A Tale of Two Platforms: Decoding the Digital Footprints of High School Students in Bilingual Scaffolded MOOCs

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Abstract
While Massive Open Online Courses (MOOCs) are widely used in higher education, their application and effectiveness for high school students, especially English as a Foreign Language (EFL) learners grappling with language barriers in English-Medium Instruction environments, remain underexplored. There is a recognized gap in understanding how high school students' attitudes toward English, self-regulated learning motivation, online behaviors, and perceptions of course design within bilingual scaffolded MOOCs (courses providing linguistic and instructional support in both students' native language and English) influence course completion outcomes. A mixed-methods design was employed, involving 115 high school students from Northern Taiwan. Data were collected throughout an eight-week intervention. Results show: (1) those perceiving English as practical demonstrated higher self-regulated learning (SRL) motivation and learning satisfaction; (2) discussion participation was a significant predictor of course completion, while reading materials and watching videos were not significant predictors; (3) students primarily valued content knowledge, learning strategies, and language knowledge, and suggested improvements related to information accessibility and course design, including more explicit instructor guidance. The results suggest that MOOC designers and online educators should foster a positive attitude and belief toward English as a Lingua Franca, increase SRL, and design online lessons featuring easy-to-access materials and interactive activities. This study contributes to the broader discourse on inclusive and accessible online learning for global high school students.

Keywords: English as a lingua franca (ELF); Self-regulated learning; English MOOCs, Bilingual policy

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Introduction

As English continues dominating international communication, the rise of English as a lingua franca (ELF) has transformed language education, necessitating innovative approaches to meet learners' evolving needs. In Taiwan, the government has launched the Bilingual 2030 policy to enhance English proficiency among citizens and boost international competitiveness (National Development Council, 2021). Successful implementation of this policy requires effective strategies to develop students' intercultural communication competencies, which, though urgently needed, remain underexplored.

Among the strategies for expanding access to language learning, Massive Open Online Courses (MOOCs) have emerged as a promising platform for large-scale support (Yousef & Sumner, 2021). While MOOCs have been widely adopted in higher education, their application in high school settings remains relatively underexplored (Koutsakas et al., 2020). This limited research highlights a critical gap, especially considering that high school students, particularly those learning English as a Foreign Language (EFL), often encounter significant challenges when participating in English-medium instruction (EMI) MOOCs. These language barriers may hinder comprehension, reduce student engagement, and contribute to low course completion rates (Lin et al., 2021; Tien, 2023).

Faced with the challenge of relying solely on immersive English classrooms as a strategy for high school students to develop the language skills and attitudes needed to fulfill the bilingual policy, we propose the use of bilingual scaffolded MOOCs (courses that provide instructional support in both students' native language and English; Ertugruloglu et al., 2023) and examine how students perceive the course design and learn in this innovative environment. These bilingual-scaffolded MOOCs are well-supported by the literature introducing effective multilingual strategies that address language barriers. For example, the dual-language facilitation pairing English-medium instructional content with facilitators who catered to different language communities successfully boosted active participation and peer tutoring in the first week (Colas et al., 2016). Moreover, multilingual teaching assistants have been shown to bridge linguistic gaps and enhance intercultural communication in global MOOCs (Li et al., 2024). Collectively, these interventions provide a strong rationale for the design of our bilingual scaffolded MOOCs.

By integrating bilingual practices directly into the MOOC environment, we aim to reduce comprehension barriers students may encounter, enhance their learning engagement, and support more equitable access to course content. This linguistic scaffolding empowers EFL learners to participate in globally available MOOCs, such as those offered on platforms like Coursera, MIT OpenCourseWare, and FutureLearn, without being excluded from the global online learning ecosystem due to language limitations (Nguyen, 2022; Phan, 2018).

Literature Review

This section provides the theoretical and empirical foundation for this study. It first situates the growing prominence of ELF and the rise of EMI MOOCs in K–12 education. It then synthesizes research on the psychological, attitudinal, and behavioral factors that predict success in MOOC learning.

English as a Lingua Franca and K–12 MOOCs

English has flourished as a global language spoken by many non-native speakers (NNSs) with diverse backgrounds. This global situation paves the way for viewing English as a means of practical communication under various terms, such as English as a Lingua Franca (ELF), Global Englishes, English as an International Language, and World Englishes (Rose et al., 2020).

So far, researchers have conceptualized ELF in several ways. For example, three typical components of attitude toward ELF are the cognitive component (beliefs/perceptions about ELF), the affective component (feelings about ELF), and the behavioral component (actions related to ELF) (Rose et al., 2020). Another example includes awareness of language and language use (being aware of how ELF differs from "standard" English and the reasons leading to the differences), awareness of instructional practice (being aware of how teachers teach English and their interpretation of the practices), and awareness of learning (being aware of how using English as a lingua franca influences learning) (Sifakis, 2017). Studies have also documented positive impacts of ELF on student attitudes, knowledge acquisition, and confidence in using English (Rose et al., 2020).

Most study participants were university or postgraduate students (Rose et al., 2020). Little is known about how younger learners, such as high school students, perceive ELF. Besides, the relationship between learner conditions, such as prior English proficiency and attitude and belief toward ELF, is rarely discussed. To measure learners' language proficiency, Kirkpatrick (2012) argued that it is necessary to add a sociocultural perspective to the evaluation by considering the settings relevant to learners instead of evaluating whether they acquire native-like proficiency and norms. That is, locally based measurement seems more suitable than international standardized tests.

