HYPOTHESIZED LEARNERS' TECHNOLOGY PREFERENCES BASED ON LEARNING STYLE DIMENSIONS

Zahra NAIMIE
University of Malaya, Malaysia

Saedah SIRAJ
University of Malaya, Malaysia

Rana AHMED ABUZAID
University of Malaya, Malaysia

Reihaneh SHAGHOLI
University of Malaya, Malaysia

ABSTRACT
If students are demotivated, confused and look tired in class, one solution is to use new teaching styles in your class to overcome such problems. This is because learners learn in different ways such as hearing, seeing, taking notes, imagining and visualizing, among many others. The paper reports firstly, the impact of teaching and learning style preferences and their match or mismatch on learners' achievement and secondly, the proposed technology preferences for learners based on learning styles dimension. To obtain the data, the Index of Learning Styles was used together with observations and interviews to collect data. The participants were 4 lecturers and 310 students in an English major program in Iran. The findings from this study suggest that it is crucial for teachers to have knowledge about learner preferences in their classes to consider in their teaching design. The students show a positive response and higher achievement when their learning preferences and needs are accommodated by their lecturers. Based on findings, it is hypothesized that the different learning styles dimensions have their own preferences in terms of technology usage.
Key words: Learning styles, teaching styles, match, mismatch, achievement, technology

INTRODUCTION

Have you ever faced the situation that the students are bored in your class? They are demotivated, confused and look tired. If so, it is time to look for the solution in the form of a new teaching style in your class. Learners learn in different ways such as hearing, seeing, taking notes, imagining and visualizing among many others. These ways or tactics are called learning styles. Much research has been done on learning styles in recent years (Armstrong & Mahmud, 2008; Coffield, Moseley, Hall, & Ecclestone, 2004; Demirbas & Demirkan, 2007; Garcia, Amandi, Schiaffino, & Campo, 2007; Herbert & Stenfors, 2007; Hyde, 2007; Kayes, 2007; Li, Chen, & Tsai, 2008; Reynolds & Vince, 2007; Welsh, Dehler, & Murray, 2007; Sievers, 2007). What is the impact of each of these learning styles on university students' learning? This basic question opens our vision to the vast area of learning style research. A sizable body of empirical research suggests that students learn best when they are taught in ways that match their way of learning (Lovelace, 2005; Mahlios, 2001; Ogden, 2003; Stanberry & Azria, 2001). Does this mean that we should adapt our teaching to fit student learning styles? The sample in this study consists of 310 English Major Students (EMSs) and four lecturers teaching in a faculty of foreign languages. The Index of Learning Styles (Felder & Soloman, 2006), scheduled interview and observation were used as the instruments. This research aimed at investigating the impact of teaching and learning style preferences and their match and mismatch impact on learners' achievements and also this study tries to hypothesize the technology preferences for each learning styles dimension.

Findings of studies done in the realm of the language learning indicated that a) students do learn differently from one another; b) learner's performance in different subject is related to their learning styles c) when students are taught with their preferred techniques or styles in learning their achievement is increased (DeBello, 1985; Dunn et al., 1986).

Learning Styles Preferences and Educational Technology

There are different nature for learning concept in majority of educational environment, traditional learning and learning influenced by technology. In traditional learning, the teacher delivers the pre-determined lesson to students. This kind of delivery is done under different forms,

a. Lectures; teacher explains the knowledge to the students.

b. Exercises; learners apply the new learned items via some controlled tests. c. Feedback/Assessment; it will inform the students how proper they have used the acquired knowledge.

The end product of this kind of learning is the development of some of the skills such as social skills that is a necessary pillar for all members of the society. Opposed to this traditional learning, there is another kind of learning which is learning influenced by technology. Conducting the learning merged with technology is considered as a new trend in the educational environment. Pudichery (2003) believed that technology or in other words World Wide Web has been playing the important role in education world during the last decades. It is true that technology/net offers huge amount of information, it also "resemble an untamed jungle for those seeking knowledge on a particular subject".

