RESEARCH ARTICLE

OPEN ACCESS

ENHANCING EFL READING COMPREHENSION THROUGH SELF-DIRECTED LEARNING INTEGRATION IN A FLIPPED CLASSROOM ENVIRONMENT: THE MODERATING ROLE OF DIGITAL LITERACY

Willy Satria

Department of English Literature, Bung Hatta University

ABSTRACT

Objective: This study investigates the effectiveness of integrating Self-Directed Learning (SDL) principles into a Flipped Classroom model to improve English as a Foreign Language (EFL) reading comprehension among undergraduate students. Furthermore, it examines whether students' digital literacy levels moderate this relationship. Methodology: A quasi-experimental 2x2 factorial design was employed involving 60 second-year students from the English Education Study Program at Universitas PGRI Sumatera Barat. Participants were assigned to an experimental group (n=30) taught using a Flipped Classroom model explicitly designed with SDL scaffolding, and a control group (n=30) taught using an A La Carte blended model. The intervention spanned eight weeks. Data were collected using a validated reading comprehension test (based on Barrett's Taxonomy) and a standardized digital literacy questionnaire, then analyzed using Two-Way ANOVA. Findings: The results revealed a statistically significant main effect for the learning model (p < .05). Students in the Flipped Classroom-SDL group demonstrated superior reading comprehension compared to the A La Carte group. Interestingly, digital literacy did not show a significant main effect or interaction effect, suggesting that the pedagogical structure of SDL effectively supports learners regardless of their technical proficiency. The study concludes that the deliberate integration of SDL strategies, such as goal setting and self-monitoring, within the Flipped Classroom significantly enhances students' ability to comprehend complex EFL texts, overcoming potential barriers posed by low digital literacy.

Introduction

Reading comprehension remains a critical yet challenging skill for English as a Foreign Language (EFL) students in Indonesia. Despite years of instruction, many undergraduate students struggle to move beyond literal understanding to deeper inferential and evaluative comprehension. The root of this problem often lies in traditional instructional methods that prioritize teacher-centered lectures, leaving little room for active cognitive engagement or student autonomy during class hours.

The rapid evolution of educational technology has introduced Blended Learning (BL) as a potential solution. Among BL models, the Flipped Classroom has gained prominence for its unique structure: shifting direct instruction to the pre-class phase and utilizing class time for active problem-solving (Bergmann & Sams, 2012). However, the success of the Flipped Classroom is heavily dependent on students' ability to manage their own learning outside the classroom, a competency known as Self-Directed Learning (SDL). Without adequate SDL skills, students may fail to engage effectively with pre-class materials, rendering in-class activities ineffective.

The Imperative of Higher-Order Reading Skills in EFL Contexts

In the contemporary landscape of higher education, proficiency in English reading comprehension constitutes the bedrock of academic success and professional development. For English as a Foreign Language (EFL) undergraduate students, reading is not merely a linguistic exercise of decoding symbols but

Corresponding Author: Willy Satria, Email: wlly.satria@bunghatta.ac.id
Bung Hatta University, Padang, West Sumatra, Indonesia.

a complex cognitive process involving the construction of meaning, critical analysis, and the synthesis of information from diverse sources (Grabe, 2009). University-level curricula increasingly demand that students move beyond literal comprehension, simply recalling facts stated in the text, towards higher-order thinking skills (HOTS), such as inferring authorial intent, evaluating arguments, and connecting texts to broader societal contexts (Barrett, 1976).

However, a persistent disparity exists between these academic expectations and the actual proficiency of EFL learners, particularly in the Indonesian context. Traditional instructional methodologies, often characterized by teacher-centered lectures and passive consumption of texts, have proven insufficient for fostering these advanced cognitive skills. In such environments, students frequently rely on the instructor to interpret texts, resulting in a "dependency syndrome" that stifles learner autonomy. Consequently, when faced with complex academic materials independently, students often struggle to regulate their cognitive strategies, resulting in a superficial understanding and low retention. This pedagogical stagnation necessitates a paradigm shift towards instructional models that not only deliver content but also actively cultivate the metacognitive strategies required for autonomous deep reading.

