase. To improve engagement and retention, microlearning courses were created, including movies, interactive quizzes, simulations, and gamified components (Dichev & Dicheva, 2017). Customizing the online learning platform to hold these resources guarantees flawless integration and easy navigation. The platform was assessed for compatibility across devices, accessibility, and general functionality.

The last element was applying the cyberlearning approach to the intended audience. Participants were given access credentials and direction on how to negotiate the system when the learning platform was first launched. Systems were set up to track student involvement, get comments, and evaluate performance. To enhance the learning process, this phase also includes constant assistance and changes depending on user comments.

3.6. Integration of Microlearning Modules Focused on Entrepreneurship

Microlearning modules were designed to cover core topics in edutechpreneurship, each focusing on specific learning objectives such as opportunity recognition, business model development, technology integration, and market analysis. Modules ranged from 5 to 15 minutes and included video Lectures, that is, short expert talks on entrepreneurial concepts

and edutech trends. Interactive Scenarios: Simulations of real-world entrepreneurial challenges requiring problem-solving and decision-making. Quizzes and Reflections: Brief assessments to reinforce learning and encourage self-reflection (Shail, 2019). Resource Library: Access to articles, case studies, and tools for further exploration. The micro-learning approach aims to accommodate diverse learning preferences and schedules, promoting flexibility and continuous engagement (Hug, 2010).

3.7. Data Collection Methods

Quantitative data were collected using standardized instruments administered before and after the intervention: Entrepreneurial Competence Questionnaire (ECQ): Measured competencies such as creativity, risk-taking, and strategic planning (Lans et al., 2008). Technology Proficiency Self-Assessment: Evaluated participants' confidence and skills in using educational technologies. These instruments provided quantifiable measures of changes in edutechpreneurship skills resulting from the intervention

3.8. Interviews and Focus Groups for Qualitative Data

Qualitative data were gathered through semi-structured interviews and focus group discussions with a subset of participants (n=20). The topics explored included experiences with the cyberlearning model and microlearning modules. Perceived impact on entrepreneurial mindset and skills. Suggestions for improvement and reflections on learning processes. These methods allowed for in-depth exploration of participants' perceptions and experiences (Kvale & Brinkmann, 2009).

The learning platform's analytics dashboard collected data on module Completion Rates and tracked progress through the microlearning modules. Engagement Metrics: Monitored time spent on activities, interaction frequency, and participation in collaborative tools. Performance Data: Recorded quiz scores and assignment outcomes. This data provided insights into learner engagement patterns and the effectiveness of specific modules (Ifenthaler & Widanapathirana, 2014).

3.9. Data Analysis Techniques

Descriptive Statistics: Summarized demographic data and baseline characteristics. Paired t-tests: Compared pre- and post-intervention scores to assess changes in competencies (Field, 2018). Analysis of Variance (ANOVA): Examined differences among subgroups, such as gender or prior experience levels. Statistical significance was set at $p < .05$, and effect sizes were calculated to determine the magnitude of changes (Cohen, 1988).

4. Results and Discussion

The data on the need for adequate digital devices and lightweight, mobile-accessible platforms to support online learning is broken down by gender.

Table 1. Needs Analysis Results Based on Gender of Respondents

Requires adequate digital devices (laptop/smartphone) to support online learning	Need an application or platform that is lightweight and easy to access via mobile devices			
Gender	Needed	Needed so much	No Need so much	Total
Men	15	23	0	38
Girls	28	44	1	73
Grand Total	43	67	1	111

The data shows that female respondents have a higher demand for lightweight and mobile-friendly platforms, with the majority stating “Very Needed” or at least “Needed.” Meanwhile, male respondents have a smaller total demand than female respondents but still show similar interest, albeit with a slightly lower level of need. The greater number of women expressing a need for digital devices and lightweight applications for online learning indicates differences in learning styles and technology preferences between genders. Women tend to be more active and engaged in online learning activities that require intensive use of digital devices, and they prioritize convenience and ease of access to technology. Furthermore, in some social contexts, women have limited access to personal digital devices, requiring lightweight applications that are easily accessible via smartphones. This reflects a generally higher level of motivation, engagement, and sensitivity to the effectiveness of learning technology among female students than among male students.

