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Toward a Framework for Personalized Interactive Learning in Higher Education: Theoretical Insights and Implications

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Abstract

Technological innovation is transforming the landscape of higher education, shifting from rigid standardization to flexible personalization. However, personalized learning is not individualized learning in isolation, but rather an interactive and interconnected learning process that requires social and digital interactions with both human and computer. With the increasing need to create learning environments that move beyond traditional one-size-fits-all designs and foster meaningful interaction tailored to individual learners' needs, this paper proposes a theoretical framework for personalized interactive learning in higher education with specific reference to college English instruction. Drawing upon insights from social and psychological theories, the framework aims to accommodate learners' diverse interaction mindset and promote collaborative engagement and communication. It explores how educational design can address learners' affective state while fostering their social behavior. The findings highlight the potential of these models to enhance engagement, collaboration, and real-world communication skills in College English courses. By combining theoretical insights with practical implications, this study highlights the dual contribution of psychology and sociology to the design of sustainable learning models in higher education.

Keywords: Personalized Interactive Learning, Interaction Mindset, Collaborative Behavior, Social Communication

Introduction

The advancement of Information and Communication Technology (ICT) has revolutionized the field of education. The traditional "one-size-fits-all" approach to instructional design is far from realizing the potential of technology in student-centred learning. Education institutions must keep pace with the upgrading expectations related to the unique learning experience and the advancement of technological innovations (Cevikbas & Kaiser, 2022; Chen & Jumaat, 2023). Nevertheless, personalization is not differentiation nor individualization, and is greater

than one plus one (U.S. Department of Education, 2010). Personalized learning is not learning alone or on your own, but interactive learning through social cooperation with human and technology, which aims to foster personalized personalities and create personalized value in a collective learning community and environment (Reategui, Boff, & Campbell, 2008; Ha & Im, 2020).

The complexity in the concept of personalized learning requires considering and conducting it in a communicative environment. Up till now, seldom research explores how personalized learning is achieved through social interaction and how to strike a balance between personalization and socialization. What's more, with the flourishing of technology, the effectiveness of personalized learning are less satisfactory than the researchers expect. For one thing, despite the entanglement due to the concept of personalized learning, researchers seldom substantiated alignment to learning theories that guided the conceptualization of their designs (Bernacki et al., 2022). For another, effective personalization needs to be implemented into interactive activities to gain sustainment from the environment and balance the needs of individual and community, thus avoiding the definition confusion of personalization and individualization. (Cevikbas & Kaiser, 2022). Further, designers often developed personalized learning that aimed to achieve a diverse set of target outcomes with only a single design element. Any single method of personalization requires multiple design choices and evidence to suggest their appropriateness for accommodating a single-learner feature (Bernacki et al., 2022). In summary, multi-component methods of personalized learning further need to be designed within multiple theoretical frameworks and practical contexts to accommodate a specifically selected set of learner characteristics.

Interaction mindset, which was defined as learners' affective states, can guide and influence their social interactions (Burnette et. al., 2013; Sato, 2016; McDonough et al., 2021). Learners' mindset is the key to interpreting their behavior, and thus study on learner's mindset in interaction plays an important role in in-depth psychology of learners' interactional behavior (Lei & Xu, 2022). Collaborative behavior, in the sociocultural theory, refers to the interaction and collective efforts of individuals in a social context with the aim of shared understanding, problem-solving, and knowledge construction (Vygosky, 1978; Wertsch, 1985). Based on the theory, learning is socially mediated through interaction and interactions with more knowledgeable others can be seen as a form of collaborative behavior through which learning occurs.

Previous studies have focused on learners' interaction and communication during language learning process. However, these studies lack attention to individual differences, failing to analyze the diverse types of mindset of different students and to make personalized interactive learning designs for such differences (Lei & Xu, 2022). Meanwhile, due to this individual ignorance, there is still enough space for personalized and appropriate stimulation on students' collaborative behavior to maximize and enhance interactive learning. Furthermore, the dynamic relationship between interaction mindset and collaborative behavior can not be thoroughly interpreted without focus on individual difference and variability with time and space.

Therefore this study aims to design and develop a theoretical framework of a personalized interactive learning model in higher education for the adaptation of English as a Foreign Language (EFL) learners' interaction mindset and to examine its potential effects in fostering learners' interaction mindset and collaborative behavior. The study contributes a theoretically informed framework that integrates personalization and interactivity, providing both conceptual and practical guidance for designing effective technology-enhanced personalized learning experiences. By integrating insights from educational psychology and sociology, the study seeks to provide theoretical foundations and practical implications for enhancing student engagement, teacher training, and institutional innovation in higher education contexts.

