Journal of Nusantara Studies 2022, Vol 7(2) 81-102
Universiti Sultan Zainal Abidin
ISSN 0127-9386 (Online)
http://dx.doi.org/10.24200/jonus.vol7iss2pp81-102

STEM STUDENTS' ENGLISH LANGUAGE LEARNING STRATEGIES AND UNDERLYING FACTORS PERTAINING TO OPEN DISTANCE LEARNING

[1]Nurul Jannah Ahmad Ghulamuddin, [*2]Tengku Intan Suzila Tengku Sharif & [3]Zainurin Abd Rahman

[1,2] Academy of Language Studies, Universiti Teknologi Mara,
Cawangan Pahang, 26400 Bandar Jengka, Malaysia.
[3] Kuliyyah of Education, International Islamic University Malaysia,
P.O. Box 10, 50728 Kuala Lumpur, Malaysia.
*Corresponding author: intansuzila@uitm.edu.my

Received: 05.02.2022 Accepted: 16.04.2022

ABSTRACT

Background and Purpose: The COVID19 pandemic challenges on learning necessitate the understanding of students' Language Learning Strategies (LLS). Studies on science, technology, engineering, and mathematics (STEM) students' English LLS is scarce. The objectives of the study are to examine the LLS employed by STEM students learning English as a second language (ESL) in a public university (PU) in Malaysia and to investigate the LLS underlying factors pertaining to the open distance learning (ODL).

Methodology: This study was designed as survey research, employing the quantitative approach to gather data. The Strategy Inventory of Language Learning (SILL) questionnaire was administered to 250 engineering undergraduates as respondents, who were chosen using a purposive sampling method. Data were analyzed descriptively using the Statistical Package for Social Sciences (SPSS) version 21.0. The Principal Component Analysis (PCA) with varimax rotation was conducted to determine the construct validity. PCA appropriateness was suggested by the inter-item correlation.

Findings: The compensation, metacognitive and cognitive learning strategies were the most frequently used strategies while the memory and affective strategies were the least. The PCA added vital information like the memory strategy corresponds to the metacognitive strategy. The cognitive strategy

concept of 'practice,' may demand a revisit to some traditional grammar learning methods. There are also demands for social-emotional factors to be considered. ODL has imposed bigger demands too.

Contributions: The findings may assist ESL educators to boost STEM students' self-monitoring behavior, to plan and coordinate their own learning process. PCA's 'Self-Awareness' concept revealed that policy makers need to conduct more training to ensure executions run smoothly.

Keywords: English, Language Learning Strategies (LLS), Open Distance Learning (ODL), Science Technology, Engineering, and Mathematics (STEM).

Cite as: Nurul Jannah, A. G., Tengku Intan Suzila, T. S., & Zainurin, A. R. (2022). STEM students' English language learning strategies and underlying factors pertaining to open distance learning. *Journal of Nusantara Studies, 7*(2), 81-102. http://dx.doi.org/10.24200/jonus.vol7iss2pp81-102

1.0 INTRODUCTION

English language is an important language in Malaysia. Although bahasa Melayu (L1) is the first and official language, acknowledgement is given to the English language as a second language (ESL or L2). It is used in most daily transactions in Malaysia (Singh, Liew, & Siau, 2021). The Malaysian education system emphasizes on its importance. Thus, the teaching of English language in Malaysian educational institutions aims at persuading students to use the language in everyday situations. The students' English language competence may aid their studies especially for knowledge acquisition, as well as their future occupational needs. Furthermore, present day employers are infinitely seeking competent English users (Ting, Marzuki, Chuah, Misieng, & Jerome, 2017; Thirusanku & Yunus, 2014; Hanapiah, 2004).

The Malaysian public higher learning institutions (PUs) graduates have often been dubbed by some employers as possessing poor English language mastery (Nadarajah, 2021; Singh, 2021). After spending at least three years in PUs, graduates are expected to be equipped with the knowledge and skills to help them be fluent in English. Unfortunately, the graduates' good performance on academic transcripts does not reflect their overall competencies in using English language, and this is worrying. For employability prospects, the PUs must prepare students with the adequate grasp of English language, though preferably, a high level of proficiency in English language to meet the demands of globalization (Lising, 2021; Ting et al., 2017). Thus, students do not only learn English language to pass examinations, but they must also be able to use the language proficiently to cope with the career world (Singh et al., 2021).

The lack of competency and proficiency in English language among the students may be influenced by their use of language learning strategies (LLS). In acquiring the language, students need to employ the appropriate LLS to achieve the best results and to enable them to understand and communicate using the language fluently (Sukraini, 2021; Citra & Zainil, 2021; Rubaai, Hashim, & Yunus, 2019; Kazi, 2017). These strategies will hopefully facilitate the learning of English language in an efficient and effective manner.

Research concerning the Malaysian students' LLS have been conducted, but the gap lies in the sampling of a specific faculty or group of students. So, this study is narrowed to technical stream groups like the engineering students. The engineering students are more likely to be involved in experiments and hands-on tasks, making them hesitant to acquire English communication skills. As Malaysians ESL students, they are expected to have a good command of the English language.

