

THE EFFECTIVENESS OF MICRO-BASED BLENDED LEARNING MODEL IN HIGHER EDUCATION

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Abstract: This experimental research aimed to assess the effectiveness of a micro-based blended learning approach as a substitute for exclusive online learning within higher education. The research was conducted using a single-shot casework design with 70 lecturers across multiple universities in Istanbul, Turkey, as participants, selected via simple random sampling. Data was gathered through a 15-item questionnaire and analyzed using multiple regression. Results showed that the micro-based blended learning model enhanced effectiveness, with scores ranging from 93-96% compared to 70-74% prior to implementation. The model explained 85.20% of the variance in learning effectiveness following the pandemic. The micro-based blended approach is more effective and successful than solely virtual education. Integrating online and in-person micro-learning modules improved student outcomes, comprehension, engagement and expression. The study provides strong empirical evidence to support adopting the micro-based blended learning model as a viable alternative to fully online learning in the post-COVID-19 disruptions in higher education.

Keywords: Effectiveness, Microlearning, Blended learning, Model, Higher Education

INTRODUCTION

The COVID-19 disaster has profoundly affected the global higher education sector, resulting in significant disruptions to educational institutions worldwide. As a result, these institutions have been compelled to adopt online learning as a continuing education method (Joseph Paschal and Mkulu 2020). While this shift was necessary for the safety of students and faculty, it also highlighted the limitations and challenges of fully online education (Baum and McPherson 2019). As we look towards a higher education future, Blended learning, an essential topic to delve into, holds significant importance in higher education institutions as it can potentially establish an optimum educational setting (Ntim, Opoku-Manu, and Addai-Amoah Kwarteng 2021). Blended learning, an instructional strategy that integrates online and in-person learning methods, has the potential to provide a well-rounded educational experience for learners. By merging the advantages of virtual and physical instruction, It offers much freedom and customisation of online learning while retaining the valuable aspects of face-to-face interaction. This combination enables a personalized learning experience that meets individual needs and preferences (Okaz 2015). Blended learning allows students to have the convenience of accessing course materials and lectures online while also having the chance to get involved in experiential learning and discussions during in-person sessions (Welker and Berardino 2005). Community and student collaboration are at the forefront of this approach, creating space for valuable networking opportunities (Islam, Sarker, and Islam 2022). Additionally, Combining different instructive methods, blended learning caters to individual learning preferences and styles, enabling students to select their ideal learning environment (Waha and Davis 2014).

In reality, especially in the field of higher learning, the attainment of perfection is significantly undershot by the execution of blended education. There are many obstacles to the use of mixed learning in a higher-level education environment. One major challenge is that instructors need more training and support to effectively integrate technology into their learning methods (Rasheed, Kamsin, and Abdullah 2020). Moreover, such resistance may arise from students and faculty familiar with conventional classroom settings and hesitant to adopt innovative learning methods. In addition, the need for more technological know-how among educators inhibits the development of inventive learning methods, complicating their efforts to adopt dynamic instructional techniques (Alammary, Sheard, and Carbone 2014). This challenge can result in a lack of variety in learning methods and limited use of multimedia resources. Additional challenges arise when more technological resources and infrastructure are needed, hindering blended learning implementation effectiveness (Taylor and Newton 2013) and making it easy for instructors to integrate technology into their educational practices without any difficulty. In order to meet these challenges, adequate solutions are needed, such as providing adequate support and resources for instructors and students, which are key to achieving mixed learning success in a higher-level educational