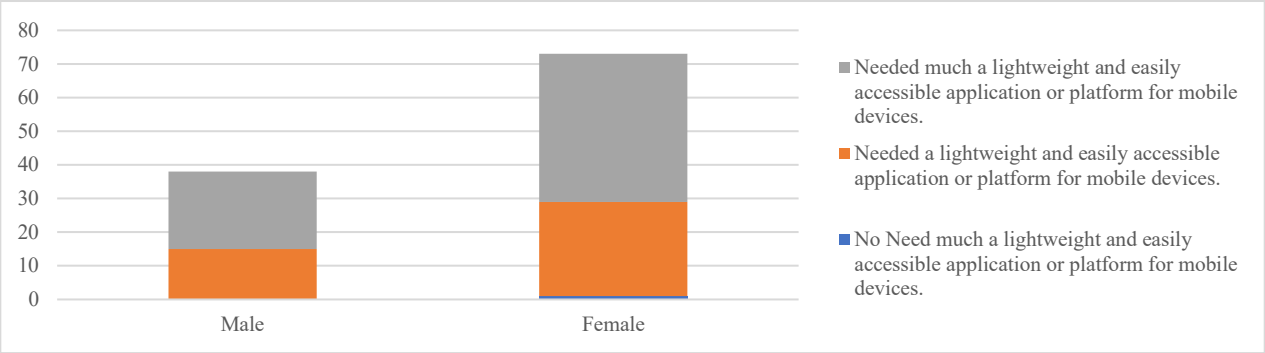

Figure 1. Needs Analysis Results Based on Gender

Table 2. Needs Analysis

No	Statement of Technology Accessibility	Average	Needs Level
1	I need adequate digital devices (laptop/smartphone) to support online learning.	3.86	Very high
2	A fast and stable internet connection is essential to maximize online learning with microlearning.	3.94	Very high
3	I need an application or platform that is lightweight and easy to access via mobile devices.	3.59	Very high
4	I need access to applications that can be accessed anytime and anywhere.	3.67	Very high
5	I need technological aids such as good headphones or cameras to support online learning.	3.62	Very high
7	Statement of Microlearning Strategies		
8	Learning materials in the form of small modules (micro-content) are very necessary to facilitate my understanding.	3.29	Very high
9	I need short learning videos (micro-videos) to make it easier to understand the material.	3.38	Very high
10	Each learning material should be presented in the form of a short and interactive module.	3.36	Very high
11	Microlearning content that focuses on one concept or topic per module is very necessary to improve my focus.	3.37	Very high
12	I need a short quiz after each module to evaluate my understanding gradually.	3.39	Very high
	Edutechpreneurship Capabilities		
13	Materials related to technological innovation in education are essential to improve my entrepreneurial skills.	3.30	Very high
14	I need materials relevant to entrepreneurship in educational technology (Edutechpreneurship).	3.33	Very high
15	I need practice-based projects or assignments to improve my edutechpreneurship skills.	3.25	Very high
16	I need real-life examples of educational startups to learn more about entrepreneurship in edutech.	3.29	Very high
17	Project-based learning is essential to hone my entrepreneurial skills.	3.28	Very high
	Statement of Interactivity in Learning		
18	I need an online discussion feature (forum, chat) that facilitates active communication between students and lecturers.	3.33	Very high
19	I need a direct Q&A feature with the lecturer through the platform used for learning.	3.23	Very high
20	I need quick feedback from the lecturer regarding the assignments I have completed.	3.36	Very high
21	I want to get the opportunity to collaborate with fellow students through online group projects.	3.18	Very high
22	Automatic feedback through the learning platform is essential to monitor my progress.	3.33	Very high

