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Empirical analysis of language learning strategies for optimizing online language courses

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ABSTRACT

In today's changing education world, online language classes are becoming more important. Recognizing the important role of the relationship between language learning strategies and students' preferences, our empirical study examines the patterns or factors that explain the observed correlations among variables to provide insights in optimizing online language courses. Addressing a critical gap in the existing literature that has traditionally treated language learning strategies and online language education as distinct entities, our survey-based research collected comprehensive data from students enrolled in online language courses. Focused on six key language learning strategies: memory, cognitive, compensation, metacognitive, affective, and social. The research shows a delicate connection between these strategies and students' preferences in online teaching mode. The empirical findings provide insights into certain strategies that work better for specific online learning methods. This helps us grasp the varied preferences of groups of students. This research enriches online language education by revealing an unexplored connection between strategies and preferences and provides a valuable resource for educators and course designers. The information given helps make online language classes better. It ensures that students learn languages more effectively online, considering their functional and practical needs in online learning.

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1. INTRODUCTION

In the evolving landscape of education today, the increasing popularity of learning languages online is a significant development [1]–[3]. As technology continues to reshape educational paradigms, the significance of online language education grows exponentially [4]. As current academic scenario has been changed globally, it is important to understand how language learning strategies and what students like are connected [5]. However, in the past, books and studies kept them separate, treating how to learn a language and learning online as different things [1], [6]. This gap emphasizes the importance of connecting the dots to enhance our understanding of how we learn a language and what learners prefer when doing online learning [2].

This research aims to fix this gap in the past, trying to understand how the ways we learn a language connect with good online language teaching methods. The main goal is to closely look at how these strategies affect what students prefer, helping us understand better how online language learning works [7], [8]. This study is important because it explores new areas and could give useful ideas to make online language courses better. By digging deep into how learning strategies and good teaching methods are connected, this research wants to fill a gap in what we already know. This provides educators and course designers with valuable tools to customize their online language courses, thereby improving language acquisition outcomes in the digital learning environment [9].

Learning languages online has become really popular, giving learners the chance to access it easily and be flexible with their time [6], [9], [10]. However, despite its potential, there is a need to better understand how students' language learning strategies align with and impact effective online teaching methods [9], [11], [12]. A gap exists in the literature regarding the comprehensive exploration of the interplay between language learning strategies and online teaching practices [13], limiting the optimization of online language courses. This research aim is to examine language learning strategies in online language courses by analyzing the various strategies used by learners. There are two research objectives (RO) to support this aim which are to assess the central tendencies of language learning strategies in the context of online language education through descriptive analysis, focusing on mean values of relevant variables (RO1). While the second objective is to identify the key factors and latent variables influencing students' preferences in online language education using exploratory factor analysis (RO2). The study seeks insights into optimizing online language education and enhancing learning experiences for a diverse range of language learners within a concise framework [3].

Language learning strategies, as defined by Oxford [14], [15], are specific techniques or approaches that learners employ to enhance their language acquisition process [16]. These strategies can be categorized into various dimensions, including memory, cognitive, compensation, metacognitive, affective, and social strategies [17], [18]. Research suggests that students often employ a combination of these strategies, and the effectiveness of these strategies can vary depending on individual factors such as motivation, learning style, and cultural background [14], [19].

In online language learning, people use different strategies to get better at understanding and using a new language [20]. These strategies are like tools that help in various ways [21], [22]. Memory strategies help in remembering words and things students learn online [18], [23]. Cognitive strategies make it easier for students to think and understand when learning a language through online methods. Compensation strategies act as backup plans, especially when students are unsure about a word or phrase during online learning. Metacognitive strategies help students control and understand how they learn languages online [18]. Affective strategies are important for managing student's feelings and staying motivated while learning online. Social strategies involve talking and working with others online to improve student's language skills [21], [24]. In online language learning, these strategies are essential tools that make the learning process effective and enjoyable [25].

Direct language learning strategies are ways you directly interact with the language to learn [20]. This includes methods like practicing speaking, listening to native speakers, and reading in the language [22]. These strategies involve a direct engagement with the language itself. Indirect language learning strategies are methods that do not involve direct interaction with the language but still contribute to learning. These can include using resources like dictionaries, learning grammar rules, or even setting goals for language improvement. Indirect strategies support your learning in a more indirect or supportive way. Figure 1 shows the classification of language learning strategies.

Online language education has become more popular in recent years, offering learners flexibility, accessibility, and a diverse range of resources for language acquisition [26]. It is characterized by its asynchronous and synchronous components, multimedia resources, and interactive communication tools [13]. However, effective online language instruction requires careful consideration of pedagogical approaches that take advantage of the unique affordances of online learning environments [26].