Research Questions

1. How to design and develop a personalized interactive learning model for enhancing Chinese EFL learner's interaction mindset and collaborative behavior
2. How to analyze the effectiveness of the personalized interactive learning model towards Chinese EFL learner's interaction mindset and collaborative behavior
3. How to investigate a relationship between Chinese EFL learners' interaction mindset and collaborative behavior through personalized interactive learning
4. How to develop a framework of designing personalized interactive learning model for enhancing Chinese EFL learner's interaction mindset and collaborative behavior

Literature Review

Interaction Mindset in Language Learning

Interaction mindset is defined as a disposition toward the task and /or an interlocutor prior to and /or during the interaction in the EFL context (Sato, 2016). It focuses on learners' affective states that may guide and influence their social interactions (Burnette etal. 2013; Sato, 2016; McDonough et al., 2021). Interaction mindset in the EFL context is constructed from five sub-strings:peer interaction, collaboration for language learning, attention to language form, provision of peer feedback, and reception of peer feedback (Sato & McDonough, 2020). A measurement model that can detect EFL learners' interaction mindset in multiple interaction contexts was developed from six sub-constructs: interaction reflection (IRF), interaction acknowledgement (IAM), collaboration awareness (CAW), form orientation (FOT), interaction reception (IRN) and interaction initiation (IIN) (Lei &Xu, 2022). Sato (2016) has constructed an affective-social-cognitive theoretical model to interpret the relationship among language learners' interaction mindset, interactional behavior and their language development (Sato, 2016). The study discovered that language development was mediated by learners' interaction mindsets, which subsequently impacted their interactional behaviors (Sato, 2016). However, interaction mindset is a dynamic construct that can change during interaction due to the task itself or the social experience with the interlocutor (Sato, 2016). Therefore, more future studies need to explore the changing characteristics of interaction mindset in time dimension and focus more on individual features and differences (Lei & Xu, 2022).

Collaborative Behavior in Language Learning

Collaborative behavior, in the socio-cultural theory, refers to the interaction and collective efforts of individuals in a social context with the aim of shared understanding, problem-solving, and knowledge construction (Vygosky, 1978; Wertsch, 1985). Based on the theory,

interactions with more knowledgeable others can be seen as a form of collaborative behavior through which learning occurs. Collaborative behavior in language learning context can be further divided into two subconstructs: interactional moves and collaborative patterns. Interactional moves refers to the specific actions individuals take during interaction, such as providing feedback, responding to peers, or modifying their language output based on the feedback they received (Sato, 2016). Interactional moves are seen here as socially mediated scaffolding behaviors that occur in collaborative peer interaction. On the other hand, three collaborative patterns in EFL context were identified as language-related collaboration, task-related collaboration, and collaborative sentence completion (Sato, 2016).

From a psychological perspective, effective collaborative behavior during collaborative learning activities increases learners' motivation and engagement especially in a more interactive and supportive learning environment (Tran, 2019). Collaborating with peers reduce anxiety and fear of making mistakes in language learning. Successful collaborative experiences can enhance learners' self-esteem and confidence, leading to a more positive attitude towards learning (Lei & Xu, 2022;). However, it is important to note that the benefits of collaborative behavior may vary depending on the design and implementation of collaborative activities, as well as the learner's individual characteristics and cultural background.

Personalized Learning in Higher Education

Educators have historically adapted their instructional design to provide differentiated and individualized instruction based on learner needs (Drumheller, 1971; Slavin, 1984). Personalization is increasingly becoming an aspirational standard in K-12 educational settings and higher education (Grant & Basye, 2014; Great School Partnership, 2015). Personalized learning (PL) is a 21st-century model of instruction that incorporates technology and the use of mobile devices to address each individual student's readiness, interest, and learning profile through differentiation of content, process, and product and help all students achieve high levels of learning (Grant & Basye, 2014; Huang et al., 2023).

With the innovation and development of technologies, a PL system permit to be adaptive and adaptable to each learner's level of knowledge and preferred modality through robust and continuous data collection and retrieval, interactively responds to learner' s actions considering the data, and allows evaluation of the recommendation and adaptation using knowledge tracing and learning analytic techniques (Cevikbas & Kaiser, 2022; Murtaza et al., 2022; Apoki et al., 2022). However, PL is not the digitization of traditional learning. It is the individualization of learning through use and mastery of modern digital tools and interactive strategies among teachers, students, and peers who utilize the unique possibilities of the digital environment (Grant & Basye, 2014). Further research needs to identify the roles of human and technology and the interactions between them in PL practices.