No	Statement of Technology Accessibility	Average	Needs Level
	Statement of Learning Flexibility		
23	I need flexible learning in terms of time so that I can study according to my own schedule.	3.48	Very high
24	I need access to materials that can be studied from anywhere, anytime, without being limited by location.	3.61	Very high
25	I need microlearning materials that can be accessed via mobile devices (smartphones or tablets).	3.43	Very high
26	Online learning that can be adjusted to my daily activities is very important for my learning success.	3.28	Very high
27	I need flexibility in choosing when to do assignments or take quizzes according to my free time.	3.35	Very high

The results of the questionnaire analysis showed that respondents had a high need for an online learning model based on microlearning strategies, with good access to technology, adequate devices, and easy-to-use applications on mobile devices. Microlearning is considered effective because it presents short modules and interactive videos that support understanding. Content quality is a top priority, with the need for up-to-date, informative, and diverse format materials, as well as interactivity through discussions, Q&A, and collaborative projects to maintain active engagement. Flexibility of time and place is also important so that learning can adjust to respondents' schedules and busyness. After that, Task Analysis is carried out to identify the skills and knowledge needed in the learning process, so that the material can be arranged systematically. This analysis ensures that each stage of learning is designed logically and effectively so that students can easily master the necessary skills.

Table 3. Task Analysis

Task Analysis	Description
Accessing the Cyber Learning Platform	Students need to learn how to access the cyberlearning platform using mobile or desktop devices.
Following Microlearning Modules	Students must follow short learning modules (micro-learning) independently in sequence.
Managing Independent Learning Time	Students are expected to develop flexible and efficient learning time management skills.
Gaining Knowledge and Using Edutechpreneurship	Edutechpreneurship is a notion that students must grasp and how to implement in the framework of educational technology.
Participating on Platform Discussions and Social Interactions	To deepen knowledge, students are asked to actively participate in online forums, group projects, and Q&As.
Completing Collaborative Project Assignments	Students need to work together on projects that apply the principles of edutechpreneurship using online learning media.
Measuring and Assessing Abilities Through Digital Tests and Evaluations	Students take cyber learning-based tests and evaluations to measure improvements in understanding and skills.

Concept Analysis is done to identify and organize the main concepts in the material so that the relationship between concepts can be understood comprehensively. This analysis ensures that concepts are not presented separately, but are interconnected to form a complete understanding. In microlearning, for example, Concept Analysis helps students understand not only the benefits of videos and short modules but also how these elements contribute to an interactive and flexible learning process. Thus, students can see the big picture of the material and understand how each concept supports learning outcomes.

Table 4. Analysis Concept

Analysis Concept	Description of Concept
Cyber Learning	Learning is conducted online, utilizing digital platforms as the main media.
Microlearning Strategy	Learning techniques that use short modules and short videos to deliver core material quickly and effectively.
Edutechpreneurship	Entrepreneurial skills and insights in the field of educational technology, including the development of digital educational products and solutions.
Interactivity in Digital Learning	Active student involvement through interactive features such as discussions, direct Q&A, and collaborative projects.

Analysis Concept	Description of Concept
Technology Accessibility	Availability of adequate technology, including mobile devices and internet connections to support cyber learning.
Online Learning Flexibility	The ability of students to organize their time and place of study according to their busy schedules increases learning comfort.
Quality of Digital Learning Content	Provision of up-to-date, informative materials presented in a format that is appropriate for various student learning styles.

After completing the task and concept analysis, the next stage is Specifying Instructional Objectives, which is formulating instructional objectives based on the results of all previous analyses. These objectives serve as a guide in designing learning evaluations and describing the skills or knowledge that students are expected to achieve. The final step in this Define stage is to compile the Data Model to be developed, which includes the information needed to support the implementation of the instructional objectives that have been set. This data model will later become the basis for developing an effective learning system or device.

4.1. Define

The Design stage in the development of a microlearning-based Cyber Learning Model aims to design an effective learning model to improve students' edutechpreneurship skills. This process begins with the construction of a Criterion-Referenced Test to measure learning achievement according to standards, followed by the preparation of evaluation instruments such as questionnaires, rubrics, and product feasibility tests. Furthermore, Media Selection is carried out to select media that support the microlearning strategy, including short videos, infographics, gamification, PPT, and reading materials, so that the material is easier to understand and increases student engagement.

