# Opportunities of Digital Era: Structural Equation Modeling of Informal Learning, L2 Interest and Intercultural Competence with Jamovi, SPSS and R

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**Abstract.** The objective of this study aims to explore the correlations of individual interest for second language learning, understanding of self and others in terms of intercultural competence, and informal digital language learning of college students majoring in language. A questionnaire was administered to more than 200 language major students (English, Spanish, and Portuguese) enrolled in a Chinese college, and the data collected were analyzed using Jamovi, SPSS and R. The findings demonstrate a positive association between interest in language learning and informal language learning in digital ways, and a positive relationship between informal digital language learning and intercultural competence. SEM result shows that informal digital language learning serve as a complete mediator between interest in language learning and intercultural competence.

**Keywords:** L2 interest, digital learning, intercultural competence ,Structural Equation Modeling

## 1 Introduction

Given the irreversible process of globalization, intercultural competence, also known as intercultural communicative competence, has become increasingly important and relevant in various fields, particularly in education. Pusch [1] and King and Baxter Magolda [2] emphasize that in a world characterized by growing global interdependence, education plays a crucial role in developing individuals who possess intercultural competence. It is widely recognized that individuals who can bridge cultural differences and have intercultural attitudes are essential to the progress of human civilization.

The advent of digital technology has brought about significant changes in traditional learning paradigms, reshaping the learning environment, resources, and methods. In today's globalized digital era [3], intercultural communication in digital settings has become pervasive in all aspects of life. Consequently, there is an opportunity to raise awareness among students about multicultural and multilingual realities that are often overlooked in formal education, where dominant national cultures tend to take precedence. This can be achieved by encouraging students to engage with digital resources

that challenge stereotypes and cultural norms, as advocated by scholars like Byram et al. [4] and Larsen-Freeman[5]. The importance of informal digital language learning and its potential impact on individuals' intercultural competence deserves more attention from the academic community. This study aims to examine the relationship among the interest of English, Portuguese, and Spanish major students, informal digital language learning and intercultural competence.

## 2    Intercultural Competence and Informal Digital Language Learning

The process of globalization, facilitated by efficient transportation systems and advanced communication methods, has resulted in increased interactions and stronger connections among individuals from different countries. This has led to a widespread use of foreign languages, particularly English. When people from diverse cultural backgrounds communicate, they inevitably encounter cultural differences. In international communication, a deep understanding of foreign cultures is crucial for effective language use. College students, in particular, have recognized the importance of intercultural competence in internationalization. [6] Intercultural competence encompasses multilingual abilities, cultural understanding, integration, and an open-minded and cooperative attitude. It has become an essential skill in modern society, contributing to personal growth and overall development. Moreover, the cultivation and utilization of intercultural competence are widely acknowledged as crucial for individual, societal, and organizational success in establishing and sustaining relationships.[7]

The use of technology to facilitate intercultural learning is not a recent phenomenon. Students can collaborate and share content on digital platforms, engage in real-time audio and video communication through tools like Skype and email, and express their thoughts through social media platforms such as Twitter, blogs, and podcasts. [8] Technology is widely employed to enhance communication between individuals from diverse cultural backgrounds. Various digital methods, such as Virtual Exchange, Telecollaboration, 3D Contextual Interactive Games, digital Storytelling, and Blogging, are utilized to promote digital intercultural communication.[9] Additionally, as younger generations are more accustomed to digital lifestyles, future intercultural education should explore digital intercultural exchanges in a more effective and appropriate manner. [10]

A person's learning journey is composed of formal, non-formal, and informal education. When discussing the development of intercultural competence (ICC), it is important to consider the intercultural experiences that extend beyond the classroom context, as ICC is a lifelong process for individuals. The cultivation of ICC should be coherent and consistent, and involvement outside the classroom is crucial for fostering ICC through genuine interpersonal interactions, awareness, attitude, and knowledge. Therefore, higher education institutions should place emphasis on activities beyond the classroom, such as extracurricular and co-curricular activities.[11]

In today's digital era, language learners have access to a wide range of resources through digital devices to learn languages and gain insights into different cultures and

effective communication with individuals from diverse cultural backgrounds. Students can be encouraged to become more aware of the multicultural and multilingual realities that are often overlooked in formal education, where dominant national cultures are often highlighted, by engaging with digital resources that challenge stereotypes and cultural norms.[12] The cultural and intercultural aspects of informal language learning deserve more attention from scholars.