The underpinning issues and challenges of learning English language may remain the same even during the COVID19 pandemic. Dzakiria, M Idrus, and Atan (2005) studied students' interactions in Open Distance Learning (ODL) environment before the pandemic. The challenges discovered were similar to recent studies (Van Den Berg, 2020; Wanami & Kintu, 2019). These include interaction issues on all education levels and the lack of support and services in implementing ODL. The crucial problem lies on the issue of interaction with technologies, teacher-student, and the course content. Students might take some time to familiarize themselves with the technology or platform used for ODL, especially those who are not well-exposed to it. The same goes to the teacher-student communication, where appropriate feedback on course content is ineffectively delivered which then leads to students' reserved attitude and participation during online class sessions. On the other hand, these ODL students are struggling with the issues like insufficient support and facilities like motivation, peer support and infrastructure. Attempts to address students' reserved attitudes, poor heuristic behavior and external barriers need to begin by understanding the underlying factors and learning strategies undertaken by students.

The present study seeks to examine the LLS employed by STEM engineering students in a local PU in Malaysia, and investigate the underlying factors of English LLS pertaining to ODL. Hence, the objectives of this study were: (1) to examine the English LLS employed by engineering students in a local public PU, and (2) to investigate the underlying factors of English LLS among engineering students. These objectives lead to the construction of the following research questions: (1) what are the LLS employed by engineering students in PU in

learning English?, and (2) what are the underlying factors of STEM engineering students' English LLS in PU?

2.0 LITERATURE REVIEW

2.1 Language Learning Strategies (LLS)

Incorporating learning strategies may accelerate learning development. O'Mally and Chamot (1990) described learning strategies as unique opinions or performances that individuals use to manage and assist comprehension, learning, or preserving new-found information. LLS are steps taken by learners to enhance language learning quest. Nambiar (1998) suggested that LLS are language learning behaviors employed by learners in the process of learning language. Oxford (1992) has proposed a near similar definition. Learning strategies are actions, doings, measures, or methods that students (often by choice) apply to ameliorate their learning progress in developing L2 skills (Oxford, 1992). Hence, strategies are the instruments for self-reliant participation in developing learning ability.

LLS system connects both individual and group strategies with all the four main language skills (listening, reading, speaking, and writing). This strategy system is appropriate for examining both perceptual learning style and learning strategies as learners would be displaying auditory, visual, kinesthetic, tactile, group or individual learning style while using the four language skills. Strategies are classified into two major categories: direct and indirect strategies. The strategies are summarized in Table 1.

Table 1: Oxford's (1990) learning strategies

No.	Strategies	Type of Strategy	Description
1	Direct Strategies	Cognitive strategies	Using all your mental processes
		Memory strategies	Remembering more efficiently
		Compensation strategies	Compensating for missing knowledge
2	Indirect Strategies	Metacognitive strategies	Organizing and evaluating your learning
		Affective strategies	Managing your emotions
		Social strategies	Learning with others

There are several LLS schemes. Oxford (1990) has produced a scheme of LLS which is more comprehensive than the earlier classification models. It claims to be the most organized and inclusive tool to be developed for determining learning strategies in ESL. Although there are other instruments used in research on LLS such as LLS Questionnaire (LLSQ) by Setiyadi

(2016) and Language Strategy Use Survey by Cohen and Oxford (2002), SILL is still the best instrument to fit the purpose of this current study as it has consistent validity (Amerstorfer, 2018). Besides, many of the recent studies (Duong & Nguyen, 2021; Rianto, 2020; Rubaai et al., 2019; Alfian, 2018) on LLS have also employed this instrument. These studies sufficiently reflect the validity and reliability of SILL. SILL is a comprehensible design, user-friendly for both L2 learners and researchers, and these are the features that make SILL owes its remarkable popularity as a self-evaluation and research tool (Amerstorfer, 2018). Hence, SILL was chosen as the instrument for the current study.

2.2 Learning Strategies during Online Distance Learning (ODL)

The COVID19 pandemic has made ODL significant to ensure a continuous academic process. ODL has temporarily replaced the traditional face-to-face interaction between students and educators during the pandemic (Daniel, 2020). Aldossary (2021) refers ODL as a process of distance learning over the internet in an academic context while Dzakiria et al. (2005) defines ODL as a brilliant approach in equipping learners with the greatest possible control over time, place, and pace of learning. On the other hand, Horn and Staker (2011) interpret online learning as education that comprehends the transfer of instruction and content through the internet and caters the communication between learners and teachers. Thus, ODL can be summarized as a medium of communication in teaching and learning which integrates telecommunication technology to enhance the process of teaching and learning despite the distance. To cope with ODL, learners are expected to generate their own learning strategies that can complement their online learning.

Students may improve their understanding and academic performance during ODL by employing self-learning, consulting the lecturers, and discussing with their friends (Muin, 2021). They preferred to study on their own and look for other sources of information to complete any assigned tasks instead of asking questions or participating in the discussions. Prinz (2019) and Matuga (2009) found there were two factors that determined the success of PUs in ODL which were students' self-motivation and self-regulation as well as communication and interaction.

Self-regulated and motivated learners tend to not procrastinate, use more cognitive and metacognitive learning strategies and be more inspired to achieve their learning goals. Allam, Hassan, Mohideen, Ramlan, and Kamal (2020) found out that students are expected to adopt learning strategies that focus on enhancing the motivation and self-directed learning as these two factors are the major elements that affect the ODL readiness among them. However, there

are other learning strategies that need to be considered by the learners during ODL. As Van Den Berg (2020) suggested, PUs should focus on the issues of students' interaction with technology. Dzakiria et al. (2005) initially found the interaction challenges included communication between the students and medium for online learning, lecturers, and friends. Thus, it can be concluded that students are struggling in communicating to others (teachers and friends) and lack the competency in using technology, especially involving the online platform for the learning process to take place. Thus, there is an absolute need to determine the students' learning strategies to assist students in coping with ODL.