environment. Of course, it becomes a necessity to combine a learning model. Integration of various models, like microlearning, completes blended learning. By breaking down content into digestible pieces, microlearning allows students to consume and easily retain them quickly (Díaz Redondo et al. 2021). This method can potentially augment the efficacy of blended learning by allowing students to access information when needed and at their individualised pace. Consequently, it fosters heightened engagement and enhances the retention of knowledge (Nikou 2019). The incorporation of mixed learning principles into microlearning can foster heightened student motivation and concentration, rendering it a valuable adaptation for higher-level educational contexts. The amalgamation of microlearning and blended strategies facilitates the creation of more compact, easily digestible modules that seamlessly contribute to a broader educational framework. This approach enhances student engagement and retention by enabling personalized learning experiences and fostering collaborative learning among students. Given the ongoing technological advancements and the increasing need for tailored educational approaches, the micro-based blended learning model emerges as a valuable solution within contemporary education. It is imperative to conduct a comprehensive assessment of the efficacy of a micro-based blended learning model in order to gain a deep understanding of its implications and advantages. Thoroughly researching and studying its effectiveness can unveil the merits of this innovative approach, which includes heightened student engagement, enhanced learning outcomes, and the ability to cater to individual needs. By carefully analyzing valuable student feedback and identifying areas for improvement, educators can develop best practices and guidelines for the successful implementation of this method across a wide range of educational settings. This study aims to analyze the effectiveness of adopting a micro-based blended learning model as a viable alternative for effectively replacing online education in higher education.

Research has consistently highlighted the significance of incorporating active learning and creative- thinking methods in education to enhance overall educational quality. By prioritising student engagement and critical thinking, active learning empowers students to participate in meaningful activities that foster deep understanding and retention. This approach has been proven to be extremely valuable for educators and individuals seeking to enhance student performance (Hernández-de-Menéndez et al. 2019). Promoting creative thinking in learning methods nurtures the growth of problem-solving abilities, innovative ideas, and critical thinking skills among students. (Li, Chen, and Kang 2022). Both approaches have demonstrated their ability to improve students' comprehension, retention, application of knowledge, and satisfaction with the entire learning experience. Mixed learning, which blends virtual and classroom instruction (Yu and Du 2019), has gained popularity in recent years as a way to promote active and creative thinking in learning methods in higher education. The blended learning model provides students with personalised and flexible learning experiences (Bouilheres et al. 2020), as they can access course materials and engage in online discussions. Integrating technology enhances engagement and collaboration through interactive multimedia resources, encouraging exploration and interaction (Serrano et al. 2019). Various challenges are faced by the blended learning model in higher education (Ngigi and Obura, n.d.). Such as limited training and support for teachers, resistance from students and faculty, and low creativity among teachers in designing learning strategies. The blended learning model faces these obstacles in higher education, discouraging its implementation from supporting blended learning; To create equitable learning experiences in a blended learning environment, instructors must proactively address structural and instructional barriers. Structural issues like inadequate WiFi access must be tackled, alongside strategies for course design, content, social interaction, and instructor-student connection (Taj 2023). Incorporating an equity mindset within a Positive Behavioral Interventions and Supports (PBIS) framework can also promote equitable practices, enhancing implementation through team structures and baseline data evaluation (Farley and Burbules 2022). At part of that various models are required, with the micro-based blended learning model being utilized in this context. It harnesses the advantages of both microlearning and Blended learning. Microlearning, on the other hand, entails using small units and short-term activities as a method of instruction (Hug 2005). By combining these approaches, educators can foster inclusive virtual environments and ensure diverse learners have equal opportunities for success

Microlearning is learning in bite-sized, small, easily digestible units (Fernandez 2014). This approach enables the delivery of concise- and easily digestible learning modules that seamlessly fit into a broader blended learning system (Leong et al. 2021). Individuals can better understand and engage with the material by breaking complex concepts into smaller, more manage-able pieces. This approach also enhances information retention. Moreover, the micro-based blended learning model allows students to customise their learning experience and concentrate on specific areas that require extra support or practice. This dynamic approach has been proven to enhance student outcomes and foster greater engagement and motivation (Nikou 2019). Incorporating micro-based blended learning enhances education by personalising it to accommodate each learner's diverse learning requirements and preferences. This approach also encourages collaboration and interaction among students, fostering the exchange of ideas, progress updates, and valuable insights (Zhang and Xu 2015). With continuous technological advancements and the increasing demand for personalised education, the micro-based blended learning model is undoubtedly a valuable solution in modern education (Adinda and Mohib 2020). Institutions offer students a more tailored and engaging learning experience (Dolasinski and Reynolds 2020). The flexibility of virtual learning is blended with the benefits of practical learning and direct interactions in this method (Lai, Lam, and Lim 2016). Introducing By integrating microlearning modules into the curriculum, students can easily access bite-sized and

interactive lessons tailored to their interests and learning objectives. This approach significantly enhances their overall learning experience.

