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Research Article

Mobile Vocabulary Apps' Impact On English Proficiency, Mediated By Learning Engagement, Moderated By Students' Skills And Motivation.

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ABSTRACT

Background of the Study: The growing use of mobile technology, especially mobile applications, has changed various aspects of life, including education. Mobile apps offer dynamic and attractive resources that promise to enhance language learning experiences. In addition, the study recognizes the important role of teachers in shaping students' academic travel, as they plan to learn by providing guidance and support to students، implement and assist.

Purpose: It examines the relative engagement, motivation, and moderate role of skills. The goal is to improve teaching methods, increase student engagement, and create a more equitable education system by understanding the interactions between students, teachers and education.

Methodology: Data is collected from 200 professors and students in various Chinese educational institutions through self-report surveys, app use logs and English language eligibility tests. After a comprehensive literary review, quantitative research methods, including structural equation modeling (SEM), are used to analyze data. The study uses a facility sampling method, a type of convenience sampling.

Findings: The study shows that when language learners are encouraged and engaged, mobile word apps can effectively enhance language skills. Teachers who engage in professional learning opportunities acquire new knowledge, enhance their teaching skills, and keep up-to-date on research-based teaching methods which benefits both teachers and mediators in the field of language education.

Contribution: It offers insights that can inform students of teaching techniques, educational methods, and interventions to enhance student motivation, engagement, and learning outcomes. The teachers can use this information for more attractive and effective learning experiences for students. In addition, this study provides guidance for the development and use of mobile language learning apps to effectively support language acquisition.

Keywords: English language proficiency, Mobile vocabulary apps, Self-directed learning, Adaptivity, Learning engagement, Student skills and motivation.

1. Introduction:

Education for English language learners is changing and offers both opportunities and difficulties. The rapidly expanding English language community is expected to satisfy demanding content standards while learning English to be prepared for college and careers by the end of high school (Halle et al., 2012). In actuality, all learners' reading comprehension and language proficiency are significantly influenced by their vocabulary knowledge. Due to the growing recognition of the importance of vocabulary knowledge, theoretical and empirical research on the subject of efficient vocabulary acquisition in both first and second languages has been conducted (Lee, 2018). Growing one's vocabulary through personal reading is individualized, which is one of the main barriers to vocabulary acquisition (Deris and Shukor, 2019). Due to

its multilingual heritage and extensive vocabulary, English poses a special challenge (Deng and Trainin, 2015). The learning of pupils has been proven to benefit from training programs that encourage self-regulated learning. Furthermore, academic achievement is well predicted by self-regulated learning (Loyens et al., 2008). We are showcasing a carefully chosen body of literature that reflects the various outcomes. Teachers' self-efficacy levels vary across domains of activities regarding students' capabilites. Given that it is regarded as a crucial activity for enhancing students' skills, such as team performance, innovation, and creativity, knowledge sharing has drawn considerable interest in regions all over the world (Heo et al., 2022). Education experts have recently become particularly interested in a particular sort of motivation known as accomplishment motivation, which is concerned with what, why, and how students are driven in various learning circumstances (Fadlelmula, 2010).

1.1 Contribution of the study:

This study aims to fill this knowledge vacuum by examining the impact of self-directed learning, adaptivity, and mobile vocabulary apps on English language competency. For educators, developers, and policymakers involved in language education to make well-informed judgments on the use of technology in language learning programs, it is essential to understand the efficacy of mobile vocabulary apps. The study might investigate methods for tailoring training to each student's particular needs, learning preferences, and skills. This can support more specialised and efficient educational experiences by fostering personalised learning opportunities that are adapted to each student's unique interests and strengths.The study may have the ability to enhance student academic progress by discovering efficient practises and interventions. Implementing practises that are supported by evidence can improve student outcomes and aid in their long-term educational success.The potential for self-directed learning and adaptivity to improve language learning outcomes is what drove the inclusion of these concepts in the study rationale. The study's ability to inform educational practises, policies, and interventions that improve student learning experiences, advance fairness, promote motivation and well-being, and boost academic accomplishment constitutes its overall impact to students. The study can support ongoing efforts to enhance student learning outcomes and overall educational experiences by addressing important research topics and producing new knowledge.

Based on the problem statement and gaps of the study discussed, the research questions are given below.

1. Do mobile vocabulary apps, self-directing learning, and adaptivity impact on English language proficiency?
2. Do learning engagement influence on English language proficiency?
3. Does learning engagement mediate the relationship between mobile vocabulary apps, self-directing learning, and adaptivity on English language proficiency?
4. Does students' skills and motivation moderate the relationship in the relationships between learning engagement and English language proficiency?

The objectives of the study are:

1. To examine the impact of mobile vocabulary apps, self-directing learning, and adaptivity on English language proficiency.
2. To assess the influence of learning engagement on English language proficiency.
3. To explore the mediating role of learning engagement in the relationships between mobile vocabulary apps, self-directing learning, and adaptivity on English language proficiency.
4. To explore the moderating role of students' skills and motivation in the relationships between learning engagement and English language proficiency.

2. Literature Review

2.1 English languageproficiency:

The study discovered that despite being in an environment that is favorable to language learning, many students find it difficult to speak freely in english due to a variety of reasons, including their inadequate English language proficiency and a lack of confidence and drive (Rashid and Asghar, 2016). This study aims to investigate the usage of translation techniques for learning while taking into account the various viewpoints regarding the use of translation as a language learning approach (Adil, 2020). English is crucial in the twenty-first century as a global language and as a foreign language, particularly in international communication. Universities' educational professionals have made enough room for the teaching and learning of english because of the importance of learning the language (Woodcock et al., 2022). As a result, creating engaging teaching methods that promote learning is a requirement for teachers. According to Oxford, compensation strategies "allow learners to use the language despite their frequently significant gaps in knowledge," cognitive strategies "enable learners to understand and produce new language by many different means," and memory strategies "help students store and retrieve new information" (Li et al., 2017). The capacity of people to speak and comprehend English is measured directly on two different levels. The language used to communicate with family members and friends regularly as well as how frequently an English language newspaper is read are also noted. Early on, studying two languages has several advantages (Ibrahim et al., 2023). Fluent multilingual speakers have access to opportunities that monolinguals do not, particularly in the increasingly globalised economy (Halle et al., 2012).

