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Nursing Students' Readiness to Apply Flipped Learning: A Cross-Sectional Study

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ABSTRACT

Background: Flipped learning (FL) is a contemporary teaching approach that offers numerous benefits, particularly in the complex nursing educational environments. Assessing students' readiness for FL is essential to ensure its successful and satisfactory adoption. **Objectives:** To assess the readiness for implementing FL pedagogy in Egypt, particularly among nursing students, and to identify the factors influencing its adoption. **Methods:** The current study employed a cross-sectional descriptive research design, recruiting 372 nursing students from three different universities in Egypt to improve the generalizability of the findings. These institutions included Cairo University, Helwan University, and Misr University for Science and Technology. Data were collected using a self-administered questionnaire titled 'Nursing Students' Readiness for FL. **Results:** 75.2% of student's demonstrated moderate (above average) readiness, with an overall mean readiness score of 64.8%. Technical readiness was the highest (74%), while environmental readiness was the lowest (53.6%). There was a significant correlation between the readiness domains ($p < 0.001$). Academic level (B = 2.205, $p < 0.001$) and GPA (B = 5.705, $p < 0.001$) were influencing factor of readiness, with higher academic levels and GPAs linked to increased readiness. Conversely, gender, age, and university affiliation were not significant influencing factors. **Conclusion:** Nursing students demonstrated above-average readiness for adopting FL. The implementation of FL shows great potential, particularly if more attention is given to improving access to e-learning resources, providing technical support for students, and raising awareness among freshmen and those with lower academic achievement regarding FL and its benefits.

Keywords: Educational Pedagogy; Flipped Learning; Nursing Students; Readiness

INTRODUCTION

The complexity of the nursing care and learning environment has increased the need to incorporate the latest teaching methods in nursing education to improve knowledge, competencies, and learner outcomes (Baker, Cary & Da Conceicao Bento, 2021). One such method is flipped learning (FL), which has recently been adopted by many educational institutions, particularly in nursing, to prepare competent and proactive nurses who can meet the demands of increasingly complex clinical settings (Ni *et al*., 2024; Youhasan *et al*., 2021b).

Bergmann and Sams introduced the flipped learning (FL) approach in 2007, where students engage with learning materials before class, enabling classroom time to be used for deepening understanding through peer discussions and teacher-led problem-solving. This approach was later elaborated by Bergmann and Sams (2012). In a traditional classroom, nursing students are introduced to new knowledge during face-to-face sessions and then given take-home tasks to apply what they have learned, often with limited support. However, FL shifts this dynamic by having students learn foundational content beforehand, so class time can focus on applying and reinforcing that knowledge (Eustaquio & Gannaban, 2024; Masruddin, *et al*., 2024). This approach makes lecture time more efficient, especially in Egypt, where large student numbers often attend lectures due to shortage of faculty members compared to the number of students as a significant challenge in the

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Egypt education system (Ang, Afzal & Crawford, 2021; Sabry, 2024).

A core objective of FL is to transition students from passive to active learning, encouraging engagement through collaborative activities, peer learning, and problem-based learning, which may lead to increased student satisfaction, confidence, and improved academic performance (Masruddin, *et al*., 2024). In this approach, the role of the teacher shifts to that of a facilitator and coach, helping students take more responsibility for their own learning. Additionally, the integration of technology enhances the FL process, supporting the development of essential 21st century skills, such as digital literacy (Han, 2022).

Despite the noted benefits of FL, previous research has identified several challenges, including inadequate student preparation, as some may not engage with materials before class, and technological barriers, such as limited access to necessary devices and internet connectivity (Shi *et al*., 2020). Instructors may also struggle to adapt their teaching styles to a facilitator role, and classroom management can become difficult, particularly in larger groups. Additionally, assessment methods may need revision to align with active learning principles, and there may be resistance from students and educators to shift away from traditional methods (Masruddin, *et al*., 2024). Furthermore, the effectiveness of FL relies heavily on the quality of online resources, which can vary. Given these challenges, assessing student readiness is crucial before implementing the FL approach (Humrickhouse, 2021).