Technology serves as a way to significantly redesign traditional learning experiences. It is the tool that makes PL easier and more efficient, as well as supporting educators in making pedagogical decisions about PL and avoiding unnecessary struggles while saving time and energy for designing and implementing PL. Learner characteristics, learning environment and learning outcome can be identified as the variables in PL researches (Bernacki et al., 2022). Learner characteristics in PL can be classified into cognitive factors, beliefs and motivations,

emotions and effect, and social and cultural factors (Plass &Pawar, 2020; Walkington & Bernacki, 2020; Bernacki et al., 2022). Among which, growth mindset is considered as motivational variables (Plass &Pawar, 2020; Bernacki et al., 2022). Learning outcomes in PL includes satisfaction, improved motivations and beliefs, behavior change, persistence, academic performance or achievement, learning efficiency and etc. (Bernacki et al., 2022). PL design adaptive to the learning environment leverage and accommodate the various and specific learner characteristics, promoting the deserved learning outcome while in turn improving better engagement in the environment. The determination of variables may be considered from three perspectives: relevance to achieve the intended learning outcomes, enough learner variability on the variable to justify the need of personalization; sufficient knowledge on how to adapt to learner differences for this variable (Plass & Pawar, 2020).

Interactive Learning Models and Strategies

Collaborative learning, rooted in sociocultural theory, promotes active engagement in interaction, communication, and collaboration within dynamic and interactive environments. In context of language learning, collaborative learning is essential for integrating core language skills with social and linguistic competence, emphasizing active collaboration and effective communication to enhance both individual and group engagement (Salih & Mohammad, 2022; Su & Zou, 2020; Pozzi et al., 2023).

Computer-assisted collaborative learning (CACL) enhances the learning experience by integrating technology to support group-based educational activities. Tools like Duolingo or Grammarly provide tailored exercises based on individual performance, while also enabling group challenges or collaborative tasks (Fanguy et al., 2023; Luo et al. 2020). This ensures that learners of varying proficiency levels can work together effectively. Platforms like Google Docs, Miro, and Slack enable real-time interaction, document sharing, and peer feedback, fostering meaningful collaboration among students (Adhami & Taghizadeh, 2022; Fanguy et al., 2023). Incorporating videos, simulations, and interactive exercises engages multiple senses and facilitates deeper understanding of content. CACL tools mediate learning by serving as a bridge between the learner's goals and the required resources or community interaction. AI-driven systems can allocate roles or suggest tailored tasks within group projects based on individual strengths and weaknesses, ensuring equitable contribution and engagement (Pang, 2022; Fischer & Yang, 2022). Tools like Padlet or Trello organize group activities and track progress, promoting accountability and clarity. Real-time feedback from both peers and AI systems helps refine group outputs, ensuring that the learning process is iterative and constructive. By combining these technological advantages, CACL not only supports collaborative learning but also adapts to the diverse needs of learners, creating a more interactive and engaging educational environment.

Methodology

This study employs a quantitative research method using a pre-experimental one group pre-test and post-test design. Both quantitative and qualitative data were collected. The quantitative data consists of questionnaires to measure learners' interaction mindset, and the qualitative data was gathered from recordings and documentation that represent learners' collaborative behaviour. A correlational approach is also used to explore relationships between variables. The research employed a purposive non-random sample selected from this population of first-year students. A purposive non-random sampling

method was used because the researcher needed to follow the Ministry of Education (MOE) policy and select Chinese EFL learners with specific characteristics that were crucial for the research and aligned with the study's goals. Participating students were required to have a certain level of English proficiency, prior experience with blended learning environments, and particular interaction capabilities. The sample for this research consisted of 52 first-year students from one class at the faculty. This purposive sampling ensured that all participants possessed the necessary traits to explore the behaviors and outcomes relevant to the study. By focusing on a particular subset of students, the researcher ensures that the sample is representative of the population under study while addressing the practical constraints of the research. Table 1.1 indicates the distribution of questions for each construct included in Interaction Mindset Scale questionnaire.

Table 1.0
Instruments and Data Analysis for Each Research Question

1 No.	2 Research Question	3 Instrument	4 Data Analysis
5 1	6 How to design and develop a personalized interactive learning model for enhancing Chinese EFL learner's interaction mindset and collaborative behavior? 7	8 Computer-assited collaborative learning (Beatty, 2010) 9 10 Universal Design for Learning (Cast, 2018)	11 ——
12 2	13 How to analyze the effectiveness of the personalized interactive learning model towards Chinese EFL learner's interaction mindset and collaborative behavior 14	15 Interaction mindset scale 16 17 Collaborative behavior coding scheme	18 Descriptive analysis 19-Mean 20-Standard Deviation 21-Frequency 22-Percentage 23 Inferential analysis 24-Normality test 25-Paired-sample t-test 26 Content analysis
27 3	28 How to investigate a relationship between Chinese EFL learners' interaction mindset and collaborative behavior through personalized interactive learning 29	30 Interaction mindset scale 31 32 Collaborative behavior coding scheme	33 Spear-man correlation
34 4	35 How to develop a framework of designing personalized interactive learning model for enhancing Chinese EFL learner's interaction mindset and collaborative behavior 36	37 Interaction mindset scale 38 39 Collaborative behavior coding scheme	40 Triangulation of the data