The concept of informal digital language learning (IDLL) is based on Informal Digital Learning of English.[13] When discussing Informal digital Learning of Language (IDLL), it is important to clarify the terminology and avoid overlapping and misunderstanding with similar concepts such as "digital informal language learning," "informal mobile language learning," and "ICT-based Informal Language Learning." This paper will adopt the definition of Informal digital Learning of English (IDLE) proposed by Lee and Lee to define IDLL. According to the conceptualization of IDLE, IDLL can be described as informal, self-directed language learning that utilizes various digital tools (such as computers and cellphones) and resources (such as social media and digital applications). Lee [14] conceptualized IDLE based on Benson's four aspects of out-of-class language learning (OCLL), as illustrated in Figure 1.

| Category | Formal | Non-formal | IDLE Extracurricular | IDLE Extramural |
|---|---|---|---|---|
| Formality | Structured | Structured | Semi-structured | Unstructured |
| Location | In-class | Out-of-class | Out-of-class | Out-of-class |
| Pedagogy | Instructed | Instructed | Self-instructed | Naturalistic |
| Locus of control | Other-directed | Other-directed | Self-directed | Self-directed |

**Fig. 1.** Benson's four dimensions of OCLL and IDLE

Building on the division of extracurricular IDLE and extramural IDLE within IDLE, IDLL can also adopt this categorization. In this research, IDLL can be further divided into receptive IDLL activities (RIA) and productive IDLL activities (PIA) based on the divisions of receptive IDLE and productive IDLE. This study aims to further explore the informal digital learning context through extramural activities in students' daily lives to shed light on the development of ICC beyond the traditional classroom setting.

# 3        Conceptual Framework

Based on the broaden and build theory of positive emotions [15], this study aims to explore the "broaden and build" function of interest on intercultural competence through informal digital language learning. Based on the theoretical and conceptual basis, the conceptual framework for this proposed study is shown in figure 2.
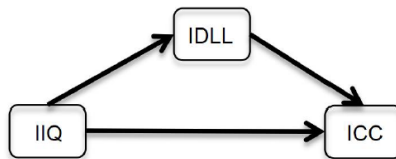


**Fig. 2.** Conceptual framework.

Theoretically, students with more interest in language learning tend to broaden their learning to informal digital language learning, which leads to an enhanced intercultural competence.

H1: The initial assumption suggests that there is a positive connection between interest and informal digital language learning.

H2: The second proposition indicates that there is a positive correlation between informal digital language learning and intercultural competence.

H3: The third assumption suggests that there is a positive relationship between interest and intercultural competence.

H4: The forth hypothesis is that informal digital language learning serves as a mediator between interest and intercultural competence.

# 4      Analysis

This research is divided into two sections. The first part is the design of questionnaire and the second part is analysis of the data collected. Questionnaire is powered by www.wjx.cn (Wen Juan Xing). After the data is collected, SPSS and R studio will be used to analyze the regression among interest, informal digital language learning and intercultural competence. Structural Equation modelling (SEM) plot will also be made with R studio.

The questionnaire includes Individual Interest Questionnaire (IIQ), Informal digital Language Learning (IDLL) and Intercultural Competence (ICC). Individual interest is revised from IIQ proposed by Rotgans [16] and the example item is "I am very interested in learning English/Portuguese/Spanish". IDLL is revised from the questionnaire of IDLE and the example item is "I read content written in English/Portuguese/Spanish on digital devices (e.g. phone, computer, pad).". The section of knowledge of self and knowledge of others are from Intercultural competence designed by Pen Wu and Fan [17]. The example item for knowledge of self (KS) is "I understand native history". The example item for knowledge of others (KO) is "I understand foreign knowledge of history". The specific information is presented in the following table 1.