In response to the growing prominence of ELF, researchers have advocated for a pedagogical shift in English Language Teaching (Galloway & Rose, 2018; Rose et al., 2020). Among the practices, the design of MOOCs appears to hold promise for several reasons. First, the predominant English-based MOOCs create a natural communication space for global learners with diverse native languages. Notably, instructors may also be NNSs of English. Within this inherently multilingual learning environment, English is an international lingua franca, facilitating communication between interlocutors from disparate first-language backgrounds. It has been suggested that a genuine learning environment where ELF is used naturally is ideal for investigating its role (Seidlhofer, 2005). MOOCs are a perfect scenario where learners encounter diverse English input (e.g., videos and reading materials) and use English for knowledge transmission and construction. This experience holds value for EFL learners, who often have limited access to English as a communicative tool in daily life (Kirkpatrick, 2012).

Following the initial launch in 2008 for adult and university learners, MOOCs experienced a surge in K–12 student enrollment in 2013 (Koutsakas et al., 2020; Yin et al., 2015). While research on MOOCs in K–12 education remains comparatively nascent compared to adult and university learners, a growing body of literature highlights their positive impact, including enhancing learning opportunities, personalizing learning experiences, and achieving learning gains (Guggemos et al., 2022). Given the distinct learning needs of K–12 students (e.g., a greater reliance on modeling and scaffolding), researchers have advocated for a reevaluation of MOOC design and implementation (Guggemos et al., 2022; Koutsakas et al., 2020; Yin et al., 2015). A comprehensive review by

Koutsakas et al. (2020) revealed a significant trend: K–12 MOOCs primarily function as supplementary resources within the existing curriculum rather than extracurricular projects beyond the compulsory courses. This finding implies that most K–12 students' access to MOOCs occurs in formal learning settings (Yousef & Sumner, 2021), which creates a niche to explore students' informal learning experience on MOOCs. This autonomous learning aligns with the core value of MOOCs: the flexible and self-directed pursuit of knowledge (Koutsakas et al., 2020; Yousef & Sumner, 2021; Zhu & Bonk, 2019). Further research is necessary to elucidate the intricate relationships between autonomous motivation and relevant variables, such as learning satisfaction and engagement (Guggemos et al., 2022; Yousef & Sumner, 2021).

Psychological, Attitudinal, and Behavioral Factors Predicting Course Completion

Due to the multifaceted nature of learning in MOOCs for high school students within the innovative bilingual scaffolded MOOCs framework, we explored various internal and observable factors repeatedly linked to successful course completion. These factors can be broadly categorized into psychological, attitudinal, and behavioral factors. For the psychological factor, we narrowed the focus to self-regulated learning (SRL) motivation. As for the attitudinal factors, emphasis was placed on learning satisfaction and engagement. Finally, behavioral factors encompassed observable online activities that demonstrated learner engagement. We aim to extend prior research by exploring the effects of these factors on learning outcomes in the underexplored context of bilingual scaffolded MOOCs for high school students.

SRL refers to learners' ability to manage and monitor their learning processes independently—including goal-setting, progress-tracking, and strategic learning application. It has emerged as a consistently strong predictor of successful course completion in both face-to-face and online environments (Tang & Bao, 2022; Yousef & Sumner, 2021). In a review by Yousef and Sumner (2021), they identified a surprising gap in the MOOC literature: there is a need to investigate SRL motivation within MOOC environments. Barnard et al. (2009) developed reliable and valid questionnaires measuring SRL. These instruments have been successfully employed in various studies, establishing the connection between SRL and academic achievement (Kucuk & Richardson, 2019; Nortvig et al., 2018; Wei et al., 2023). However, to broaden the current understanding of learning success within MOOC environments, the consideration of additional outcome factors that go beyond the past scope of review appears necessary, such as learning satisfaction, engagement, and even ELF (Wesely, 2012; Zulfikar et al., 2019).

Despite the promise of MOOCs, high dropout rates remain a concern. Researchers have identified learning satisfaction and engagement as key factors influencing course persistence (Koutsakas et al., 2020; Moore & Blackmon, 2022). Course assessment, content, and delivery—rather than mere support—significantly shape satisfaction, with assessment mediating the relationship between content and learner experience (Kumar & Kumar, 2020). Similarly, course quality strongly predicts satisfaction and continued engagement (Pozón-López et al., 2021).

Moore's (1990) theory of distance education offers a relevant framework, emphasizing learner autonomy, dialogue, and structure. Dialogue—such as that enabled through discussion forums—plays a vital role in sustaining engagement and reducing isolation, particularly for K–12 learners (Lan & Hew, 2020; Guggemos et al., 2022). In bilingual scaffolded MOOCs, this interaction becomes both linguistic and cognitive

scaffolding, supporting learners' participation in English while allowing native-language reinforcement (Ertugruloglu et al., 2023).

Higher levels of self-regulated learning (SRL) are consistently associated with greater satisfaction and engagement (Moore & Blackmon, 2022), and SRL also mediates the link between engagement and perceived learning gains (Wei et al., 2023). Engagement, in turn, predicts course completion and differentiates completers from non-completers (Lan & Hew, 2020). Given its multidimensional nature—encompassing behavioral, emotional, social, and cognitive elements—engagement warrants further study in K–12 MOOC contexts (Deng et al., 2020; Ogunyemi et al., 2022).