Society is facing the rapid transform as the technology is progressing in our life; however, education is not a process which ends when we graduate high school or university. Instead we are all required to practice lifelong learning to be update with the technology changes and improvements. Therefore it is considerable to use the technology in field such as education to facilitate the student's learning. Akpinar, Bayramoglu.(2008) stated that "Technology based teaching and learning materials became more common in educational settings. To provide an information source for teachers, administrators, students and parents." Considering the fact mentioned by Akpinar, Bayramoglu (2008), still in some of the countries the traditional learning and instruction is practiced. However, researches indicated that the E-learning concept regarding the learner's preferences consideration is in infancy stage in most of the educational setting.

In a study done by Yaghoubi, Mohammadi, Iravani, Attaran and Gheidi (2008), it is indicated that technology in education considered as the new concept in Iran and only few educational institutional have introduced these techniques. They stated that technology concept in Iran is 5 to 6 years old. This system has been introduced /provided by both private and governmental bodies in some of the universities in Iran (Yaghoubi et al., 2008).

White (2007) believed that internet is considered as the primary source used by the students to obtain the information. He also found out that the learners used the websites such as Google and Wikipedia excessively. However, accessibility of the different tool of the technologies such as high band, wireless and other devices has developed the E-learning implementation possibilities in different educational setting (Sharples, 2000).

One of the important key points is to evaluate how appropriate/suitable the technologies meet the needs of the learners. Technology infusion, the context and classroom quality are the sub categories of the huge learning issue merged with technology. Having knowledge about learners' need and learning concept are important factors in order to choose the proper technology to nourish their need in educational field. The most proper and successful learning settings are those that are up to date with the 21 century development and are aligning with the information age. There are ways and suggestions for improving the learning in the classroom environment whether in a traditional or an E-learning classroom environment. (One of the ways that sounds practical is to design system, program or lesson plan that consider the learner's preferences.) McKenzie (2001) suggested that the schools and universities must consider learners preferences when designing the curriculum and also focus on activities that support technology merged with the education. Some studies have looked at the learning styles preferences among the technology graduate students (Hogan, 2009) to investigate the preferences of the students in order to empower the learning. Felder, Felder, and Dietz (2002) believed that mismatch between the instructions and learning preferences is one of the causes for low performance and student demotivation.

Match and Mismatch?

Finding of studies on English language learning indicated that in order to be effective ESL/EFL teachers, one should have knowledge about the learners' learning needs, individual differences in learning, the required teaching methods, learners' preferences as well as the necessary teaching materials required to meet learners' needs in the educational setting (Bain, 2004; Beck, 2001; Bull & Ma, 2001; Felder & Spurlin, 2005; Li et al., 2008; Rayneri, Gerber, & Wiley, 2006; Woolfolk Hoy & Murphy, 2001; Zhang, 2006).

More specifically, recently, emphasis has also been paid to teaching and learning styles. Most of the research on teaching and learning styles has been cross-sectional in nature; many deal with the learning styles of students in higher institutions of learning. Frequently the studies focus on how demographic variables such as gender, age, university major, and personality influence learning styles (Brew, 2002; Li et al., 2008). The learning style concept must be studied in depth for three main reasons. Firstly, based on many studies, it is clear that learners have their own preferences regarding learning, and, in some cases, certain types of psychological characteristics are associated in certain "types" of individual (Smith, 2002; Stevenson & Dunn, 2001). Secondly, there is evidence showing that the attempt to provide different learning styles may help learners achieve better results (Bull & Ma, 2001; Rayneri et al., 2006). Finally, teachers should know how to develop a classroom methodology that is based on students' learning style preferences. There have also been studies on the matching and mismatching of teaching and learning styles (Beck, 2001; Zhenhui, 2001).

Research on learning styles in particular on L2 learning is still very much limited (Peacock, 2001). Research on learning and teaching styles and specifically the match or otherwise between them is still very much under-researched in ESL and EFL. The findings of some studies propose that mismatches often occur and have bad effects on students' learning and attitudes (Jones, 1997; Littlewood, Liu, & Yu, 1996). The findings of past studies explained that a learner's achievement in any class is determined by factors such as native ability, and the level of congruence between learners' learning styles and teachers' teaching styles.

