

The E-learning base on Mastery Learning model-Study the result of learning time and effectiveness

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Abstract

In this century, the internet is used by many people and specialty domain, it become more and more popular, many people are involved in the digital content study、learning and etc., in the past few years, if learner want to catch a new knowledge or technology, he/she will spend a lot of time and fortune, but after internet and web skill become popular, the situation become much easier, because e-learning don't limit by the time and space, learner can study in everywhere and anytime, e-learning have become a main trend of future study.

In tradition, most of people they think the high effect of learning is depend on learner's intelligence or ability, but learner's study ability and intelligence are all different to other one, so they spend the time in study are different, if we can give sufficient time to every learner then the certain study effect will reach for everyone.

Recently, the government is developing and trying to improve all the citizen's English level and skill, especially for students in university. So in this research, we will use e-learning platform, base on Mastery Learning model so we have created a e-learning platform that learner can depend on his/her ability or time to practice、exam themselves and try to improve their English level, in the same time, I have collected their learning process step and calculate the time that they have spent, finally

to prove the Mastery Learning model is true and correct。

Key Word : digital content、e-learning、Mastery Learning model

Chapter 1. Background and Motivation

1.1 Background

The concept of mastery learning is that most students can master most study content in the suitable situation. It is also a way of teaching that is flexible to adapt accordingly to students' required learning time to maximize learning efficiency for individual students. Thus the concept of mastery learning is effective to obtain very good learning outcomes in the general discipline (Hyman & Cohen ; Black Burns).

This paper will adopt the concept to“ teaching – evaluation -- re-teaching -- re-evaluation” upon the theory of mastery learning as main objectives to improve students' capabilities in learning English. The author will discuss the influence between online reading time and learning effects as based on Bloom's theory (Bloom,14) of mastery learning theory, as well as analyzing the importance of a reward points system to induce motivation and improve learning effectiveness of students. Furthermore, the author will discuss the effectiveness of the digital learning platform. In sum, the purposes of this research is as follows:

1. To discuss the influence between learning

- time length and learning effect.
2. To discuss the relation between learning effect and digital learning platform.
 3. To understand the learner's satisfaction by use digital learning platforms.

1.2 Research Procedure

As per the objectives of this research, a research outline is as follows:

1. Research question: To discuss whether the online reading time influence the effectiveness of learning.
2. Literary objects:
 - i. The use of freshman English textbooks to determine the effectiveness of learning through textbooks.
 - ii. The use of literature related to this research to obtain theoretical and analysis grounding for the experiment.
3. Hypothesis: To confirm assumptions as outlined in 1.1 via experimentation and analysis from information obtained from related literature.
4. Research subjects: Freshman students enrolled in the Information Management Department of the University, who are divided into the 'Experimental group' and 'Control group'.
5. Research design: We designed a learning platform based on the Flow Theory and assigned the Experimental group to use this platform. On the other hand, the Control group used the general digital learning platform. After eight-weeks of learning, the two groups were subjected to a final test to determine the effectiveness of learning between the two learning platforms.
6. Experiment procedure: The Experimental group and Control group students must have on-line learning and evaluation in

the requested period of time. The duration of learning and scoring of points will be recorded entirely by the system. The system also includes a discussion board for students' opinions and queries. Furthermore, the system will also record spending time and issue times, for further analysis. In order to motivate interactive learning for students, as well as to encourage them to use the system, a reward-point feedback mechanism is implemented as part of this system. Rewards are given based on learning-time, test times the number of issue, questions and answers the student has contributed to the discussion board.

7. Data analysis: as according to the system records and questionnaires.
8. Conclusions and recommendations: As per the conclusion of the experiment and literary background.

Chapter 2. Literature

2.1 E-learning/electronic learning

The definition of "digital learning" is learning contents can also be shared from the internet, local or wide area network, recording tapes or video tape, satellite broadcast and interactive TV or CD-ROM media (Kaplan-Leiserson.21).

In the future, digital learning will be applied in many areas, as it is already pervasive as one of the many indispensable tendencies in our modern-day society. The idea of digital learning can be categorized into three types of learning models.

They are outlined as below:

1. Synchronous learning: Synonymous with traditional learning, it is based on a structure of teacher-student interaction. The main difference is that the teacher-student interaction in synchronous learning occurs only when the teacher and student meet

virtually (online), rather than physically, at the same time and space.