Aside from using questionnaires to measure learning engagement, a group of researchers specifically focused on learner behaviors in MOOCs, collecting, analyzing, and comparing various learner footprints (Emanuel & Lamb, 2017). A systematic review of 78 published studies on language MOOCs (Sallam et al., 2022) demonstrates that learner behaviors such as early engagement, social participation, self-regulated strategy use, and active interaction with instructors and peers are strongly linked to persistence and course completion. These findings reinforce the importance of designing MOOCs with features that facilitate authentic communication and sustained behavioral involvement. Among the empirical studies, two that studied students in Taiwan drew our attention. Chiu et al. (2018) used learning activity data from OpenEdu, a Taiwanese MOOC platform, to predict student performance. Thirteen features, including video views, forum participation, and exercise completion, were analyzed using linear and logistic regression models. The models identified answering questions, watching videos, and participating in forum discussions as significant predictors of course completion. Hsueh et al. (2022) also collected data from OpenEdu. Employing PLS-SEM to examine the effects of online time, video watching, and document reading on self-assessment and final grades, they found that video watching and self-assessment significantly predicted grades, while document reading is less impactful. Besides, it was through self-assessment that online time impacted final grades. Drawing from this body of literature, watching videos, reading materials, and participating in forum discussions emerge as critical behavioral indicators of student performance and grades. In the present study, we similarly rely on these specific indicators to predict the course completion outcomes of MOOCs for high school students.

Research Questions

This study explores using bilingual scaffolded MOOCs to promote self-directed online learning among high school students. We addressed three research questions:

1. What are the relationships among high school students' attitudes/beliefs toward ELF, self-regulated learning motivation, English proficiency, learning engagement, and learning satisfaction in the learning context of bilingual scaffolded MOOCs?
2. Which learning behaviors (i.e., watching videos, reading materials, and participating in forum discussions), as captured through learning analytics, predict course completion in bilingual scaffolded MOOCs for high school students?
3. What do students find most valuable in the learning experiences with bilingual scaffolded MOOCs, and what suggestions do they have for course improvement?

Mixed-Methods Research Design

Methodological Approach

This study employed a convergent mixed-methods design, integrating quantitative learning analytics and survey data with qualitative thematic analysis (Creswell & Creswell, 2018). The quantitative strand addresses Research Questions 1 and 2 using correlational and logistic regression analyses, while the qualitative strand addresses Research Question 3 through thematic exploration of open-ended responses.

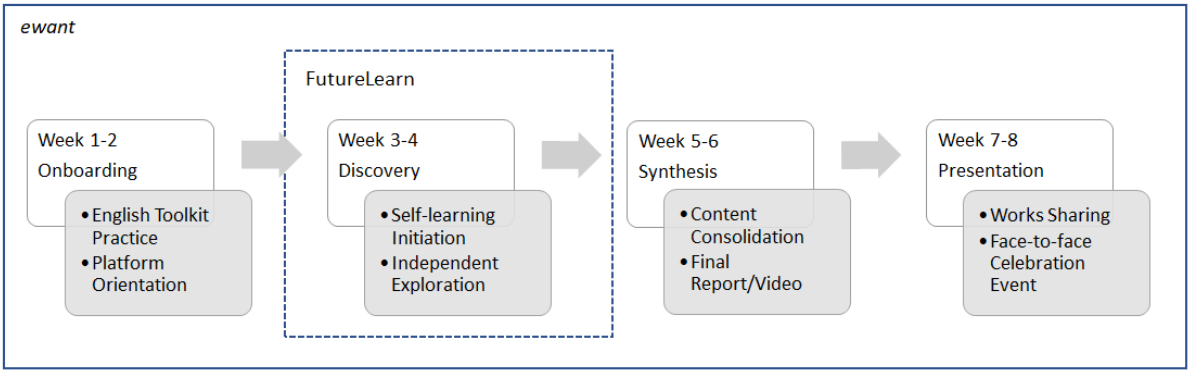
Program Design and Context

The bilingual scaffolded MOOCs in the present study were built upon two MOOC platforms. The first platform is FutureLearn (FL; futurelearn.com), the third largest English-speaking MOOC platform serving global learners. The other platform, *ewant* (ewant.org), is a local and popular MOOC platform in Taiwan. The lecturers on *ewant* shared the same native language and cultural background as the participants, and they were skillful at applying scaffolding strategies.

Figure 1 presents the program structure. During the onboarding phase (Week 1-2), under the guidance of local instructors, students practiced English toolkits. They underwent bilingual platform orientation to familiarize themselves with the online learning environments (both *ewant* and FL). This phase ensured that students were well-prepared for the self-directed learning journey ahead. The Discovery phase (Week 3-4) focused on initiating self-learning and encouraging independent exploration. Students actively engaged with the course materials on FL and interacted with international peers and instructors in English. In the Synthesis phase (Week 5-6), students consolidated their learning by compiling a final report or creating a video showcasing their learning gains. Local instructors helped students synthesize the knowledge and skills they had acquired and prepared them for the final presentation. Finally, the Presentation phase (Week 7-8) involved uploading and sharing works and reflection, followed by a physical meeting for celebration. This phase provided an opportunity for students to present their achievements and have real-life interaction with local peers and instructors. We *ewant* maintained detailed records of students' online learning "footprints," including time spent on the platform, views of videos and materials, and interactions in discussion forums. The threshold of course completion was defined as achieving 60 out of 100 points, with rubrics designed by the local instructors.