2.2 Mobile vocabulary apps:

According to the literature, there are two main methods for efficiently retrieving and permanently retaining vocabulary items. One is multimodal presentation, which makes use of various media types to show word knowledge (Wang et al., 2021). The cognitive theory of multimodal learning claims that the two channels visual and auditory are how word knowledge develops. By stimulating both channels and creating linkages between knowledge forms and their storage in memory, learners who see word knowledge in multimedia formats are better able to retain information and speed up knowledge retrieval (Kohnke et al., 2019). The mobile application being utilized and its features may have an impact on the students' acceptability of utilizing them for language learning. According to research on learners' readiness for mobile learning, there are some preferred mobile learning elements that students favor, including audio learning modules, study suggestions, and reminders for crucial occasions. Even if students enjoy using their phones in class, there is still a limit to their use because lecturers discourage it. Large file storage was another challenge for learners, as certain learning apps continuously drain the battery of their phones (Deris and Shukor, 2019). Smartphones and associated applications (apps) are an integral part of our life in the era of Industrial Revolution 4.0, which is characterized by the ongoing automation of old manufacturing and industrial practices and the use of current smart technologies. 90% of mobile time, according to statistics data, is spent using applications (Klimova, 2021).

2.3 Self-directed learning:

Literature resources that are thought to be relevant must be critically assessed. Additionally, to arrange their self-study well and be well-prepared for the upcoming tutorial session, students must manage their time well. These exercises effectively put students in charge of theirs learning because they require them to assess, following the tutorial meeting, whether their own and their peers' study efforts have been sufficient to meet their learning needs (Loyens et al., 2008). A special session on teacher proficiency should be included in English language teacher conferences and seminars (for example, sharing sessions on how instructors work to increase their proficiency levels). This will allow us to convey to our english teachers a clear message about the value of having a strong command of the English language (Lee, 2022). A crucial source of competitive advantage in the information society, e-learning, e-education, or online learning refers to the way individuals communicate and study electronically. Online learning, intranet-based training, interactive distance learning, and intranet-based training all seem to be various names for similar but distinct learning methods. The boundaries and capabilities that historically distinguished these divisions, meanwhile, are becoming fuzzier as a result of technological advancements. Despite having some distinct distinctions, including those in bandwidth, user interface, or interaction, they all use the same approach to give flexible learning. Additionally, these online learning platforms have started to consolidate around a delivery infrastructure and common technology standards, using the Internet as a medium (Roffe, 2002). The moderating function of student liveliness was discussed using the example of the self-directing teacher. The use of the self-directing instructor expands on the underlying knowledge of how student liveliness increases students' interest in online learning. The results suggest that the positive relationship between university support and online learning engagement is strengthened when students have an innate drive and motivation to take action (Azila-Gbettor et al., 2023).

2.4 Adaptivity:

By dynamically modifying learning content to each student's unique abilities or preferences, adaptive learning systems seek to give students a quick, effective, and personalized learning experience. Adaptive learning systems have been shown repeatedly over the past three decades to be effective and successful in boosting student learning, but their real impact and acceptance in education are still mostly limited to research projects. To give students a productive, successful, and personalized learning experience, adaptive learning systems employ data on students, learning processes, and learning products to dynamically modify learning activities and content to each student's unique preferences or skills (Khosravi et al., 2020). With the increased use of web technology for learning, the term "e-learning" is growing in use. Electronic learning is referred to as e-learning. These issues are addressed by adaptive e-learning systems, which alter the way the content is presented to account for each particular student. The concept of customizing the systems for each learner derives from hypermedia systems and intelligent tutoring systems. The adaptive e-learning system employs a user model to collect data about the student's learning objectives, preferences, and background knowledge and then uses that data to customize the experience to meet the student's needs (Surjono, 2011). Both user and task-level adaptivity features can be offered by non-intelligent learning systems. For instance, the change in explanation granularity at the user level may be related to the user's repeated demands for a specific granularity level duplicated elsewhere, where it is not demanded but anticipated to be intended. The user's preferences for a task can be applied to other tasks of a similar nature at the task level (Oppermann et al., 1997). Numerous studies in the fields of education and adaptive e-learning systems have focused on the characteristics of learners. The system determines the choice of traits. Traditional adaptation mechanisms rely on the learner's established features from when he or she first used the system, including personal data, learning preferences, goals, and objectives. It is created before learning ever starts. However, dynamic

adaptation necessitates a process of user and system interaction. The usage of dynamic attributes updated in real-time is necessary for that situation. Examples include information, feelings, aptitude, historical context, navigation, and test outcomes (Ennouamani and Mahani, 2018).

2.5 Learning engagement:

The separation of students and teachers in time and geography is the most visible feature of online learning. The promotion and maintenance of learners' learning engagement has thus become a research priority. The level of active student participation in learning activities is referred to as learning engagement. In online learning environments, learning engagement is seen as a significant component for determining students' learning achievement and is linked to some variables, including students' self-efficacy, perceived task value, and teachers' teaching presence (Zhang and Liu, 2019). Since students must simultaneously master the course material and how to learn online, online learning can be particularly difficult (Hu and Hui, 2012). These preliminary researches lend credence to the social construct of learning engagement, which identifies behaviors, emotions, and cognitive engagement as three crucial areas. Students that engage in behavior do so by taking part in activities like course assignments (Borup, 2016). Students' affective behaviors towards instructors, peers, or even the course as a whole are referred to as emotional engagement. Students' assessments of the relevance and significance of the course material are a measure of cognitive engagement (Buelow et al., 2018). Students' intrinsic motivation to learn is also increased when they are encouraged to participate in creating the course requirements (purpose). Students' capacity to filter through supplied material as well as critically reflect on and analyze their performance improves the more control they have over the learning process. Student-directed assessment can also be used as a teaching tool to encourage self-reflection and analysis (Douglass and Morris, 2014). Despite all the recent upheaval and changes in higher education, the majority of academics and decision-makers continue to strive for the elusive objective of enhancing student learning. The majority of research on teaching and learning is concerned with ways to increase student learning, whether it is through addressing issues like failing pupils, the relevance of the curriculum, the efficacy of teachers, or perceptions of teaching and/or learning. One line of research has focused on classroom behaviors that are linked to engagement; these are characterized by being active, such as participation through question-asking or teamwork with other students (Bryson and Hand, 2007).