Many studies (Bull & Ma, 2001; Rayneri et al., 2006) have been done to investigate the relationship between learning style and academic achievement. Matching and mismatching between teaching and learning styles exist in any academic setting, at least to a certain extent. Some studies have also found that congruence (matching) between teaching and learning styles has a positive impact on achievement and satisfaction (Felder, Felder, & Dietz, 2002). A mismatch is said to occur when students' preferred methods of processing information are not aligned with the teachers' preferred styles of teaching. Felder and Spurlin (2005, p. 2) stated:

> When mismatches exist between learning styles of most students in a class and the teaching style of the professor, the students may become bored and inattentive, do poorly on tests, get discouraged about the courses, the curriculum, and themselves, and in some cases change to other curricula or drop out of school. (p. 2)

Universities in Iran are also places in which English is taught in a range of independent fields of study, such as English language and literature, teaching English as a second /foreign language and English translation. The students in these fields are referred to as English Major Students (EMSs). A majority of EMSs in Iran have a certain degree of capability in the use of the English language but there are some students who have low proficiency. Every EMS goes through two years of training that covers general English, which is about the four main skills of reading, listening, writing and speaking. In the next two years, the students focus on their specialized course of study. Some of the learners have problems in grasping the contents and concepts of the course given in English and this seems to be one of the problems that EFL students face in Iranian universities. One possible reason for this is the inability or weaknesses of the students in English language basics. As such, the students may not do well academically. However, even if the students pass their courses, it is not an indication that they have attained an acceptable level of proficiency in English. According to Farhady, Jafarpur, and Birjandi (1994), after passing their core courses and graduating, Iranian EFL graduates are found to be still wanting in English language use and its components. The teaching of English is growing so fast in Iran that there is a need to understand the mechanics involved in the teaching and learning of English in Iran. Currently there is a lack of research in this direction; in particular, there is a dearth of research with regard to teaching and learning styles of EFL learners and almost none on the match or mismatch of teaching and learning styles and their impact on achievement.

Many learning style specialists (Sarasin, 1999; as cited in Klein, 2003; and Ford & Chen, 2001; Peacock, 2001; Woolhouse & Blaire, 2003; Zhang, 2006) confirmed the theory that students will learn more and will enjoy the class experience and environment when they can use their preferred learning styles. In some cases, students are blamed when the classroom activity is not compatible with their way of learning. In a very recent study, Mulalic et al. (2009) suggested that:

> Teaching and learning styles should become one of the greatest interests of the educators particularly their relationship. However, one of the weaknesses of the research into LS is the lack of the investigation into the matching of teaching and learning styles. Theoretically, many variables exist in the educational literature but few researches dealt with the matching of teaching styles and learning styles (p. 102).

Bonham (1989) cited in Ruhnau (2006) proposed a solution for this situation, that is by selecting the teaching approach which will "match" different learning styles. Even though this approach sounds practical in theory, considering the diversity of student learning styles in the "real world" it is not practical within the classroom. Another solution is to identify the learners' learning styles preferences and then assist them to widen their learning styles and develop their "learning comfort factor" (Bonham, 1989, cited in Ruhnau, 2006).

OBJECTIVES AND RESEARCH QUESTIONS

The objective of this study was to explore the impact of teaching and learning style preferences and their match or mismatch on learners' achievement in Azad University, Iran. The study is based on the belief that appropriate

teaching styles that are aligned with students' learning preferences can improve student achievement. On the minor scale, previous studies on teaching styles/ learning styles have been reviewed in order to explain the link which may exist between the two variables and its relationship with technology preferences in classroom setting. This study attempted to answer the following questions:

R1

a. What are the teaching style preferences of EMSs lecturers and learning style preferences of EMSs learners in a university classroom setting in Iran?
b. Does the match or mismatch of teaching and learning styles impact on the achievement of EMSs learners in a university classroom setting in Iran?

R2

a. What are the hypothesized students technology preferences based on their learning styles preferences?

METHOD

The research method used for this study is the mixed method approach to look at the impact of the congruence and incongruence between the teaching styles and learning styles in the classroom setting and the level of its impact on learner achievement. This study also hypothesized the technology preferences for each preferred learning style dimension. The objective of this study is to explore and investigate the outcome of the congruence and incongruence between the teaching and learning styles on EMSs learners' achievements in Iranian universities. The independent variables of this research are teachers' teaching styles and learners' learning styles that were measured through the ILS (Index of Learning Styles) developed by Felder and Silverman (1988), interview and observation. The dependent variable is student achievement, which is measured through their final exam marks. In the first round of research the researcher used the survey to obtain the variety of the students' learning styles and their teachers' teaching styles. In the second round, the researcher used interview and observation to provide the necessary information for the related research questions and also to strengthen the results obtained in the first round of data collection.