The alignment between students' language learning strategies and online teaching methods is crucial for optimizing language learning outcomes [27], [28]. Research has shown that when language learners are equipped with strategies that align with their individual preferences, they are more likely to experience success in language acquisition [14], [29], [30]. In an online context, this alignment becomes particularly relevant as learners navigate the challenges and opportunities presented by digital platforms [20].

2. METHOD

The study employs a quantitative research design, utilizing a survey-based approach to gather comprehensive data on language learning strategies. The survey is structured to capture responses from students enrolled in online language courses, emphasizing the exploration of memory strategy, cognitive strategy, compensation strategy, metacognitive strategy, affective strategy, and social strategy.

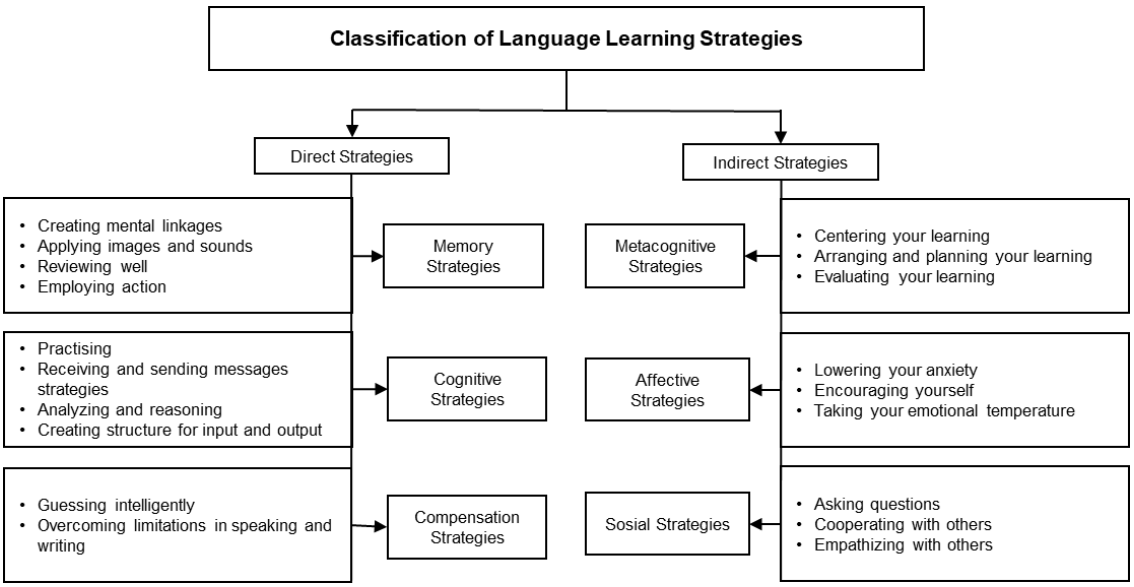

Figure 1. Classification of language learning strategies [14], [20]

2.1. Instrument development

A close-ended questionnaire was developed based on the Oxford's theoretical framework of language learning strategies [14], [15], [17]. The Oxford's instrument was called strategy inventory of language learning (SILL) [14], [31]. The questionnaire aims to quantitatively assess the utilization of different strategies, ensuring a focused exploration of the identified components of language learning. The inclusion of SILL's memory, cognitive, compensation, metacognitive, affective, and social strategies in the questionnaire aligns with a comprehensive understanding of language learning dynamics [16], [27]. The questionnaire was adapted from previous study [28]. The questionnaire employed purposive sampling, where students were asked to indicate their preferences for each item listed under each category of language learning strategies. The criteria include four Likert scales, ranging from 1 (Strongly disagree) to 4 (Strongly agree). The data obtained from the questionnaire were student preferences on using certain learning strategies to support their language courses.

2.2. Participants

The study comprises 73 participants from a public university in Malaysia who are enrolled in Mandarin language courses. Participants are drawn from two faculties: 42 students (57.5%) from the Faculty of Manufacturing Engineering (FKP) and 31 students (42.5%) from the Faculty of Information and Communication Technology (FTMK). This diverse sample ensures representation across different academic disciplines and enhances the generalizability of findings.

2.3. Data collection and data analysis techniques

Data were collected through an online survey administered to the participants. The survey focuses on participants' perceptions and utilization of specific language learning strategies. The close-ended nature of the questionnaire facilitates efficient data collection and ensures a standardized approach in gathering responses from participants. This study implements two types of data analysis which are descriptive analysis based on means values (to support RO1) and exploratory factor analysis (RO2) to show a connection between language learning strategies and students' preferences in online language education. The combined use of these two analyses suggests a comprehensive approach to understanding the interplay between language learning strategies and students' preferences. Descriptive analysis provides a foundational overview, while exploratory factor analysis delves deeper into the underlying structures or patterns that may exist within the data. The responses collected through the questionnaire are subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS). This approach allows for a rigorous examination of the quantitative data, enabling the identification of patterns and trends within the participants' reported use of different language learning strategies. This methodological framework ensures a systematic and rigorous investigation into the language learning strategies employed by participants in the online Mandarin language courses. The combination of a well-structured survey instrument, diverse participant representation, and descriptive and exploratory factor analysis techniques enhances the reliability and validity of the study's findings.