2.6 Students' skills and motivation:

Developing essential abilities is only one aspect of the equation; effort, which is the visible manifestation of motivation, is also crucial. The effectiveness of incentives, which raise motivation, and prevalent disincentives (obstacles), which lower motivation, determine how much work or motivation a distance education instructor puts out. The identification of instructor-perceived incentives and obstacles is crucial to achieving the goal of eliciting a higher level of effort in an organizational setting where incentives are achievable, obstacles are reduced, or both(Crumpacker and Crumpacker, 2001). Relationships between faculty and students serve as a powerful motivator and measure of learning(Komarraju et al., 2010). According to researchers, pupils should be driven in the main to practice using their meta-cognitive abilities and managing this process. Therefore, it is believed that pupils who are not motivated to learn will not make the effort to set learning objectives, choose and employ instructional tactics, and evaluate their progress. When students find their own learning style and perceive themselves as effective, they have a good attitude towards learning and become motivated(Oguz, 2016). An achievement exam's performance is the outcome of the interaction between prior knowledge, information processing speed, and test motivation. In some circumstances, general intelligence can partially make up for a lack of domain-specific expertise. However, test motivation, or the will to focus on test items and put forth the necessary effort and perseverance, cannot be replaced(Baumert and Demmrich, 2001). Any organisation needs motivation because it promotes staff productivity and raises the likelihood that goals will be accomplished quickly and effectively. Empirical study has focused a lot on the motivation and effectiveness of instructors' work. Its value in the workplace depends critically on its broad appeal across different cultural perspectives. An empirical study revealed that management at educational institutions may employ a variety of techniques and strategies to inspire its teachers(Owan et al., 2022).

2.7 Hypothesis development:

2.7.1 Mobile vocabulary apps and English language proficiency:

Numerous academics have examined the use of mobile learning in educational settings, and they have discovered generally favorable opinions on the part of students. Students respond strongly to applications that offer a user-friendly interface, touchscreen functionality, flexibility, and the capacity to customize learning. The purpose of the current study was to determine whether mobile vocabulary learning programs may help learners acquire and retain business terminology more effectively (Kohnke et al., 2019). The four language skills that are developed through the use of mobile applications in the study of English as a foreign language are reading, listening, speaking, and writing. The development of all four linguistic functions as well as language proficiency depend on learning new words and phrases (Klimova, 2021).Existing research on the variables influencing students' academic success in higher education identifies a variety of variables in several dimensions. Academic, psychological, cognitive, and demographic are the four general areas in which

these variables might be categorized (Light et al., 1987). Mobile vocabulary apps and English language proficiency have a supportive and improving relationship. These applications offer users useful materials, engaging tools, and easy access to vocabulary study, all of which help learners improve their knowledge of and command over the English language.
H1: *There is a relationship between mobile vocabulary apps and english language proficiency.*

2.7.2 Self-directed learning and English language proficiency:

The second part of senior general secondary education and pre-university education is one of several developments in secondary education happening around the country (Halle et al., 2012). Schools should be changed into "houses of study" where students learn to study more independently in order to better prepare them for further education, the workforce, and life (Bolhuis and Voeten, 2001). Between instructor and student, there must be equality of rank and respect (Hewitt-Taylor, 2001). A conundrum arises from the focus on independent learning in educational programs. It is a crucial tool for enabling pupils to build autonomous learning skills, which will be necessary for a continuously changing environment (Slevin and Lavery, 1991). Successful academic English language acquisition is directly related to the conditions and requirements of language learning environments. Particularly for adolescent pupils, there is a marked distinction between language used at school and language used in conversation with friends and family (He and Miller, 2011). Self-directed learning greatly aids in the growth of English language proficiency by encouraging learner autonomy, targeted learning, continual practise, self-assessment, and lifetime learning abilities. Higher levels of language competency and a deeper comprehension of the English language are more likely to be attained by learners who actively participate in shaping their own learning process.
H2: *There is a relationship between self-directing learning and english language proficiency.*

2.7.3 Adaptivity and English language proficiency:

Since students learn more successfully when instruction is tailored to their requirements, personalizing learning to match students' various needs has a great deal of potential to improve learning. As more students enroll in formal academic programs, which frequently provide instructors with the need to alter their instruction, colleges and professional degree programs are becoming more and more interested in investigating the use of adaptive learning systems as a tool to meet student's specific learning needs and characteristics (Liu et al., 2017). Adaptive programs use a variety of curricula and methodologies that have been successfully used with a wide range of students and in some classroom contexts. These include big and small group teaching modalities, individual tutorials, cooperative teams, and mastery learning, all of which have demonstrated moderate to large effect sizes in prior study syntheses (Waxman et al., 1985). Without explicit instruction, people can pick up new words from a variety of contexts through incidental vocabulary learning. Learning happens gradually as students build up instances and contexts to acquire a fuller understanding of word meanings (Carhill et al., 2008). Most vocabulary is picked up unintentionally through reading and digital media after the basic skill has been attained, according to researchers, and fewer words are learned consciously. Given the scope of the vocabulary learning assignment, it becomes clear that the majority of words are acquired as a result of real-world reading, listening, speaking, and writing activities (Deng and Trainin, 2015). This study investigates features of linguistic competence that are pertinent to a specific educational setting. Even though this study refers to the implementation and perception of a broader notion of communicative competence, including grammatical, pragmatic, sociolinguistic, strategic, and discourse competence, the term "proficiency" may be deficient. I use it because it is widely accepted in the local school context (Martin-Beltrán, 2010). Learners can gain from personalised, differentiating, and targeted instruction that caters to their particular requirements by adding adaptivity into language learning systems and treatments. This adaptive method encourages participation, inspiration, and ongoing development, all of which contribute to improved English language ability.
H3: *There is a relationship between adaptivity and english language proficiency.*

2.7.4 Learning engagement and English language proficiency:

A social cognitive model of learning that emphasises the dynamic character of the engagement between the learner and environment has been connected to engagement in learning orientations. This strategy emphasizes the dynamic and perpetually reconfigured interaction between the student's perception and experience, their interpretation of it, and their involvement with education. This raises concerns about the purpose of higher education and suggests a deeper and broader understanding of involvement than merely increasing active participation in the classroom (Bryson and Hand, 2007). Chinese government representatives and educators are looking for methods to use pervasive technology environments to address two national educational concerns as a result of increased Internet connectivity and the availability of free online resources. Private tutoring at unsustainable amounts and low student learning engagement (Hur and Oh, 2012). A study of current empirical studies reveals some knowledge-sharing-related research areas in online learning. The first stream looks at online learning that is offered through a platform that is shared by peer learners and on which they communicate with one another continuously through asynchronous written communication, frequently in the form of discussion boards. Authenticity was important, but only to the

extent that it offered accurate representations of the language being spoken (Kavakli, 2021).The connection of peer learners and their engagement in knowledge-sharing behavior are two of the major success aspects in online learning, according to all of these research streams. The development of theories and methods that aid practitioners in facilitating the interaction and exchange of knowledge among learners is therefore a major focus of much online learning research (Ma and Yuen, 2011). English language competency is critically dependent on learning engagement. Engaged students are more likely to participate actively, be driven, retain and recall language knowledge, seek out language exposure and practise, and display self-directed learning behaviours. These elements work together to support the growth of English language competency and the general success of learners in learning and effectively using the language.