Research instrument

In order to answer research question 2, the Interaction Mindset Scale from Lei and Xu (2022) was adopted in this research. The scale consists of 6-point likert scale from 1-Absolutely Disagree to 6-Totally agree. The scale was developed from six sub-constructs: interaction

reflection (IRF), interaction acknowledgement (IAM), collaboration awareness (CAW), form orientation (FOT), interaction reception (IRN) and interaction initiation (IIN) (Lei &Xu, 2022). Table 1.1 indicates the distribution of questions for each construct included in Interaction Mindset Scale questionnaire.

Table 1.1
Constructs of Interaction Mindset Scale

No.	Construct	Questions
1	Interaction acknowledgement(IAM)	IM2、IM11、IM18、IM26
2	Collaboration awareness (CAW)	IM4、IM6、IM13、IM16
3	Form orientation (FOT)	IM5、IM9、IM7、IM23
4	Interaction initiation(IIN)	IM8、IM10、IM12
5	Interaction reception (IRN)	IM15、IM17、IM21、IM28
6	Interaction reflection (IRF)	IM 20、IM24、IM27、IM 29

In order to answer research question 3, the research will use a coding scheme to explore the pattern of student's collaborative behavior. The name of this instrument is Collaborative Behavior Coding Scheme. In the EFL context, collaborative behavior have been identified as interactional moves and collaborative patterns (Sato & Viveros, 2016). Among them, interactional behaviors includes corrective feedback and modified output (Ellis et al., 2006; Kim, 2018). Collaborative patterns refers to language-related collaboration, task-related collaboration, and collaborative sentence completion. Language-related collaboration (LRC) refers to the exchanges of language between individuals that talks about language use or correct themselves or others (Sato, 2016; Swain & Lapkin, 1998). Task-related collaboration (TRC) are the interaction and exchanges in which learners identified and analyzed the task at hand rather than revolving around linguistic issues (Sato, 2016). Collaborative sentence completion (CSC) was identified when a learner struggled to finish his or her utterance with the rest of the sentence supplied by others (Sato, 2016). Table 1.2 shows the coding scheme of collaborative behavior.

Table 1.2
Coding Scheme of Collaborative Behavior

41 **Construct**	42 **Coding**
43 Interactional moves	44 Corrective feedback (CF); Modified output (MO)
45 Collaborative patterns	46 Language-related collaboration (LRC); Task-related collaboration (TRC); Collaborative sentence completion (CSC)

Proposed Learning Framework

Theoretical Framework

Social interdependence theory (SIT) was put forward by Morton Deutsh in 1949 and later expanded by David W. Johnson and Roger T. Johnson in the 1970s. This theory suggests that the structure of group members' goals affects their interactions, which subsequently influences the outcome of group's activity (Deutsh, 1949; Johnson, & Johnson, 1989). It proposes a framework in social psychology that explores how the relationships and

interactions among individuals and their psychological process influence their behavior, motivation, and outcomes. The theory demonstrates the significance of fostering a cooperative environment where collaborative learning approaches have been shown to improve academic performance, cultivate social skills, and enhance motivation. As applied in this study, understanding the types of interdependence help the researcher design effective group activities and interventions to promote positive interactions and achieve better group outcomes. It also provides a framework for analyzing and understanding learner's psychological state as interaction mindset and how it influences individual's collaborative behavior and the interaction dynamics within the group.

Sociocultural theory (SCT) traces back to the cultural-historical psychology developed by the Russian psychologist Lev Vygotsky in the 1920s and 1930s, whose fundamental belief is that all human activities are accomplished through use of culturally-constructed mediational means (tools and artifacts), and that the internalization of those means contributes to the higher forms of consciousness (Vygotsky, 1986). It suggests that humans learn first through the use of cultural tools, for instance, language, within specific cultural communities and then become internalized. It is an important approach that emphasizes the role of social interaction in shaping beliefs, values, and behaviors. Based on SCT, this study conceptualizes learning as a socially mediated process in which cognitive development emerges through interaction. Peer collaboration provides opportunities for learners to engage in social mediation, peer scaffolding, and co-construction of knowledge within their zone of proximal development. And from the sociocultural lens, this study interprets interactional moves such as corrective feedback and modified output as tools that learners use to support each other's cognitive growth. Therefore, the framework integrates cognitive development as a socially situated outcome of collaborative behavior.