One of the concerns that mitigates the advantages of the FL model is the lower levels of student readiness for this new model. Research indicates that some students, particularly those usually used to teacher-Centered instruction, may show lower FL readiness (Baig & Yadegaridehkordi, 2023; Sınıf *et al.*, 2023). These students often require more structured guidance and feedback, especially to improve their self-regulated learning skills, which are essential for engaging in pre-class activities (Van Alten *et al*., 2020). Nevertheless, the implementation of the FL model remains uncommon in low-resource regions, such as African countries. While global studies have consistently demonstrated the benefits of FL in enhancing learning outcomes, research specifically addressing its readiness and implementation in Egypt and neighbouring regions remains limited (Polat, Hopcan, & Arslantaş, 2022; Rahman *et al*., 2015). Assessing readiness is a crucial preliminary step for ensuring the effective adoption and success of FL (Luo & Gan, 2022), as various contextual factors could hinder its applicability and effectiveness. It is essential to recognize that not all newly introduced innovative approaches are universally applicable, and their integration must be tailored to align with the unique needs and challenges of specific communities. Therefore, this study aims to assess the readiness for implementing FL pedagogy in Egypt, particularly among nursing students, and to identify the factors influencing its adoption. To achieve this aim, the study addresses the following research questions: (1) Are nursing students in Egypt ready to implement FL pedagogy? (2) What factors influence nursing students' readiness to adopt FL pedagogy in Egypt?

METHODOLOGY

Study Design

This study utilized a cross-sectional descriptive research design with a quantitative research approach conducted between July 2024 and September 2024 to assess nursing students' readiness to adopt FL pedagogy. This design is particularly suited for the exploratory nature and aim of the current study, as it allows for the efficient collection of data at a single point in time. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist guidelines for cross-sectional studies. Informed consent was secured from all participants prior to data collection.

Participants Sample and Setting

The research was conducted at three Faculties of Nursing in Egypt to ensure the generalizability of the study findings. These included two public universities, Cairo University (Cairo, Egypt) and Helwan University (Helwan City, Cairo, Egypt), and one private university, Misr University for Science and Technology(6th of October City, Giza, Egypt). All faculties are regulated by the Ministry of Higher Education. Nursing students across Egypt are required to complete a 4-year Bachelor of Nursing Science (BScN) degree, followed by a

mandatory 1-year internship to practice professionally.

A total of 372 nursing students were recruited for the study using a convenience sampling method to ensure accessibility to the target population. The sample size was determined based on a previous study, with a statistical power of 95% and an alpha error of 5% (Hao, 2016; Shanmugapriya *et al*., 2023). Inclusion and exclusion criteria were not specified in participant selection to preserve the diversity of the sample, ensuring that the study captures a broad range of nursing students' experiences.

Participation in the study was entirely voluntary, and participants had the right to withdraw at any time without any academic consequences. Informed consent was obtained prior to the commencement of the study, ensuring that all participants were fully informed of the study's purpose, potential risks, and benefits. The study was conducted in compliance with local Egyptian laws, with the rights and safety of participants safeguarded throughout. Anonymity was maintained by assigning each participant a unique identification number, and confidentiality was strictly maintained.

Measurement Tool

This study utilised a self-administered questionnaire entitled "Nursing Students' Readiness for Flipped Classroom" (NSR-FC). The questionnaire is an adopted tool designed by (Youhasan *et al*., 2021a). The questionnaire was specifically designed for nursing students and consisted of 20 items categorized into four domains: personal readiness (5 items), technical readiness (7 items), environmental readiness (5 items), and pedagogical readiness (3 items). These areas encompassed multiple elements pertaining to students' readiness for engaging in FL. Responses were quantified using a five-point Likert scale, from "strongly disagree" (1 points) to "strongly agree" (5 points). The total score represents the sum of responses across all items, with a total score of 100. Based on the students' total scores, those who score below 50% are considered to have low readiness, those scoring between 50% and less than 75% are classified as having moderate readiness, and those scoring 75% or higher are regarded as having high readiness. Completing the questionnaire required approximately 10-15 minutes, and it was administered online using Google Forms. The tool's construct validity was verified with a comparative fit index of 0.87, and its internal consistency reliability was determined using Cronbach's alpha, resulting in a coefficient of 0.9 (Shanmugapriya *et al*., 2023).