H4: *There is a relationship between learning engagement and english language proficiency.*

H5: *Learning engagement mediates the relationship betweenmobile vocabulary apps and english language proficiency.*

H6: *Learning engagement mediates the relationship betweenself-directing learning and english language proficiency.*

H7: *Learning engagement mediates the relationship betweenadaptivity and english language proficiency.*

H8: *Students' skills and motivation moderate the relationship between learning engagement and english language proficiency.*

As a result, the study's structure, which is depicted in Figure 1, was constructed based on the literature analysis and discussion presented above.

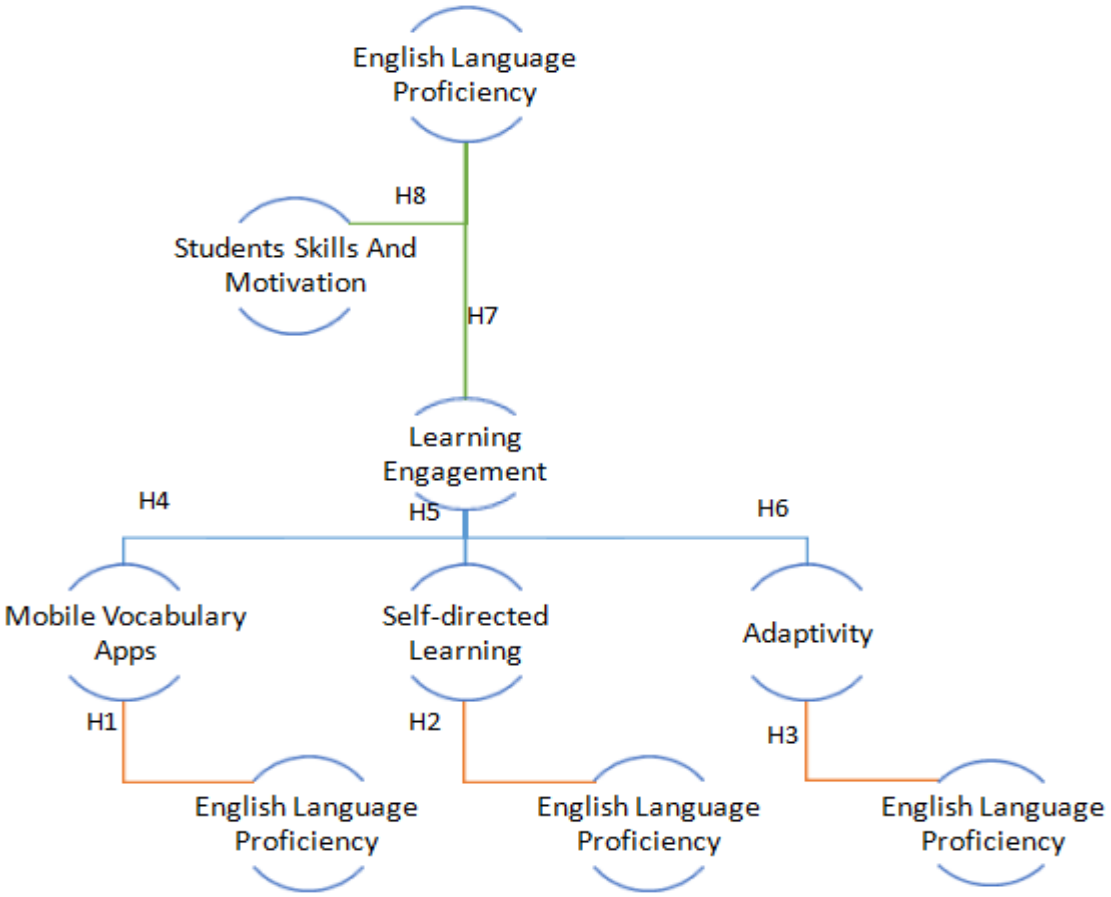

Figure 1. Conceptual framework

3. Methodology:

A research design is a collection of strategies used to finish a research project. The method frameworks and strategies that the researcher will employ to accomplish the study are specified as research design. We employed a quantitative research strategy in this study. The identification of the population is the first step in the sampling procedure. To achieve the study's goal, data was collected from a sample of teachers and students in China using questionnaires and web content analysis. A self-administered survey was employed for this. A convenience sample strategy was used to acquire data from 200 respondents from university students and professors. A questionnaire is a technique for gathering data. Previous research has used a structured questionnaire. The adaptability of questions relating to independent, dependent, and mediating factors serve as the foundation for the questionnaire. Because 50 surveys were not completed, only 250 were

included for statistical analysis. SPSS was used to analyze demographic information, whereas Smart PLS was utilized to assess the reliability, validity, and association between variables.

3.1 Measures:

Through the use of a structured questionnaire, data is gathered. The study items have been taken English language proficiency (Oliver et al., 2012), mobile vocabulary apps (Deris and Shukor, 2019), self-directed learning (Slevin and Lavery, 1991), adaptivity (Oppermann et al., 1997), learning engagement (Buelow et al., 2018), students' skills and motivation (West, 2003).

4. Data analysis:

The Smart-PLS 4 software program's PLS-SEM (partial least rectangular structural equation modeling) approach was used to analyze data in this study.PLS-SEM was chosen over covariance-based structural equation modeling because it is more suited for exploratory studies. PLS-SEM is also easier to comprehend than covariance-based completely structural equation modeling (Nawaz et al., 2023). PLS-SEM is also superior to covariance-primarily based structural equation modeling since it is less difficult to implement.

4.1Measurement model:

A measurement model is used to estimate and analyze reliability and validity(Jr et al., 2008). Composite reliability is used to measure the internal consistency of variables, and outer loading is used to measure the reliability of components. When the reliability and validity of this concept have been established or satisfied, a link between variables is considered to be normal (Peter and Churchill, 1986). A measurement model's PLS-SEM analysis was done using Smart PLS 3.0 (Avotra et al., 2021; Sandra Marcelline et al., 2022; Nawaz et al., 2023). Table 1 and Figure 2 illustrate the results of the validity, reliability, and factor loading tests performed on the items used to create a PLS measurement model. Cronbach's alpha, which measures an item's internal consistency, should be at least 0.70 (Xiaolong et al., 2021; Yingfei et al., 2021). Cronbach's correlation coefficient alpha and CR values were both more than 0.70 for the variables chosen. Because the average variance extracted values for discriminant validity were more than 0.50, this demonstrated adequate reliability and confirmed convergent validity (Fornell& Larcker, 1981). Our findings revealed that Cronbach's alpha, CR, and AVE values of 0.6, 0.7, and 0.5 for all of the aforementioned metrics were acceptable (F. Hair Jr et al., 2014).