Social constructivism, a theory rooted in the works of Vygosky, Piaget, and Bruner, posits that knowledge is co-constructed through social interactions and shared experiences (Vygotsky, 1978). It is the theoretical foundations for technology-enhanced CLL (Su & Zou, 2020). It views learning as a social process where meaning is constructed through interaction with others and the environment. Collaborative learning, as an instructional approach, goes well with social constructivist principles. It means students work together to reach shared learning goals, using each other's strengths and skills to improve the overall learning experience. In this research, the theoretical framework of social constructivism and collaborative learning provides a solid foundation for understanding and fostering interaction mindset and collaborative behavior in a computer-assited environment. By leveraging the principles of the theory, educators can create learning experiences that fosters active engagement, meaningful interactions, and productive collaboration among students.

The Universal Design for Learning (UDL) in education context holds that education serves as a system that provides principles and strategies to design a learning environment that suits all learners (Meyer et al., 2014). The Center of Applied Special Technology (CAST) organized the UDL framework from three main principles respectively in align with three specific brain areas to investigate how human brain learns (CAST, 2018a). The three principles are representation, expression and action, and engagement (CAST, 2018a). As the UDL framework aims to provide means of engagement, representation, and action and expression for addressing inter- and intra- learner variability, it guides intentional designs of flexible

learning environments to promote personalization and learner-environment interaction (CAST, 2018; Meyer, Rose, & Gordon, 2014). The three principles, nine guidelines and 31 checkpoints of UDL facilitates active and personalized instructional design by tailoring learning goals, assessments, instructional methods, and matierials to diverse learning needs in a given context (Almeqdad et al., 2023). Emergent research has shown the effects of UDL in supporting students' PL experiences and provides direction for further investigating UDL framework in designing, implementing, and measuring PL environments (Almeqdad et al., 2023). Implementing UDL as a design framework for PL has the potential to provide specifc research-based considerations for designing learning environments tailored to individual learners. The study of how PL and UDL interact as a design framework is still in its early stages of development as an educational innovation.

In summary, this study adopts a socially grounded theoretical framework to examine how learners' interaction mindset and collaborative behavior develop through personalized interactive learning activities. Anchored in social interdependence theory, sociocultural theory, social constructivism, and UDL principles, the study offers an affective-social-cognitive perspective of how language learning occurs through socially mediated interaction.

Overview of the Model

The proposed model integrates three key elements to create an effective learning environment for college English courses. Activity Theory provides the framework for designing collaborative and interactive tasks, ensuring that learning is socially situated and mediated by tools. Universal Design for Learning (UDL) guarantees inclusivity and flexibility by offering multiple ways for learners to engage with content, represent knowledge, and demonstrate understanding. Computer-Assisted Collaborative Learning (CACL) leverages technology to enhance personalization, collaboration, and engagement through adaptive platforms, collaborative and interactive tools, and multimedia resources.

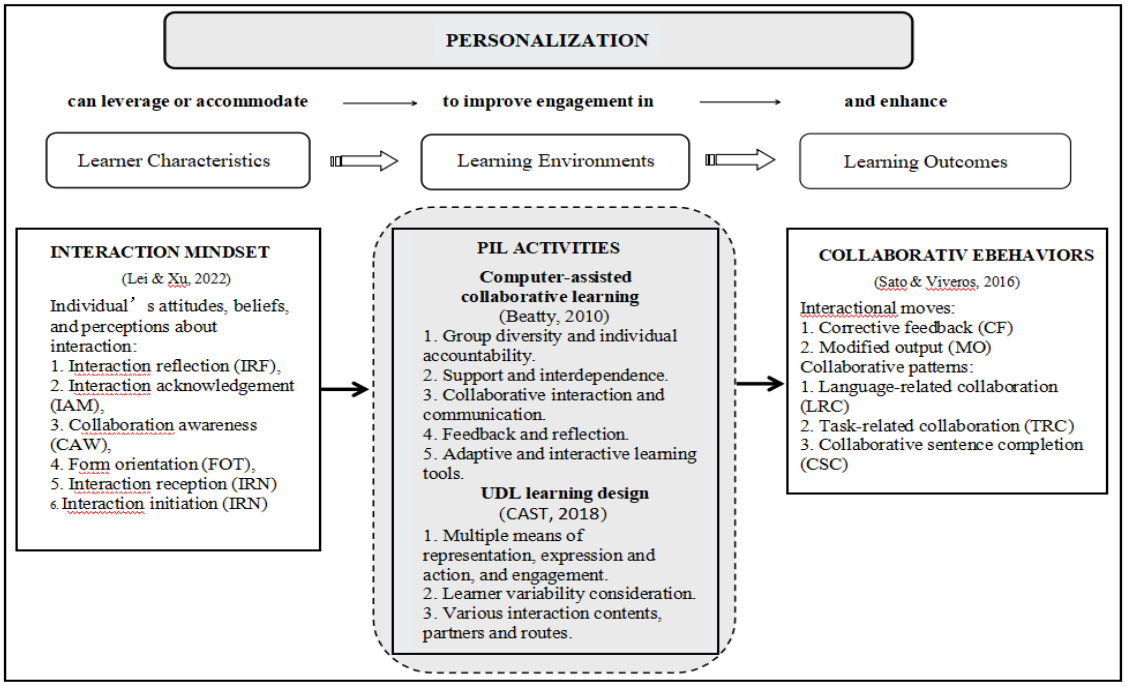

Figure 1. Design framework of personalized interactive learning for college English course creates a robust model that addresses diverse learner needs, promotes teamwork, and utilizes technology to enrich the educational experience.