3.0 RESEARCH DESIGN

This study applied a quantitative research method, and it involved the collection of data through questionnaires distribution. 250 engineering students from a local PU were conveniently sampled. The participants were recruited because they may represent the STEM students. The engineering program emphasizes tasks or assessments and are more towards hands-on and technical experimentation. So, there was less expectation for these samples to have very good English proficiency, especially in communication, hence, fit the criteria of this study. The reason for only one local PU was adopted for the study was due to its exploratory nature as to establish potential problems in relation to STEM students LLS. Quota-sampling technique was applied. All respondents were from the five courses offered in the Bachelor in Engineering (B.Eng) degree which were Aerospace, Mechanical-Automotive, Biochemical-Biotechnology, Electronics-Computer and Information, as well as Communications. The samples in this study course were tabulated to reach a 16.6% for each for a well-adjusted presentation. This brings to fifty respondents per course. This technique was chosen due to its convenience as well as the accuracy of representing the population of interest. This would also replicate the population of interest. All the respondents were undergraduate students. Questionnaires were distributed to all respondents and returned on the same day.

3.1 Instrumentation

The Strategy Inventory for Language Learning (SILL) by Oxford (1989) was adopted as the instrument to gather the needed information. The questionnaire comprised of two sections. Section A consisted of 50 items with 6 sub-constructs representing the LLS which intend to draw out information regarding students' learning strategies towards the learning of English. A 5-point Likert scale item, ranging from 'never or almost never true of me' to 'always or almost always true of me' was used to gauge responses as it could help the respondents in

choosing the best option that reflected their views. Section B comprised items on demographic information, which was intended to elicit participants' backgrounds. The questionnaire adopted a 5 Likert scale format. In the analysis, the Likert scale 1 and 2 ('never or almost never true of me' and 'usually not true of me') were being disregarded, which then indicated negativity of the responses or 'not true'. On the other hand, Likert scale 3, 4 and 5 ('somewhat true of me', 'usually true of me', 'always or almost true of me') were combined which indicated positivity of the responses or 'true'.

The previous Cronbach Alpha for SILL was reported to be consistent. According to Park (2011), the SILL's internal consistency reliability has been well above an acceptable value of .60 or .70. Yang (1999) reported the alpha coefficient of .94, Robson and Midorikawa (2001) with the alpha coefficient of 0.93 and Khalil (2005) with the alpha coefficient of .86. Park (2011) and Russell (2010) have broken down the number of items and the reliability of the sub-constructs they purportedly measured. These assured the instrument was reliable.

Table 2: Breakdown of items according to sub-construct (Park, 2011; Russell, 2010)

Strategies	**Items**	**Cronbach Alpha**	
		Park (2011)	**Russell (2010)**
Memory	1-9	0.69	0.75
Cognitive	10-23	0.75	0.89
Compensatory	24-29	0.43	0.70
Metacognitive	30-38	0.78	0.91
Affective	39-44	0.45	0.70
Social	45-50	0.70	0.75

The SILL is a self-reporting instrument with an overall of 50 questions to identify one's language learning strategies. The SILL was chosen because it has been specifically projected to assess the second language learning strategies (Amerstorfer, 2018; Ehrman, Leaver, & Oxford, 2003; Rianto, 2020; Charoento, 2017). It furnishes a comprehensive inventory of 6 strategies gathered from the past research and the result is systematically formalized in a variety of settings especially in the context of non-native language learners.

3.2 Data Analysis

Data were analyzed descriptively using SPSS Version 24 for relevant mean and standard deviation to answer the first research question. In answering the second research question, Principal Component Analysis (PCA) was used to identify the underlying factors of the

students' English LLS. Wiedbusch, Dever, Wortha, Cloude, and Azevedo (2021) used PCA on the data processing in prodding into the underlying patterns and found the frequency of strategy grouping occurred with and without pedagogical agent scaffolding. Van Ha, Murray, and Riazi (2021) found six underlying factors while using the similar analysis on students' beliefs corrective feedback. The similarities between these studies and the current study are that PCA was used in making sure the items belong to each subs-construct and are not overlapping with each other. Russell (2010) validated the process of the SILL by conducting a confirmatory factor analysis and found out that all six constructs in SILL "were unique and interrelated to each other" (p. 48). This shall assist to prove whether all 50 items do belong to the same sub-constructs or factors. Considering the context of the study, this data analysis is suitable as the respondents were among the engineering students.

4.0 ANALYSIS AND DISCUSSION

The first research question is 'What are the LLS employed by engineering students in local PU in learning English?' Thus, to identify the LLS employed by the students in learning English, the mean score for every strategy is presented. The most and the least frequent strategy used were also identified. It is concluded that the two most frequently used learning strategies were the compensation learning strategy and metacognitive learning strategy because both shared the same mean $\bar{x}$=3.71, with standard deviation (SD) of 1.4 and 0.94 respectively. The least frequently used strategy is the affective learning strategy ($\bar{x}$=3.29, SD 1.12). On the other hand, the reported mean and SD for the cognitive strategy is $\bar{x}$=3.58, SD 1.12 while Social and Memory Strategies are at $\bar{x}$=3.55, SD 0.98 and $\bar{x}$=3.32, SD1.1 respectively.