Table 1. Construct reliability and validity

	Items	Outer Loading	VIF	Cronbach's Alpha	CR	AVE
Adaptivity	AD1	0.561	1.202	0.799	0.863	0.561
	AD2	0.766	1.682			
	AD3	0.790	1.789			
	AD4	0.836	2.015			
	AD5	0.761	1.734			
English language proficiency	ELP1	0.722	1.385	0.726	0.818	0.488
	ELP2	0.726	1.469			
	ELP3	0.342	1.086			
	ELP4	0.831	1.709			
	ELP5	0.766	1.575			
Learning engagement	LE1	0.509	1.146	0.736	0.827	0.494
	LE2	0.701	1.378			
	LE3	0.756	1.518			
	LE4	0.757	1.630			
	LE5	0.759	1.658			
Mobile vocabulary apps	MVA1	0.730	1.402	0.763	0.840	0.516
	MVA2	0.789	1.683			
	MVA3	0.752	1.551			
	MVA4	0.729	1.572			
	MVA5	0.571	1.296			
Self-directed learning	SDL1	0.712	1.369	0.716	0.814	0.468
	SDL2	0.672	1.272			
	SDL3	0.717	1.438			
	SDL4	0.694	1.326			
	SDL5	0.622	1.312			
Students' skills and motivation	SSM1	0.474	1.075	0.736	0.828	0.497
	SSM2	0.704	1.385			
	SSM3	0.719	1.553			
	SSM4	0.802	1.653			
	SSM5	0.778	1.695			

After determining data dependability, the next stage is to determine data validity. A statistic called discriminant validity is used to assess a research model's capacity to differentiate between two or more distinct constructs. This indicates how much the questions or measurements designed to evaluate one construct assess a model construct. The component correlations computed by Fornell-Larcker are compared to the square root of the average for each construct (see Table 3). To establish discriminant validity, the square root of a construct's average must be greater than the correlation with the other components of the model. The discriminant validity of the test is shown in Table 1.

Table 2. Discriminant Validity (Fornell-Larcker)

	Adaptivity	**English language proficiency**	**Learning engagement**	**Mobile vocabulary apps**	**Self-directed learning**	**Students' skills and motivation**
Adaptivity	0.749					
English language proficiency	0.304	0.699				
Learning engagement	0.595	0.410	0.703			
Mobile vocabulary apps	0.440	0.675	0.579	0.718		
Self-directed learning	0.589	0.437	0.801	0.541	0.684	
Students' skills and motivation	0.563	0.411	0.982	0.583	0.765	0.705

According to recent research trends, discriminant validity is the most prevalent and crucial component of SEM (Xiaolong et al., 2021). The discriminant validity employing heterograft-heteromethod ratio (HTMT) criteria, one of three forms of PLS discriminant validity findings, is shown in Table 4. HTMT refers to the research of the indicators' associations of several ideas measuring various occurrences. Furthermore, HTMT with bootstrapping provides a threshold value less than or equal to one, demonstrating confirmations of discriminant validity(Henseler et al., 2015).

Table 3. Discriminant validity (HTMT)

	Adaptivity	**English language proficiency**	**Learning engagement**	**Mobile vocabulary apps**	**Self-directed learning**	**Students' skills and motivation**
Adaptivity						
English language proficiency	0.385					
Learning engagement	0.775	0.536				
Mobile vocabulary apps	0.546	0.849	0.762			
Self-directed learning	0.792	0.612	1.099	0.721		
Students' skills and motivation	0.735	0.528	1.337	0.761	1.066	

When the R2 score is more than 0.5, it is concluded that the model's initial data strength is strong. The values of R2 in this study for learners' engagement and English language competence were 0.466 and 0.686, respectively Which indicates a mildly strong model (Hair et al., 2016). In addition, the models have a Q2 value of each hidden construction that is more than zero, which is essential for moralize inclusion. It also serves as an example of notable symptoms.

Table 4. R-Square values and Q-Square values for the variables

	R2	Q2
English language proficiency	0.466	0.001
Learning engagement	0.686	0.048

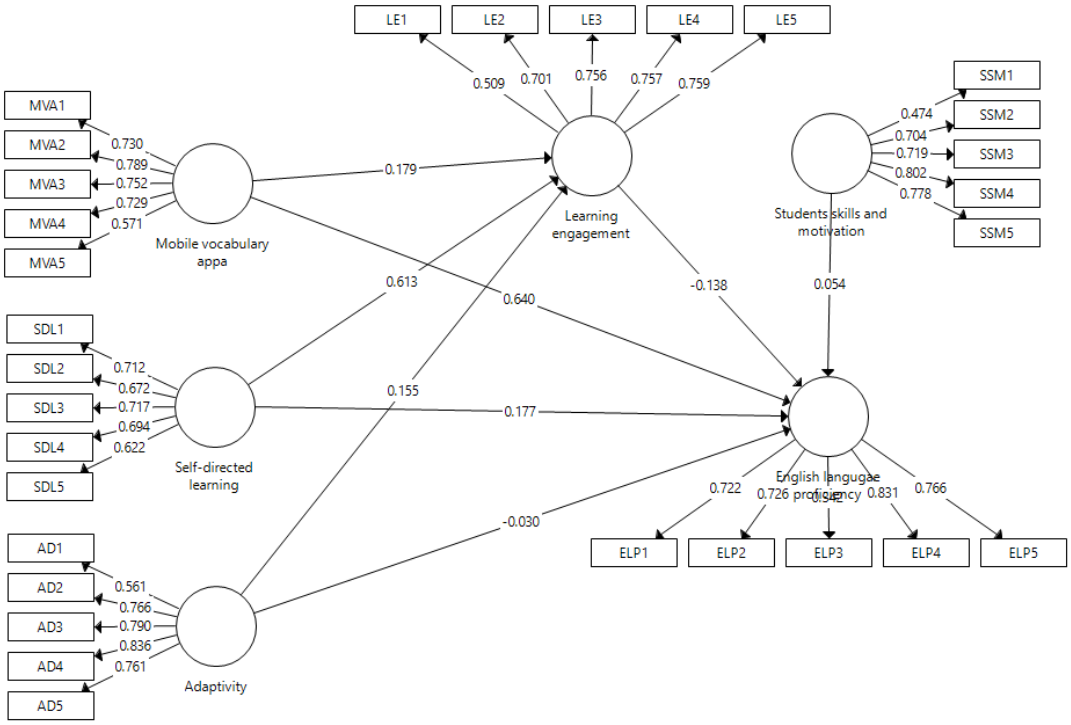

Figure 2. Measurement model

4.3 Direct and Indirect Path Analysis

Mobile vocabulary apps and English language proficiency have a positive relationship (t = 9.115, p = 0.000). Hence H1 is ok. The study's second hypothesis claimed that self-directed learning has a significant impact on English language proficiency (t = 1.682, p = 0.000). As a result, H2 isacceptable. The study's third hypothesis is that adaptivity has asignificant influence on English language proficiency (t = 0.371, p = 0.000). As a result, H3 is approved. According to the study's fourth hypothesis, mobile vocabulary apps have a positive and substantial influence on learning engagement (t = 3.676, and p = 0.000).As a result, H4 is acceptable. If the study found that self-directed learning had a substantial and beneficial influence on learning engagement (t = 11.311, p = 0.000), this would be the fifth hypothesis. As a result, H5 is approved. The study's sixth hypothesis claimed that adaptivity has a significant impact on learning engagement (t = 3.141, p = 0.002). As a result, H6 isacceptable. The results of direct route analysis are shown in Table 6 and Figures 2 and 3.