Data Collection Procedure

After obtaining the necessary administrative and ethical approvals for data collection, contact information for the students was acquired from the Student Affairs departments at the selected universities. The students were invited to participate in the study after a thorough explanation of the study's aims and benefits. The questionnaire was developed using Google Forms and began with a consent form. Participants indicated their consent by clicking "I agree" on the consent form before accessing the main questionnaire. All questions in the questionnaire were mandatory to ensure completeness and avoid missing data. The final form was then sent to willing participants via a link to their email addresses. To ensure the clarity and comprehensibility of the tool, a pilot study was conducted with 32 students. The purpose of the pilot study was to assess the tool's readability, and ease of use, as well as to identify any ambiguous or confusing items. This allowed for adjustments to be made to enhance the tool's effectiveness. Following this, the link to the questionnaire was distributed to all interested students. Those who had any questions were encouraged to email us, and they were assured of a response within two working days.

Data Analysis

Data were analysed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequency, percentage, mean, and standard deviation (SD), were used to summarize the data. The normality of the data was assessed using the Shapiro-Wilk test and histograms. Multiple linear regression was employed to examine the influence of demographic characteristics on students' readiness to adopt FL after verifying that all necessary assumptions were met. Statistical significance was set at $p < 0.05$.

Ethical Consideration

The researchers obtained ethical clearance from the Research Ethics Committee for Human from the

Faculty of Nursing, Helwan University, Egypt with reference number # 42/2024 on 14th July 2024.

RESULTS

A total of 622 nursing students were initially invited to participate in the study, with data from 372 students ultimately analysed. The reasons for participant dropout during the study process are presented in Figure 1. Nearly half of the participants were female (52.4%), and a significant portion were in their second academic year (37.4%). The participants had a mean age of 20.9 years, and 35.7% were affiliated with Helwan University (Table 1).

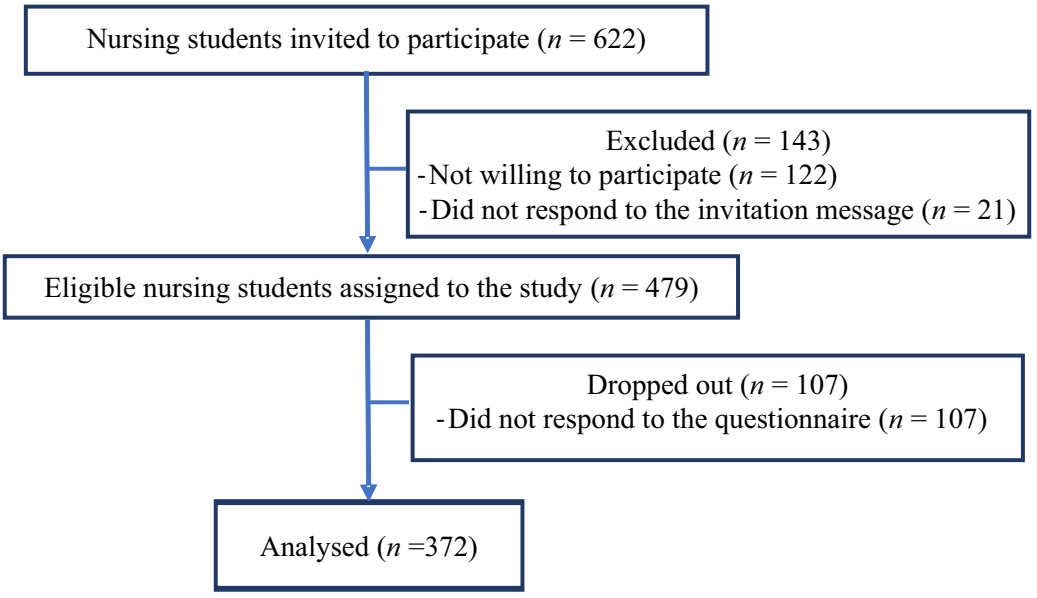

Figure 1: Flow Chart of Participant Enrolment

Table 1: Characteristics of the Studied Participants (n=372)

Demographic characteristics	n (%)
Gender	
Male	177 (47.6)
Female	195 (52.4)
Age (years old)	
Mean + SD	20.9 ± 1.46
Academic Characteristics	
Last semester GPA	
A	84 (22.6)
B	89 (23.9)
C	93 (25.0)
D	91 (24.5)
F	15 (4.0)
Academic Level:	
1st Level	113 (30.4)
2nd Level	139 (37.4)
3rd Level	80 (21.5)
4th Level	40 (10.8)
University	
Cairo	113 (30.4)
Helwan	133 (35.7)
MUST	126 (33.9)