The experimental research on microlearning was guided by the Theory of Learning in Micro, which emphasizes that learning is a continuous process best supported by smaller, focused learning resources and activities (Helmanto and Adri 2023). This theory provides a foundation for designing and developing microlearning by focusing on two main beliefs: knowledge and design. Additionally, the research incorporated Robert Gagné's nine events of instruction framework to maximize cognitive processing and learner engagement during online microlearning activities (Bal et al. 2023). The study aimed to determine how microlearning influences learning in the area of Social Science among secondary school students, utilizing a methodology that included creating content capsules for accessible and flexible learning experiences (Zamata-Aguirre et al. 2023).

Additionally, the blend of online and offline components allows for a more dynamic and well-rounded educational experience, enabling students to apply their knowledge in real-world settings and collaborate with peers and instructors (Wu et al. 2016). In the last few years, employing micro-based learning as a substitute for traditional online education at the higher education level has become increasingly familiar. This model offers flexible learning options and leverages technological advancements (Ahmad 2019). Many educational institutions have turned to this method to fulfil the demands of a varied student group. During disasters or when typical school environments are not available, accessing online course materials and participating in virtual discussions has become incredibly valuable. The micro-based blended learning model has gained popularity, especially among students who balance multiple responsibilities like work or family obligations. This approach offers convenience and accessibility for learners. However, it is essential to note that this learning mode may only be suitable for some students. Some individuals may struggle with the lack of interaction with learners and find it challenging to stay motivated without the structure of a physical classroom. The digital divide still exists, with some students lacking access to reliable internet or the necessary technology (Banerjee 2022). As educators, it is crucial to consider these limitations and provide alternative options to ensure all students have equal opportunities for success.

RESEARCH METHODS

In this study, quantitative research was conducted using an experimental methodology and a single-shot casework design. In experimental research, utilising the single-shot-case scenario concept is highly beneficial for evaluating measurement reliability and scientific validity (Kariman et al. 2019). In higher-level education, a single-shot-case scenario concept is applied to compare the impact of learning programmes before and after incorporating a micro-based blended learning design. The primary focus of this research is to enhance comprehension regarding the effectiveness of implementing micro-based blended learning approaches in higher education. An effectiveness questionnaire was designed to assess effectiveness. Additionally, Figure 1 illustrates the design scheme of the single-shot-case scenario concept employed in this research.



Figure 1. Single-shot casework design

RESULT AND DISCUSSION

As Figure 1 serves as a visual representation, elucidating that X symbolises the intervention employed as the independent variable and indicates the application of micro-based mixed-learning approaches in higher education. Simultaneously, O functions as an evaluative metric for assessing the execution and integration of the micro-based blended teaching model in higher education. The research was conducted across several universities in Istanbul, Turkey. The study's participants comprised 70 lecturers selected employing a simple random sampling technique due to the similarities observed among lecturers at state universities in Istanbul.

Respondents provided information through a questionnaire consisting of fifteen statements, and each statement was evaluated employing a Likert scale (Five points) ranging from One score (1) representing low to Five (5) score representing high. These statements and remarks were explicitly formulated to evaluate the execution and practical application of micro-based mixed-learning approaches in higher education. Furthermore, the questionnaires were disseminated to gather data and evaluate whether the respondents' effectiveness level in employing the micro-based blended learning model was high or low.