Table 5. Direct effects

Constructs	Path coefficient	T-statistics	P-value
Adaptivity -> English language proficiency	0.082	2.371	0.000
Adaptivity -> Learning Engagement	0.049	3.141	0.002
Learning engagement -> English language proficiency	0.347	1.397	0.000
Mobile vocabulary apps -> English language proficiency	0.070	9.115	0.000
Mobile vocabulary apps -> Learning Engagement	0.049	3.676	0.000
Self-directed learning -> English language proficiency	0.105	1.682	0.000
Self-directed learning -> Learning Engagement	0.054	11.311	0.000

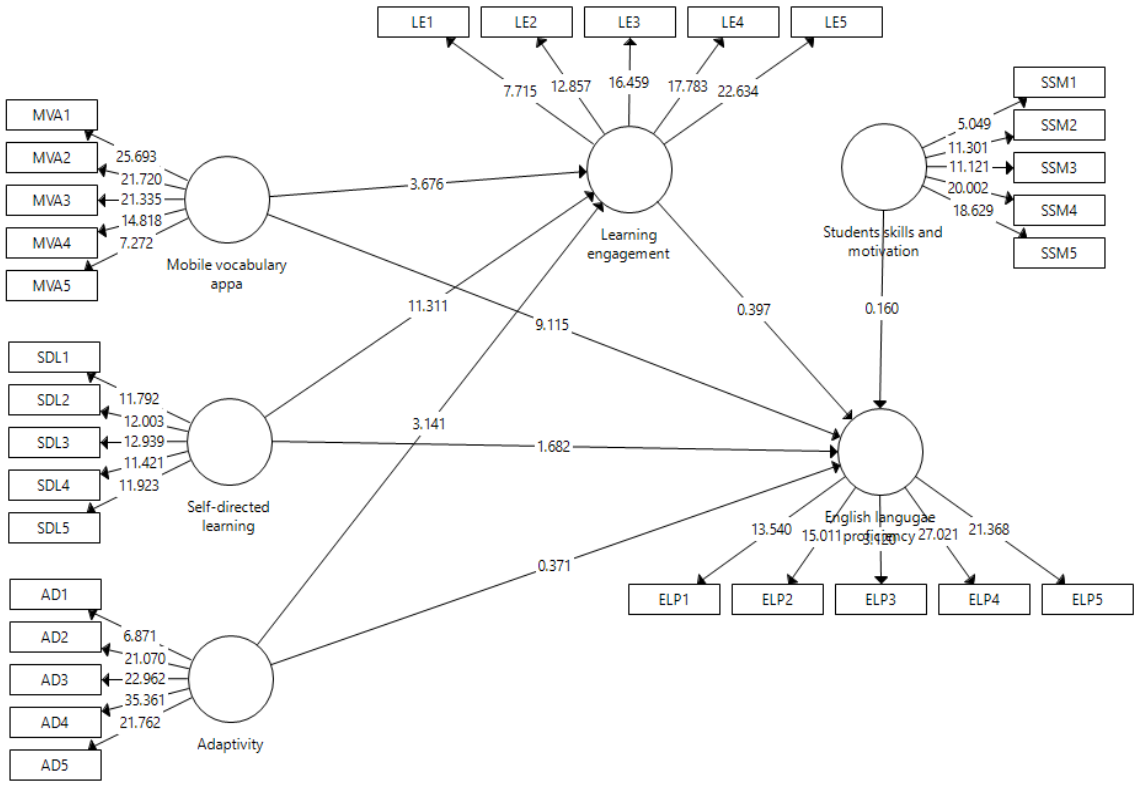

Figure 3. Structure model

Table 6. Mediation effects

	Specific Indirect Effects	T Values	P Values
Adaptivity -> Learning engagement -> English language proficiency	0.057	0.373	0.709
Mobile vocabulary apps -> Learning engagement -> English language proficiency	0.064	0.384	0.701
Self-directed learning -> Learning engagement -> English language proficiency	0.216	0.390	0.697

Furthermore, according to H7 of the study, learning engagement negatively influences the association between mobile vocabulary apps and English language proficiency. The study's findings confirm this hypothesis (t = 0.384, p = 0.701), hence H6 is not accepted. According to H8 of the study, learning engagement negatively mediates the association between self-directed learning and English language proficiency. The study's findings confirm this hypothesis (t = 0.390, p = 0.697), hence H7 is not accepted. According to H7 of the study, learning engagement negatively mediates the association between adaptivity and English language proficiency. The study's findings confirm this hypothesis (t = 0.373, p = 0.709), hence H8 is not accepted.

4.4 Moderation analysis

According to the study's assumptions (H9), students' skills and motivation considerably affect the association between learning engagement and English language proficiency. The study's findings confirm this hypothesis (t = 2.808, p = 0.005), hence H9 is accepted. Table 7 and Figure 4 display the findings of the moderation study.