Instruments

Three instruments were used in this study: First is the Index of Learning Styles (ILS) (Felder & Silverman, 1988) for identifying the student's and teacher's learning styles. The survey instrument used was the Learning Styles Index (LSI) developed by Felder and Soloman (2006). Felder and Spurlin (2005) reported a reliability score of .77 using the Cronbach's alpha statistical technique for this instrument. In another unpublished study, Felder and Spurlin (2005) and Livesay et al. (2002) that was conducted on 584 learners at North Carolina State University, the reported Cronbach's alpha coefficient for the index of learning styles was .76 . Second is observation as a technique to complement a dominant technique. Third is the iInterview schedule for semi-structured interviews in order to obtain the necessary information about the preferences concerning the instruction and learning styles. To ensure the plausibility of the interview, the interview responses were checked back and identified to the participants.

Sample

The sample consisted of 310 EFL learners and 4 lecturers from one of the universities in Iran, where the education system requires students to learn English as one of the foreign languages. The learners were selected randomly from the various courses conducted in English. Four lecturers from the courses were also involved in the study. The lecturers were selected based on their willingness to participate in the study. All the students were native speakers of Persian, all of whom intend to be teachers/translators/linguists/ of English at the different levels or enter a field where expert use of the English language is required. The final score of that particular subject in the class was observed and considered as the scale for the student's achievement level. As the survey method advances, the attention is drawn to proper sampling techniques and analysis. Since this study involves 310 students and 4 teachers, the questionnaire survey is the best data collection method available for describing and analyzing the number of participants who are considered a group which is too large for direct observation.

Data Analysis

All responses from the questionnaires survey will be statistically analyzed and organized to offer answers to the research questions. Descriptive and inferential analysis of the quantitative data will be examined using the Statistical Package for the Social Sciences (SPSS).

Descriptive statistics such as means, standard deviations, frequencies, and percentages will be analyzed for variables including gender, age, learning styles and teaching styles. Several types of statistical testing will be conducted using the SPSS for inferential analysis. Pearson correlation will be conducted to measure the extent of correlation between ILS and teaching style preference results. The chi-square tests will be used to determine

whether two variables, for example learning style preference and age, were independent of each other. Analysis of variance (ANOVA) will be adopted to test for significant differences between means in order to compare and analyze variables. The main aim of these analyses is to investigate the issues in relation to student learning style preferences among EMSs learners as well as their teachers. Relationship between age, gender, parents' educational background and learning style preferences, relationship between learning style and teaching style preference will be explored.

As mentioned earlier, the findings of this study will determine the effective teaching based on individual differences among the EFL students in Iran. Literature review on learning styles recommends that there are two approaches regarding the matching of learning styles and teaching styles. The results of many studies implied that students learn more effectively when they are taught according to their learning style preferences and therefore, it is more practical to identify the learners' learning styles. According to Kaur (2003), when there is a lack of a relationship between the learners' preferred learning style(s) and the teachers' style(s), the class may not be useful for the students.

The following studies discussed the match and mismatch between the learning styles and teaching styles: Kovacic (2008), Peacock (2001), Demirel (2004) and many more believed that learning is more effective when there is a match. On the other hand, Glass (1967) and Montgomery (1972) discussed that effective learning can be achieved only when there is mismatch between learning styles and teaching styles. This study will also look at the level of the match and mismatch between the teaching styles and learning style and the impact of this match on student achievement. Learning style is considered as a general pattern while teaching style is considered as more specific for the language teachers.