The samples of engineering students mostly used the compensation strategy. The strategy enabled learners to apply the newly learned language for either inclusion or as the final product despite the possible restrictions of information along the process. In this context, the students did not use the new language, however, they used their first language to aid in learning English (Amerstorfer, 2018). So, these strategies enable the learners to come out with spoken or written products using the new language without total knowledge on the language (Kazi, 2017). Coining words to compensate for the lack of appropriate vocabulary is one of the examples of using the compensatory strategy.

The sampled students mostly adopted the metacognitive strategy too. This strategy offered beyond cognitive devices and let the learners to facilitate their own learning process (Oxford, 1990). There were eleven skills listed under three sets of metacognitive strategies-Centering Your Learning, Arranging and Planning Your Learning and Evaluating Your

Learning. Oxford (1990) and Duong and Nguyen (2021) believe that metacognitive strategy skills are very crucial for successful language learning. The skills such as paying attention and associating with existing knowledge are incorporated in them. Learners who at times get overwhelmed by the novelty of the target language, such as unfamiliar words, confounding and overlapping rules need these strategies. Students can regain their focus by consciously using metacognitive strategies as the coordination of the learning process is catered for (Amerstorfer, 2018).

The findings of this study were supported by some of the previous research findings by Duong and Nguyen (2021), Citra and Zainil (2021), Fithriyah and Yusuf (2019), and Charoento (2017), especially regarding the most frequent usage of compensation and metacognitive strategies among the students in learning English language. Lee and Heinz (2016) found that their respondents frequently mentioned metacognitive as the most effective strategy used. Park (1995) had also reported that 332 respondents in his study ranked metacognitive strategies as the most frequent strategy used compared to other categories of strategies. Holt (2005) found that the most frequent strategy used by all students is the compensation strategy.

In the ODL environment, the ability to metacognitively strategize learning quests is relevant because during this crucial period, the students need to sharpen their learning skills independently. Independent learning demands efficient metacognitive strategies because the students are in dire need to be conscious about their own learning process. Since metacognitive can be simply defined as thinking about thinking, students should be able to be metacognitively aware of what they need to do on their own. ODL has generated a great atmosphere to practice the skills. Since ODL is a more independent medium for learning, the room for the students to be conscious of their own thinking should be sufficient. In an ODL environment, students may be independent to take conscious steps in planning and evaluating their own learning from home. At the same time, the ability to employ compensation strategies during ODL is crucial for the students as it helps to overcome their limitations in language learning. By using adaptive aids like relying on non-verbal communication, students can get additional clues on what they are learning.

The least frequently used strategy is the affective strategy. Oxford (1990) refers the term “affective” to feelings, attitudes, motivation, and values. Affective factors in language learning are incorporated in all types of learning. Positive emotions will lead to better performance in language learning (Zhang & Tsung, 2021; Fandiño Parra, 2010). There are three skills listed under this strategy namely, (1) lowering your anxiety, (2) encouraging yourself and (3) taking your emotional temperature. Examples would include using laughter to

relax and reward oneself for good performance and discuss the feelings with someone (Nambiar, 1998).

In learning the English language, students in the current study were less capable in controlling their emotive side. They might not be exposed to some techniques to regulate their anxiety. Even though music and laughter are very typical relaxing techniques among students, they may fail to apply it in language learning. There are also possibilities where the students might have no rewarding mechanism upon any success or achievement in language learning. This somehow could be related to their background study which was engineering. Engineering revolves around technical learning so the focus on language is disregarded. Thus, students might tend to reward themselves for their good performance in their major courses rather than rewarding themselves in their language progress. Furthermore, the students might also feel shy to discuss their feelings with their other friends about the challenges in language learning, and it was not their normal practice or habit to share feelings with others regarding the issue.

During ODL, it is very possible for the students to be less frequently employing the affective strategies in their language learning endeavors. In an ODL setting, some students have not met their classmates face to face and thus no interactions have ever occurred. Being all alone without friends and classmates at home might be the main factor why students were reluctant to share their feelings with others. Moreover, tasks assigned, and the deadline set in language learning could be the factors that the students have very limited time to connect with classmates and this situation led to the seldom use of affective strategies.

To answer the second research question, which is What are the learning underlying factors of students' English LLS among engineering students in PU?, the Principal Component Analysis (PCA) with varimax rotation was conducted. This is to determine the construct validity of the data on English LLS among respondents. As this study was an explanatory study, there was no confirmation on the assumed structure. Moreover, before subjecting the data to the mentioned analysis, underlying statistical assumption tests were checked. The appropriateness of PCA for the data was suggested by the inter-items' correlation. The sampling adequacy was acceptable (KMO = .91) and Barlett's test of sphericity demonstrated that correlations between items were large enough to run a PCA ($x2(1081) = 5489.67$, $p < .001$). If the individual MAS score is greater than .70, it justifies the appropriateness of applying the PCA (Wiedbusch et al., 2021).

Throughout this study, there were five new factors extracted by PCA, which comprised the items from different groups of strategies each. Some of the new factors have higher reliability than the reported one. The findings support previous studies which reported the

Cronbach's alpha coefficients that was higher than .60 (Park, 2011; Russel, 2010). The overall total variance explained by the five factors is 40.8%. The total variance explained by each factor is shown in Table 3 below.

