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CHINESE CHARACTER COGNITIVE CARDS: FACTORS AFFECTING CHINESE CHARACTERS USING FORGETTING CURVES

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ABSTRACT

Based on learning strategies, many children require increased accuracy in writing Chinese characters. To address this issue, Chinese character cognitive cards were introduced by the researchers, utilizing the Ebbinghaus forgetting curve (FC) to identify and analyze the factors influencing the retention of Chinese character memory. A questionnaire survey was conducted among 556 children aged 10 to 12 in China. In this study, the technology acceptance model (TAM) and the stimulus organ-response model (SOR) were used to study the factors affecting the intention and behavior of using Chinese character cognitive cards based on the function of the FC. The research also aimed to determine the relationship between the frequency of card usage and memory retention. Preliminary analysis indicated that repeated exposure to the cognitive cards significantly reduces the rate of forgetting. Additionally, the study examined the impact of the cognitive cards on different proficiency levels in Chinese character writing. The results show that the function of the FC in the Chinese character cognitive cards can make learners perceive the ease of use and usefulness of the Chinese character cognitive cards. The use of the FC positively influences Chinese character memory ability, and the influence is strong.

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Keywords: Chinese character card design; forgetting curve; Chinese character memory ability; perceived ease of use; perceived usefulness

1. INTRODUCTION

The acceleration of knowledge dissemination and forgetting due to globalization has made the study of learning and memory increasingly important. The Ebbinghaus forgetting curve (FC) illustrates the principle of memory decay over time, emphasizing that spaced repetition strategies were deemed crucial for enhancing memory (Kornell & Bjork, 2008). Traditional memory methods are challenged in Chinese character learning due to unique writing and cognitive demands. Researchers have explored how the principles of the FC and spaced repetition could improve the cognitive ability and long-term memory of Chinese characters (de Jonge & Tabbers, 2013). Although extensive research has focused on applying the Ebbinghaus FC in various learning domains in recent years, its specific application to Chinese character learning needs to be studied more. Notably, in the learning process of Chinese characters for children, how to effectively use the FC to enhance learning efficiency and memory retention remains an unresolved issue. Therefore, it has become crucial to examine the practical implications of these theories in the context of Chinese character education for children.

This study aimed to explore the FC's application in Chinese character cognitive learning and propose specific learning strategies. To address these aims, this study formulated the following research objectives: RO1: Explore the strategy of applying the FC to improve the cognitive ability of Chinese characters in children aged 10 to 12. RO2: Evaluate the role of FCs in improving efficiency and memory retention during children's Kanji learning. RO3: Analyze children's acceptance of the FC learning method and its impact on learning outcomes using technology acceptance model (TAM) and stimulus-organism-response (SOR) theoretical models. The originality of this research lies in integrating the FC theory with Chinese character cognitive learning, with a particular focus on children aged 10 to 12, aiming to develop suitable learning strategies for this age group. Combining the TAM and the SOR theoretical models has made exploration into children's acceptance of and the learning outcomes from using the FC method (Gong et al., 2016; Lii et al., 2013). Three research questions were proposed in this study to analyze the impact of the FC on the cognitive ability of Chinese characters and its application in functional design. Through empirical research and theoretical model integration, specific strategies to improve the efficiency of Chinese character learning were explored.

This study is expected to provide new perspectives and methods for research on Chinese character learning strategies, particularly for children's cognitive learning of Chinese characters. It was also intended to offer theoretical support and practical guidance for Chinese character teaching practices, promoting increased learning efficiency and reducing forgetting speed. By discussing the application of the FC in Chinese character learning, this paper aims to provide new strategies and theoretical support for Chinese character teaching and cognitive learning, significantly contributing to the effectiveness and efficiency of learning Chinese characters.

2. LITERATURE REVIEW

This section introduces the Ebbinghaus FC and its application to cognitive learning, TAM, and SOR. First, the researchers explore the principles of the FC and the advantages of distributed learning in memory retention; second, the researchers explain the TAM and SOR models for learners' acceptance of the FC and their behavior in using them; third, the effect of the functionality, ease of use, and utility of a Chinese character cognitive cards on learners' ability to memorize Chinese characters is investigated by formulating hypotheses and combining the TAM and SOR models.