Table 5. Edutechnopreneurship Media

Meetings	Materials	Video	Info graphs	Gamification	Slide Power Point	Reading Materials
1st	Introduction to Edutechpreneurship (Understanding the definition, concept, and scope of edutechpreneurship. Discussion on the development of edutechpreneurship and the differences with traditional entrepreneurship).	✓	✓	✓		✓
2nd	Trends and Opportunities in Digital Education (Analysis of educational needs in the digital era. Research on technology trends and market needs in the education industry).			✓	✓	✓
3th	Market Research and Needs Identification in Edtech (Market research techniques to find opportunities in the edutech field. Practical activities: Case studies and simulations of Edutech market research).			✓	✓	✓
4th	Business Models in Edutech (Understanding common business models in edtech startups. Using the Business Model Canvas to design an Edutech business).			✓	✓	✓
5th	Idea Development and Product Validation (Brainstorming edtech product ideas and market validation techniques. Lean Startup and Customer Development techniques to validate ideas).			✓	✓	✓
6th	Utilization of the Latest Technology in Edtech Products (Understanding AI, VR, AR, and gamification technologies in edtech. Discussion of successful edutech startup case studies with the latest technology).			✓	✓	✓
7th	Prototyping Edtech Products (Steps in building an edtech product prototype. Practical activity: Creating a simple prototype with digital tools).		✓	✓		✓
8th	Marketing Strategy for Edtech Products (Digital marketing strategies and the use of social media for		✓	✓		✓

	Edutech. Discussion on promotional techniques specifically for educational products).				
9th	Branding and Product Identity Development (Building a strong brand and identity for edtech products. Exercise in building brand positioning for proposed edtech products).		✓	✓	✓
10th	Funding for Edtech Startups (Understanding various funding sources and how to attract investors. Discussion on accelerator and incubator programs specifically for Edutech).		✓	✓	✓
11th	Legality and Ethics in Edtech (Becoming aware of regulations, licensing, and data privacy issues in Edutech. Discussion on ethical challenges in the use of user data).		✓	✓	✓
12th	Measuring the Impact and Efficacy of Edtech Products (Methods for measuring the effectiveness of technology-based educational products. Exercise in designing an Edutech product impact evaluation instrument).	✓	✓		✓
13th	Project and Team Management in Edtech Startups (Managing Edutech projects and multidisciplinary teams. Discussion on managing time, resources, and workflow in startups).	✓	✓		✓
14th	Pitching and Presentation of Edtech Products (Effective pitching techniques to attract investors. Simulation of Edutech product presentation in front of the class).	✓	✓		✓

In the next stage, Format Selection is carried out to determine the most appropriate format to support cyber learning, namely integrating the selected media into an easily accessible online platform and creating a learning platform using Moodle that has been modified according to the needs analysis carried out previously. The cyberlearning platform that is developed can be accessed on the page https://cyberlearn.id/. Materials and activities are arranged with a gamification concept, allowing them to follow a sequential and structured learning path while still supporting independent learning, where learners can complete the learning at their respective learning speeds.

4.2. Develop

The Cyber Learning Model based on the Microlearning Strategy was developed to improve students' Edutechpreneurship skills through several main components.

The model syntax emphasizes breaking down material into small, independent modules. The social system includes collaboration between students, lecturers, and technology through an LMS or online platform. The reaction principle provides immediate feedback for each module, helping students understand the material better. The supporting system includes technology infrastructure, internet access, and learning media such as videos, infographics, and quizzes to increase learning flexibility. The instructional impact of this model increases students' understanding of the digital education market, business opportunities, and basic business concepts in the Edutech field, as well as training in independent learning, time management, and discipline.