The pie chart in Figure 2 indicates that a substantial majority of students (75.2%) show a moderate level of

readiness, while a smaller proportion demonstrates low (18.3%) or high (6.5%) readiness levels. In examining the mean scores across the four readiness domains, the bar chart reveals that "Technical readiness" achieves the highest mean score (25.9/35), representing 74%, whereas "Environmental readiness" records the lowest mean score (13.4/25), resulting in 53.6%. A highly significant correlation was found between the four domains, with a *p*-value of <0.001. The overall mean readiness score across all domains is 64.8%.

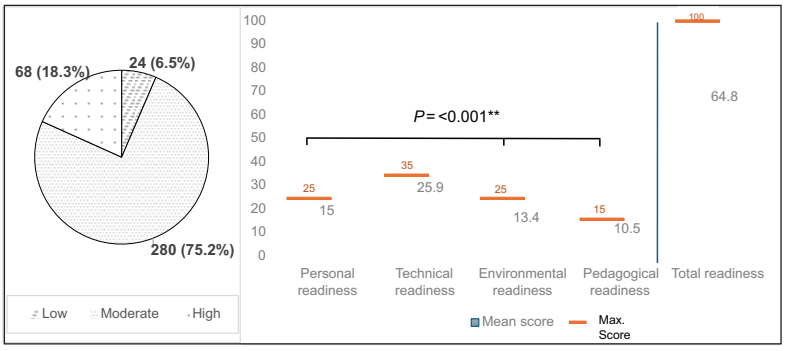

Figure 2: Overall Distribution of Students' Readiness Levels with The Mean Scores in Different Readiness Domains

The participants' responses to each item in the readiness assessment questionnaire varied, as indicated by the mean scores, with a maximum possible score of five for each item. The highest mean scores were observed in the following items: "I can download files from the internet" (mean = 4.3±0.89), "I have learned and am familiar with learning from video lectures" (mean = 4.1±1.03), and "I can operate the Google Classroom app to watch or listen to study materials" (mean = 4.0±0.48). Conversely, the lowest mean scores were recorded for items such as "I have access to an internet connection at the college/university" (mean = 2.1 ±0.43), "I can search for the information I need from online resources" (mean = 2.1±0.3), and "Technical help is available for e-learners at the university" (mean = 2.3±0.66) (Figure 3).

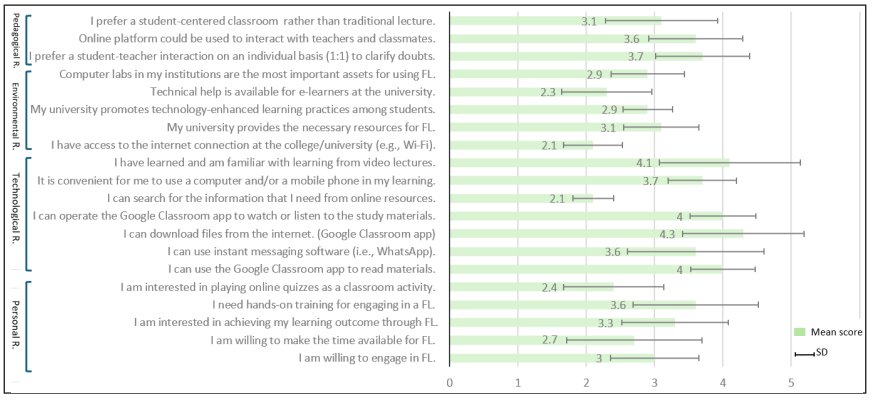

Figure 3: The Participants' Responses to Each Item in the Readiness Assessment Questionnaire

The results of the multiple linear regression analysis demonstrate the key factors influencing nursing students' readiness for FL. The model explains 71.5% of the variance in readiness (Adjusted $R^2 = 0.709$, $p < 0.001$). Academic level significantly affects readiness (B = 2.205, $p < 0.001$), with higher readiness in the 4th academic level (mean = 70.2) compared to the 1st level (mean = 62.7). Last semester's GPA also significantly predicts readiness (B = 5.705, $p < 0.001$), with a higher GPA associated with higher readiness; students with an "A" grade had the highest mean readiness score (75.1), while those with an "F" had the lowest (52.0). In contrast, gender did not significantly influence readiness (B = 0.367, $p = 0.417$). Similarly, university affiliation (B = 0.855, $p = 0.063$) and age (B = 0.367, $p = 0.417$) were not significant predictors of students' readiness for FL (Table 2).