3. RESULTS AND DISCUSSION

In this section, present the results of this study and engage in discussions based on these findings. Begin by examining the demographic characteristics of the studied population. Subsequently, the results were obtained through descriptive analysis and principal component analysis (PCA). Following this presentation, we engaged in a detailed discussion that contextualized these findings.

3.1. Demography

The demographic profile of the participants (n=73) in the survey on optimizing online language courses reveals a predominantly young adult cohort, with 89% falling within the age range of 21 to 25 years. The gender distribution is balanced, with 52.1% male and 47.9% female participants. The racial composition is primarily Malay (84.9%), reflecting the regional context, while the distribution across faculties indicates a significant representation from the FKP at 57.5%, and the FTMK at 42.5%. These demographics offer insights into the specific context of the study and suggest that the findings are reflective of a diverse yet predominantly young and technologically engaged population. These details show how crucial it is to make online language courses fit the needs and likes of this particular group. When designing and giving language classes online, it is essential to put into consideration the demographic factors such as age, gender, and which faculty students belong to. Refer to Table 1 to see the demography of the participants.

Table 1. Demography of the participants (n=73)

Item	Characteristics	n (%)
Gender	Male	52.1%
	Female	47.9%
Age	17 to 20years	9.6%
	21 to 25 years	89.0%
	26 years and above	1.4%
Race	Malay	84.9%
	Chinese	0.0%
	Indian	11.0%
	Others	4.1%
Faculty	FTMK	42.5%
	FKP	57.5%

3.2. Results: descriptive analysis

3.2.1. Affective strategy (AS)

Affective strategies (AS) emerged as the most dominant among online language learners, with a remarkable mean score of 3.23 as shown in Table 2. This suggests that a significant majority of respondents actively engage in emotional and motivational aspects during their language learning journey. The high percentage of 80.75% reflects a widespread utilization of effective strategies, underscoring the importance of cultivating a positive emotional and motivational environment in online language education.

The survey results focusing on AS shed light on the emotional and motivational aspects of online language learning. Participants, on average, exhibit a positive emotional response to language learning activities, as indicated by the relatively high overall mean of 3.23. Noteworthy items include AS2 ("I notice my tension and nervousness when speaking in front of the classroom") and AS4 ("I try to relax whenever I feel afraid of using a third language"), which suggest a heightened awareness of emotional states and efforts to manage anxiety during language presentations. While AS6 ("I talk to my friends about my feeling before doing a presentation in a third language") received a slightly lower mean score, it still shows that students are trying to use strategies about feelings. This means students are working hard to feel good and positive when learning a new language.

Table 2. Affective strategy

Item ID	Item	Mean	SD
AS1	I feel happy after doing a presentation in a third language.	3.11	0.66
AS2	I noticed my tension and nervousness while speaking in front of the classroom.	3.45	0.69
AS3	I will bring my notes when I do the presentation. Note makes me feel helped.	3.32	0.68
AS4	I try to relax whenever I feel afraid of using a third language.	3.30	0.62
AS5	I try to speak a third language to my friends.	3.15	0.76
AS6	I talk to my friends about my feelings before doing a presentation in a third language.	3.04	0.90
	Total average	3.23	0.72

3.2.2. Metacognitive strategy (MCS)

Metacognitive strategies (MCS) secured the second position as explained in Table 3 with a mean score of 3.09. This indicates a substantial engagement of online language learners in activities that involve monitoring and controlling their cognitive processes. The high percentage of 77.25% highlights the significance of learners' awareness and reflection on their learning strategies, contributing to more effective language acquisition. The survey results focusing on MCS provide valuable insights into the cognitive and self-regulatory approaches adopted by students in online language courses. Notably, participants exhibit a strong inclination towards planning and self-reflection, as evident in high mean scores for MCS1 ("I always make planning for projects or assignments that I have") and MCS4 ("I am concerned about what progress I achieve during learning my third language"). These findings align with established literature highlighting the importance of metacognitive awareness in effective language learning. However, certain items, such as MCS7 ("I sing my third language songs to practice my tongue") and MCS9 ("I try to practice when text my lecturers by using my third language"), received lower mean scores. This suggests a variability in the adoption of certain MCS, indicating that not all students employ similar techniques to enhance their language learning experience.