The expert trial phase ensures that this model meets quality standards in content validity, learning design, functionality, and ease of use. The evaluation shows that this model has an attractive design, easy navigation, and good interactivity, but needs improvement in design consistency, multimedia integration, and the addition of clearer subtitles. In addition, early recognition of students' abilities and learning styles is recommended to support learning personalization. Overall, this model is considered feasible and valid with some improvements for more optimal results.

The results of expert trials on the content and relevance aspects of the microlearning-based Cyber Learning Model indicate that this model has met most of the indicators expected to support the improvement of students' edutechpreneurship skills. The material presented is considered relevant to learning needs, and the microlearning modules have been linked to specific skills needed in edutechpreneurship, although some aspects can be refined for greater depth in delivering the material. The level of readability and clarity of instructions in this model is also very good, with language that is easy to understand and appropriate for students' academic contexts

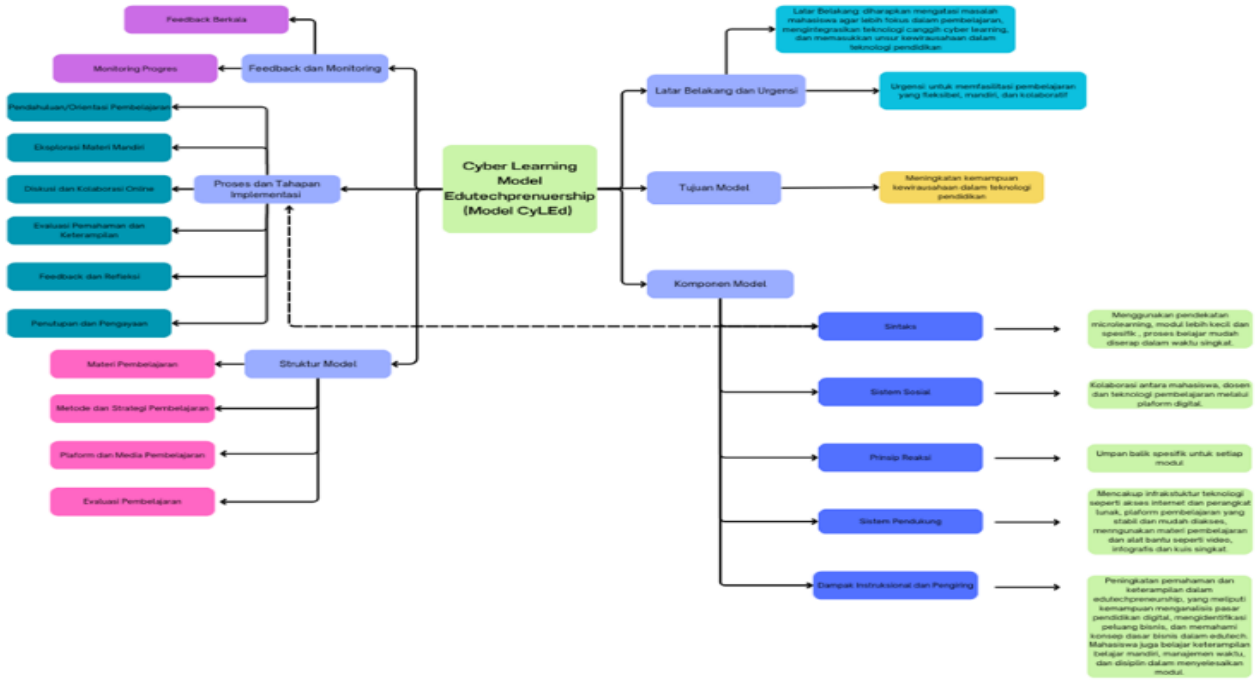

Figure 2. Cyberlearning Design Model

Table 6. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.241	27	.000	.863	27	.002
Posttest	.212	27	.003	.845	27	.001

The Pretest and Post-test data are not normally distributed based on the outcomes of the normality test applying Kolmogorov-Smirnov and Shapiro-Wilk. The significant value (Sig.) in both approaches—all less than 0.05—both for Pretest (Kolmogorov-Smirnov: 0.000; Shapiro-Wilk: 0.002) and Post-test (Kolmogorov-Smirnov: 0.003; Shapiro-Wilk: 0.001). Thus, the assumption of normality is not met in these two groups of data. Therefore, if further statistical analysis is to be carried out, the non-parametric test method is recommended to be used because it is more appropriate for the characteristics of data that are not normally distributed.