The data analysis process commenced with assessing the questionnaire's suitability to ascertain its validity and reliability, a procedure outlined by Bolarinwa (Bolarinwa 2015). For item validity assessment, the Pearson product-moment correlation validity test was employed. In parallel, the questionnaire's reliability was evaluated within this research using Cronbach's alpha equation, as illustrated in equation (1).

$$r_{11} = \left(\frac{k}{k-1} \right) \left(1 - \frac{\sum \sigma b^2}{\sigma \tau^2} \right) \quad (1)$$

Equation (1) indicates that r_{11} represents the reliability score of the instrument. In this equation, 'k' represents the total of parts into which a whole is divided, the $\sum \sigma^2$ represents the sum of item variances is used to measure the overall variability or dispersion of the data set, and σ^2 stands for the variances (Sharma 2016). The data analysis approach employed to address the research objectives involves comparing the effective functioning of learning activities before and after implementing the micro-based blended learning model, which is considered adequate and efficient when the learning effectiveness test results fall within the 80-100% range, Classifying the high level of effectiveness of the micro-based blended learning model. Classifying the medium level of effectiveness, it scored in the 70-79% range. Classifying the low level in scores below 70%, following the framework(Deschacht and Goeman 2015). Additionally, we conducted a regression analysis using SPSS software to evaluate the micro-based blended learning model's effectiveness in higher education.

QUESTIONNAIRE VALIDITY AND RELIABILITY

The questionnaire utilised in this study was validated by applying the Pearson product-moment correlation test. The correlation coefficients obtained for each questionnaire item, as presented in Table 1, were compared against the critical r-table value for the sample size of 15 participants, which is 0.36. All questionnaire items exhibited correlation values well above this critical value, with the minimum correlation being 0.884 for item 7. These high, statistically significant correlations indicate that the questionnaire successfully measures what it was designed to assess regarding the efficacy of the micro-based blended learning model. Since each item correlated strongly with the overall questionnaire score, evidenced by correlation values all exceeding 0.8, the questionnaire can be considered a valid instrument for evaluating the micro-based blended learning model based on the validity testing conducted.

Furthermore, a reliability evaluation was carried out to appraise the questionnaire's reliability as an instrument for gauging the efficacy of the micro-based blended learning model. This research utilised the Cronbach Alpha equation for the reliability analysis, and the assessment was facilitated through the SPSS software. The outcomes of this reliability examination for the questionnaire are delineated in Table 2.

Table 1. Results from the validation assessment of the questionnaire.

Number.	(C) Correlations	(SL) Significance level	(I) Interpretation
1	0.958	0.05	Valid
2	0.948	0.05	Valid
3	0.947	0.05	Valid
4	0.948	0.05	Valid
5	0.973	0.05	Valid
6	0.891	0.05	Valid
7	0.884	0.05	Valid
8	0.973	0.05	Valid
9	0.908	0.05	Valid
10	0.973	0.05	Valid
11	0.973	0.05	Valid
12	0.955	0.05	Valid
13	0.946	0.05	Valid
14	0.935	0.05	Valid
15	0.973	0.05	Valid

Table 2 reveals a reliability score of 0.988 for the questionnaire. When assessing the reliability of a measuring instrument using Cronbach's alpha equation, a coefficient value exceeding 0.60 indicates the instrument's reliability (Taber 2018). Questionnaires with Cronbach's alpha values above 0.60 are considered to have acceptable reliability. The analysis of this questionnaire yielded a Cronbach's alpha of 0.988, well above the 0.60 threshold. This high alpha coefficient indicates that the items on the questionnaire produce consistent results, demonstrating good reliability. Since the alpha value exceeded the commonly accepted standard, we can conclude that the questionnaire is reliable for measuring the effective functioning of the micro-based blended learning model in higher education. The high-reliability score proves that the questionnaire consistently measures the construct it was designed to assess. Therefore, the questionnaire can be deemed a dependable tool for evaluating the micro-based blended learning model based on the reliability analysis conducted.

Table 2. Outcomes of the questionnaire's reliability assessment.