3.2.3. Compensation strategy (CPS)

While these strategies have slightly lower mean scores, Table 4 shows the percentages ranging from 70.25% to 74.75% indicating their substantial usage. Compensation strategies (CPS) highlight learners' adaptive skills in overcoming language challenges, cognitive strategies point to engagement in deeper thinking processes, and social and memory strategies emphasize the importance of interaction and information retention. The survey's focus on CPS provides valuable insights into how online language learners navigate challenges in understanding and expressing themselves in a third language. The overall mean score of 3.02 suggests a moderate engagement with compensation strategies. Notably, CPS1 reveals a prevalent use of contextual guessing, highlighting learners' reliance on the surrounding text to deduce word meanings. However, the slightly lower mean scores for CPS2 and CPS4 indicate less frequent use of substituting similar words or mentioning correlating terms when faced with language gaps. Additionally, the utilization of body gestures (CPS3) signifies an alternative mode of communication employed by learners during language presentations.

Table 3. Metacognitive strategy

Item ID	Item	Mean	SD
MCS1	I always make planning for projects or assignments that I have.	3.25	0.64
MCS2	I always discuss my third language assignment with my friends.	3.25	0.78
MCS3	I put my attention to my friends' performance during the presentation.	3.16	0.73
MCS4	I am concerned about what progress I achieve during learning my third language.	3.37	0.61
MCS5	I read my third language texts to complete my task.	3.16	0.75
MCS6	I try to find out how to be a better learner of my third language.	3.42	0.58
MCS7	I sing my third language songs to practice my tongue.	2.66	0.93
MCS8	I try to practice speaking with my friends by using my third language.	2.97	0.78
MCS9	I try to practice when text my lecturers by using my third language.	2.53	0.87
	Total average	3.09	0.74

Table 4. Compensation strategy

Item ID	Item	Mean	SD
CPS1	I try to guess the meaning of my third language words based on its context.	3.30	0.54
CPS2	When I do not know my third language words, I use similar words during the presentation.	2.92	0.70
CPS3	I use body gestures to explain my third language words during the presentation.	2.97	0.71
CPS4	I mention some words that correlate to my third language words that I do not know.	2.89	0.72
	Total average	3.02	0.67

3.2.4. Cognitive strategy (CS)

The survey's focus on cognitive strategies (CS) unveils the diverse approaches that online language learners employ to enhance their understanding and usage of a third language. Table 5 shows the total average mean of 2.82 suggests a moderate engagement with cognitive strategies. Notably, participants exhibit a strong inclination towards utilizing the internet for browsing materials (CS4), highlighting the significance of online resources in the language learning process. Additionally, a considerable emphasis is placed on the repetition and correction of utterances (CS1, CS9), indicating a commitment to reinforcing learning through practice and self-correction. However, the slightly lower mean scores for items such as CS2 and CS6 suggest varying degrees of involvement in discussing materials with friends and correcting pronunciation errors, revealing the diversity in cognitive strategy preferences among learners.

The importance of CS in the online language learning landscape, with a total average mean of 2.82. The prevalence of internet usage for accessing materials aligns with the evolving role of technology in language

education. The diverse engagement in discussing materials, error correction, and repeated practice highlights the multifaceted nature of cognitive strategies. Educators can leverage these findings to tailor instructional approaches that incorporate a variety of cognitive techniques, acknowledging and accommodating the diverse preferences within this cognitive domain. By doing this, teachers can help make online language courses better. They create an environment that fits the unique learning needs of a diverse group of students.

3.2.5. Social strategy

The exploration of AS in online language learning reveals insights into students' emotional and social engagement with the learning process. Table 6 shows the total average mean of 2.81 suggests a moderate involvement in affective strategies. Notably, participants express a considerable inclination towards seeking clarification when facing difficulties (SC1); engaging in collaborative learning by practicing speaking with friends (SC2); and seeking assistance from peers (SC6). These findings indicate an active effort to create a supportive learning environment through interpersonal interactions. However, lower mean scores for items such as SC3 and SC4 suggest a less frequent engagement in asking questions in the third language and involving family members in language performance, revealing variations in the application of affective strategies.

3.2.6. Memory strategies (MS)

The examination of memory strategies (MS) in online language learning provides valuable insights into how students engage with and retain new language knowledge. Table 7 shows the total average mean of 2.81 suggests a moderate involvement in memory strategies. Notably, participants show a preference for immersive learning experiences, as indicated by the higher mean scores for items like MS2 ("I learn a third language through movies") and MS6 ("I watch third language-subtitled movies to learn my third language"). Additionally, the emphasis on daily review (MS7) and finding the meaning of words within context (MS9) suggests a commitment to reinforcing and contextualizing language knowledge. However, lower mean scores for items such as MS3 and MS5 indicate a less frequent engagement in daily speaking practice and a reluctance to translate word by word, revealing variations in the application of memory strategies among learners.