Table 7. Non-Parametric T-Test

Null Hypothesis	Test	Sig.	Decision
The median of the difference between the pre-test and post-test equals 0	Related samples Wilcoxon signed rank test	.000	Reject the null hypothesis

Null Hypothesis Summary. Asymptotic significance is displayed; the significance level is .05.

The null hypothesis was disproved when the analysis employing the Wilcoxon Signed Rank Test revealed a significance value of 0.000 (less than $\alpha = 0.05$). The pretest and post-test scores differ significantly, suggesting that the intervention or therapy applied affects changes in responder data. Stated differently, using the Cyber Learning Model has shown success in raising the Edutechpreneurship abilities of students. Combining educational technology with entrepreneurship, the idea of Edutechpreneurship creates chances for creative ideas in online learning systems. In the

framework of online learning, this idea can be rather helpful since it promotes the development of tools and platforms that improve the learning process and inspire entrepreneurial abilities among the students. An essential component of edutechpreneurship is including entrepreneurial instruction in the online learning structure.

Evaluations of cyberlearning models that currently focus on pre-tests, post-tests, and surveys are indeed effective in measuring immediate improvements in learning outcomes. However, this approach is still limited to the cognitive and perceptual aspects of participants. To gain a more comprehensive picture of the model's effectiveness, behavioral analytics should be added, such as tracking student interactions with the platform, the duration of time spent on each module, and participation patterns in online learning activities. Furthermore, long-term follow-up of students' entrepreneurial outcomes—for example, the extent to which they apply edutechpreneurship skills in the real world—would provide a deeper understanding of the model's lasting impact on the development of digital entrepreneurial competencies and independence.

Studies have shown that while online platforms can provide entrepreneurial knowledge, practical experience is essential for effective learning (Fidan, 2023). This implies that Edutech solutions should not only concentrate on academic issues but also give chances for students to participate in practical entrepreneurship. Project-based learning—where students create a company plan or participate in simulations replacing real-world entrepreneurship challenges—can be included in online courses. Further clarifying the dynamics of the cyberlearning environment, the established cyberlearning model has also considered the community of inquiry model, which stresses the relevance of social, cognitive, and instructional presence

This model states that the effectiveness of the cyber learning experience is moderated by extrinsic factors such as content richness and perceived ease of use (Lee & Faulkner, 2011). The integration of these elements is essential to foster an engaging learning environment that encourages deeper learning and critical thinking among students (Wang, 2021). Furthermore, the role of metacognition in e-learning cannot be ignored; learners' self-regulation and cognitive experiences significantly impact their engagement and success in the online learning environment (Mwambe & Kamioka, 2019).

The microlearning strategy used in this model is considered effective in improving edutechpreneurship skills because small, continuous modules facilitate gradual learning and support progressive understanding (Means et al., 2013). In addition, this model is considered to be in line with the main objectives of developing edutechpreneurship and includes key topics that are interrelated to build an integrated understanding. Students can be actively involved in the learning process, and each activity is designed to increase their interest and motivation to learn.

This model also provides practical exercises that allow students to apply the skills learned in real contexts (Maddox et al., 2018), although some aspects of the practice could be improved to be closer to the real world. Relevant evaluations are also provided to measure students' edutechpreneurship skills, and assessment instruments can provide constructive feedback for further skill development. In terms of technology, the Cyber Learning Model is considered very good at utilizing technology that supports online learning and is easily accessible to students through various devices (Koe et al., 2023). In conclusion, although some aspects need improvement, this model is quite effective in supporting students' edutechpreneurship learning in a sustainable and relevant manner. The input from material experts stated that learning should be directed at implementing a comprehensive project for one semester so that the completeness of understanding of the concept is completed, then entering the development of a product prototype, and also the material is very interesting and complete, but a more in-depth study of the material is needed.