The Promise and Pitfalls of Blended Learning Models

The integration of digital technology into education through Blended Learning (BL) has emerged as a potent response to these challenges. By combining the flexibility of online learning with the interactivity of face-to-face sessions, BL theoretically optimizes the learning environment (Garrison & Kanuka, 2004). Among the various BL configurations, the A La Carte model, in which students take an online course to supplement their traditional curriculum, has gained popularity for its flexibility. Ideally, this model allows students to learn at their own pace. However, the efficacy of the A La Carte model is frequently undermined by a critical oversight: the assumption that students inherently possess the self-discipline and skills to manage unstructured online learning. Without explicit pedagogical scaffolding, the freedom offered by the A La Carte model often devolves into isolation and procrastination, failing to significantly improve comprehension outcomes.

In contrast, the Flipped Classroom model offers a more structured inversion of traditional teaching. By shifting direct instruction (such as lectures and initial reading) to the pre-class asynchronous phase, the Flipped model liberates synchronous class time for active, collaborative problem-solving (Bergmann & Sams, 2012). This structure aligns perfectly with social constructivist theories, which hold that knowledge is built through social interaction. Yet, the Flipped Classroom is not a panacea. Its success is precariously balanced on one pivotal factor: the student's preparation. If students fail to engage deeply with the pre-class materials, the subsequent in-class activities collapse. This vulnerability points to the absolute necessity of Self-Directed Learning (SDL).

Integrating Self-Directed Learning (SDL) as a Pedagogical Core

SDL, defined by Knowles (1975) as a process in which individuals take the initiative to diagnose their learning needs and formulate goals, is often treated as a desirable outcome rather than a prerequisite instructional component. This study argues that for BL models to enhance reading comprehension, SDL cannot be left to chance; it must be deliberately engineered into the course design. While previous studies have examined Flipped Classrooms and SDL separately, there is a paucity of research that operationalizes SDL as an explicit *instructional intervention* within a Flipped framework specifically for EFL reading. A "Flipped Classroom with SDL Integration" goes beyond simply posting videos online; it involves embedding mechanisms, such as mandatory goal-setting protocols, self-monitoring checklists, and reflective prompts, directly into the Learning Management System (LMS). This study posits that such structured autonomy effectively bridges the gap between pre-class passive viewing and in-class active doing, a mechanism potentially missing in the looser A La Carte model.

The Contested Role of Digital Literacy

Complicating the pedagogical landscape is the variable of Digital Literacy. In an era where screens increasingly mediate learning, a student's ability to access, manage, and evaluate digital information is paramount (Eshet-Alkalai, 2004). The prevailing literature offers conflicting narratives regarding the role of digital literacy in BL

success. One camp argues that high digital literacy is a strict prerequisite; students with low technical skills are predicted to struggle with the cognitive load of navigating online platforms, thereby hindering their content learning (Tang & Chaw, 2016). Conversely, another perspective suggests that robust instructional design acts as an "equalizer." If a BL course is designed with clear navigation and strong pedagogical support, the impact of a student's technical limitations may be mitigated. This debate raises a critical empirical question: *Is the success of advanced BL models, like the Flipped-SDL, reserved only for the "tech-savvy," or can inclusive design lift all learners regardless of their digital proficiency?*

Research Gap and Objectives

Despite the extensive literature on Blended Learning, few studies have conducted a head-to-head comparison between specific BL architectures (Flipped-SDL vs. A La Carte) while simultaneously investigating the moderating role of digital literacy in the specific context of EFL reading comprehension. Most existing research compares BL to purely traditional methods, which fail to capture the nuances of which blend type works best. By answering these questions, this research seeks to provide empirical evidence to guide educators and curriculum designers in moving beyond the "tech-first" approach towards a "pedagogy-first" architecture that fosters both reading excellence and learner autonomy.

Conversely, other blended models, such as the A La Carte model, offer flexibility by allowing students to take online courses alongside traditional ones, but they often lack the cohesive structural support found in Flipped Learning. A significant gap exists in empirical studies that directly compare these two specific blended models while explicitly integrating SDL strategies. Furthermore, the role of Digital Literacy as a potential moderator in this dynamic remains debated; some scholars argue it is a prerequisite, while others suggest good design can mitigate technical gaps.

This study aims to fill this gap by answering two primary research questions:

1. Is there a significant difference in EFL reading comprehension achievement between students taught using a Flipped Classroom model integrated with SDL strategies versus those taught using an A La Carte model?
2. Does digital literacy significantly moderate the relationship between the learning model and reading comprehension outcomes?