The design framework emphasizes a learner-centered approach where collaboration, inclusivity, and adaptability are interwoven into the learning process. At its core, the model balances technological advancements with pedagogical principles to create a structured yet flexible system. The framework incorporates scaffolding mechanisms to support learners at varying proficiency levels, ensuring that tasks are neither too challenging nor overly simplistic. It facilitates real-time interactions through collaborative tools, enabling learners to co-construct knowledge and provide peer feedback in a guided environment. The integration of multimodal learning pathways ensures that information is accessible to all learners, catering to auditory, visual, and kinesthetic preferences. Additionally, the framework emphasizes iterative learning through dynamic feedback loops, where learners receive continuous input from instructors, peers, and AI-driven tools, helping them refine their understanding and skills. This structured yet adaptable framework positions learners as active participants in their education while leveraging the strengths of technology to support collaboration and personalization.

Implementation Strategies

Personalized online learning activity significantly enhanced students' engagement in learning, perceived competence, and hedonic motivation.Some researchers have investigated the effectiveness of conducting personalization in an interactive learning environment (Huang et al., 2012;). It proves that there is a positive impact on students' learning engagement, performance and satisfaction in personalized delivery of content recommendations or personalizability of skill level and task difficulty through interactive learning tools or learning systems in online and offline learning environment (Reategui,et al., 2008; Ha, Y. & Im, H., 2020). With the technology, the online learning environment provides an exciting opportunity to enhance learning experience of learners by offering interactive and personalizable content. It is critical for successful online learning to design learning tools that allow interactive and personalized learning experience. It is also important to examine how personal differences in learning styles affect students' performance and responses to this type of interactive online learning activity (Ha, Y. & Im, H., 2020). Besides, researchers have emphasized the critical role of human-computer interaction and urged need for expanding the scope of interactivity from human-human interaction to human-computer interaction in an online learning environment (Ha, Y. & Im, H., 2020).

Meanwhile, personalized learning supported students in becoming more conected, and not just because of technology (Porath & Hagerman, 2021). It did more than just individualization and differentiation. It did more than adapt instruction to the needs and interests of the students to connect them in deeper relationships with the content, their teachers and peers, and the community to support their learning both in and out of school (Porath & Hagerman, 2021). It provides a type of environment for both teachers and students to shift their traditional roles and co-design the learning environment and experience through mutual interaction and communication.

Therefore, personalized learning needed to go beyond addressing environmental or contextual change. It needs more constructivist approaches with collaborative and interactive learning structures to address the culture of the classroom (Su, 2020). This must go hand in hand with he exploration of digital tools to individualize instruction through content delivery, assessment and pacing (Porath & Hagerman, 2021). Both the context and culture of teaching and learning need to be addressed in robust personalized learning to prompt a both student-centered and student-driven environment.

Benefits and Potential Challenges

Interactive and collaborative tasks keep students actively involved in the learning process, thus greatly enhancing learning engagement. Adaptive technologies cater to individual proficiency levels and learning styles, ensuring that each student receives appropriate challenges and support. UDL-aligned design principles ensure that content is accessible to diverse learners through multiple modes of representation, such as text, audio, and visual formats. And it allows learners to engage in multiple ways of interaction with both human and computer. Last but not least, learners who can enjoy various modes of communication and expression with multimodal tools hold promise for reducing anxiety and fostering closer and more meaningful relationships. However, technological barriers such as limited access to devices or reliable internet connectivity can hinder participation in technology-driven activities. Unequal participation in collaborative tasks may arise due to unclear expectations or differing levels of commitment. And both educators and learners may need training to effectively use new tools and platforms, which can be time-intensive.