Moreover, the combination of cyberlearning and microlearning facilitates data collection and analytics, providing insights into learner behaviour and outcomes that can inform the continuous improvement of educational programs. The integration of microlearning into online platforms has been shown to positively impact student motivation by providing engaging, relevant content that meets learners' immediate needs (Nikou & Economides, 2018). Microlearning modules' interactive approach helps boost natural drive by encouraging a sense of accomplishment and advancement. Microlearning's emphasis on repetition and reinforcement helps to move material from short-term to long-term memory, therefore promoting knowledge retention. Content's accessibility lets students review it as needed, therefore enhancing their recall and mastery of the topics (Marinskaya, 2020).

Experts evaluation of the relevance of microlearning materials and modules showed that the materials were quite relevant to improving students' Edutechpreneurship with a deep understanding (average score of 3.5 or valid), although the relevance could still be improved. In terms of ease and student engagement, the instructions were easy to understand, the activities allowed for active engagement (score 4, valid), and the language was appropriate to the academic context (score 3.5, valid but needs improvement). The Microlearning strategy was considered very effective in improving

Edutechpreneurship skills with small modules that support continuous learning (score 4, valid). Continuity and integrated understanding were also considered good, with materials that had inter-topic connections to support holistic understanding (score 4, valid). In terms of Practical Exercises and Evaluation, the exercises were considered quite relevant for the application of Edutechpreneurship skills (score 3.5, valid), but the evaluation could still be improved to be more optimal in measuring students' skills. In terms of Technology Accessibility, the platform and technology used were easily accessible and supported cyberlearning effectively (score 4, valid), ensuring a flexible and optimal learning experience. Overall, the microlearning-based Cyber Learning Model is considered valid and effective, with several aspects that can still be improved for more optimal results.

The microlearning strategy used in this model is considered effective in improving edutechpreneurship skills because small, continuous modules facilitate gradual learning and support progressive understanding. In addition, this model is considered to be following the main objectives of developing edutechpreneurship and covers key topics that are interrelated to build integrated understanding. Students can be actively involved in the learning process, and each activity is designed to increase their interest and motivation to learn.

This model also provides practical exercises that allow students to apply the skills learned in real contexts (Maddox et al., 2018), although some aspects of practice can be improved to be closer to the real world. Relevant evaluations are also provided to measure students' edutechpreneurship skills, and assessment instruments can provide constructive feedback for further skill development. In terms of technology, this Cyber Learning Model is considered very good at utilizing technology that supports online learning and is easily accessible to students through various devices (Koe et al., 2023; Means et al., 2013). Some aspects need improvement, This model is quite effective in supporting students' edutechpreneurship learning in a sustainable and relevant manner. Meanwhile, input from material experts stated that learning should be directed at implementing projects comprehensively for one semester so that the understanding of the concept is completed, then enter the development of product prototypes, and also the material is very interesting and complete, but a more in-depth study of the material is needed.

A needs analysis for the implementation of a cyberlearning model utilizing microlearning methodologies to develop Edutechpreneurship skills would entail identifying specific needs, deficiencies, and requirements within the target learner demographic, with institutional competencies. Employing a cyberlearning model alongside microlearning strategies can markedly improve students' Edutechpreneurship competencies by offering them accessible, concentrated, and pragmatic learning experiences. This method equips students with entrepreneurial and technological competencies, preparing them to innovate and enhance the future of educational technology.

Some studies support this study, conveying that microlearning has been shown to enhance learning outcomes in online courses, which is beneficial for complex, skill-based topics such as EdTech entrepreneurship. The digitization of entrepreneurship entails a revised framework of assumptions regarding entrepreneurial processes and outcomes, as well as a more decentralized entrepreneurial agency. Consequently, these assumptions necessitate innovative theorization in entrepreneurship that would gain from the meticulous integration of theoretical viewpoints, concepts, and constructs related to digital technology (Nambisan, 2017). Real-time collaboration technologies in cyberlearning settings enhance engagement, teamwork, and the quality of collaboration. These abilities are essential for Edutechpreneurship (Schneider & Pea, 2017).