Figure 1

Program Structure



This study involved routine educational practices delivered through the *ewant* platform and qualified for IRB exemption under local institutional guidelines (Ministry of Health, Taiwan, 2012). Informed consent was obtained from all participating students before data collection, and participants were informed of their right to withdraw at any time. According to the *ewant* platform's End-User License Agreement, analyzing student learning records was permitted for educational and research purposes. All data were anonymized, aggregated, and reported in group form without disclosing personally identifiable information. The procedures adhered to Taiwan's Personal Data Protection Act and international standards of research ethics, including the Declaration of Helsinki.

Participants

Two cohorts of high school students (aged 15 to 17) from Northern Taiwan participated in the bilingual scaffolded MOOCs during the summers of 2022 and 2023. These students were recruited through a city-wide initiative in Taoyuan, where public high schools allowed students to earn self-learning course credits by enrolling in online courses offered on the *ewant* MOOC platform. Students freely selected courses aligned with their interests and submitted individual learning plans to their teachers for approval and supervision. Participation in the MOOC was thus both voluntary and self-directed, reflecting authentic engagement in informal, interest-driven learning environments.

Over the two years, 115 students enrolled in the study. Table 1 presents their distribution by course and completion rate. Specifically, 36 students enrolled in two courses during 2022, with a 50% completion rate. In 2023, 79 students participated in eight courses, with a completion rate of 35%. In addition to behavioral data drawn from the *ewant* system, survey data were collected from students who provided informed consent. Of the 79 students in the 2nd cohort, 45 (56.96%) responded to the pre-program survey, and 17 (21.52%) completed the post-program survey. A summary flow chart (Figure 2) has been added to illustrate each cohort's program structure and participant recruitment separately.

Table 1

Distribution of Participants Concerning Course Topics, Enrollment, and Course Completion

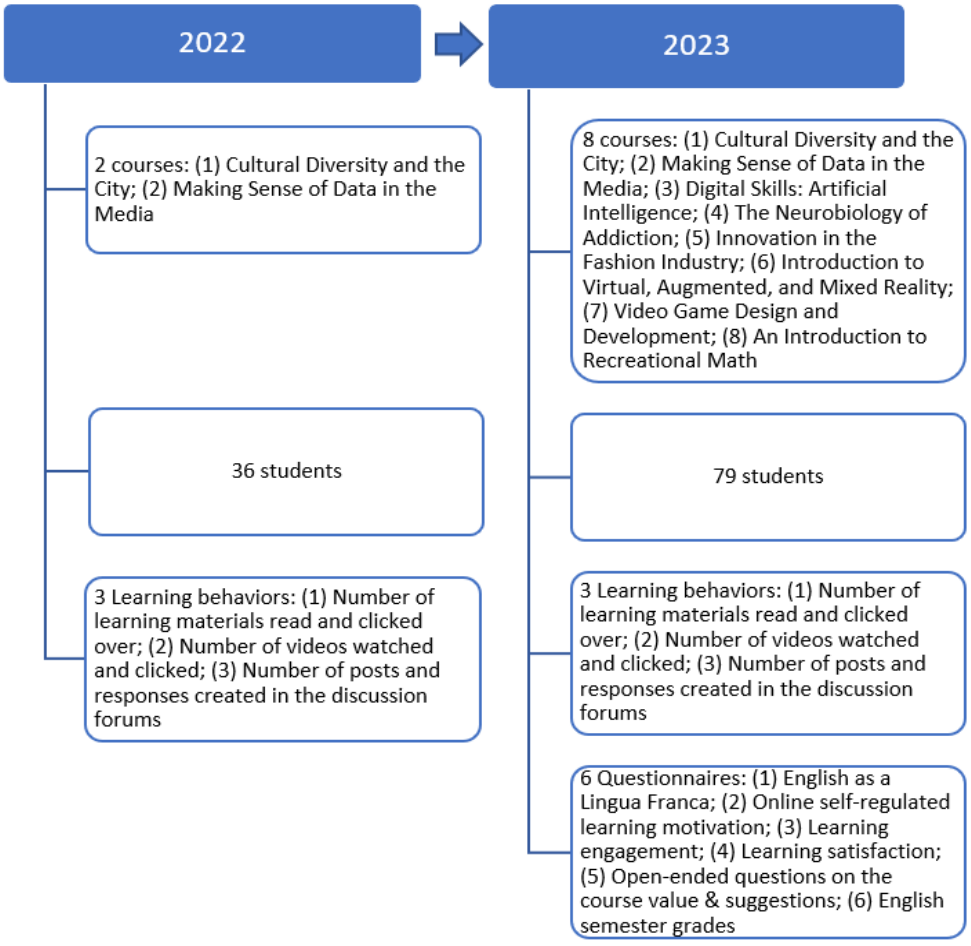
Courses	# of enrollment	Course completion on *ewant* (%)
2022		
CD	19	10 (53)
DM	17	8 (47)
Total	36	18 (50)
2023		
CD	9	0 (0)
DM	6	3 (50)
AI	16	5 (31)
NA	23	8 (35)
FI	5	2 (40)

VRMR	9	6 (67)
VGD	9	2 (22)
RM	2	2 (100)
Total	79	28 (35)

Note. CD = Cultural Diversity and the City, DM = Making Sense of Data in the Media, AI = Digital Skills: Artificial Intelligence, NA = The Neurobiology of Addiction, FI = Innovation in the Fashion Industry, VRMR = Introduction to Virtual, Augmented, and Mixed Reality, VGD = Video Game Design and Development, RM = An Introduction to Recreational Math.