Reliability statistics

Cronbach's Alpha N of items

0.988 15

THE EFFECTIVENESS OF THE MICRO-BASED BLENDED LEARNING MODEL

Following the effective development of the questionnaire during this research, the subsequent phase entailed its use to analyse the effective functioning of the micro-based blended learning model in higher education. The findings referring to the effective functioning of the micro-based blended learning model underline its good impact on educational activities in this era. This affirmative influence becomes clear when analysing the micro-based blended learning approach's effectiveness in higher education educational activities, as stated in Table 3.

Table 3. The percentage reflects the effectiveness of the micro-based blended learning model.

previous to implementing the micro-based blended learning model		Features evaluated	Subsequent to implementing the micro-based blended learning model	
Value	Percentage (%)		Value	Percentage (%)
258	73.71	Ability to attain learning objectives	326	93.14
245	70.00	The capacity to guarantee that learners feel fulfilled about the learning process	331	94.57
256	73.14	The capacity to guarantee that learners are more innovative in their learning experiences	333	95.14
262	74.86	Ability to harness the benefits of technological advances in the learning process	337	96.29
253	72.29	Ensuring that the information is more straightforward for learners to understand	332	94.86
256	73.14	The capacity to guarantee that the kids learn more	330	94.29
252	72.00	The capacity to guarantee that learners are more	329	94.00
259	74.00	The capacity to guarantee that learners get good learning outcomes in the learning process	336	96.00
258	73.71	Ability to guarantee that the learning process is	335	95.71
259	74.00	The capacity to guarantee that the learning	332	94.86
256	73.14	The capacity to guarantee that pupils obtain	334	95.43
254	72.57	The capacity to guarantee that learners are more	333	95.14
259	74.00	Providing a learning process saves money on	333	95.14
257	73.43	The capacity to guarantee that learners are more	334	95.43
261	74.57	The capacity to guarantee that the learning process is better and follows technology	335	95.71

The amalgamated learning approach demonstrates remarkable effectiveness, achieving an impressive rate of 96.29%. Concurrently, a pivotal juncture arises concerning the utilisation of technological advancements within the educational process preceding the adoption of the micro-based blended learning model, resulting in a rate of 74.86%. This research primarily concerns itself with gauging effectiveness in terms of its capacity to facilitate students' comprehension of study materials during the learning process. Prior to the integration of the micro-based blended learning model, the effectiveness was recorded at 72.29%. However, subsequent to the incorporation of the micro-based blended learning model, the effectiveness soared to 94.86%. These findings underscore the affirmative impact of employing the combined learning method in enhancing students' grasp of study materials. The exploration of its potential to foster flexible learning among students is equally intriguing. In this regard, the micro-based blended learning model stands out, boasting an impressive 94.29% effectiveness rate, a significant improvement over the pre-micro-based blended learning rate of 73.14%. Moreover, this study emphasises enabling students to express themselves more effectively in learning.

In this context, the micro-based blended learning model emerges as notably more effective, boasting an effectiveness rating of 94%. In contrast, the ability to facilitate optimal student expression within the learning process, prior to the adoption of the micro-based blended learning model, stood at a modest 72%. Moving on to ensuring favourable learning outcomes for students, it becomes evident that the micro-based blended learning model outperforms conventional methods, achieving an impressive 96%, while the conventional approach lags at 74%. This trend extends to enhancing the allure of the learning process, with post-micro-based blended learning

effectiveness surging to 95.71%, compared to the pre-micro-based blended learning figure of 73.71%. Furthermore, the quest for a more diversified learning experience also underscores the merits of micro-based blended learning, which records an effectiveness rate of 94.86% compared to the pre-micro-based blended learning figure of 74%. The significance of ensuring that students acquire information pertinent to their learning outcomes is unmistakable, with micro-based blended learning achieving an effectiveness rate of 95.43%, surpassing the 73.14% recorded before its implementation.