Micro-learning is a versatile educational technique that can be utilized to instruct a substantial audience across several platforms. Consumers complete lessons more rapidly due to micro-learning on mobile devices, which maintains elevated engagement levels by employing various media formats to fascinate consumers (Shail, 2019). Significant evidence supports the utilization of microlearning to augment students' behavioral and emotional involvement while enhancing their intrinsic motivation. Microlearning content enhances learning through visual segments and diminishes cognitive load while also increasing engagement due to the online platform's resemblance to a social media environment (Fidan, 2023). Microlearning can be utilized as an effective strategy to enhance learning outcomes (Monib et al., 2024).

These studies collectively support the findings that the integration of cyberlearning models with microlearning strategies can significantly augment Edutechpreneurship skills by offering a flexible, engaging, and pragmatic learning experience. The cyberlearning environment promotes technological proficiency, adaptability, and teamwork, whilst microlearning enhances retention, self-efficacy, and engagement with entrepreneurial material. Collectively, they provide a systematic yet adaptable framework that addresses the rapid, interdisciplinary requirements of EdTech entrepreneurship, preparing students with the fundamental skills necessary for success in this evolving domain. Furthermore, the uniqueness of the cyberlearning model utilizing microlearning methodologies is in its inventive method of fostering an engaging, adaptable, and pragmatic educational experience. Integrating digital technologies with

modern educational approaches efficiently prepares university students with the skills and mindset required for success in the edutech sector.

The study has implications for the incorporation of cyberlearning and microlearning into educational programs, particularly those that are centered on entrepreneurship within the Edu-Tech sector. This learning approach offers useful experience via digital entrepreneurship initiatives in addition to theoretical delivery. Combining Community of Inquiry (CoI) components in cyberlearning helps students to acquire in an interactive setting, critical thinking, cooperation, and problem-solving abilities. The microlearning approach lets them pick up knowledge gradually using small modules that facilitate ongoing learning. This strategy guarantees that students not only grasp the idea of Edutechpreneurship but also can implement it in practical contexts, such as creating digital goods and educational technology-based companies. This approach has benefits in terms of flexibility and accessibility, which allows students to study via digital devices anywhere and at any moment. Furthermore, the combination of learning analytics lets data-based evaluation track students' skill improvement more precisely. Therefore, this study helps to create a learning model that is not only successful in enhancing digital entrepreneurship abilities but also flexible enough for technological changes and the requirements of the contemporary education sector.

This study has limitations, namely that the model relies heavily on stable internet connectivity, which may not be available in underdeveloped regions. The study's generalizability may be limited to specific educational contexts. The study could cover particular demographics or educational contexts (e.g., university students in Edu-Tech disciplines) in some universities in Indonesia, potentially constraining the generalizability of the results to other populations. Measuring the direct correlation between cyberlearning and microlearning and professional success in Edu-Tech entrepreneurship is tough due to the complexity of success criteria and the influence of several external variables.

5. Methods

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The investigation indicates a significant demand for an online microlearning model that emphasizes technological accessibility, high-quality information, engagement, and flexibility. Microlearning, via concise modules and interactive videos, markedly improves comprehension and engagement. Task and Concept Analyses facilitate a systematic learning process and an in-depth comprehension of essential concepts, allowing students to apply learning outcomes proficiently. The Cyber Learning Model is designed to enhance edutechpreneurship abilities by integrating criterion-referenced assessments, evaluation tools, and interactive media, such as short movies, infographics, and gamification. The concept, available through an integrated Moodle platform, facilitates self-directed, adaptable learning. Expert evaluations validate the model's content, design, and functionality, accompanied by suggestions for enhancing design consistency, multimedia integration, and clarity. The model is successful and pertinent but should be further developed to improve depth, readability, and personalization for an optimal learning experience.

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