Figure 2

Program Overview and Participant Recruitment Across Two Independent Cohorts [CC1] (2022 and 2023)



Survey Instruments

English as a Lingua Franca (ELF)

This questionnaire assessed participants' attitudes and beliefs regarding English learning, pronunciation, and competency, using translated scales developed by De Meerleer (2012) Following an exploratory factor analysis of the seven original subdomains (excluding

the emotional and general learning subdomains), three subscales emerged and were renamed to improve conceptual clarity in the high school context: (1) Adaptivity to Global Englishes (10 items, e.g., "I feel at ease when I have to speak English"), (2) Preference for standard English (5 items, e.g., "It is important to speak English with excellent pronunciation"), and (3) Practicality of English (6 items, e.g., "To me, English is more important than my mother tongue"). Four items with low or cross-factor loadings were removed, reducing the total from 25 to 21 items across the three factors. Each item was rated on a 5-point Likert scale. The Cronbach's α values of each subscale were .85, .68, and .77, respectively.

Online Self-Regulated Learning Questionnaire (OSLQ)

This study adopted the Chinese version of the OSLQ developed by Wu et al. (2013), based on Barnard et al. (2009), to assess students' self-regulation in online learning. The 24-item scale covers six dimensions—goal-setting, environmental structuring, task strategies, time management, help-seeking, and self-evaluation—and was used without modification. All items were rated on a 5-point Likert scale (e.g., "I set goals for my learning performance in this online course"; "I took notes while studying online"). The composite scale demonstrated high internal consistency (Cronbach's α = .93).

Learning Engagement

The learning engagement questionnaire, initially developed by Fredricks et al. (2005), was adapted to contextualize the items for online course settings in the bilingual MOOC environment. Specifically, terms related to general classroom experiences were revised to refer to online learning (e.g., "I like taking online courses"; "I feel excited about online course activities"). The final version comprised 15 items measuring behavioral, emotional, and cognitive engagement. All items were rated on a 5-point Likert scale. The composite scale demonstrated strong internal consistency, with a Cronbach's α coefficient of .91.

Learning Satisfaction, English Semester Grades, and Open-Ended Questions

The learning satisfaction questionnaire, developed by the research team to reflect the bilingual MOOC context, consisted of nine items (e.g., "I am willing to recommend others to use *ewant* for learning."). All items were rated on a 5-point Likert scale and demonstrated high internal consistency (Cronbach's α = .87). Additionally, students were asked to report their English semester grades from the previous term, scored on a 0–100 scale, as an indicator of their general English proficiency and academic engagement. Finally, two open-ended questions were administered to explore students' learning experiences and feedback for improvement: (1) The most valuable thing I learned from this course was… and (2) Any suggestions for improving this course?

Learning Behavior Indicators

Data Extraction

The data of learning behaviors were extracted from *ewant*'s backend system, which operates on a relational database system (e.g., MySQL or PostgreSQL) with three primary databases (user information, course information, and management) and tracks log repository. Since our focus was participants' online learning behaviors, we collected the tracking log data, a detailed record of course user activities. This data encompassed views and clicks on learning materials, videos, and posts in discussion forums. In addition, the course database

supplied final course scores and completion records.

We selected behavioral indicators for the 2022 data pool based on the user tracking log repository. These indicators were aligned with the suggestions proposed by Chiu et al. (2018). Specifically, we extracted the following indicators:

(1) Number of learning materials read and clicked.

(2) Number of videos watched and clicked.

(3) Number of posts and responses created in the discussion forums.

Data Standardization

Given the high intercorrelations among several behavioral indicators (see Table 2), a standardization process identified three meaningful variables, resulting in the formulation of variables used for the 2023 dataset. First, the weekly reading completion rate was retained for reading behaviors, with each week's reading completion rate averaged. Similarly, the weekly video completion rate was calculated to represent students' video-watching behaviors. Finally, students' discussion behaviors were quantified and converted into percentages, resulting in the discussion contribution rate. Table 3 illustrates the calculation of these variables.

Table 2

Properties and Zero-order Correlations Among 2022 Learning Behavioral Indicators

Property	CC	L1n	L2n	V1n	V2n	Lc	Vc	D1n	D2n
n	36	36	36	36	36	36	36	36	36
M	–	.96	4.80	.85	7.64	1.29	1.38	7.08	130.44
SD	–	.62	3.11	.52	4.78	1.08	1.25	6.15	120.78
Min/Max	0/1	0/1.60	0/8	0/1.33	0/12	0/3.38	0/4.47	0/17	0/437
CC	–								
L1n	.875**	–							
L2n	.875**	1.000**	–						
V1n	.846**	.959**	.959**	–					
V2n	.846**	.959**	.959**	1.000**	–				
Lc	.746**	.895**	.895**	.844**	.844**	–			
Vc	.790**	.791**	.791**	.782**	.782**	.813**	–		
D1n	.913**	.931**	.931**	.925**	.925**	.873**	.839**	–	
D2n	.804**	.866**	.866**	.845**	.845**	.905**	.925**	.900**	–

Note. **p <.01. CC = Course completion, 1 = Pass, 0 = Fail. L1n = Number of learning materials read per week, L2n = Total number of learning materials read, V1n = Number of videos watched per week, V2n = Total number of videos watched, Lc = Average clicks per learning material, Vc = Average clicks per video, D1n = Total discussion interactions (posts + responses), D2n = Number of discussion forums browsed/clicked.