Table 3: Total variance explained for each factors

No.	**Factors/ practices**		**Total Variance Explained (%)**	**Rotation sums of squared loadings**		
				total	**% of variance**	**cumulative %**
1	Factor 1	Metacognitive	29.6	4.6	9.19	9.19
2	Factor 2	Memory and Mind	7.2	4.43	8.87	18.0
3	Factor 3	Social- Emotional	4.8	4.0	8.04	26.1
4	Factor 4	Cognitive	3.7	3.3	6.64	32.7
5	Factor 5	Self-Awareness	3.0	3.0	6.19	38.9

To report the PCA for every factor extracted, firstly, the number of items belonging to the same dimension were mentioned, followed by the Eigenvalue or Cronbach Alpha of the particular factor. It is important to mention the eigenvalue as it would show that all items belong to the same dimension or factor. Next, a new name for each factor is given; this is either they stick to the original name or needed a new one according to appropriateness. Every factor is complimented by a table, each comprising the original strategy for each item, the items, Cronbach Alpha (α) for the factor, as well as the factor's Total Variance Explained (TVE).

The first extracted factor contains 3 items. All items are from metacognitive strategy. The reliability of factor 1 is Cronbach Alpha α: 0.85. As all items in this factor were originally from the Metacognitive construct, the name of the factor was maintained as 'Metacognitive'.

Table 4: Factor 1 - Metacognitive

No.	Original Strategy	Items	α	TVE (%)
1	Metacognitive 2	I notice my English mistakes and use that information to help me to do better.	0.85	29.6
2	Metacognitive 3	I pay attention when someone is speaking English.		
3	Metacognitive 4	I try to find out how to be a better learner of English.		

Metacognitive strategies are processes devised for learners to 'think' regarding their 'thinking' which satisfy the coordination of learning practices (Amerstorfer, 2018). They are critical for successful language learning (Oxford 1990; Duong & Nguyen, 2021) as it curates the student's own effort and plan to learn. A student can begin by paying attention to someone else's English-speaking mistakes thus using this information to help him do better in discovering how to be a superior learner of the English language.

All the three new items in factor 1 are about identifying one's own errors in both understanding and enhancing the new language. The students who sometimes get overwhelmed by the novelty of the target language, like unfamiliar vocabulary, blurring and overlapping rules need these strategies because it can help the students to construct suitable plans for learning information, which can be memorized and finally turned into a routine (Nambiar, 1998). This might be slightly similar to the concept of self-monitoring. As students become aware of the way they learn, they will use this metacognitive strategy to efficiently acquire new information, thus becoming more of an independent thinker.

The second extracted factor contains six items. These six items are a combination of the memory, cognitive and metacognitive strategy. The reliability of factor 2 is Cronbach Alpha α: 0.82. Out of the six items, four are from the memory construct which makes the other two items minority. So, this new factor will be named 'Memory and Mind' as the majority construct is the memory strategy.

Table 5: Factor 2 - Memory and mind

No.	Original Strategy	Items	α	TVE (%)
1	Memory 5	I use rhymes to remember new English words.		
2	Memory 6	I use flashcards to remember new English words.		
3	Memory 7	I physically act out new English words.		
4	Memory 8	I review English lessons often.		
5	Cognitive 10	I look for words in my own language that are similar to new words in English.	0.82	7.2
6	Metacognitive 5	I plan my schedule so I will have enough time to study English.		

The memory strategies are used to submit information into ones' memory and to retrieve it. Memory-related strategies facilitate learners to associate one's L2 items or ideas with another but do not necessarily imply deep understanding. This somehow can be related to the theory of schemata where learners tend to create mental linkages (Amerstorfer, 2018). For instance, they relate new information to existing ones or colligate one bit of information to another to create associations in memory like looking for words in their native language that are similar to the new words in the English language. The relevance of this strategy relates well with the status of English language in Malaysian context where English is not the native language (Hanapiah, 2004). Malay learners' mastery in English language is undeniably less compared to bahasa Melayu. This makes the memory strategy is a very useful strategy and applicable to learners. The relations between the new information and the existing ones might not always hit the point, yet it would still help to clarify the context clearer. For example, the word 'recipe' in English as the target language has a similar definition to the native L1 language, 'resipi' where both refers cooking ingredients and instructions. Implicitly, upon seeing this new vocabulary in a sentence, the memory strategy will allow the learners to get the gist of the context. At least, the learner may understand the overall idea might be related to cooking or any dishes preparing tutorials.

Recalling visual and auditory representations is also part of the memory strategy. Thus, applying actions, images and sounds is essential (Kozmonová, 2008). It includes the usage of flashcards, rhymes and acting out the new English words. The memory strategies can impart powerfully to language learning (Oxford, 1990) if the learners put in extra efforts to retrieve

the information like using rhymes and flashcards to remember new English words. This study coins these as the memory and mind factor.

The third factor extracted contains seven items. These seven items are the combination of the social and affective strategies. The reliability of factor 3 is Cronbach Alpha (α: 0.81). Out of these seven items, five are dominated by social and affective strategy so; the new name for this factor shall be the 'Social-emotional' factor.

Table 6: Factor 3 - Social-emotional strategy

No.	Original Strategy	Items	α	TVE (%)
1	Social 2	I ask English speakers to correct me when I talk.		
2	Social 3	I practice English with other students.		
3	Social 4	I ask for help from English speakers.		
4	Social 5	I ask questions in English.		
5	Social 6	I try to learn about the culture of English speakers.	0.81	4.8
6	Affective 5	I write down my feelings in a language learning diary.		
7	Affective 6	I talk to someone else about how I feel when I am learning English.		