Table 2: Multiple Linear Regression Analysis of Factors Influencing Nursing Students' Readiness for FL

Model			B	β	*t*	Sig.	*R*	R^2	Adjusted R Square	*F*	*p*
Dependent variable	**Independent variables Mean (SD)**										
Nursing students' readiness for FL (Mean score)	(Constant)		66.309		7.72	0.00	0.884	0.715	0.709	116.7	<0.001
	Gender		0.367	0.058	0.812	0.417					
	Male	65.1(9.55)									
	Female	64.6 (9.14)									
	Academic level		2.205	0.228	3.312	<0.001					
	1st Level	62.7 (4.16)									
	2nd Level	63.1 (12.43)									
	3rd Level	68.2 (7.3)									
	4th Level	70.2 (6.87)									
	University		0.855	0.073	2.137	0.063					
	Cairo	64.3 (10.22)									
	Helwan	65.11 (9.05)									
	MUST	64.9 (8.82)									
	Last Semester GPA		5.705	0.728	22.430	<0.001					
	A	75.1 (5.73)									
	B	67.9 (7.43)									
	C	61.4 (6.83)									
	D	57.8 (4.89)									
	F	52.0 (6.36)									
	A										
	[a]**Age**		0.367	0.058	0.812	0.417					

β=Standardized regression coefficient; B=Unstandardized regression coefficient; SD=Standard deviation; aContinuous variable

DISCUSSION

As far as available literature, this is the first study in Egypt and the Middle East to quantitatively assess nursing students' readiness to adopt FL and identify the factors influencing this readiness. The findings revealed that the majority of nursing students demonstrated a moderate level of readiness overall, with a mean readiness score of 64.8%. This suggests that the students are generally 'above average' in their readiness for FL. While they appear to be adequately prepared, they are not at an advanced or highly proficient level. This finding is consistent with the previous study conducted by (Hao, 2016), which aimed to assess students' readiness for FL, and found that students' readiness levels were slightly above neutral. On the other hand, other studies have found that nursing students, particularly from current generations, exhibit a high readiness for FL due to their familiarity and preference for using technology as "digital natives," (Shanmugapriya *et al*., 2023; Youhasan *et al.*, 2021a).

It is contended that the moderate level of readiness may be attributed to a lack of awareness and understanding among students regarding the significance of the FL model. Furthermore, most nursing students in Egypt are likely more familiar with traditional lecture-based learning. Consequently, the FL model, which emphasizes self-directed learning and increased online engagement, may be a relatively new approach for these students (Elhabashy & Moawad, 2024). Additionally, FL shifts both teaching and learning styles from passive listening to active problem-solving roles. As a result, students may not have fully developed the skills necessary for this mode of learning, such as critical thinking, time management, and independent study. Literature suggests that a lack of communication self-efficacy and motivation for learning are factors that may contribute to decreased readiness for FL (Hao, 2016). Moreover, some studies indicate that students are often reluctant to engage independently in planned activities, particularly those involving practical education, which could also impact their readiness levels (Ahmad, 2021; Jiang & Jong, 2020).

The study suggests that the four domains of readiness for FL—personal, technical, pedagogical, and environmental—are strongly interconnected, with each domain influencing the others. For instance, a technically skilled student may still face challenges if environmental readiness is lacking, underscoring the need for a holistic approach to readiness. This interrelationship highlights that isolated improvements in one domain are insufficient for FL success; instead, a comprehensive strategy addressing all domains is essential. These findings emphasise the complexity of implementing FL, where individual, technological, and institutional factors must align to create a supportive learning environment. Moreover, this interconnectedness can guide

educators and policymakers in designing targeted interventions that address multiple readiness aspects simultaneously, fostering a smoother transition to FL. This finding aligns with Youhasan *et al*., (2021a), who assessed the feasibility of flipped classroom pedagogy in undergraduate nursing education in Sri Lanka and confirmed the interrelated nature of the four readiness domains.