Table 7. Moderation effects

	Original Sample	T Values	P Values
SSM*LE -> English language proficiency	0.086	2.808	0.005

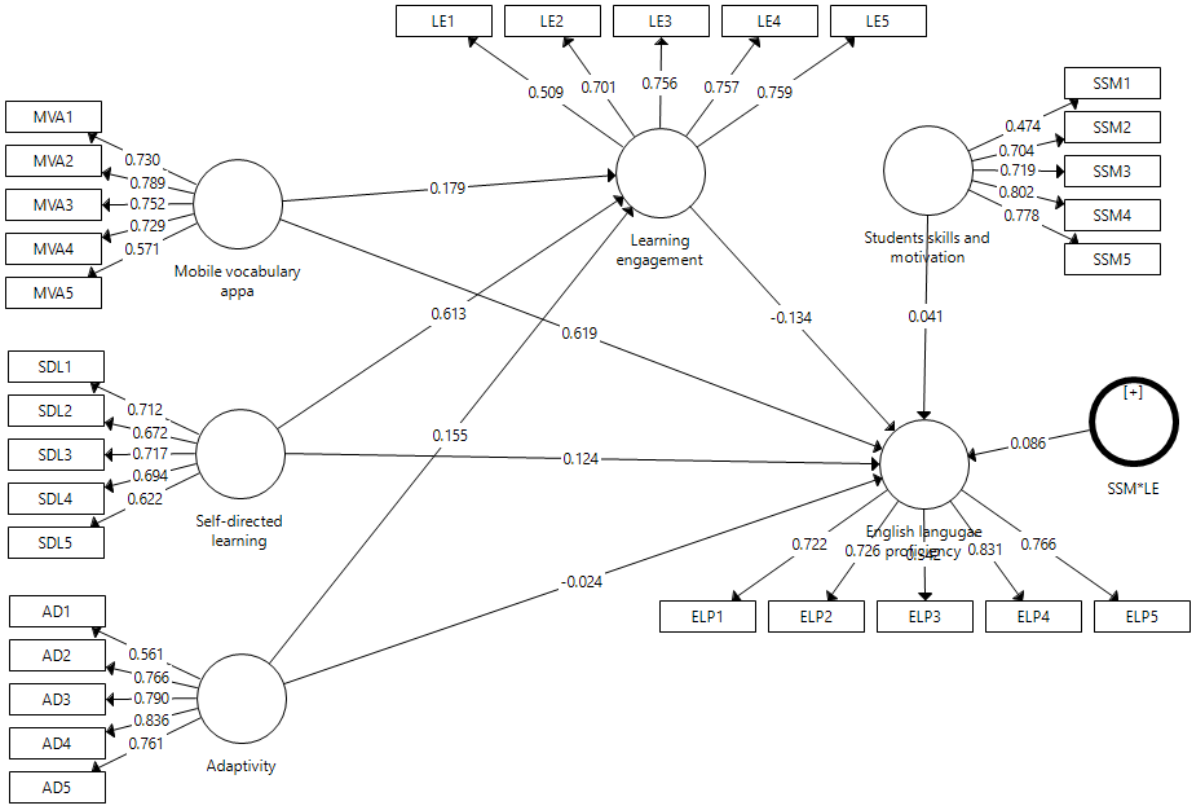

Figure 4*:* Students' skills and motivation as a moderator between learning engagement and English language proficiency

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5. Discussion and Conclusion:

The adoption of mobile phones for language study still presents difficulties for students, despite its positive acceptance. Even if students enjoy using their phones in class, there is still a limit to their use because lecturers discourage it. Large file storage on mobile devices was another challenge for learners, as some learning programs continuously drain the battery of their devices. In addition, some of the students mentioned that they preferred using laptops for reading and writing since they were more comfortable on larger screens. Additionally, students are enticed to spend their learning time playing games or chatting with friends (Deris and Shukor, 2019). But when we looked more closely, we uncovered some discrepancies between the descriptions of competency levels found in state english language proficiency requirements and exams. Differences between state english language competency requirements and assessments were discovered in the number of proficiency levels, the vocabulary used to designate the levels, and the descriptions to encompass each level, particularly in the states that chose consortia or commercial tests. These problems point to a serious difficulty with the interpretation of test results for english language competency with state standards and the alignment of standards and assessments (Carhill et al., 2008). Mobile vocabulary apps give students the freedom to practise English vocabulary whenever and wherever they like. By using these apps, students can learn vocabulary at their own pace and convenience on their smart-phones or tablets. According to the findings of the study, there is a considerable association between mobile vocabulary apps and english language proficiency. As a result, H1 is supported.

The assertion of claims and the specification of the precise categories of valid evidence that should be gathered is then guided by this fundamental specification.The study's second goal indicated that self-directed learning has a negative influence on english language proficiency.A test of english language ability that has been validated as serving one purpose cannot be presumed to also serve another because each of the purposes may call for different supporting documentation. One needs to gather numerous pieces of evidence to support each validity claim after developing one for the purpose (for example, given english language proficiency test results can be utilized to establish the students' degree of english proficiency) (Wolf et al., 2008). In contrast to the situation in law and business schools, where problems were faced and solved after some competency was attained, students began working with problems before they had gained any substantial knowledge of the topic at hand. To put it another way, problem-based learning stands apart by making issues the first step in the learning process (Loyens et al., 2008). Self-directed learning promotes analytical, problem solving and the development of information literacy capabilities. Using these skills to learn language, children identify resources on their own, assess their value. And will be able to apply the technique of productive study to advance your English language capacity during your life. According to the

results of the study, there is a positive connection between self-directed learning and English language skills. This investigation validated our findings, hence H2 is approved.

According to the study's third goal, adaptivity has a substantial influence on english language proficiency. The use of portable audio-video and computing devices for language learning has attracted interest for as long as those technologies have existed. With the rise of iPods and other MP3 players over portable cassette players, audio-based learning tools like language podcasts with integrated transcripts have become more popular (Truong, 2016). However, the primary purpose of the phones for the students to keep travel diaries proved to be problematic because the text input system (T9 keyboard) was too slow and error-prone for efficiently writing longer texts. The picture-taking, text messaging, and dual-language dictionaries proved to be very helpful(Godwin-Jones, 2011). Adaptive systems are able to pinpoint the areas in which students are having difficulty and provide remedial materials or activities to address those particular issues. Additionally, these systems might offer more difficult content or advanced language assignments to help advanced learners enhance their language proficiency. Adaptive systems make ensuring that learners are suitably encouraged and stimulated by adjusting to their competence levels. According to the study's findings, there is a significant link between adaptivity and english language proficiency. As a result, H3 is approved.

According to the study's fourth goal, learning engagement has a negative influence on english language proficiency. Self-directed learning has a history of being conceptualized as both a method of learning and a design element of the learning environment. Naturally, self-directed learning settings are made to encourage students to take initiative in future learning scenarios. Self-directed learning is prioritized as a component of the learning environment's design since it allows for students' flexibility in their academic endeavors (Loyens et al., 2008). Each teacher should be able to review both himself and his students' work -This is true for students who want to continue following their educational goals after earning their degree and / or help in the educational work of others. Despite this, traditional curricula frequently offer few opportunities for students to develop this skill. It is debatable whether such evaluations should be formative (giving direction for future study) or summative (informing decisions regarding the student's future) (Avani, 2017). The invention of radio led to the creation of educational radio, which started with correspondence learning at the turn of the century. It became outdated quickly following the invention of television as instructional television, which is still a part of our society today, replaced it as the principal medium for remote learning. The extent and rate of change is perhaps the biggest obstacle. Like no other breakthrough of the past century, rapidly developing technological advancements continue to change distance education. Few effective models have arisen as contemporary educational institutions scramble to create and maintain their remote education programs (Crumpacker and Crumpacker, 2001). During language learning activities, engaged students are more likely to pay attention, concentrate, and process information efficiently. Improved memory and recall of vocabulary, grammatical rules, language structures, and other language constituents result from this concentrated attention and cognitive processing, which boosts total language ability. According to the study's findings, there is a significant link between learning engagement and english language proficiency. As a result, H4 is approved.