**Table 1.** Design of questionnaire

| | |
|---|---|
| Individual Interest Questionnaire | Rotgans, 2015 |
| Informal Digital Language Learning | Lee & Drajiat, 2019 |
| Intercultural Competence | Pen Wu & Fan, 2015 |

The questionnaire has been distributed to 219 students in Guangzhou Xinhua University out of convenience sampling. 182 female students and 37 male students participated in this study voluntarily. As is shown in table 2, among them, 42 students are at grade one, 97 students are at grade two, 44 students are at grade three and 36 students are at grade four. 91 students are majoring in English, 69 students are majoring in Portuguese and 59 students are majoring in Spanish. The specific percentages are shown in table 2.

**Table 2.** Specific information of participants

| | | |
|---|---|---|
| Female | 182 | 83.11% |
| Male | 37 | 16.89% |
| Grade 1 | 42 | 19.18% |
| Grade 2 | 97 | 44.29% |
| Grade 3 | 44 | 20.09% |
| Grade 4 | 36 | 16.44% |
| English-major | 91 | 41.55% |
| Portuguese-major | 69 | 31.51% |
| Spanish-major | 59 | 26.94% |

After collecting data from 219 students, SPSS and R studio is used to analyze the result of regression and make SEM plot.

With the employment of SPSS, the α-values of the four parts were .897 (Interest), .916 (IDLL), .899 (knowledge of self), and .957 (knowledge of others), which exceed the standard of .7 proposed by Kline [18]. This indicates that the data collected has demonstrated internal consistency. The KMO-value (0.893) and Bartlett's Test of Sphericity ($\chi 2 = 3420.98$; df = 171; $p < .001$) were conducted. Based on the results obtained, further exploratory factor analysis can be conducted to examine the factor structure and loadings of the items. Jamovi was used to analyze factor loadings of the items. The factor loadings of the four items ion individual interest were from 0.76-0.91; the factor loadings of the eight items in informal digital language learning were from 0.63-0.87; the factor loadings of the three items in knowledge of self (KS) were from 0.80-0.95; the factor loadings of the three items in knowledge of others (KO) were from 0.90-0.96. Although the factor loadings of some items in informal digital language learning were lower than 0.7, but they were above 0.5 and still considered acceptable.

As the factor loadings were acceptable, R studio was used to measure the model. To assess the model fitness, various model-fit indices can be computed and examined. Through the examination of these model-fit indices, we can evaluate the degree to which the proposed model aligns with the observed data and ascertain its appropriateness. The corresponding data can be found in Table 3, where the model-fit indices are presented for analysis.

**Table 3.** Goodness-of-fit indices of the model[19]

| Indices | Value | Recommended |
|---|---|---|
| $\chi^2/df$ | 2.95 | <5 |
| CFI | 0.926 | >0.9 |
| RMSEA | 0.094 | <0.8 |
| TLI | 0.911 | >0.9 |
| SRMR | 0.068 | <0.1 |
| (Kline, 2015; Wheaton et al., 1977) | | |