2. Asynchronous learning: This is when teachers create their own learning contents or record the multiple media contents and upload onto the learning platform. Students can then study the content in any time and any place. In addition, the teacher may record students' learning activities via a learning course tracing, as measured by e.g. online contact hours, discussion forums, online examinations.
3. Mixed learning: Primarily a combination of traditional teaching and E-learning for online teaching, learning and/or interaction. This mode of learning is advantageous as it utilizes both synchronous learning and asynchronous learning.

As mentioned above, one of the objectives of this research is to induce the advantages and disadvantages of the three types of learning models, as outlined in Table 2.2. Essentially, digital learning transcends the limits of time and space, as exemplified by the internet.

Table 2.2 digital learning pattern advantages and disadvantages

	Advantages	Disadvantages
Synchronous learning	High level of teacher-student interaction	Time limited
Asynchronous learning	Not limited by time and place	Low level of interaction
Mixed learning	Moderate level of teacher-student interaction + unlimited by time and space	None

2.2 Mastery learning

There is a general consensus in related literature on the notion of a high correlation between that the amount of learning time and learning results, with good results as motivational factors for students (Carroll.15; Bloom.14) (Harnischfeger, A & Wiley.19) (Fredrick Wayne C. & Walberg Herbert J.17) (Johnston, K. & Aldridge.20). Mastery learning is based on a creative teaching theory and methods. The basic concept is that if we provide enough learning time in line with the amount of time a student needs to learn optimally, then each student can achieve their 'mastery', or optimal learning (張春興.4). Slow learners and/or students who are lacking in motivation may benefit from the individually-catered amount of learning time required, and may also look towards those who are benefiting from the learning process as potentially a form of inspiration to increase their motivation to learn (黃光雄.10).

In "The New Model of School Learning", Carroll stipulated that the degree of effective learning is a function that is proportionate to a stipulated (real) learning time for student over the learning time that is actually needed by the student.

$$\text{Degree of learning} = f(\text{real learning time} / \text{needs learning time}).$$

According to Carroll (53), people educated in traditional forms of learning believed that their own intelligence aptitude is dependant on school grades and that students' intelligence aptitude is reflective of their learning speed. Furthermore, he stipulated that the learning capability (aptitude) of each student is different depending on the duration of learning time. Carroll stated that, if students have enough learning time and manages equal amounts of learning time over their required period of their learning, it is then possible to obtain some degree of learning (林寶山, 2).

In addition to the Carroll learning time theory, Bloom (14) stated that students' level of learning is distributed similarly across general teaching. In other words, if enough time of learning were granted to students, then results achieved by each student would be optimally the same.

2.3 Flow Theory

There are various activities that occur in the every day live of a human being. The following are the three basic classification of such activities (陳秀娟 translated, 6):

1. Production activity: This category of activity is primarily for the comfort of one's life, e.g. earning an income.
2. Maintenance activity: This activity is primarily for maintaining bodily function and individual property, e.g. eating and cleaning.
3. Leisure activity: Consists of media and social consumption (such as talking) for the development of and individual's ability and skills to socialize. There is a strong emphasis on creativity and a defined goal within the definition of leisure. The exclusion to this is activities such as watching TV or light reading.

Flow theory is also applied to analyze behaviors of network users in recent years. Within the context of network, the concept of flow is determined by the flow of the hyperlink. In other words, the network is prone to 'flow' due to the fluency of browsing. Users are less concerned with the direction of their browsing, disregarding destinations and set goals that is otherwise present in the concept of 'Flow activity' (盧希鵬, 14). As such, there is interest in inquiring how does flow occur during Internet browsing for the user. Scholar suggest four parts to this understanding (Novak & Hoffman & Yung, 23):

1. Core Experience: The occurrences of flow are synonymous with enjoyment and/or a

loss of self-consciousness.