Conclusion

This study presents a comprehensive framework for personalized interactive learning in college English courses, integrating the theoretical underpinnings of Social Interdependence, Sociocultural, Social Constructivism, and the inclusivity-driven principles of Universal Design for Learning (UDL), and the innovative capabilities of Computer-assisted Collaborative Learning (CACL) technologies. The proposed model is designed to address the diverse interaction needs of learners, ensuring both adaptability and inclusivity through its theoretically robust structure. By incorporating practical applications, the framework aims to create dynamic, collaborative, and engaging educational experiences that align with contemporary pedagogical demands. While the model offers a promising avenue for transforming college English education, further empirical research is essential to validate its efficacy in diverse classroom settings. Such studies should evaluate the model's impact on learner outcomes, including engagement, anxiety reduction, and skill development, while also examining its scalability and adaptability to different educational contexts. Additionally, iterative refinements based on feedback from practical implementations will be critical for optimizing the model and ensuring its relevance in an evolving educational landscape. This research contributes to the broader discourse on leveraging theoretical insights and technological advancements to promote communicative interaction and personalized learning experience in higher education.

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References

Adhami, N., & Taghizadeh, M. (2022). Integrating inquiry-based learning and computer-supported collaborative learning into a flipped classroom: Effects on academic writing performance and perceptions of students of railway engineering. Computer Assisted Language Learning. Advance online publication. https://doi.org/10.1080/09588221.2022.212744

Almeqdad, Q. I., Alodat, A. M., Alquraan, M. F., Mohaidat, M. A., & Al-Makhzoomy, A. K. (2023). The effectiveness of universal design for learning: A systematic review of the literature and meta-analysis. Cogent Education, 10(1), 2218191. https://doi.org/10.1080/2331186X.2023.2218191

Apoki, U. C., & Crisan, G. C. (2022). A modular and semantic approach to personalised adaptive learning: WASPEC 2.0. Applied Sciences, 12(15), Article 7690. https://doi.org/10.3390/app12157690

Bernacki, M. L., Greene, M. J., & Lobczowski, N. G. (2021). A systematic review of research on personalized learning: Personalized by whom, to what, how, and for what purpose(s)? Educational Psychology Review, 33(4), 1675–1715. https://doi.org/10.1007/s10648-021-09615-8

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. Psychological Bulletin, 139(3), 655–701. https://doi.org/10.1037/a0029531

CAST. (2018). Universal Design for Learning Guidelines (Version 2.2). Retrieved from http://udlguidelines.cast.org

Cevikbas, M., & Kaiser, G. (2022). Promoting personalized learning in flipped classrooms: A systematic review study. Sustainability, 14(18), 11393. https://doi.org/10.3390/su141811393

Chen, Y., & Jumaat, N. F. B. (2023). Blended learning design of English language courses in higher education: A systematic review. International Journal of Information and Education Technology, 13(2), 364–372. https://doi.org/10.18178/ijiet.2023.13.2.1926

Cordova, D. I., & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. Journal of Educational Psychology, 88(4), 715–730. https://doi.org/10.1037/0022-0663.88.4.715

Deutsch, M. (1949). A theory of cooperation and competition. Human Relations, 2(2), 129–152. https://doi.org/10.1177/001872674900200204

Ellis, R., Loewen, S., & Erlam, R. (2006). Implicit and explicit corrective feedback and the acquisition of L2 grammar. Studies in Second Language Acquisition, 28(2), 339–368. https://doi.org/10.1017/S0272263106060141

Fang, Q., Liu, G., Hu, Y., & Wang, J. (2022). A blended collaborative learning model aiming to deep learning. SHS Web of Conferences, 140, 01017. https://doi.org/10.1051/shsconf/202214001017

Fanguy, M., Costley, J., Almusharraf, N., & Almusharraf, A. (2023). Online collaborative note-taking and discussion forums in flipped learning environments. Australasian Journal of Educational Technology, 39(2), 142–152. https://doi.org/10.14742/ajet.8096

Fischer, I. D., & Yang, J. C. (2022). Flipping the flipped class: Using online collaboration to enhance EFL students' oral learning skills. International Journal of Educational

Technology in Higher Education, 19(15). https://doi.org/10.1186/s41239-022-00348-3

Grant, P., & Basye, D. (2014). Personalized learning: A guide for engaging students with technology. Eugene, OR: International Society for Technology in Education (ISTE).

Great Schools Partnership. (2015). The glossary of education reform: Personalized learning. Portland, ME: Great Schools Partnership. Retrieved from https://www.edglossary.org/personalized-learning

Ha, Y., & Im, H. (2020). The role of an interactive visual learning tool and its personalizability in online learning: Flow experience. Online Learning, 24(1), 205–226. https://doi.org/10.24059/olj.v24i1.1620

Huang, A. Y. Q., Lu, O. H. T., & Yang, S. J. H. (2023). Effects of artificial intelligence–enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. Computers & Education, 194, 104684. https://doi.org/10.1016/j.compedu.2022.104684

Huang, Y.-M., Liang, T.-H., Su, Y.-N., & Chen, N.-S. (2012). Empowering personalized learning with an interactive e-book learning system for elementary school students. Educational Technology Research and Development, 60(4), 703–722. https://doi.org/10.1007/s11423-012-9237-6

Johnson, D. W., & Johnson, R. T. (1989). Cooperation and competition: Theory and research. Edina, MN: Interaction Book Company.