Table 5. Cognitive strategy

Item ID	Item	Mean	SD
CS1	I say and write new third language words several times.	2.79	0.71
CS2	I discuss the material with friends by using my third language.	2.38	0.86
CS3	I write down in a notebook to make a list of different words.	2.96	0.81
CS4	I use the internet to browse the materials.	3.70	0.46
CS5	I speak my third language by considering correct grammar.	2.79	0.71
CS6	I notice my friends' errors in pronunciation and try to correct them.	2.34	0.85
CS7	I create questions by using the correct sentence structure in my third language.	2.51	0.88
CS8	I am aware of my pronunciation.	2.88	0.78
CS9	I repeat my utterance when I find an error.	3.03	0.73
	Total average	2.82	0.75

Table 6. Affective strategy

Item ID	Item	Mean	SD
SC1	I ask the lecturer to repeat his/her explanation when I don't understand the materials.	3.10	0.75
SC2	I practice speaking my third language with my friends.	3.03	0.82
SC3	I ask questions in my third language.	2.58	0.80
SC4	I ask my family to see my third language performance.	2.40	0.98
SC5	I read aloud my third language text in my class.	2.62	0.95
SC6	I ask my friends to help me speak my third language.	3.15	0.70
	Total average	2.81	0.83

Table 7. Memory strategy

Item ID	Item	Mean	SD
MS1	I listen to third language songs to learn new vocabulary.	2.79	0.93
MS2	I learn a third language through movies.	3.18	0.84
MS3	I practice speaking a third language more than 5 times a day.	2.32	0.76
MS4	I add my third language knowledge by correlating what I have known to what I have learned.	3.01	0.70
MS5	I try not to translate word by word into my native language.	2.36	0.82
MS6	I watch third language-subtitled movies to learn my third language.	2.82	0.98
MS7	I review my third language lessons every day.	2.51	0.75
MS8	I notice my error in my third language and find the correct ones.	3.10	0.77
MS9	I find the meaning of my third language word by looking at the context.	3.19	0.68
	Total average	2.81	0.80

3.3. Discussion: students' preference of online language learning strategies

The results of the study, presented in Table 8, provide a comprehensive overview of students' language learning strategies (LLS) in the context of online language courses. The mean scores, standard deviations (SD), ranks, and percentages offer insights into the prevalence and prominence of different strategies employed by the overall respondents as shown in Table 8.

Table 8. Overall results on student's preference of online LLS

No.	Types of LLS	Mean	SD	Percentage
	Direct strategies			
1.	Compensation strategy	3.02	0.67	74.75%
2.	Cognitive strategy	2.82	0.75	70.50%
3.	Memory strategy	2.81	0.80	70.25%
	Indirect strategies			
4.	Affective strategy	3.23	0.72	80.75%
5.	Metacognitive strategy	3.09	0.74	77.25%
6.	Social strategy	2.81	0.83	70.25%

The survey results highlight that affective strategy are the most commonly used, with a mean score of 3.23, indicating their importance in online language courses. This underscores the need to address the emotional and motivational aspects in language learning. Metacognitive strategies closely follow, with a mean score of 3.09, emphasizing proactive planning, self-improvement efforts, and reflective practices. Compensation strategies, with a mean of 3.02, show moderate engagement, especially through contextual guessing. Cognitive and social strategies have slightly lower mean scores, indicating varying degrees of involvement. Memory strategies also show moderate engagement, emphasizing immersive learning experiences. The lower mean scores for cognitive, social and memory strategies in online language courses may be influenced by the evolving nature of virtual learning environments, the diverse preferences among learners, and the dominance of integrated learning approaches [32], [33]. These findings reveal the detailed aspects of language learning strategies in online courses, emphasizing the need for tailored instructional approaches aligned with diverse learner preferences.

The survey indicates that online learners employ various strategies for language learning. Affective and metacognitive strategies are the most popular, suggesting their importance in improving online language courses. Compensation, cognitive, social, and memory strategies are used less frequently. This underscores the importance of flexibility in teaching methods to accommodate different learner preferences. The findings provide insights for enhancing online language courses, considering the complexity of learning a language online. The survey results categorize language learning strategies into two types: direct strategies (memory, cognitive, and compensation) and indirect strategies (affective, metacognitive, and social). Direct strategies are favored by a significant percentage of participants, with 74.75% for compensation, 70.50% for cognitive, and 70.25% for memory strategies. Indirect strategies also have notable preferences, with 80.75% for affective, 77.25% for metacognitive, and 70.25% for social strategies. These findings indicate a balanced use of both direct and indirect strategies, emphasizing the complexity of language learning online. Educators should consider incorporating a variety of strategies to cater to diverse learner preferences and enhance the overall effectiveness of online language courses.