2. Correlates of Flow Experience : The user experiences happiness, which contribute to flow.
3. Antecedents : Conditions to induce flow such as the level of challenge, skill, arousal, telepresence, play, time-distortion, interaction, interactivity, focus, attention and control.
4. Consequence of Flow : Network user often has exploratory behavior after experiencing flow and an increased degree of loyalty and trust for specific network service. (Choi & Kim, 16) °

2.4 Learning Progress Portfolio

The concept of the Learning Progress Portfolio (LPP) is widely adopted by individuals in the careers of the arts, such as photography, architecture, designer and musician. The concept is based on referring to previous products they have created, taking into consideration the potential improvements for future products, which in turn, is useful as a marketing tool to attract more customers (江雪齡, 1). As one may use their own LPP to understand their own skills growth as a form of self-learning, similarly, we can adopt this idea into digital learning. As such, LPP will allow the digital system to record the learning process of an user, so that records will contain the type and number of pages browsed, browsing times and browsing duration, which can then be accessed for future use.

Within the definition of the LPP (陳聖謨, 9), its main functions are as follows (陳得利, 30) :

1. Highlights learner's growth, or 'progressive situation': This is a special record that includes long-term study achievements, as well as the contents of one's learning. As a result, the teacher can access this information to know of the

- learner's progress.
2. Provides the opportunity for the learner to set goals and be self-diligent.
 3. Indicates the sustainability of the learner's progress.
 4. Reveal the performance or work achievement of the learner.
 5. Provides a basis for employment and applications to further education.
 6. Allows efficient observations to be made by the teacher in the course of the learner's study (張美玉, 5).
 7. Provides the basis of teacher's introspection and insight to understand learner's progress.
 8. Allows the development of the learner's ability and management of knowledge, echoing the notion that "the knowledge become the strength only through the goal, the system, the organized study" (Drucker).

2.5 Learning effects

Learning results in traditional teaching always measure from classroom performance and from test results from medium/ final grades. On the other hand, learning results from internet teaching not only emphasize on result but also the learning process. Many research has mentioned that good learning results must build from good learning behaviors first. (Gagne et al.18) proposed five categories of the learning effects: (黃偉豪, 11)

1. Intellectual skills : This refers to the use of symbols and concepts to interact with the environment, as such used in the learning of basic language abilities to scientific skills.
2. Cognitive strategies : This is the self-controlled abilities of learning, memory and thinking. It is a self-behavior management. The accumulation of learning experiences will allow the learner

to form suitable cognition strategies.

3. Verbal information : Verbal information is oral information, e.g. verbal statements and questions to stimulate information research and answers.
4. Motor skills : The ability to master tools, e.g. typing, operating the computer, driving a vehicle and so on.
5. Attitude : This refers to the emotional reaction of the learner. The learner may have a positive or negative reaction from the learning. Individuals' degree of attitude in any environment is measured by the frequency of the chosen thing. In this case, having strong attitudes will assist learning; weak attitudes will be against learning.

The categories of the learning effects as proposed by Gagne et al. (18) will assist this experiment to discover the suitable interface. Thus, we will develop appropriate measure tables to examine the learning effects of the learner in a network teaching environment.

Chapter 3. Methodology

We will use two methodologies in this experiment.

1. Experiment method:

Aim: To observe whether learning results (dependent variable) is influenced by changes in the learning time (independent variable).

Method: First-year students (subjects) of the MIS department, Cheng Shiu University, were randomly selected, and later allocated into either the 'mastery learning methodology' (experimental) group or the group that used the normal e-learning (control group). Tests were held before and after the experiment, and results from the two tests compared to find out the relationship between the result effect and time spent in learning.

2. Questionnaire investigate method:

The purpose of the questionnaire is to understand whether have students' learning effect

improved and how satisfied they were after using the Digital Learning Platform. The questionnaire survey went through the Internet process, specifically via the ASP.Net (Active Server Page) system program that connects to the Server Database.

1. Personal learning efficiency: to understand if the Digital Learning Platform was helpful for the subjects.
2. Satisfaction level of system: to understand the satisfaction level of subjects towards the learning platform as well as subjects' perspectives on the improvement of their learning as a result. Subjects' answers will be evaluated against Gagne (18), 陳盈潔 (7)、黃偉豪 (11)、Alavi(13)、Leidner and Fuller (22)、施賀建 (3) and the course software evaluation table from the University's Education department.

3.1 Research procedure

In this research, the Digital Learning Platform is used to help learners enhance their English abilities, overcome the fear of learning English and to build up their self confidence in English.