Materials and Methods

This study employed a quasi-experimental 2x2 factorial design.

- Independent Variable: Learning Model (Level 1: Flipped Classroom with SDL; Level 2: A La Carte).
- Moderator Variable: Digital Literacy (High vs. Low).
- Dependent Variable: English Reading Comprehension Scores.

This study employed a quasi-experimental research design with a non-equivalent control group pretest-posttest arrangement, as random assignment of individual students was not feasible in the university setting (Creswell, 2012). A 2x2 factorial design was utilized to examine the main effects of the instructional model (Independent Variable: Flipped Classroom-SDL vs. A La Carte) and the moderator variable of Digital Literacy (High vs. Low), as well as their interaction effect on English reading comprehension (Almeida et al., 2016). This design is particularly robust for educational research as it allows for the isolation of specific pedagogical interventions while controlling for learner characteristics.

The population comprised undergraduate students from the English Education Study Program at Universitas PGRI Sumatera Barat, Indonesia. The sampling technique employed was cluster random sampling, where intact classes were selected rather than individuals (Cohen et al., 2018).

The sample consisted of 60 second-year students enrolled in the "Advanced Reading" course during the 2021/2022 academic year. The participants were homogeneous in their academic backgrounds, having completed prerequisite courses in General Reading and Literal Reading.

- Experimental Group (n=30): Received the Flipped Classroom treatment integrated with Self-Directed Learning (SDL) strategies.
- Control Group (n=30): Received the A La Carte blended learning treatment.

Results and Discussion
Results
Descriptive Statistics
Below table presents the mean scores for reading comprehension. The Flipped-SDL group achieved higher scores across both levels of digital literacy.

Table 1. Descriptive Statistics of Reading Comprehension Scores

Learning Model	Digital Literacy	N	Mean	Std. Deviation
Flipped Classroom (SDL)	High	15		
	Low	15		
	Total	30	80.19	5.99
A La Carte Model	High	15		
	Low	15		
	Total	30	71.44	8.11

Hypothesis Testing
The Two-Way ANOVA results (Table 3) illustrate the main and interaction effects.

Table 2. Summary of Two-Way ANOVA Results

Source	Type III SS	Df	Mean Square	F	Sig.
Corrected Model	110.594	3	36.865	2.860	0.55
Intercept	11819.531	1	11819.531	917.068	.000
Learning Model	101.531	1	101.531	7.878	.009*
Digital Literacy	3.781	1	3.781	0.293	.593
Interaction	5.282	1	5.282	0.410	.527
Error					

*Significant at the 0.05 level

Effect of Learning Model: There is a significant difference between groups (F = 7.878, p = .009). The Flipped-SDL group significantly outperformed the A La Carte group.
Effect of Digital Literacy: There is no significant difference based on digital literacy (F = 0.293, p = .593).
Interaction Effect: There is no significant interaction (F = 0.410, p = .527).

Discussion
Two validated instruments were used to collect data:
1. Reading Comprehension Test
To measure the dependent variable, a 40-item multiple-choice test was developed based on Barrett's Taxonomy of Reading Comprehension (Almeida et al., 2016). The items were distributed across three cognitive levels:
- *Literal Comprehension (20%):* Recognition of details and main ideas.
- *Inferential Comprehension (40%):* Inferring cause-and-effect and author's intent.
- Evaluative Comprehension (40%): Making judgments based on external criteria.

Content validity was established through expert judgment by three senior lecturers in EFL reading. The empirical validity was tested using Point Biserial correlation, and reliability was measured using the Cronbach's Alpha formula, yielding a coefficient of 0.87, which indicates high internal consistency (Kumar et al., 2021).
2. Digital Literacy Questionnaire
Digital literacy was measured using a 35-item questionnaire adapted from (Ng, 2012) and the framework proposed by (Aviram & Eshet-Alkalai, 2006). The questionnaire assessed three dimensions: (a) Technical Dimension (operational skills), (b) Cognitive Dimension (critical thinking in digital environments), and (c)

Socio-Emotional Dimension (internet etiquette). The instrument utilized a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The reliability coefficient for this instrument was 0.89.