This survey findings on language learning strategies in online courses reveal detailed aspects influenced by diverse student preferences. Affective strategy shows a positive emotional response, emphasizing the importance of managing language-related anxieties. Participants exhibit a proactive approach in metacognitive strategies through planning, self-improvement, and reflective practices. Compensation strategies are moderately used, mainly through context guessing, while cognitive strategies vary, focusing on internet usage and repetition. Memory strategies indicate moderate involvement, with a preference for immersive learning experiences. These insights emphasize the need for educators to acknowledge diversity within each strategy domain, allowing tailored instructional approaches aligned with varied learner preferences. The findings contribute to optimizing online language courses for an inclusive and effective learning environment. The dominance of affective and metacognitive strategies suggests active engagement in emotional regulation, motivation, self-awareness, and cognitive control in online language learners. These findings align with broader literature on effective language learning, emphasizing the interconnectedness of affective and cognitive dimensions.

Additionally, the substantial use of compensation, cognitive, social, and memory strategies emphasizes the multifaceted nature of language learning online. Learners showcase adaptive skills, deeper cognitive engagement, and the importance of interaction and memory retention in language acquisition. Educators should consider these results when developing online language courses, emphasizing the integration

of affective and metacognitive components. Fostering an environment encouraging adaptive strategies, cognitive engagement, and meaningful social interactions could enhance the efficacy of online language education. The study's insights contribute to understanding diverse strategies in online language learning, providing a foundation for refining teaching methodologies and optimizing the online language learning experience.

3.4. Exploratory factor analysis

3.4.1. Results: principal component analysis

The study involved 73 participants and future research could benefit from exploring a larger sample size. The 43 items from the SILL underwent principal components analysis (PCA) using SPSS version 27. Before conducting PCA, we assessed the data's suitability for factor analysis, which requires a correlation matrix showing at least some correlations of r = .3 or greater. The inspection of the correlation matrix revealed many coefficients of .3 and above for all 43 items. Subsequently, we performed a PCA on the 43 items using the Direct Oblimin rotation method. The Kaiser-Meyer-Olkin (KMO) value exceeded the recommended .60 [34]–[36], and Bartlett's Test of Sphericity [37] reached statistical significance (p=0.000), supporting the factorability of the correlation matrix. From the communality values, we focused on extraction values exceeding .30 [34], as low values suggest poor fit within components [34]. No items were deleted as none had an extraction value below .30, aiming to maximize the total explained variance.

The PCA revealed 12 components with eigenvalues exceeding 1, explaining varying percentages of the variance. A scree plot indicated a break after the fourth component. Following the previous scree test [38], we proceeded with four components, explaining a total of 47.34% of the variance, with each component contributing different percentages. Direct Oblimin rotation was then performed for interpretation. Component 1 included items related to cognitive, metacognitive, affective, and social strategies, while component 2 encompassed memory and compensation strategies. Components 3 and 4 had mostly negative loadings, possibly influenced by the small sample size. The rotated solution highlighted two components with strong loadings, where positive affect items loaded on component 1 and 2, and negative affect items on component 3 and 4. This supports the separate use of positive and negative affect items as suggested by the scale [39]. Figure 2 shows the PCA results for each item in each dimension of language learning strategy.

We conducted further analysis by considering the factor loading magnitude as: strong loading (0.6 or higher), moderate loading (0.4 to 0.59), low loading (0.39 or lower). A positive loading indicates a positive relationship between the item and the factor. A negative loading indicates a negative relationship between the item and the factor. Based on the PCA results, component 1 consists of integrated learning strategies that accounts for the most variance (25.99%) suggests a dominant learning style that combines various strategies. Component 2 consists of media-based memory strategies that accounts for 8.06% of variance represents a distinct learning approach. Table 9 shows the distribution of the items loading highly for each language learning strategy in component 1 and 2 based on the PCA results. In conclusion, learners in our sample exhibit two primary learning strategies in language learning: i) Integrated strategy: employing a range of cognitive, metacognitive, affective, and social strategies; and ii) Media-based memory strategy: focusing on media exposure and compensatory techniques. Learners who score high on component 1 actively engage with the language through planning, discussion, reflection, seeking support, and managing emotions. They utilize both cognitive and social resources for learning. On the other hand, learners who score high on component 2 rely on media-based exposure for vocabulary acquisition and compensatory strategies to overcome language gaps. They may prefer more passive learning methods. The total variance explained (47.34%) suggests room for further analysis to uncover additional factors or refine the model.