Preparation:

1. Arranged research objectives and framework through initial theoretical research on digital learning and teaching methods in this field, then addressing the research thesis topic accordingly.
2. Researched references in Cheng Shiu University general library, relevant theses from Doctorates and Masters in the National Library of Taiwan and other researches on relevant papers.
3. Proposed the research plan and research flow path.
4. Categorized course contents, design digital content and completed the

construction of the Digital Learning Platform software.

5. Designed research information analysis tools and learner satisfaction questionnaires for system.

Experiment:

1. Implemented pre-test for all subjects to assess the learners' English level. This was followed by organizing the learners' basic knowledge of English, before commencing their e-learning experiment. It was required that learners needed to finish the pre-test within seven days to proceed into the E-learning course.
2. Within eight weeks of the E-learning, learners were tested independently in each section. After completing the E-learning course, the learners were given the questionnaire on their perception of English improvement and their overall satisfaction with the course.
3. Compiled a Statistical Data Analysis to compare results between test results before and after the course.
4. As according to the results of the Data Analysis, discussions, explanations, conclusions and suggestions were proposed.

3.2 Research Design

The aim of this study is to understand the effect of the Mastery Learning. The variable in the experiment is the mastery learning method; the control is the normal E-learning method. The contents of both the Mastery Learning and E-Learning are the same. The dependant variable is the time spent on learning the contents; the independent variable is the difference between the learning effects between the two groups. Subjects were randomly selected from two first year classes

in Cheng Shiu University, from which the students were allocated into either the experimental or the control group, as illustrated below:

Table 3.1 experiment methodology design mode

Groups	Pre-test	Experiment	Pro-test
Experimental(R)	T1	X	T2
Control(R)	T1		T2

The research design mode is explained as followed:

1. Experimental group: (R=Random selection)

Experimental group: This was based on a methodology proposed by Bloom (14) that, according to Carrol (15), is “a model of school learning for teachers and college records”. The emphasis here is the importance of unit evaluation after each unit of study, and that if the result of evaluation is not considered a pass, then the student restudies that unit until the results shown it as a pass.

Control group: No methodology required. Learners use E-learning as per usual from the internet. Restudy is not necessary as evaluation is reserved until the entire course has been completed.

2. Pre-test (T1) and Post-course-test (T2)
Results for this experiment are inferred by comparing results from the pre-tests and the post-course-test.

3. Individual’s ability to cope with the experiment (X),

Evaluation of students’ progress is available in the Experimental group but not available in the Control group. This methodology is based on the Mastery theory, whereby its emphasis is on the process of Teaching-Evaluation and Re-Teaching-Re evaluation. Learners choose their free time for learning in E-learning platform until they have met the required English proficiency level. We submitted four research questions:

- 1.1 Is there a relationship between learning

time and score improvements?

- 1.2 Are there any differences in improvement between Experimental and Control group?
- 1.3 Are improved results in favor for the E-learning platform?
- 1.4 What is the overall student satisfaction level of the two systems?

3.3 Research subjects

Participants in the research were 80 first-year students (40 in Experiment group and 40 in Control group). They were required to use the assigned learning platforms to enhance their English ability, as well as the use of their first year textbook as required in their course. To avoid any bias from group divisions, all subjects were given a pre-test to test their pre-experiment English abilities, and another test after the experiment to identify and compare the result differences.

3.4 Questionnaire design

The questionnaire will consist of four categories: ‘Cognitive Learning’, ‘Learning Interest’, ‘Cognitive skill development’ and ‘Satisfaction of Teaching Design’. Answers are based graded scale from 1 to 5: Strongly Disagree (SD, 1 point), Disagree (D, 2 points), Undecided (U, 3 points), Agree (A, 4 points) and Strongly Agree (SA, 5 points). This is illustrated in Table 3.2.

Table 3.2 Learning effect measure for problems distribution table

Index of Learning Effect Questionnaire	Points
Cognitive Learning	1、2
Learning Interesting	3、4、5
Cognitive skill development	6、7、8、9

Satisfaction of Teaching	10、
Design	11、
	12、
	13、
	14、
	15、
	16、
	17、
	18、19

3.5 Data collection and analysis

1. Pre-test (T1) : Given to students before commencing the E-learning to evaluate learners' English ability levels.
2. Arranged Experiment (X) : This will record learners' individual learning time and their re-learning time of each unit. The system will then provide the sum of the overall learning time needed by each students.
3. Post-Experiment Test (T2) : This is the test given to students again after they have completed all components of the course. SPSS is used to analyze the data that has been collected, from which we compared the result between T1 and T2 to find out what are the different in students' learning effectiveness between the experiment and the control group. In addition, we use the result of T2 – T1 to understand what is the differences in improvement between the two groups.