Among the four readiness domains assessed, technical readiness emerged as the strongest. This suggests that students feel confident in their ability to use technology, such as downloading files and operating e-learning platforms like Google Classroom. This is unsurprising, given the increasing use of technology, cell phones in education globally and the digital proficiency of current student generations. This result is consistent with previous research, where Hao (2016) reported that students generally indicated a slightly above-neutral readiness for flipped learning, and Shanmugapriya *et al*. (2023) found that most novice nursing students validated a moderate level of readiness towards FL, particularly showing confidence in consuming educational technologies. However, the lowest domain was related to environmental readiness, such as limited internet access at universities or inadequate technical support, indicating that students face challenges in their learning environments. This may be attributed to the large number of enrolled students, which exceeds the capacity of the faculty's computer labs, technical equipment, and e-learning support. This result is consistent with findings from Shanmugapriya *et al*., (2023) and Youhasan *et al*., (2021b).

Both academic level and GPA were significant factors influencing students' readiness for FL. An increase in academic level corresponds to greater readiness for FL, with fourth-year students demonstrating the highest levels of readiness. This is likely attributed to their accumulated exposure to self-directed learning, which enhances their academic maturity and experience. Fourth-year students also tend to engage in more complex coursework, requiring higher levels of independent study and critical thinking, naturally preparing them for the demands of FL. This result aligns with Hao (2016) who found that junior students displayed significantly higher readiness levels, likely due to greater self-efficacy and motivation.

In relation to GPA, the study showed that students with higher GPAs exhibited greater readiness for FL. This finding corresponds with the research by Polat, Hopcan and Arslantaş (2022) which indicated a positive correlation between students' academic achievements and their readiness for FL. In contrast, demographic factors such as gender, university affiliation, and age were not found to be significant influencing factors. This suggests that readiness for FL is shaped more by academic-related factors rather than demographic variables, a finding consistent with Cho and Kim (2021) who also highlighted the demographic factors such as age and gender not affecting FL readiness.

Limitation

While the sample of 372 students provided a strong foundation for analysis, broader representation from diverse regions could enhance future studies. Self-reported readiness scores, though valuable, may benefit from validation through objective assessments. This cross-sectional study identified key influencing factors, but longitudinal research could offer deeper insights into their evolution. Additionally, considering external factors like socioeconomic status and residence may provide a more comprehensive understanding. Finally, although online data collection facilitated wide participation, integrating face-to-face follow-ups in future studies could enhance the verification of students' learning environments and experiences, thereby improving the overall rigor and validity of the research.

CONCLUSION

This study provides valuable insights into the readiness of nursing students in Egypt for adopting FL. The findings reveal that the majority of students demonstrate a moderate (above-average) level of readiness, with technical readiness scoring the highest and environmental readiness the lowest. Academic factors such as academic level and GPA significantly influence students' readiness, while sociodemographic factors like age, gender, and university affiliation were not significant. The study suggests that utilizing FL in nursing education in Egypt could be highly beneficial if institutional support is improved. Enhancing access to e-learning resources, such as providing Wi-Fi and technical support within faculties, and increasing the awareness of both students and faculty about the advantages of FL could significantly enhance its efficiency.

Future research could examine FL implementation across various regions of Egypt, comparing public, private, and national institutions to assess differences in readiness and outcomes. Further studies could explore FL's impact on student learning, engagement, and satisfaction, as well as faculty development and institutional support. FL's alignment with evidence-based nursing education makes it a valuable tool for fostering active learning and critical thinking in clinical practice. Comparing its application in nursing to other professional disciplines could offer additional insights into its benefits and challenges.

Recommendation

Based on the findings of this study, it is recommended that nursing education institutions in Egypt focus on improving environmental readiness for FL by enhancing access to e-learning resources, such as reliable internet and technical support. Additionally, raising awareness about FL and its benefits, particularly among freshmen and students with lower academic achievement, can help increase readiness. Institutions should also provide training to develop self-directed learning skills, such as time management and critical thinking, to better prepare students for FL and ultimately improving student engagement and learning outcomes.

Conflict of Interest

The authors declare that they have no competing interests.

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