Table 9. Distribution of item loadings in component 1 and component 2 of the PCA results

No.	Types of LLS	Items highly loading	Factor loading magnitude
Component 1: Integrated learning strategies (25.99%)			
1.	Cognitive strategy	CS2(0.391), CS3(0.329), CS4(0.322), CS5(0.339)	Low: CS2, CS3, CS4, CS5
2.	Metacognitive strategy	MCS1(0.440), MCS2(0.657), MCS3(0.494), MCS4(0.527), MCS5(0.387), MCS8(0.678), MCS9(0.644)	Strong: MCS2, MCS8, MCS9 Moderate: MCS1, MCS3, MCS4 Low: MCS5
3.	Affective strategy	AS1(0.545), AS4(0.521), AS5(0.609), AS6(0.502)	Strong: AS5 Moderate: AS1, AS4, AS6
4.	Social strategy	SS1(0.708), SS2(0.523), SS3(0.629), SS4(0.629), SS5(0.597), SS6(0.774)	Strong: SS1, SS3, SS4, SS6 Moderate: SS2, SS5
Component 2: Media-based memory strategies (8.06%)			
5.	Memory strategy	MS1(0.785), MS2(0.636), MS6(0.592)	Strong: MS1, MS2 Moderate: MS6
6.	Compensation strategy	CPS1(0.092), CPS2(0.172), CPS3(0.158)	Low: CPS1, CPS2, CPS3

Pattern Matrix[a]

Item Code	Component 1	2	3	4	Item in the language learning strategy questionnaire
MS1	-0.214	0.785	-0.252	0.138	I listen to third-language songs to learn new vocabulary.
MS2	0.066	0.636	-0.142	0.066	I learned a third language through movies.
MS3	0.025	0.116	-0.190	0.504	I practice speaking a third language more than 5 times a day.
MS4	-0.013	0.134	-0.580	0.205	I add my third language knowledge by correlating what I have known to what I have learned.
MS5	0.100	0.220	-0.017	0.551	I try not to translate word by word into my native language.
MS6	0.341	0.592	-0.011	-0.174	I watch third language-subtitled movies to learn my third language.
MS7	0.136	-0.032	-0.375	0.315	I review my third language lessons every day.
MS8	0.062	-0.136	-0.675	0.210	I noticed my errors in my third language and found the correct ones.
MS9	-0.016	0.058	-0.597	0.240	I find the meaning of my third language word by looking at the context.
CS1	0.132	-0.151	-0.449	0.443	I say and write new third language words several times.
CS2	0.391	-0.016	0.108	0.592	I discuss the material with friends by using my third language.
CS3	0.329	-0.390	-0.216	0.401	I write down in a notebook to make a list of different words.
CS4	0.322	-0.090	-0.245	-0.207	I use the internet to browse the materials.
CS5	0.339	0.129	-0.070	0.320	I speak my third language by considering correct grammar.
CS6	0.019	-0.070	-0.206	0.700	I notice my friends' errors in pronunciation and try to correct them.
CS7	0.089	0.097	-0.062	0.677	I create questions by using the correct sentence structure in my third language.
CS8	-0.074	0.003	-0.368	0.335	I am aware of my pronunciation.
CS9	-0.131	-0.154	-0.775	0.030	I repeat my utterance when I find an error.
CPS1	-0.092	0.092	-0.654	-0.031	I try to guess the meaning of my third language words based on its context.
CPS2	0.258	0.172	-0.562	-0.150	When I do not know my third language words, I use similar words during the presentation.
CPS3	0.352	0.158	-0.460	-0.265	I use body gestures to explain my third language words during the presentation.
CPS4	0.040	0.246	-0.642	-0.074	I mention some words that correlate to my third language words that I do not know.
MCS1	0.440	-0.408	-0.251	0.042	I always make planning for projects or assignments that I have.
MCS2	0.657	-0.300	-0.170	0.080	I always discuss my third language assignment with my friends.
MCS3	0.494	-0.088	-0.153	0.329	I put my attention to my friends' performance during the presentation.
MCS4	0.527	0.141	-0.266	0.026	I am concerned about what progress I achieve during learning my third language.
MCS5	0.387	0.179	-0.040	0.091	I read my third language texts to complete my task.
MCS6	0.168	0.260	-0.526	0.075	I try to find out how to be a better learner of my third language.
MCS7	-0.025	0.837	-0.011	0.231	I sing my third language songs to practice my tongue.
MCS8	0.678	-0.021	0.081	0.293	I try to practice speaking with my friends by using my third language.
MCS9	0.644	0.185	0.235	0.253	I text my lecturers by using my third language.
AS1	0.545	0.144	-0.264	-0.008	I feel happy after doing a presentation in a third language.
AS2	0.321	-0.010	-0.189	-0.101	I noticed my tension and nervousness while speaking in front of the classroom.
AS3	0.385	0.344	-0.278	-0.381	I will bring my notes when I do the presentation. Note makes me feel helped.
AS4	0.521	0.120	-0.184	-0.162	I try to relax whenever I feel afraid of using a third language.
AS5	0.609	-0.132	-0.082	0.242	I try to speak a third language to my friends.
AS6	0.502	0.115	0.004	-0.247	I talk to my friends about my feelings before doing a presentation in a third language.
SS1	0.393	0.232	-0.338	0.004	I ask the lecturer to repeat his/her explanation when I don't understand the materials.
SS2	0.708	-0.070	-0.060	0.216	I practice speaking my third language with my friends.
SS3	0.523	0.141	0.092	0.393	I ask questions in my third language.
SS4	0.629	0.000	0.157	0.152	I ask my family to see my third language performance.
SS5	0.597	0.281	0.398	0.073	I read aloud my third language text in my class.
SS6	0.774	-0.150	0.050	-0.096	I ask my friends to help me speak my third language.