The social strategies assist the learner to collaborate with others in understanding the target culture as well as the language. Oxford (1990) implied that language is a manner of societal conduct which supports this finding. It is impossible to distinguish language from social interaction. Yet, this does not mean that the learner's feelings are neglected just because they are too focused on social and external interaction. There is nothing wrong in writing down one's feelings in a language learning diary, for example or talking to someone else about how one feels upon learning English. Learners are encouraged to perform this 'therapy' because it promotes a more rapid usage of the language as the learners get more comfortable in using it. Indirectly, this would enhance the writing and speaking skills of the target language. Moreover, social strategy should be relevant in the context of this study because learning is not something that can be done in isolation (Amerstorfer, 2018). The impact of learning in seclusion is not going to be as impactful and positive as it should. Thus, social interaction is beneficial and necessary. Learners might want to ask questions, or they may need clarifications about the language to the teachers, friends, or any other English speakers. This social interaction somehow promotes practice in using the target language (Reid, 1987). As the proverb goes,

'practice makes perfect'. The more the learners practice with other students, the bigger the impact they will get. So, the social strategy may still be mandatory even in ODL.

The fourth obtained factor contains four items. All four items are from cognitive strategy. The reliability of the factor Cronbach Alpha is (α: 0.74) as shown in the Table 7 below. As all items are originally from the cognitive construct, the name of the factor will not be substituted; and it will remain as 'cognitive'.

Table 7: Factor 4 - Cognitive factor

No.	Original Strategy	Items	α	TVE (%)
1	Cognitive 5	I start a conversation in English.		
2	Cognitive 6	I watch English language TV shows spoken in English or go to movies spoken in English.		
3	Cognitive 7	I read for pleasure in English.	0.74	3.7
4	Cognitive 8	I write notes, messages, letters, or reports in English.		

The cognitive strategies involve skills such as practicing, analyzing expressions, and summarizing. The common feature is these strategies enable the learners to manipulate or transform the target language. For this reason, the cognitive strategies are requisite for learning a new language (Amerstorfer, 2018; Kazi, 2017). According to Oxford (1989, 1990), cognitive strategies are the most preferred strategies among language learners. Later studies (Derakhshan, Malmir, & Greenier, 2021; Lee & Heinz, 2016) supported Oxford's (1989, 1990). Items in this factor revolve around the element of practicing. More practice is usually needed to become proficient in the target language and if it is done the right way, the learner will become more competent.

The relevance of this factor can be seen through the items that have been extracted by the PCA where 'practice' is the gist. On forth, the initially termed as factors can be labeled as 'practice.' This strategy allows the learners to improve more by just putting in a little effort as simple as starting a conversation in the English language, reading for pleasure, writing notes, messages, letters, or reports in English as well as watching English TV shows or movies. Thus, throughout these simple efforts, students are tacitly direct to practice. This strategy is relevant as the mastery in the targeted language will be improved along the way. Teaching using traditional grammar methods has imposed constant practice which correlates with cognitive strategy.

The last extracted factor contains four items. All four items are from the metacognitive strategy. The reliability of the factor through Cronbach Alpha (α: 0.82) is as shown in the Table 8 below. As all items in this factor are about consciousness or having awareness of one's surroundings, sensations and thoughts, the new name suggested label for this factor would be 'Self-Awareness'.

Table 8: Factor 5 - Self-awareness strategy

No.	Original Strategy	Items	α	TVE (%)
1	Metacognitive 6	I look for people I can talk to in English.		
2	Metacognitive 7	I look for opportunities to read as much as possible in English.		
3	Metacognitive 8	I have clear goals to improve my English skills.	0.82	3.0
4	Metacognitive 9	I think about my progress in learning English.		

The new given term for the last extracted factor was 'Self-Awareness' strategy. In the context of this study, it refers to the consciousness of the learners in learning the target language which is the English language. By having such awareness towards learning a new language, it indicates the available vision to move forward (Mahmud, 2021). When learners look for people that they can talk to in English or even look for chances to read and understand as much as possible in English, it shows their determination to excel in the target language. It is as simple as placing something as a target and working hard for it. This strategy allows learners to have control in their actions and enables them to conduct self-assessments to ensure that they are on the right track in achieving this goal. If self-awareness were to be taken out from the context of a learner's path in learning and acquiring English language, all the goals above will not be achieved and the purpose of studying English will be lost. That is how this factor sets its relevance in the context of English language learning strategies.

In brief, this study proposes STEM students' LLS as shown in Figure 1 below. This integrated STEM-LLS may assist educators to improve STEM students' ESL learning experience through incorporating LLS that suits them better.

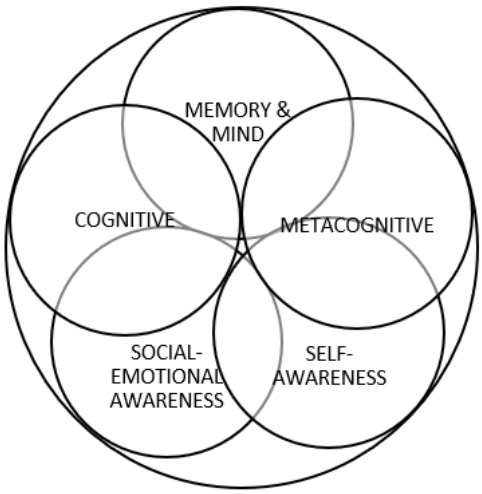

Figure 1: Integrated STEM students' language learning strategy (STEM-LLS)

5.0 CONCLUSION

The findings of this study are important to help understand the LLS training for technical-based students at the tertiary level whilst providing them with the appropriate guidance to be successful in their studies. Indirectly, ESL educators would have the opportunities to reflect and modify their teaching approaches to suit the students' LLS (Martinez, 1996). This study could raise awareness and concern on the importance of using LLS in learning English.