Table 3

Standardization of Behavioral Indicators

Behavioral Indicator	Calculation	Explanation
Reading completion rate	$\frac{Week1(\frac{1}{9} = 11\%) + Week2(\frac{3}{4} = 75\%)}{2\ Weeks} = 48.5\%$	• Week 1: 1 material completed out of 9 total materials • Week 2: 3 materials completed out of 4 total materials
Video completion rate	$\frac{Week1(\frac{1}{2} = 50\%) + Week2(\frac{1}{1} = 100\%)}{2\ Weeks} = 75\%$	• Week 1: 1 video was completed out of 2 total videos • Week 2: 1 video completed out of 1 total video
Discussion completion rate	$\frac{15}{22} = 68\%$	• 15 posts and responses, with 22 being the highest value in this category

Data Analysis

A convergent mixed-methods approach was adopted to address the three research questions (Creswell & Creswell, 2018). For RQ1, descriptive and correlational analyses were conducted using post-program questionnaire data from the 2023 cohort to examine the relationships among learners' attitudes toward Global Englishes, self-regulated learning motivation, English proficiency, and learning satisfaction. For RQ2, behavioral indicators—reading rate, video watching rate, and discussion contribution rate—were extracted from the *ewant* platform across the 2022 and 2023 cohorts and entered into logistic regression analysis to predict course completion ($p < .05$), evaluated using Nagelkerke R^2 and classification accuracy. No covariates were included, as only 17 students self-reported prior English semester grades. For RQ3, thematic analysis was applied to open-ended responses from the same 17 students using Braun and Clarke's (2006) framework to identify perceived learning gains and course improvement suggestions. As coding was conducted by a single researcher on a small dataset, this constitutes a limitation and is acknowledged in the conclusion to support a cautious interpretation of the qualitative findings.

Results

English Practicality Plays an Essential Role

Correlation analyses were conducted using IBM SPSS Statistics 24 to examine the relationships among key variables related to students' English attitudes, learning motivation, engagement, and satisfaction. Table 4 summarizes descriptive statistics, while Table 5 presents the correlation matrix. As shown in Table 5, several significant relationships emerged. Before the program, students who demonstrated greater adaptivity to Global Englishes exhibited higher self-reported English proficiency ($r = .54$, $p < .001$). Moreover, students who valued the practicality of English tended to affirm the importance of standard

English (r = .43, p = .004) and reported stronger self-regulated learning motivation (r = .39, p = .008).

Post-program responses revealed that students who scored higher on English practicality also reported elevated learning engagement (r = .73, p = .001) and satisfaction (r = .62, p = .008). These findings suggest that students with a stronger belief in the practical utility of English were more engaged and satisfied with the bilingual scaffolded MOOC experience. Finally, a strong positive correlation was found between learning engagement and learning satisfaction (r = .81, p < .001), highlighting the close alignment between affective and behavioral responses to the course.

Table 4

Properties of Variables for the Cohort 2023

	N	*M*	*SD*	*α*	Range	Skewness	*SE*	Kurtosis	*SE*
Pre-program									
Global Englishes	45	3.33	0.64	.85	2.2~4.8	0.14	0.35	-0.61	0.70
Standard English	45	3.57	0.61	.68	2.2~4.8	-0.20	0.35	0.04	0.70
English Practicality	45	3.63	0.60	.77	2~5	-0.05	0.35	0.47	0.70
SRL Motivation	45	3.45	0.58	.93	1.2~4.83	-0.89	0.35	4.80	0.70
English Proficiency	45	84.71	10.25	N/A	60~99	-0.57	0.35	-0.81	0.70
Post-program									
Global Englishes	17	3.33	0.63	.84	2.2~4.6	0.15	0.55	-0.09	1.06
Standard English	17	3.28	0.42	.31	2.4~4	-0.04	0.55	-0.12	1.06
English Practicality	17	3.32	0.81	.86	1.33~4.67	-0.58	0.55	0.94	1.06
Learning Engagement	17	3.71	0.61	.91	2~5	-0.50	0.55	-0.37	1.06
Learning Satisfaction	17	3.65	0.67	.87	3~5	-0.14	0.55	-1.04	1.06

Note. SRL = Self-Regulated Learning; N/A = Not applicable.

Table 5

Correlations among Variables in Pre- and Post-program Surveys

	1	2	3	4	5	6	7
Pre-program							
1. Global Englishes	–						
2. Standard English	.13	–					
3. English Practicality	.22	.43**	–				
4. SRL motivation	-.06	.11	.39**	–			
5. English proficiency	.54**	.19	.21	-.17	–		
Post-program							
1. Global Englishes	–						
2. Standard English	.33	–					

3. English Practicality	.20	.38	–				
6. Learning Engagement	.20	.40	.73**	–	–	–	
7. Learning Satisfaction	.34	.34	.62**	–	–	.81**	–

Note. **p <.01.

Discussion Participation Predicts Course Completion

After we screened the 2023 data, 11 cases were removed due to low participation (i.e., only viewing materials before courses started), leaving 68 valid cases for logistic regression analysis. Descriptive and correlational statistics were first examined to gauge data spread and potential collinearity (Table 6).