Chapter 4. The analysis and result of Data

In this research, we use the mastery learning theory that submit by Bloom(14) to confer with “The effect of learning time that base on Mastery Learning model”, and create system analysis and design, use Asp.net program language to design a digital learning platform, and use Microsoft Access to be the server database, after we process the data analysis to verify our hypothesize, and to estimate the effect of learning from learning score、learning

satisfaction、and learning efficiency, these three interface we explain as followed:

4.1 Learning Score

Before execute this project, we need to do the pretest by two classes, in the experiment group, they have 5 students did not do the pretest, the control group have 7 students did not did not do it, so have 12 students did not joint this project, finally they have 35 students in experiment group and 33 students in control group, if use sex to count then male have 39 personal is 57% of total students, female have 33 personal is 43%, and the learning satisfy questionnaire is surveyed by internet, we have issued 80 questionnaire, deduct 12 students who didn't joint the pretest, totally have 68 questionnaires back, valid rate is 85%.

Table4.1 Statistic table of experiment personal

	Experiment group		Control group		total	
	stud ents	ratio	stud ents	ratio	stud ents	ratio
Male	20	57.1 %	19	57.6 %	39	57.4 %
Femal e	15	42.9 %	14	42.4 %	29	42.6 %
total	35	100 %	33	100 %	68	100 %

To understand the begin step English ability of two groups students are same or not, so we did use pretest score to be independent sample and do t-test analysis, first we do variance homogeneity Levene test, the result show F value is not obvious, mean is the two group their variance own homogeneity ($F=.192$, $p=.66$, $p>.05$), as show in table4.2. the result of independent sample t test, the two group mean/standard Deviation are 9.886/13.078、39.758/13.007, $t=.040$, $p=.920$, $p>.05$, didn't reach obvious level, so the result showed before start the procedural, the understand level for first year English test book by two group students are

not different, mean's the study progress isn't effect by the beginning score.

Table4.2 variance homogeneity Levene test

	F	P
Pretest	.192	.662

* p<.05, ** p<.01

Table4.3 independent sample t test

group	students	Mean	Std.Deviation	Std.Error of mean
experiment	35	39.886	13.078	2.211
control	33	39.758	13.007	2.264

* p<.05, ** p<.01

After experiment we did the pretest for two group, experiment group valid sample is 35 students and control group is 33 students, then we use the data the collected by the research, like pretest 、pretest and use pair sample t test to estimate the study score have improve or not, the result of pair sample t-test as show on Table4.4, experiment group's mean and Std. Deviation are 3.714/1.380 , t=17.188 , p=.000 , p<.01 , so it's achieved obvious level, meanwhile the control group's mean 、Std. Deviation are 15.273/1.224 , t=12.476 , p=.000 , p<.01 , achieved obvious level too, so the result showed the information as both of two group student are all improved in their English level, but the experiment group have improved more than control group, so we can understand that the Mastery learning is effective.

Table4.4 pair sample t-test for two group learning result

group	students	Mean	Std.Error of mean	t	Free degree	P
experiment pretest-pretest	35	23.714	1.380	17.188	34	0.000**
control pretest-pretest	33	15.273	1.224	12.476	32	0.000**

* p<.05, ** p<.01

4.2 Learning Satisfaction

In this research, the questionnaire of Learning satisfaction adapted Gagne (1992,56) whom submitted the learning effect by five classification, and the course software evaluation table by Education department. We use Likert five points to evaluate as followed: extraordinary agree 5 points, agree 4 points, no comment 3 points, disagree 2 points, extraordinary 1 point. The questionnaire return valid sample rate are 35 pieces for experiment group and 33 pieces for control group, total have 68 pieces valid questionnaire. The 楊世瑩(12-1) has pointed out that if Cronbach's α coefficient in total reliability coefficients should be more than 0.7, in this research, you can find out the Cronbach's α is 0.7896, so it have very high accuracy and stability and belong can acceptance range, as show in table 4.5.