Additionally, cultivating greater student rigour and focus during the learning process yields impressive results, with post-micro-based blended learning scoring 95.14%, starkly contrasting to the pre-micro-blended instructional figure of 72.57%—moreover, this study's emphasis on economising learning resources. Post-micro-micro-based blended learning effectiveness reaches 95.14%, substantially improving compared to the 74% registered before micro-based blended learning implementation. The hypothesis testing from this research consistently reveals a common thread: respondents demonstrated intermediate outcomes when exposed to traditional learning methods, with scores ranging from 70.00 to 74.00. This, of course, was primarily due to the absence of any modifications. However, upon introducing the micro-based blended learning model, scores surged to a range of 93.14 to 96.00. Consequently, it is safe to assert that the micro-based blended learning model significantly enhances the effectiveness and efficiency of the learning process, resulting in highly satisfactory learning outcomes. Furthermore, this study offers valuable insights into. The effective functioning of the micro-based blended learning paradigm in higher education is elaborated in Table 4.

Table 4 in this study presents an overview of the efficacy of implementing the micro-based blended learning model in higher education, drawing on the outcomes of a regression analysis that yielded robust results, affirming a correlation with $R = 0.923$ and an explanatory power of $R^2 = 0.852$. To put it differently, the regression coefficients indicate that utilising the micro-based blended learning model in higher education accounts for 85.20% of the observed variance. In comparison, the residual of 14.80% is attributed to other influencing factors. The results support accepting the alternative hypothesis (H_a), as the significance level falls below 0.05, specifically at 0.006. This outcome signifies that the implementation of the micro-based blended learning model effectively exerts an influence on learning in higher education.

Table 4. The effectiveness of the micro-based blended learning model

R	Adjusted R Square	R Square	Std. error of the estimate	Statistics R Square Dif. F Dif.	Sig. F Dif.
.923	.8101	.852	7.764	.611 3.291	.006

This experimental study was conducted following the (1-SCS) conceptual research design to assess the micro-based blended learning model's effectiveness. To gauge the efficacy of this model, a questionnaire was developed specifically for this research and has been verified for both validity and reliability. This questionnaire can be employed by fellow researchers seeking to assess the effectiveness of learning models akin to the micro-based blended learning model in higher education. The development of this questionnaire, which is practical and dependable for evaluating the effective functioning of learning models, indirectly contributes to the field of education (Philipsen et al. 2019). It provides a valuable resource for researchers seeking valid and reliable measurement tools."

This study reveals a notable contrast with the findings of previous researchers. The outcomes of learning and discussions consistently achieved high scores, ranging from 93.14 to 95.00. In contrast, before implementing the micro-based blended learning model, the scores ranged from 70.00 to 74.00. These results underscore the fundamental need for diversified instructional approaches in education. It becomes evident that students benefit from various pedagogical methods to facilitate their rapid comprehension of the subject matter presented by educators. This observation aligns with established principles; monotony in learning can lead to disinterest, particularly among students with heightened curiosity (Burn 2017). It is unsurprising that implementing a micro-based blended learning model leads to substantially improved learning outcomes, as evidenced by consistently high scores. Students and instructors utilize many available technologies to facilitate learning. Although distance learning has advantages and disadvantages, health reasons necessitate distance learning using a micro-based blended model. With technology, distance learning via a micro-based blended model is achievable. E-learning incorporates electronic, digital, or internet technology (Arkorful and Abaidoo 2015). E-learning integrates digital content distribution and support services into an effective learning process (Cavus 2015). As such, e-learning enables learning anywhere, anytime, using computer-based tools or system (Pustika 2020). Combining e-learning with microlearning enhances the learning experience. Microlearning involves breaking down complex information into smaller, digestible chunks that learners can easily absorb. Blending e-learning with microlearning provides learners with short, interactive lessons tailored to their needs and preferences. This promotes engagement, knowledge retention, and efficient, effective learning.