All five newly discovered factors should be acknowledged as these factors have their own relevance to learners learning the English language. The metacognitive strategies help the learners to be independent thinkers by the concept of self-monitoring. To be a good language learner, learners should be able to plan and coordinate their own learning process since that is how one can see the relevance of metacognitive strategies in language learning. The memory strategies, on the other hand, should help in linking the new knowledge to the previous ones. As a non-native speaker, the easiest way to understand the context is by looking for words in the native language that are similar to the new words in English. With that, one can easily assume or get a general view on the context used. Thus, this strategy should be significant to the learners too. The relevance of social strategy on language learners is clearly depicted upon interaction, either internal or external. Language is the constitution of social behavior thus social interaction plays an important role in helping a language learner to excel in the target language. This strategy helps the learner to work with others and positive feeling will lead to an effective performance in language learning. The next factor, which is cognitive, is said to be the most popular strategy among language learners. Using its concept of 'practice' in all approaches and sub-strategies, this strategy can help the learners to improve their language

learning because 'practice makes perfect'. The last factor extracted by PCA is 'Self-Awareness'. It is obvious that without self-consciousness, language learning can never happen successfully and that is how the factor sets its relevance on the learners. These are equally profound to ODL as the problems within ESL pre and post ODL are nearly similar. Self-consciousness or awareness shall promote self-motivation in learning that has been promoted by Prinz (2019) as an element to succeed in ODL.

This study is focused on LLS in hopes that in the future, this application of this research can be expanded so that it is not limited to engineering students from PUs only. This research has put its focus on the population that studies in a PU and uses English as its official medium of communication. In the future, it is recommended that a larger number of samples from all types of tertiary level institutions such as private universities and training centers can be studied to ensure a richer set of data to reflect more on the current English LLS employed by the engineering students. In that way, a bigger number of educators and students can benefit from the study too.

REFERENCES

Aldossary, K. (2021). Online distance learning for translation subjects: Tertiary level instructors' and students' perceptions in Saudi Arabia. *Turkish Online Journal of Distance Education, 22*(3), 95-109.

Alfian, A. (2018). Proficiency level and language learning strategy choice of Islamic university learners in Indonesia. *TEFLIN Journal, 29*(1), 1-18.

Allam, S. N. S., Hassan, M. S., Mohideen, R. S., Ramlan, A. F., & Kamal, R. M. (2020). Online distance learning readiness during Covid-19 outbreak among undergraduate students. *International Journal of Academic Research in Business and Social Sciences, 10*(5), 642-657.

Amerstorfer, C. M. (2018). Past its expiry date? The SILL in modern mixed-methods strategy research. *Studies in Second Language Learning and Teaching, 8*(2), 497-523.

Charoento, M. (2017). Individual learner differences and language learning strategies. *Contemporary Educational Research Journal, 7*(2), 57-72.

Citra, M., & Zainil, Y. (2021). LLS in speaking classroom activity: Extrovert and introvert learners. In *Ninth International Conference on Language and Arts* (ICLA 2020) (pp. 161-166). Atlantis Press.

Cohen, A. D., & Oxford, R. L. (2002). Language learning strategies: Crucial issues of concept and classification. *Applied Language Learning, 3*(1&2), 1-35.

Daniel, S. J. (2020). Education and the COVID-19 pandemic. *Prospects, 49*(15), 91-96.

Derakhshan, A., Malmir, A., & Greenier, V. T. (2021). Interlanguage pragmatic learning strategies (IPLS) as predictors of L2 speech act knowledge: A case of Iranian EFL learners. *The Journal of Asia TEFL, 18*(1), 235-243.

Duong, T. M., & Nguyen, H. T. (2021). EFL students' perspectives on the employment of language learning strategies. *English Language Teaching Educational Journal, 4(*1), 49-60.

Dzakiria, H., M Idrus, R., & Atan, H. (2005). Interaction in open distance learning: Research issues in Malaysia. *Malaysian Journal of Distance Education, 7*(2), 63-77.

Ehrman, M. E., Leaver, B. L., & Oxford, R. L. (2003). A brief overview of individual differences in second language learning. *System, 31*(3), 313-330.

Fandiño Parra, Y. J. (2010). Explicit teaching of socio affective LLSto beginner EFL students. *Íkala, revista de lenguaje y cultura, 15*(24), 145-169.

Fithriyah, U. K., & Yusuf, Y. Q. (2019). The LLS used by learners studying Arabic and English as foreign languages. *Dirasat: Human and Social Sciences, 46*(1), 310-21.

Hanapiah, M. F. (2004). English language and the language of development: A Malaysia Perspective. *Jurnal kemanusiaan, 2*(1), 106-120

Holt, K. (2005). *English proficiency of Chinese students and strategies of language learning.* (Unpublished doctoral dissertation). University of Kansas.

Horn, M. B., & Staker, H. (2011). The rise of K-12 blended learning. *Innosight Institute, 5*(1), 1-17.

Kazi, A. S. (2017). Using LLS for teaching second or foreign languages. *SPELT Quarterly, 32*(2), 10-25.

Khalil, A. (2005). Assessment of LLS used by Palestinian EFL learners. *Foreign Language Annals, 38*(1), 108-117.

Kozmonová, M. (2008). *LLS and their training in a primary English class*. (Unpublished doctoral dissertation). Masarykova Univerzita, Pedagogická fakulta.