Table 6

Descriptive and Correlational Statistics for Learning Behavioral Indicators

	CC	RC	VC	DC
n	68	68	68	68
M (%)	–	46.15	60.35	30.08
SD (%)	–	35.94	38.79	27.23
Min (%)	0	0	0	0
Max (%)	1	93.06	100	100
CC	–			
RC	.633**	–		
VC	.639**	.838**	–	
DC	.814**	.741**	.779**	–

Note. **p <.01. CC = Course completion: 1 = Pass, 0 = Fail. RC = Reading completion rate; VC = Video completion rate; DC = Discussion contribution rate.

Next, the logistic regression analysis examined the effects of reading rate, watching rate, and discussion contribution rate on course completion. The dependent variable, course completion, was binary, indicating whether a student completed the course (1) or not (0). The results are shown in Table 7. As Table 7 indicates, discussion contribution significantly predicted course completion. The odds ratio for discussion contribution was 1.28, implying that for each 1% increase in discussion contribution, the odds of course completion increased by 1.28 times.

Table 7

Logistic Regression Results for Course Completion

	B	*SE*	Wald	*df*	*p*	Odds Ratio
Reading Completion Rate	.029	.031	.844	1	.358	1.029
Watching Completion Rate	.054	.046	1.389	1	.239	1.056
Discussion Contribution Rate	.247	.093	7.002	1	.008	1.280

Interestingly, the reading and watching completion rates were not significant predictors when combined with the discussion contribution rate, revealing that the discussion contribution rate was the most decisive predictor of course completion. The model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test, which indicated that the model adequately fit the data: $\chi^2(7) = 4.436$, $p = .728$. The Nagelkerke R^2 value was .90, suggesting

that the model explained approximately 90% of the variance in course completion, with the model accuracy up to 92.6%.

Students Value Both Content and Scaffolding in Bilingual MOOCs

Table 8 presents the five meaningful codes extracted from the open-ended question concerning the most valuable aspect of the program. Table 8 shows that content knowledge is the most prominent value, followed by learning strategy, language knowledge, critical thinking, and motivation. In other words, students placed the highest emphasis on mastering subject-specific content (e.g., the fashion industry and artificial intelligence) while also recognizing the importance of effective learning strategies (e.g., taking notes and utilizing online English learning tools) and language knowledge (e.g., vocabulary words and expressions). Critical thinking and motivation are also worth attention, though not as prominent as the other three codes. These findings suggest a multifaceted approach to scaffolded learning on bilingual MOOCs, where cognitive skills and motivational factors contribute to students' overall online learning experience.

Table 8

Examples and Percentage of Extracted Codes

Code	Example	%
Content knowledge	I gained knowledge about artificial intelligence.	38.89
Critical thinking	When I see data, I want to know how it was collected instead of accepting it without a second thought.	.56
Language knowledge	I learned new vocabulary related to technology.	16.67
Learning strategy	I learned how to take notes.	27.78
Motivation	I was motivated to learn.	5.56
N/A	Everything.	5.56

Note. N/A = Not applicable.

Regarding suggestions for course improvement, "Accessibility of information" (50%) and "Course design" (50%) were extracted. "Accessibility of information" is relevant to platform design. One student said, "I was confused using the platform because I could not find the information I needed." Another student replied, "When I had questions, I did not get prompt responses." These comments highlight the importance of user-friendly platform design. When learners struggle to navigate the platform or access timely support, their emotions, motivation, and engagement could be negatively impacted.

On the other hand, "Course design" pertains to the structure and organization of the course content. Students expressed concerns about teachers' guidance and the pacing of the lessons, with one student commenting, "Teachers' directions were not clear enough." Another student suggested, "I hope more sessions were saved for learning on FutureLearn." These comments indicate that students value clear instructor guidance and opportunities for deeper engagement with the content knowledge.

Discussion

The present study contributes to online learning research by exploring a less-explored context: scaffolded, bilingual MOOCs for high school students. Using a convergent mixed-methods design, we investigated (1) how learners' beliefs about English and self-regulated motivation relate to their engagement and satisfaction; (2) which types of behavioral engagement predict course completion; and (3) what learning experiences students find most

valuable. The study offers practical insights into designing inclusive online environments for linguistically diverse adolescents worldwide by examining these cognitive, behavioral, and experiential dimensions. Three significant findings are elaborated below.

First, positive correlations were found between various variables. Notably, a correlation between adaptivity to Global Englishes and English proficiency emerged. Such a finding offers insight into learners' openness to diverse English varieties as a global medium. It may enable them to navigate bilingual MOOC environments more effectively, aligning with Jenkins et al.'s (2011) affirmation that positive attitudes toward English as a global language enhance learning outcomes. The relationship highlights the potential impact of self-assurance in linguistic versatility on academic success. Furthermore, students who emphasized the practicality of English reported higher levels of self-regulated learning motivation and post-program learning satisfaction. This group also exhibited greater post-program engagement, suggesting that valuing the functional utility of English may foster more substantial involvement in online learning. These positive links resonate with existing literature, particularly studies emphasizing the positive effects of task value on motivation (Wigfield & Eccles, 1992). When students recognize English's real-world applicability, they are more likely to engage in self-regulated learning strategies, which enhances their learning satisfaction. The connection between attitudinal and motivational factors and post-program satisfaction underscores the interconnectedness of student attitude/belief, motivation, and overall program feedback.