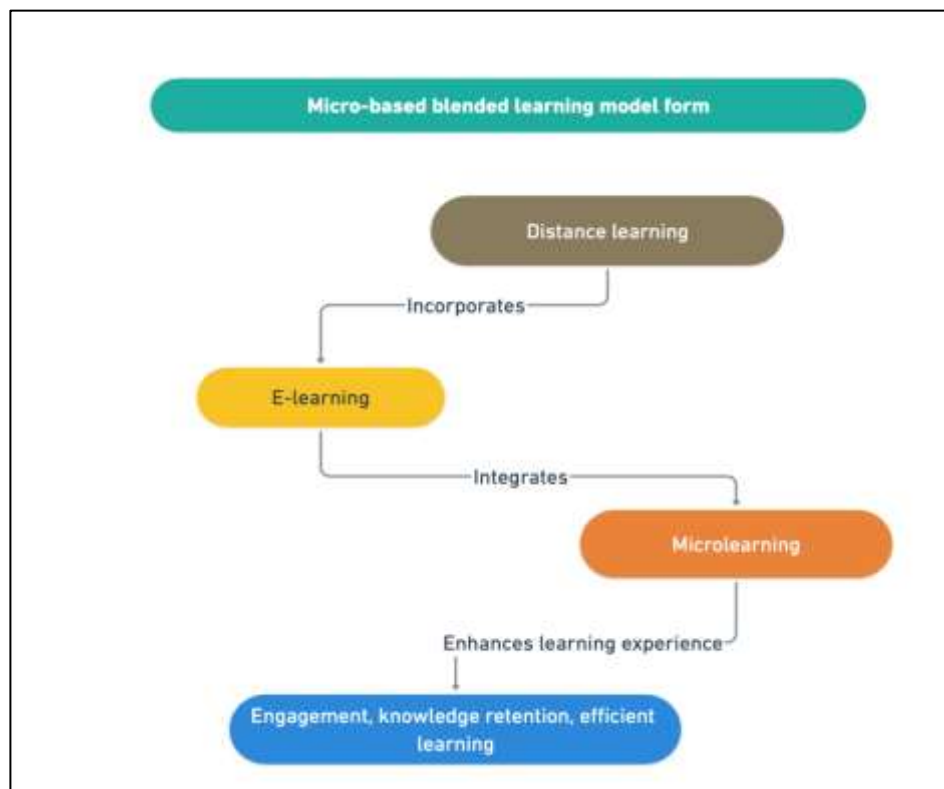


Figure 2. Micro-based learning model form

The study results align with the theoretical underpinning used by the researchers. The findings showed on figure 2 that adopting a micro-based blended model in Istanbul state universities improved higher education through blended learning by teachers and practitioners. This model focused more on enhancing knowledge quality and efficacy than appreciating blended expertise's beauty. The micro-based blended model also enabled easier parent supervision of student learning, indirectly grasping cognitive, emotional, and psychomotor development. The integrated strategy proved more effective, efficient, and straightforward. Hopefully, other schools will adopt this model, given the significant improvement in learning processes using a micro-based blended approach in higher education. Parents can also monitor children's learning. This research presents possibilities for utilizing a micro-based blended model in higher education.

CONCLUSION

This study found that employing a micro-based blended learning approach leads to greater efficacy in educational programs than before implementation. The research revealed that introducing blended learning positively enhances higher education learning activities. The results showed that a micro-based blended model could serve as an alternative learning paradigm in higher education. Additionally, teachers need variability in executing learning activities, which can make it easier for learners to grasp delivered content. Incorporating diverse learning methods also makes classes more engaging. In order to successfully employ a micro-based blended model, educators must possess the necessary competence, while students must possess a suitable level of background knowledge to engage effectively in micro-based blended learning. Researchers exploring related subjects can enhance and complement various methodologies and frameworks. Several limitations were evident in this study, primarily centred around its exclusive focus on respondents from higher education institutions and its reliance on descriptive data analysis. Future researchers exploring similar themes should consider conducting more extensive investigations within the overarching research area and adopting diverse research methodologies.

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