Experimental Procedures

The intervention was conducted over 10 weeks (1 pre-test, 8 treatment meetings, 1 post-test). Both groups followed the same syllabus based on CEFR B2/C1 reading materials but differed in instructional delivery.

A. Experimental Group: Flipped Classroom with SDL Scaffolding

The experimental group utilized a Flipped Classroom model specifically designed to foster learner autonomy, grounded in (Hashemifardnia et al., 2018) principles of Self-Directed Learning. The procedure followed three phases:

Phase 1: Pre-Class (Asynchronous SDL): Three days prior to the synchronous session, students accessed the Learning Management System (LMS). Unlike standard flipping, this phase included explicit SDL prompts:

- *Goal Setting:* Students were required to write a specific reading goal (e.g., "I want to identify the author's bias").
- *Self-Monitoring:* After watching the instructional video and reading the text, students completed a *diagnostic quiz*. The system provided immediate feedback, allowing students to self-correct—a crucial process in self-regulated learning (Zimmerman, 2002).

Phase 2: In-Class (Synchronous Active Learning): Consistent with (Bergmann & Sams, 2012), class time was repurposed for active learning. Activities included collaborative text analysis, Socratic seminars, and peer debates to deepen inferential understanding.

Phase 3: Post-Class (Reflection): Students reflected on whether they achieved their initial goals.

B. Control Group: A La Carte Model

The control group followed an A La Carte model (Horn & Staker, 2012), where students attended a traditional face-to-face lecture and separately completed an online reading module. While the content was identical, the online component was self-paced without the specific SDL scaffolding (e.g., no mandatory goal-setting or self-monitoring prompts). The teacher provided direct instruction during class time, maintaining a teacher-centered approach.

c. Treatment Schedule and Materials

The reading materials were selected based on CEFR Level B2/C1 to match the course standards. Table 1 details the 8-week intervention.

Table 3. Weekly Instructional Topics and SDL Activities

Week	Topic/Reading Text	SDL Specific Instruction (Experimental Group Only)	In-Class Activity
1	Introduction to Critical Reading	Surveying the text structure; Setting semester targets.	Workshop on distinguishing facts vs. opinions.
2	Text: "The Future of AI"	**Goal:** Identify 3 potential biases in the text before class.	Debate: "AI: Threat or Opportunity?"
3	Text: "Climate Change Impacts"	**Strategy:** Create a mind-map of cause-effect relationships.	Group project: Proposing solutions to climate issues based on text.
4	Text: "Cultural Globalization"	**Monitor:** Self-quiz on vocabulary; list confusing sentences.	Peer-teaching: Groups explain difficult paragraphs to peers.
5	Text: "Education in 21st Century"	**Evaluate:** Compare text arguments with personal experience.	Case study analysis: Designing an ideal school curriculum.
6	*Text: "Mental Health in Youth"*	**Strategy:** Write 3 inferential questions for the lecturer.	"Hot Seat" game using student-generated questions.
7	*Text: "Economic Disparities"*	**Goal:** Summarize the main argument in 50 words.	Socratic Seminar discussing global wealth distribution.

| 8 | *Review & Synthesis* | **Reflect:** Self-evaluation of reading speed and comprehension growth. | Mock final exam and feedback session. |

Data Analysis

Data were analyzed using IBM SPSS Statistics 25.0. First, prerequisite tests were conducted: the Kolmogorov-Smirnov test for normality and Levene's test for homogeneity of variance (Field, 2013). Upon satisfying these assumptions, a Two-Way Analysis of Variance (ANOVA) was performed at a significance level of alpha = 0.05 to test the hypotheses regarding the differences between groups and the interaction effects.

The Superiority of Flipped-SDL over A La Carte

The primary finding that the Flipped Classroom with SDL integration yields better reading outcomes aligns with the work of (Zainuddin & Perera, 2018) and (Karimi & Hamzavi, 2017). However, this study extends previous knowledge by identifying SDL as the critical mechanism. In the A La Carte model, students worked independently but often passively. Without the "goal-setting" and "self-monitoring" prompts used in the Flipped-SDL group, A La Carte students likely engaged in surface-level reading. The Flipped-SDL model, by contrast, operationalized Cognitive Load Theory effectively: the pre-class SDL tasks primed the students' schemas, reducing the intrinsic load during the complex in-class discussions.