Table 4.5 the analysis of Reliability Coefficients of Learning satisfaction questionnaire

Reliability Coefficients
N of Cases = 68.0 N of Items = 12
Alpha = .7896

We use variance homogeneity Levene test to find out that do they have obvious different in the learning satisfaction between two groups. The result showed, F=.031 、 p=.861 、 p>.05, so value F is not obvious, mean's two groups variance have consistence, as showed in table 5.7. The result of two groups independent sample t test is showed in Table 4.8, the average learning satisfaction rate of two groups are, 3.410 for experiment group, 3.455 for control group, mean's between agree and no comment, and t=-.636, p=.532, p>0.05 so did not reach obvious level, mean's they have not obvious different in learning satisfaction rate after two groups student are both completed the "First year English text book in university"

Table 4.7 the variance homogeneity Levene test for two group's learning satisfaction rate

	F	P
learning satisfaction rate	.031	.861

* p<.05, ** p<.01

Table 4.8 the t test for two group's learning satisfaction rate

Group	students	Mean	Std.Deviation	Std.Error of mean
experiment	35	3.410	0.176	0.051
control	33	3.455	0.172	0.050

* p<.05, ** p<.01

4.3 Learning efficiency

In the experiment group, when students learn and finish a unit then system will do the test, if the result of test have not achieved the mastery learning standard, then system will bring learner back to the content of that unit and do the study again, it will do the repeated routine until students achieve the mastery leaning standard, meanwhile the system will record the time consume of their study. For the control group, the system have recorded the time consume too, but when students finish their test, whether their do pass or don't reach the master learning standard, means their have finished this unit's study.

Therefore we will use Pearson test to find out what's the relative between the time consume and study effect. According to table 4.9 and table 4.10, we can understand both of groups all have obvious relative between the time consume and study effect, the Pearson relative coefficient of experiment group is 0.707, the control group is 0.736.

Table 4.9 the experiment group's relative between time consume and study effect

Experiment group	reading(min	Learning
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	s)	effective
reading(Pearson related	1	0.707**
P		0.000
students	35	35

**when P=0.01 時 , then related obvious .

Table 4.10 the control group's relative between time consume and study effect

Control group	t	Free degree	Reading(min	Learning
reading(Pearson related	-0.636	22	0.532	0.736**
P			1	0.000
students			33	33

** when P=0.01 時 , then related obvious .

Chapter 5. Conclusion and suggestion

5.1 Conclusion

This research was based on the mastery learning theory as proposed by Bloom (1968, 52): "The effect of learning time that is based on [the] Mastery Learning model". A system of analysis and design was created using the Asp.net program language, which was also used to design the digital learning platform for this research. Microsoft Access was used as the server database. We designed this system to verify previous hypothesis and have made the following conclusions:

1. Results of the Experiment group showed a positive correlation between learning time and learning effectiveness, such is that the more time spend in learning will improve the final test score (as shown in Table 5.4, the score of the test for the Experiment group after their completion of the course is

23.714, whereby the score of the Control group's test after their course completion is 15.273).

2. The improvement of learning in the Experiment group can be contributed to the "Mastery Learning Model" and "Flow Theory" as was the learning models adopted for the group.
3. The learning satisfaction rate for each groups were 3.410 for the Experiment group and 3.455 for the Control group. Overall, the comments were between 'Agree' and 'no comment'. Also, results have show an improvement in the learning satisfaction rate, as shown in Table 5.8.

5.2 Suggestions

1. Increase multiple media content or media recorded by teacher in the learning platform. This will be a variation to contents that are just purely texts and provide a more attractive learning environment for the students.
2. Create more varieties of the feed back system as based on the Flow theory, so that students can 'flow' in the learning platform, which may further enhance their learning improvements.
3. The need to better screen design and design function for the digital learning platform so that general student comments for the learning system can improve to 'Strongly Agree' in the students' satisfaction rate questionnaire.

5.3 Directions for future research

In this research, we use "the first year English text book of university" to be the digital content, furthermore in the future research, we will think about to use the other subject to be the digital content. The direction can use data mining method try to find out more useful information from

learner' study progress portfolio, and verify the relationship between learning route and leaning effect.

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