Second, the logistic regression analysis identified discussion contribution as a significant predictor of course completion, while reading materials and watching videos were not. This finding underscores the critical role of active engagement and interaction in online learning environments, which aligns with Moore's (1990) Theory of Distance Education and empirical evidence (Emanuel & Lamb, 2017; Jitpaisarnwattana et al., 2021). Unlike adult learners—whose completion may be equally influenced by passive and active behaviors (Bonafini et al., 2017; Chiu et al., 2018; Peng & Xu, 2020)—adolescents may require dialogic and peer-based learning experiences to sustain motivation and accountability. Discussion activities may therefore play a developmental role by fostering a sense of relatedness and cognitive engagement, which are essential to adolescent persistence. This aligns with findings in middle school learners, where peer and instructor–learner interactions predicted learning efficiency via increased social presence and engagement (Gao et al., 2024). It is also consistent with MOOC research showing social presence contributes significantly to student engagement, mediated by autonomous motivation (Chi, 2023). Together, these results highlight the relevance of socially driven learning mechanisms in designing online courses for younger learners.

Finally, students considered content knowledge the most valuable gain. This indicates that the international instructors effectively provided substantive knowledge that students deemed relevant and useful. However, as the content knowledge was presented in English, a foreign language for the participants, they needed learning strategies/tools and knowledge of English to support the self-regulated learning journey (Barnard et al., 2009; Phan, 2018; Yousef & Sumner, 2021). Therefore, they also valued "Learning strategy" and "Language knowledge," which the local instructors offered as scaffolds. With this instructional support in place, students were better able to absorb and make sense of the subject-matter content (Ertugruloglu et al., 2023; Rai & Chunrao, 2016). Echoing findings from global MOOC learners, these high school students also expressed a clear need for cognitive and linguistic scaffolding, suggesting a universal requirement for integrated support in MOOC-based

learning (Zhu et al., 2022). Although the participants of the current study focused on high school learners in Taiwan, the challenges of sustaining engagement, comprehending English content, and needing scaffolded support are shared by global adolescents who engage in online learning (e.g., Koutsakas et al., 2020; Pozón-López et al., 2021). These findings provide insights for designing scaffolded MOOCs and other online learning environments for linguistically diverse students across different cultural and educational settings.

The bilingual scaffolded MOOCs examined in this study offer a promising response to the challenges outlined by Li et al. (2024), who emphasized adolescent learners' need for language, content, technological, and emotional support in online learning environments. By addressing these needs through targeted scaffolding course design, our study contributes to global efforts to make online learning more accessible and practical for diverse learners. Our findings underscore the importance of using English for real-world content learning, particularly when learners are supported by instructors who share their linguistic and cultural backgrounds, thereby enhancing comprehension and engagement.

Conclusion

The present study explored bilingual scaffolded MOOCs as an innovative initiative to address adolescent EFL learners' linguistic and motivational needs, engaging with English-language online content. The bilingual design aimed to reduce language barriers and promote equitable access to English-Medium Instruction (EMI) by combining global MOOC content with local scaffolding strategies.

Findings from this convergent mixed-methods study yield several practical implications. First, students who endorsed the practical value of English reported higher levels of self-regulated learning motivation, engagement, and satisfaction, underscoring the pedagogical value of designing online content that is contextually meaningful and applicable to real-world scenarios. Second, behavioral data revealed that discussion forum participation was the strongest predictor of course completion, while passive behaviors such as video watching and material reading were not significant. This finding highlights the salience of dialogic and interactive learning components in fostering engagement and social presence among adolescent learners. Third, the scaffolded structure of the MOOCs—featuring culturally resonant instructors and bilingual materials—was perceived as valuable in supporting comprehension and sustaining interest.

These findings suggest that when thoughtfully designed with practical content, self-regulated learning supports, and interactive elements, bilingual MOOCs can enhance adolescent engagement and learning persistence in online settings. Educators and course designers are encouraged to incorporate strategies such as goal-setting, time management scaffolds, and structured peer interaction opportunities to support autonomous learning among high school students. Furthermore, bilingual scaffolded MOOCs may be a promising model for facilitating EFL learners' transition to English-medium instruction through supportive and context-sensitive online environments.

Despite the study's contributions, several limitations warrant consideration. First, the sample was limited to high school students in Northern Taiwan who enrolled in specific MOOCs, which may constrain the generalizability of the findings. Future research could include more diverse and representative samples. Second, only immediate learning outcomes were assessed. Longitudinal designs are needed to examine the sustained impact of bilingual MOOCs on learners' academic trajectories and language development. Third, the absence of

pre- and post-intervention surveys precluded the assessment of developmental gains. Future work should incorporate such assessments to enable within-subject comparisons. Finally, the qualitative component was limited by the small sample size and single-coder analysis, potentially constraining analytic depth and trustworthiness. Expanding qualitative data collection and employing multiple coders could improve the credibility and robustness of future analyses.

Future research should extend our work to broader populations, including adolescents or younger learners in other regions, fresh university learners transitioning to EMI, and adult EFL learners in continuing education. Comparative studies could examine how cultural background, language proficiency, and educational systems mediate the effectiveness of online bilingual scaffolding. By situating the present findings in broader contexts, researchers may advance a more global understanding of designing inclusive MOOCs for linguistically diverse learner groups.

Declarations

Ethics

This study was conducted per the ethical standards of institutional and national research committees in Taiwan and the 1964 Helsinki Declaration and its later amendments. The research involved regular teaching activities and voluntary student participation through the *ewant* platform, so it was exempt from formal IRB review. Informed consent was obtained from all students via a web form before accessing the learning content. Data were collected and used in accordance with *ewant*'s Terms of Service and Taiwan's Personal Data Protection Act, ensuring that no personally identifiable information was disclosed.

Conflicts of Interest

The authors declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

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