RESULTS

Students Learning Style Preferences and Comparison in Achievement Scores between Matched Teaching-Learning Styles with Mismatched Teaching-Learning Styles were analyzed across all four dimensions of the Learning Style Pairs (LSP) in the Learning Styles Index. There are four dimensions in the learning styles index which are (a) Active/Reflective (LSP1) (b) Sensing /Intuition (LSP2) (c) Visual/Verbal (LSP3) and (d) Global/Sequential (LSP4). The results of the study showed that the dominant learning styles of EMS students in Azad University for the LSPs respectively are Active, Sensing, Visual and Global. In order to determine the impact of match and mismatch of teaching and learning styles on student achievement, learners were categorized into five groups. The recoded variable was called Match. For learners whose learning styles matched their teachers' teaching styles across all four LSPs, Match = 4, indicating that their learning styles had a perfect match with their teacher's teaching styles across all the four LSPs. Similarly, if a learner matched his or her teachers' learning style in three of the four LSPs, the learner was categorized into Match group 3, indicating that the learner matched his or her teacher's teaching style in three of the four LSPs. If there was complete mismatch between learners's learning style and his or her teacher's teaching style across all four LSPs, the learner was categorized into Match group 0. Based on the categorization above, there were five groups under the variable Match. A one-way analysis of variance (ANOVA) was performed to determine if there were significant differences between the groups in the achievement scores. Table 1 shows the results of the Tukey HSD post-hoc multiple comparisons.

Comparison in Achievement Scores Between Matched Teaching-Learning Styles With Mismatched Teaching-Learning Styles Across All Four Dimensions Of The Learning Style Pairs (LSP) In LSI

The means and standard deviations of the achievement scores for the five groups are as shown in Table 1. Table 2 shows the results of the one-way ANOVA. Table 3 shows the results of the Tukey HSD post-hoc multiple comparisons.

Table- 1: Means and Standard Deviations of Achievement Scores for the Match Groups

Dependent Variable	Match Group				
	0	1	2	3	4
Achievement Scores	13.47	14.00	14.78	16.79	17.57
Mean	2.69	3.06	3.35	2.16	1.97
S.D.	18	27	61	136	68
N					

Table- 2: One-way Analysis of Variance on Achievement Scores for the Match Groups

Dependent Variable	Source	Sum of Squares	df	Mean Square	*F*	*p*
Achievement Scores	Between gps	562.04	4	140.51	22.22	.00*
	Within gps	1928.41	305	6.32		
	Total	2490.45	309			

*significant at $p < .05$

As can be seen from Table 1, the mean achievement scores for Match Groups 0, 1, 2, 3 and 4 are 13.47, 14.00, 14.78, 16.79 and 17.57 respectively. The results of the one-way analysis of variance, as can be seen from Table 2, showed a significant difference in the means, $F(4,305)=22.22$, $MSE = 6.32$, $p = .00$. Post-hoc multiple comparisons using the Tukey HSD tests showed significant differences between Match Group 0 with Match Groups 3 and 4, *MD* (Mean Difference)=-3.32, $p = .00$ and *MD*= -4.10, $p = .00$ respectively. Significant differences were also recorded for Match Groups 1 and 2 with both Match Groups 3 and 4. However, no significant differences in achievement were found amongst Match Groups 0, 1 and 2 or between Match Groups 3 and 4. The results indicate that Match Groups 3 and 4 outperformed the other Match Groups in achievement scores but their performance did not differ from each other. In short, the results imply that generally if teaching styles are matched to learning styles, achievement of students will be significantly better perhaps up to a point. The results in this study are consistent with those in past studies (for example, Ester, 1994; Felder, 1988; Goodwin, 1995; McDonald, 1996) where it was found that when teaching and learning styles are matched for individual LSPs, performance would be much better than if they were not. The results of this study revealed that connecting learning styles and teaching styles in EFL classes in Azad University plays an important role in student achievement. The results of the observation and interview support the results of the first part of the study which stated the fact that when there is a match between the learning styles and teaching styles in the classroom environment, it will optimize the learning task.

Table- 3: Tukey post-hoc Comparisons on Achievement Scores for the Match Groups

Dependent Variable	(I) GROUP	(J) GROUP	Mean Difference (MD) (I-J)	*p*
Achievement Scores	Match Group 0	Match Group 1	-0.53	.96
		Match Group 2	-1.31	.30
		Match Group 3	-3.32	.00*
		Match Group 4	-4.10	.00*
	Match Group 1	Match Group 2	-0.78	.66
		Match Group 3	-2.79	.00*
		Match Group 4	-3.57	.00*
	Match Group 2	Match Group 3	-2.01	.00*
		Match Group 4	-2.79	.00*
	Match Group 3	Match Group 4	-0.78	.23

*significant at $p < .05$

The results in this study are also consistent with those of other studies (Felder & Spurlin, 2005; Peacock, 2001; and Bonham, 1989, cited in Ruhnau, 2006) where it was found that when teaching and learning styles are matched for individual LSPs, performance would be much better than if they were not. Based on the findings above the technology preferences of the students were listed. Table 4 display the hypothesized technology preferences of Iranian students based on their dominant learning styles.