According to the study's conclusions, there is a substantial association between learning engagement and english language proficiency. These findings are consistent with prior research H5, H6, and H7 on mediation analysis. These applications can be incorporated into classroom instruction by teachers to improve vocabulary learning and include students in substantive language practice. Students are more likely to be involved in the language learning process if they take responsibility of their education and develop goals based on their unique needs and interests. Based on each student's needs and advancement, adaptive systems can change the pace, level of difficulty, and content. The learning process is more likely to result in deeper learning and the development of skills when students and teachers are both strongly interested in it. The main idea behind asynchronous activities is that students can participate in the exchange of ideas or information without having to worry about other students interfering at the same time (Rezaei et al., 2014). When adaptivity is used on specifically dedicated computers, apps can adapt the user only once before no further adjustments are required as long as the user's preferences remain unchanged. However, the system won't be able to offer the adaptivity capabilities at the start of the session in shared scenarios without user profiles (Khosravi et al., 2020). According to the study's findings, learning engagement is an important mediator in the interaction between mobile vocabulary apps, self-directed learning, adaptivity and English language proficiency H5, H6, and H7 are not supported by the study based on this.

This outcome is consistent with prior research H8 on moderation analysis. According to these ideas, students' skills and motivation modify the link between learning engagement and English language proficiency. When creating instructional tactics, giving targeted support, and creating a positive learning environment, educators can take into account the abilities and levels of motivation of their students. Teachers can maximize the potential of learning engagement to improve English language proficiency among students with varied skill levels and motivational profiles by addressing the specific requirements and motivations of each individual student. These educators frequently blamed their activities' outcomes on variables they could control, like effort. They frequently use greater self-control techniques (McManus et al., 1983). However, teachers with low self-efficacy thought that their skill was the major determinant about their learning outcomes and those teachers with high ability could accomplish effortlessly. These educators

explained away the outcomes of their acts by attributing them to uncontrollable outside variables like luck and circumstance. They adopted motivational regulation tactics in the online learning process less actively as a result process (Zhang and Liu, 2019). This study backs up our findings, hence H8 is approved.

Table 6. Summary of hypotheses

Hypotheses	Decision
There is a considerable association between mobile vocabulary apps and English language proficiency.	Accepted
There is a negative link between self-directed learning and English language proficiency.	Accepted
There is aninsignificant link between adaptivity and English language proficiency.	Accepted
There is aninsignificant link between learning engagement and English language proficiency.	Accepted
Learning engagement mediates the relationship betweenmobile vocabulary apps and English language proficiency.	Not Accepted
Learning engagement mediatesthe relationship betweenself-directed learningand English language proficiency.	Not Accepted
Learning engagement mediatesthe relationship betweenadaptivityand English language proficiency.	Not Accepted
Students' skills and motivation moderate the relationship betweenlearning engagement and English language proficiency.	Accepted

6. Implications:

6.1 Theoretical Implications:

For language instructors, developers, and teachers, the theoretical implications of this work have real-world applications. The results can help with the planning and execution of efficient mobile technology-based language learning activities for students. To design engaging and personalised language learning experiences, educators can make use of findings about learner engagement, individual variations, the value of self-directed learning, and adaptivity. They shed light on the ways in which these variables affect students' linguistic competence and educational experiences. The creation of evidence-based practices and interventions in language education can be influenced by this knowledge, which will ultimately improve language learning outcomes and experiences in their study.

6.2 Practical Implications:

For language educators, creators of mobile vocabulary apps, and decision-makers involved in language education, the practical consequences of this study are pertinent. By giving students control and agency over their language learning process, educators can use these findings to design personalized learning experiences. Teachers can customize lessons to each student's preferences and cultivate a sense of ownership and empowerment by including aspects that enable self-directed learning and adaptivity in their teaching methods or app design.To address unique requirements and improve language learning results, educators can give focused interventions and support by measuring and taking into account learners' prior proficiency, cognitive capacities, and levels of desire. Policymakers may prioritize expenditures in app development, infrastructure, and teacher training by taking into account the potential of mobile vocabulary apps to enhance English language competency. This will guarantee that everyone has access to efficient technology-based language learning resources. In conclusion, this study's practical implications centre on enhancing app design, encouraging personalized learning opportunities, using an individualized approach to education, offering professional development for teachers, and making informed financial and policy decisions. By putting these conclusions into practice, language educators and stakeholders can improve student outcomes for English language competency while also maximizing the use of mobile vocabulary apps.

7. Limitations and Future Directions:

7.1Limitations:

The specific traits of the sample employed in the study may limit the findings' capacity to be generalized. The results may differ in different circumstances or with different learner demographics since the participants may not fully represent the population of english language learners. A deeper knowledge of the factors under study might be achieved by adding more objective measurements or using qualitative data. The causal linkages between the use of mobile apps, learner engagement, skills, motivation, and language competency could be clarified using longitudinal or experimental approaches. Maintaining ethical standards in research requires safeguarding participant anonymity, gaining informed consent, and handling sensitive data correctly. Despite these drawbacks, this study offers insightful information about the impact of adaptivity, self-directed learning, and mobile vocabulary apps on english language competency for students and teachers

also. To further improve our comprehension of the intricate relationships in technology-mediated language learning, future research might build on these findings and solve the issues that remain.

7.2 Future Directions:

Our understanding of the impact of self-directed learning, adaptivity, and mobile vocabulary apps on english language competency can be furthered in some ways based on the results and limitations of this study. Researchers will be able to monitor changes in linguistic abilities and evaluate the effects' sustainability if they follow learners over a prolonged period. Using experimental designs can offer more reliable proof of causation. The effects of certain interventions or modifications in in-app features on language proficiency results can be studied using randomized controlled trials or quasi-experimental techniques. Using both quantitative and qualitative data collection techniques together can give researchers a more complete picture of the variables affecting language proficiency outcomes regarding students. In-depth discussions, observations, or focus groups can provide nuanced insights into how students use mobile apps, why they use them, and how they perceive their learning and adaptability. By exploring these future paths, researchers can improve language learning interventions and increase students' english language proficiency results by increasing our understanding of the efficiency of mobile vocabulary apps, self-directed learning, and adaptivity.

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