Kim, Y. (2018). Task complexity, learning opportunities, and Korean EFL learners' oral output. Studies in Second Language Acquisition, 40(3), 551–577. https://doi.org/10.1017/S0272263117000275

Lei, P., & Xu, J. (2022). Developing and applying an interaction mindset scale for EFL learners from a multiple-interaction perspective. Foreign Languages and Their Teaching, 326(5), 66–77.

McDonough, K., Kielstra, P., Crowther, D., & De Vleeschauwer, J. (2021). EFL learners' interaction mindset and their patterns of peer interaction. Language Teaching Research, 25(6), 947–968. https://doi.org/10.1177/1362168820910957

Meyer, A., Rose, D. H., & Gordon, D. (2014). Universal design for learning: Theory and practice. Wakefield, MA: CAST Professional Publishing.

Murtaza, M., Ahmed, Y., Shamsi, J. A., Sherwani, F., & Usman, M. (2022). AI-based personalized e-learning systems: Issues, challenges, and solutions. IEEE Access, 10, 81323–81345. https://doi.org/10.1109/ACCESS.2022.3193938

Pang, Y. (2022). The role of web-based flipped learning in EFL learners' critical thinking and learner engagement. Frontiers in Psychology, 13, 1008257. https://doi.org/10.3389/fpsyg.2022.1008257

Plass, J. L., & Pawar, S. (2020). Toward a taxonomy of adaptivity for learning. Journal of Research on Technology in Education, 52(3), 275–300. https://doi.org/10.1080/15391523.2020.1719943

Pozzi, F., Manganello, F., Passarelli, M., Persico, D., & Romagnoli, M. (2023). Collaborative approaches in online nurse education: A systematic literature review. The Electronic Journal of e-Learning, 21(3), 121–140. https://doi.org/10.34190/ejel.2136

Reategui, E., Boff, E., & Campbell, J. A. (2008). Personalization in an interactive learning environment through a virtual character. Computers & Education, 51(2), 530–544. https://doi.org/10.1016/j.compedu.2007.05.017

Salih, F., & Mohammad, Z. A. (2022). The value of collaborative learning in developing students' speaking skills. Route Educational and Social Science Journal, 9(5), 144–165.

Sato, M. (2016). Exploring the construct of the interaction mindset. Studies in Second Language Learning and Teaching, 6(2), 157–181. https://doi.org/10.14746/ssllt.2016.6.2.1

Sato, M., & McDonough, K. (2020). Predicting L2 learners' noticing of L2 errors: Proficiency, language analytical ability, and interaction mindset. System, 93, Article 102301. https://doi.org/10.1016/j.system.2020.102301

Sato, M., & Viveros, P. (2016). Interaction or collaboration? Group dynamics in the foreign language classroom. Language Teaching Research, 20(3), 327–347. https://doi.org/10.1177/1362168815570149

Su, F., & Zou, D. (2020). Technology-enhanced collaborative language learning: Theoretical foundations, technologies, and implications. Computer Assisted Language Learning, 1–23. https://doi.org/10.1080/09588221.2020.1750431

Su, J.-M. (2020). A rule-based self-regulated learning assistance scheme to facilitate personalized learning with adaptive scaffoldings: A case study for learning computer software. Computer Applications in Engineering Education, 28(4), 1–20. https://doi.org/10.1002/cae.22222

Sun, Z., Liu, R., Luo, L., Wu, M., & Shi, C. (2017). Exploring collaborative learning effect in blended learning environments. Journal of Computer Assisted Learning, 33(6), 575–587. https://doi.org/10.1111/jcal.12200

Swain, M., & Lapkin, S. (1998). Interaction and second language learning: Two adolescent French immersion students working together. The Modern Language Journal, 82(3), 320–337. https://doi.org/10.1111/j.1540-4781.1998.tb01209.x

Tran, V. D. (2019). Does cooperative learning increase students' motivation in learning? International Journal of Higher Education, 8(5), 12–20. https://doi.org/10.5430/ijhe.v8n5p12

U.S. Department of Education, Office of Educational Technology. (2010). Transforming American education: Learning powered by technology (National Education Technology Plan 2010). Washington, DC: U.S. Department of Education.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds. & Trans.). Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1986). Thought and language (A. Kozulin, Ed. & Trans.). MIT Press.

Walkington, C., & Bernacki, M. L. (2020). Appraising research on personalized learning: Definitions, theoretical alignment, advancements, and future directions. Journal of Research on Technology in Education, 52(3), 235–252. https://doi.org/10.1080/15391523.2020.1747757

Wertsch, J. V. (1985). Vygotsky and the social formation of mind. Cambridge, MA: Harvard University Press.