All of the calculated indices indicate that the model exhibits a satisfactory level of goodness of fit. Figure 3 presents the structural equation modeling (SEM) plot generated by R Studio.
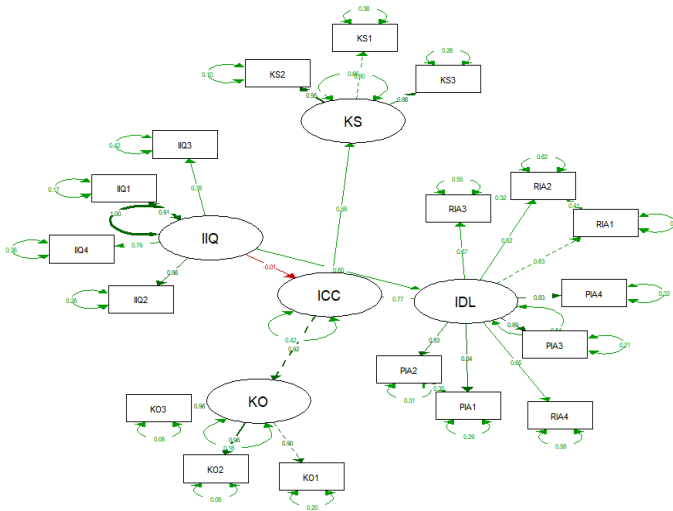


**Fig. 3.** SEM plot of the model

Results of regression analysis are presented in the figure 4.

| Regressions | | Estimate | Std.Err | z-value | P(>|z|) | Std.lv | Std.all |
|---|---|---|---|---|---|---|---|
| IDLL ~ IIQ | a | 0.497 | 0.068 | 7.306 | 0.000 | 0.599 | 0.599 |
| ICC ~ IDLL | b | 0.884 | 0.119 | 7.403 | 0.000 | 0.768 | 0.768 |
| ICC ~ IIQ | c | -0.011 | 0.073 | -0.155 | 0.877 | -0.012 | -0.012 |

**Fig. 4.** Regression analysis of the model.

Results of regression analysis manifested:

1.There is a positive relationship between individual interest in language learning and students' informal digital language learning activities.

2.There is a positive relationship between informal digital language learning activities and intercultural competence.

3.There is no positive relationship between interest in language learning and intercultural competence.

4.Informal digital language learning serves as a complete mediator between interest and intercultural competence.

Based on the analysis conducted, the findings indicate that hypotheses H1, H2, and H4 are supported, while hypothesis H3 is not supported or rejected.

# 5    Conclusion

Based on the broaden and build theory, individuals experiencing positive emotions are inclined to broaden their thoughts and actions in the present moment while also facilitating the development of their long-term personal resources. In the context of language learners, those who have a greater interest in language learning are more likely to engage in informal learning activities, which, in turn, contributes to the cultivation of intercultural competence. The analysis of the collected data reveals that students displaying higher levels of interest in learning languages such as English, Portuguese, and Spanish tend to participate in more informal digital language learning activities during their free time. Consequently, they enhance their self-knowledge (KS) and understanding of others (KO) in terms of intercultural competence as they engage in informal language learning through digital means.

To enhance the intercultural competence of language-major students, it is crucial for educators and language education scholars to prioritize the cultivation of interest in language learning. Additionally, they should strive to provide students with convenient avenues to access knowledge about themselves and others in the realm of intercultural communication. It is important to recognize that in the digital era, intercultural communication and understanding can occur in various contexts, not solely through face-to-face interactions or real-life encounters. The advent of mobile phones, computers, and other digital devices has expanded the possibilities for intercultural communication, making it essential to harness these technologies as tools for promoting intercultural competence among language learners.

There are several constraints and shortcomings in this study that need to be acknowledged. Firstly, the questionnaire only includes three specific languages (English, Portuguese, and Spanish), which restricts the generalizability of the findings. Including a wider range of languages and incorporating more language-major students in future research would provide a more comprehensive understanding of the surveyed population. Secondly, the study solely focuses on students from a single university, which limits the extent to which the findings can be generalized to other educational institutions. It is recommended to include participants from multiple universities to ensure a broader representation of language-major students. Thirdly, this study exclusively employs quantitative methods to examine the relationship between interest, informal digital language learning, and intercultural competence. Integrating qualitative research methods in future studies would offer a more comprehensive and in-depth exploration of the phenomenon. Considering these limitations, it is important for future research to address these issues to enhance the robustness and generalizability of the findings.

# Acknowledgments

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