Table- 4: Hypothesized Technology Preferences of Based on Learning Styles Preferences

LS Dimensions	LS dominant in Iran	Learning styles characteristics (Felder and Soloman)	Suggested technology preferences for Iranian learners based on their LS dimension
Active/Réflective	Active	-Hands on practice. - Finding the quick solutions to the problem.	-Design online project which deals more with group work -Providing the program which gives the students the chance for designing
Sensing/Intuitive	Sensing	-Like learning facts -Interested in discovering the possibilities and relationship -Innovative -Tend to be practical -Like to be test on things that have not been covered in class -Do not like the subjects that have no connection to the real world -Like solving problems using well-established methods; -Enjoy courses that have connections to the real world	-Program that visualize real life problem (Connecting information to real life) -E -Portfolio -Program which needs evaluation -Concept Mapping -Designing or improving blogs -Program which help them to have a mind map -Guidelines styles
Visual/Verbal	Visual	-Using books and workbooks -Prefer reading than listening -Remember information by looking at them -Like color on the page, they learn better by using different colors -Like Creative text (fancy) -Like to work in silence or quiet place -They must visualize the information in their mind therefore they can retrieve them faster -Love to take notes while reading	-Pictures, Illustration and Diagrams -Posters, Cartoons, Slideshow, Animation , -Films and Videos Collages,Flowcharts,Coloring Text -Graphs and Charts, Maps -Electronic Flash Cards -Computer interfaces -Film -Video -Audio lesson
Sequential/Global	Global	- Feel comfortable with large jumps -Quick problem solver -Skimming through the entire chapter to get an overview before starting to study specific information -Relating the subject to things already known - Like to see big picture before detail - Large jump, context of the subject - Come up with the bigger picture - Provide all the possible solution	-Build products -Ambiguous situation

RECOMMENDATIONS AND IMPLICATIONS

Based on the findings of this study, the following recommendations can be drawn:

1. If better learning style inventory test and better data collection instruments can be developed, the research performed in this study should be replicated to determine if the lack of significance seen in this study was a true representation of the current relationship between learning styles and teaching styles and its impact on student achievement, or if the lack of significance seen was the result of errors in the design or procedures of the study.

2. If the future researches find a positive correlation between the teaching styles and learning styles and student achievement in class, it will only answer half of the question. The other half is the issue of teacher acceptance and willingness toward this. Further research should be pursued to determine whether the level of benefit derived from matching the learning styles and teaching styles and its impact on student achievement within a university classroom setting compensates for the increased burden on the teachers.

3. It is not the intention of this study to argue that Iranian EFL lecturers should strive for completely one to one lecture style or individualized instruction which sounds impractical due to the classroom size they teach. However, it does suggest that educators at all levels can and should adapt their teaching to better meet the learning style preferences of the majority of their students.

4. Friedman and Alley (1984) recommend that students can identify and utilize their preferred learning styles and take advantage of those preferences under their teacher's guidance. Grasha (1972) suggests that when the teacher is sharing the versatility of learning styles by picturing those styles in their teaching styles, it may assist the learners in fulfilling their tertiary education demands. Furthermore, considering the fact that one of the crucial goals of instruction is to assist the learners in identifying and evaluating their learning styles, the idea of conducting action research besides considering the students' learning styles as one of the teaching program major components sounds practical and beneficial. This will give teachers the chance to see the benefit of using the different teaching styles in their class and its impact on student learning.

In brief, many studies have discussed learning styles and teaching styles and a growing body of literature addresses and evaluates learning styles. Based on the results of this study, the first implication is the possibility of academic success growth by addressing the learner's needs in the teaching plan. The second implication is the importance of the congruence between the learning styles and teaching styles in the classroom in facilitating the student's educational growth. Considering the fact that technology is developing very fast and that it influences all aspects of life especially education, it is advisable for the teachers and policy makers to consider facilitating the learners' need in the E- learning environment. It is predictable that in future the majority of classrooms will turn into e-learning environments; therefore it is advisable to consider the learners' needs and preferences in lesson design in order to let learners get the most from the classroom.

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