The "Equalizer Effect" of Instructional Design

A novel finding of this study is the non-significant role of digital literacy. This contradicts assumptions by Tang and Chaw (2016) that high digital literacy is a prerequisite for blended learning success. We argue for an "Equalizer Effect": The Flipped-SDL course design was highly structured and user-friendly. By providing clear, step-by-step guides and consistent SDL routines, the instructional design compensated for the lack of technical skills among "Low Digital Literacy" students. This implies that when pedagogy is sound and supportive, students do not need to be "tech wizards" to succeed in a blended environment.

Implications for EFL Pedagogy

The findings suggest that EFL educators should not merely "assign online reading" (as in A La Carte). Instead, they must design SDL scaffolds requiring students to set goals and reflect on their reading strategies. Institutions should focus on training teachers in *instructional design* rather than just technical tool usage.

Conclusions

This study provides robust empirical evidence that the integration of Self-Directed Learning into the Flipped Classroom model is a potent strategy for improving English reading comprehension. The findings demonstrate that this pedagogical combination is superior to the A La Carte model and, importantly, is effective for students across the digital literacy spectrum. Future research should explore long-term retention of these skills and apply this model to other language competencies.

References

Almeida, C. S. de, Miccoli, L. S., Andhini, N. F., Aranha, S., Oliveira, L. C. de, Artigo, C. E., Em, A. A. R., Em, A. A. R., Bachman, L., Chick, K., Curtis, D., Peirce, B. N., Askey, D., Rubin, J., Egnatoff, D. W. J., Uhl Chamot, A., El-Dinary, P. B., Scott, J.; Marshall, G., Prensky, M., … Santa, U. F. De. (2016). Model of Teaching. In *Revista Brasileira de Linguística Aplicada* (Vol. 5, Issue 1). https://revistas.ufrj.br/index.php/rce/article/download/1659/1508%0Ahttp://hipatiapress.com/hpjournals/index.php/qre/article/view/1348%5Cnhttp://www.tandfonline.com/doi/abs/10.1080/09500799708666915%5Cnhttps://mckinseyonsociety.com/downloads/reports/Educa

Aviram, A., & Eshet-Alkalai, Y. (2006). Towards a theory of digital literacy: three scenarios for the next steps. *European Journal of Open, Distance and E-Learning*.

Bergmann, J., & Sams, A. (2012). Flipped Your Classroom. In *Journal of Physics A: Mathematical and Theoretical* (1st ed., Vol. 44, Issue 8). ISTE. https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/15451/Flip_Your_Classroom.pdf

Cohen, L., Manion, L., & Morrison, K. (2018). Research Methods in Education. Eighth Edition. In *Research Methods in Education*.

Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (IV th). Pearson.

Hashemifardnia, A., Namaziandost, E., & Shafiee, S. (2018). The Effect of Implementing Flipped Classrooms on Iranian Junior High School Students' Reading Comprehension. *Theory and Practice in Language Studies*, *8*(6), 665. https://doi.org/10.17507/tpls.0806.17

Horn, M. B., & Staker, H. C. (2012). Classifying K − 12 Blended Learning. *INNOSIGHT Institute*, *May*, 1–22.

Karimi, M., & Hamzavi, R. (2017). The Effect of Flipped Model of Instruction on EFL Learners' Reading Comprehension: Learners' Attitudes in Focus. *Advances in Language and Literary Studies*, *8*(1), 95. https://doi.org/10.7575/aiac.alls.v.8n.1p.95

Kumar, A. P., Omprakash, A., Mani, P. K. C., Swaminathan, N., Maheshkumar, K., Maruthy, K. N., Sathiyasekaran, B. W. C., Vijayaraghavan, P. V., & Padmavathi, R. (2021). Validation of Internal structure of Self-Directed Learning Readiness Scale among Indian Medical Students using factor analysis and the Structural equation Modelling Approach. *BMC Medical Education*, *21*(1), 1–13. https://doi.org/10.1186/s12909-021-03035-6

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers and Education*, *59*(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Zainuddin, Z., & Perera, C. J. (2018). Supporting students' self-directed learning in the flipped classroom through the LMS TES BlendSpace. *On the Horizon*, *26*(4), 281–290. https://doi.org/10.1108/OTH-04-2017-0016