Extraction method: Principal component analysis; Rotation method: Oblimin with Kaiser Normalization.
a. Rotation converged in 35 iterations.

Figure 2. PCA results for each item in each dimension of language learning strategy

3.4.2. Discussion: recommendations for online language course developers

Based on the identified learning approaches in our PCA analysis, online language course developers can consider implementing the following recommendations to enhance the learning experience on their platforms [40]. To cater to learners adopting integrated learning strategies, four recommendations can be considered. First, it is recommended to promote active engagement course developers should design activities that encourage planning, discussion, reflection, and collaborative learning [40]. This may involve incorporating group projects, peer feedback sessions, and interactive forums, fostering an environment where learners actively participate in the learning process. Next, supporting metacognitive development is crucial for learners adopting integrated strategies [41], [42].

Online platforms can teach learners how to set goals, monitor their progress, and adjust their learning strategies [43]. Providing resources for self-assessment and reflection can empower learners to take a proactive role in their language acquisition. Third, fostering positive emotions is essential for a conducive learning environment. Developers can create a supportive atmosphere by integrating motivating elements such as gamification, positive feedback, and recognition of achievements [44], [45]. This approach helps maintain learner

motivation and enthusiasm throughout the course [44]. Incorporating social learning features is another valuable recommendation for learners adopting integrated strategies. By utilizing technology to facilitate communication and collaboration among learners, online platforms can encourage peer interaction, sharing of experiences, and group problem-solving [45]. This social dimension enhances the overall learning experience [42].

To cater for learners adopting media-based memory strategies, four recommendations can be considered. First, the online platforms can offer curated multimedia resources [46]. Providing access to a variety of engaging and educational audio and video materials like songs, movies, podcasts, and documentaries can enrich the learning experience. Next, integrating spaced repetition and review mechanisms is crucial for memory retention. Online course developers can implement algorithms or tools that present vocabulary and grammar concepts at timed intervals, reinforcing learning and preventing forgetting [46], [47]. This approach supports long-term retention and application of language skills [48]. Supporting context-based comprehension is another recommendation for learners using media-based memory strategies. Encouraging learners to use context clues to guess the meaning of new words and expressions can enhance language understanding [49]. Developing activities that focus on comprehending language in natural contexts contributes to practical language application. Providing opportunities for active practice is vital to complement passive media consumption [47]. Online language courses should not just depend on passive learning through multimedia [46]. By integrating interactive exercises, quizzes, and games, developers can ensure active participation, allowing learners to consolidate their learning and improve memory retention [46], [50]. By incorporating these adapted recommendations, online language course developers can create more effective and engaging learning experiences that cater to the diverse needs and preferences of learners adopting different strategies [46], [48], [49].

4. CONCLUSION

In summarizing the descriptive results, the study's descriptive results reveal that online language learners primarily utilize strategies related to managing emotions and thinking about their learning process. This underscores the importance of emotional regulation, motivation, and cognitive awareness in online language education. While other strategies like problem-solving, social interaction, and memory are also employed, they are slightly less prevalent. This highlights the need for educators to recognize the diverse ways learners approach language learning and tailor their teaching methods accordingly, focusing on emotional and cognitive aspects to enhance the online learning experience.

Additionally, the study's PCA provides a deeper understanding of how these strategies interrelate. Affective and metacognitive strategies emerge as pivotal factors, emphasizing learners' engagement with emotional regulation, motivation, and self-awareness. Integrated learning strategies, which encompass cognitive, metacognitive, affective, and social dimensions, align with high scores for affective and metacognitive strategies. This indicates a balanced utilization of both direct and indirect strategies, underscoring the complexity of online language learning. Educators are encouraged to consider this diversity when designing instructional approaches, promoting inclusivity and effectiveness in online language courses. In conclusion, the combined findings offer valuable insights for educators to create tailored learning environments that cater to diverse learner preferences and optimize online language education.

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