Lee, J., & Heinz, M. (2016). English LLS reported by advanced language learners. *Journal of International Education Research, 12*(2), 67-76.

Lising, L. (2021). Speak English! Social acceleration and language learning in the workplace. *International Journal of Bilingual Education and Bilingualism, 1*(1), 1-15.

Mahmud, M. R. (2021). Teaching and learning English at the tertiary level in Bangladesh. *IIUC Journals, 1*(3), 24-33.

Martinez, I. M. (1996). The importance of LLS in foreign language teaching. *Cuadernos de Filologia Inglesa*, *5*(1), 103-120.

Matuga, J. M. (2009). Self-regulation, goal orientation, and academic achievement of secondary students in online university courses. *Journal of Educational Technology & Society, 12*(3), 4-11.

Muin, N. A. (2021). Supporting and engaging isolated language learners in Open and Distance Learning (ODL) classes: A comparative study between a Malaysian and an Indonesian university undergraduate students. *In e-Proceedings of International Conference on Language, Education, Humanities &Social Sciences* (pp. 410-420). https://ir.uitm.edu.my/id/eprint/45121/1/45121.pdf

Nadarajah, J. (2021). Measuring the gap in employability skills among Malaysian graduates. *Sciences*, *4*(15), 81-87.

Nambiar, R. (1998). *Learning strategies: A Malaysian perspective.* Faculty of Language Studies, Universiti Kebangsaan Malaysia.

O'Mally, J. M., & Chamot, A. U. (1990). *Learning strategies in second language acquisition.* Cambridge University Press.

Oxford, R. L. (1992). Instructional implications of gender differences in second/foreign language learning styles and strategies. *Applied Language Learning, 4*(1&2), 65-94.

Oxford, R. L. (1990). *Language learning strategies: What every teacher should know*. Newbury House.

Oxford, R. L. (1989). Use of language learning strategies: A synthesis of studies with implications for students training. *System*, *17*(2), 235-247.

Park, G. P. (1995). *LLS and beliefs about language learning of university students learning English in Korea.* (Unpublished doctoral dissertation). The University of Texas, Austin.

Park, G. P. (2011). The validation process of the SILL: A confirmatory factor analysis. *English Language Teaching, 4*(4), 21-27.

Prinz, R. J. (2019). Self-regulation: A critical construct in research and application with children and families. *Clinical Child and Family Psychology Review*, *22*(1), 1-1.

Reid, J. M. (1987). The learning style preferences of ESL students. *TESOL Quarterly*, *21*(1), 87-111.

Rianto, A. (2020). A study of language learning strategy use among Indonesian EFL university students. *Register Journal, 13*(2), 231-256.

Robson, G., & Midorikawa, H. (2002). How reliable and valid is the Japanese version of the Strategy Inventory for Language Learning (SILL)? *JALT Journal, 23*(2), 202-226.

Rubaai, N., Hashim, H., & Yunus, M. M. (2019). Identifying English LLS used by polytechnic students. *Religación, 4*(1), 98-103.

Russell, A. M. (2010). *Assessment of Strategy Inventory of Language Learning (SILL) in students learning a second language.* (Unpublished masters thesis). University of Tennessee, Chattanooga.

Setiyadi, A. B. (2016). *Language Learning Strategy Questionnaire (LLSQ): A measurement to identify students' learning strategies and prepare the success of learning English in the Indonesian context (empirical evidence).* Graha Ilmu.

Singh, M. K. M. (2021). English language communicative competence of university interns for employability. *e-Bangi, 18*(3), 67-81.

Singh, M. K. P., Liew, J. Y., & Siau, C. S. (2021). Urban English learners' perceptions towards the influence of second language identity on employment opportunities in Malaysia. *Pertanika Journal of Human Science & Humanities, 29*(1), 27-45.

Sukraini, N. (2021). Influence of sex on students' language learning strategies: A critical review. *Journal of Research on Language Education, 2*(1), 37-43.

Thirusanku, J., & Yunus, M. M. (2014). Status of English in Malaysia. *Asian Social Science, 10*(14), 254-260.

Ting, S. H., Marzuki, E., Chuah, K. M., Misieng, J., & Jerome, C. (2017). Employers' views on the importance of English proficiency and communication skill for employability in Malaysia. *Indonesian Journal of Applied Linguistics, 7*(2), 315-327.

Van Den Berg, G. (2020). Context matters: Student experiences of interaction in open distance learning. *Turkish Online Journal of Distance Education, 21*(4), 223-236.

Van Ha, X., Murray, J. C., & Riazi, A. M. (2021). High school EFL students' beliefs about oral corrective feedback: The role of gender, motivation, and extraversion. *Studies in Second Language Learning and Teaching, 11*(2), 235-264.

Wanami, S., & Kintu, D. (2019). Students 'perceptions about a distance learning programme: A case of the open, distance and E-learning programme at Kyambogo University, Uganda. *International Journal of Advance Research, Ideas, and Innovations in Technology, 5*(1), 388-394.

Wiedbusch, M., Dever, D., Wortha, F., Cloude, E. B., & Azevedo, R. (2021). *Revealing data feature differences between system-and learner-initiated self-regulated learning processes within hypermedia.* Springer.

Yang, N. D. (1999). The relationship between EFL learners' beliefs and learning strategy use. *System, 27*(4), 515-535.

Zhang, L., & Tsung, L. (2021). Learning Chinese as a second language in China: Positive emotions and enjoyment. *System*, *96*(1), 102410.