2.1 FC and cognitive learning

German psychologist Ebbinghaus proposed the FC at the end of the 19th century (Murre & Dros, 2015). Research shows learners' memory has a FC, and new information is stored in short-term memory; with consolidation and repetition, remembering will occur. The FC flattens when information is consolidated and retrained, and memory retention prolongs. The theory proposed by Ebbinghaus in 1885 has wide use in pedagogy and psychology (See Figure 1 for the principle of FC). The FC is a learning strategy, an effective strategy to enhance visual working memory (VWM) ability. Learners use effective ways to block vision; FC is an effective visual block strategy (Ebersbach & Barzagar Nazari, 2020; Xu et al., 2020). The experiment shows that distributed learning of the FC has a more positive effect than stuffing learning. The data show that learners are significantly satisfied with distributed learning, so the distributed learning model is superior to the traditional learning model (Wang et al., 2000) (See Table 1 for the principle of time interval memory). The most important part of the FC is space learning, which can significantly improve memory and induction, and spaced learning, which can improve all forms of learning (Kornell et al., 2010). Therefore, the FC was measured in this study to reflect learners' expected long-term memory strategies for learning Chinese characters. This study integrates TAM and SOR theories to propose an extended Chinese character cognitive system model. This study collected data through surveys and tested the proposed model using structural equation models.

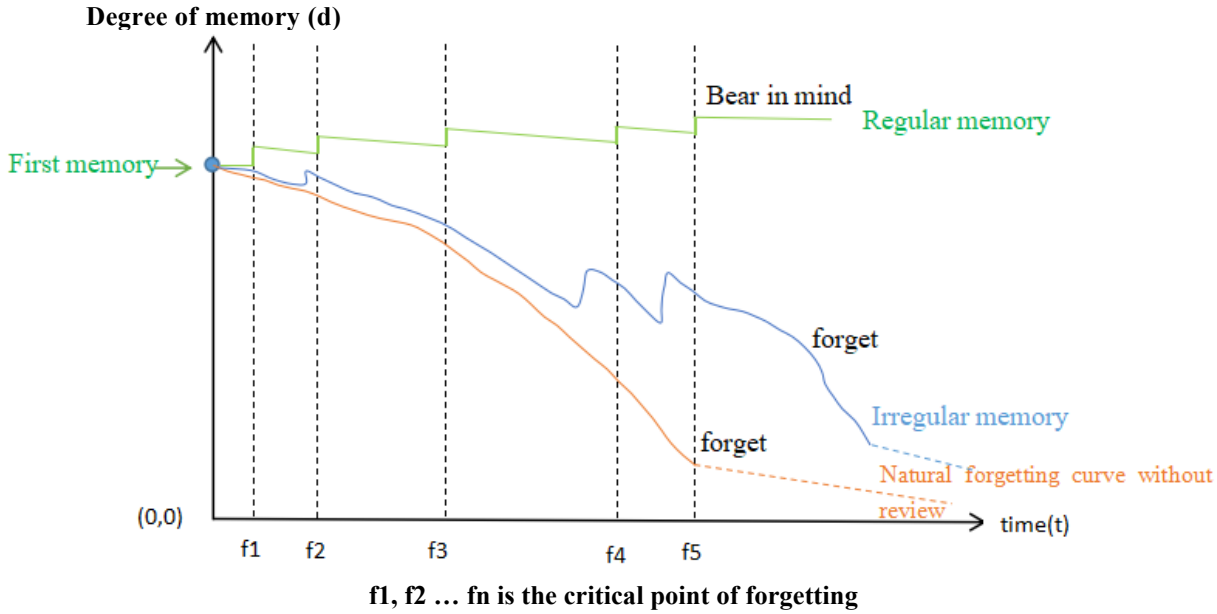

Figure 1: Schematic diagram of the forgetting curve (Murre & Dros, 2015)

Table 1: Memory diminishing over time

Time interval	Memory amount
Just finished memorizing	100%
After 20 minutes	58.2%
After an hour	44.2%
In eight or nine hours	35.8%
One day later	33.7%
Two days later	27.8%
Six days later	25.4%
A month later	21.1%

2.2 TAM and SOR models

The TAM model is the first rational behavior theory proposed by Fred Davis (Davis, 1989). The TAM model has two variables. First, perceived usefulness (PU) can be defined as when learners can use a FC to promote the cognitive learning of Chinese characters. Second, perceived ease of use (PEU) can define learners' learning strategies for FCs as easy to use. The two variables determine the learner's usage attitude (BI), and the BI determines the learner's usage intention (UI). In pedagogy, the TAM model has been used to study the impact of virtual reality on education (Alalwan et al., 2020; Alkhattabi, 2017; Cheng & Tsai, 2019; Dutot et al., 2019).

The SOR model is a psychological model that explains human behavior and response production processes proposed by Katz (1950). In the SOR model, behavior is produced by a combination of three factors: the stimulus, the individual, and the response. The basic assumption of the model is that the interaction between the stimulus and the individual explains the individual's response. The Chinese character cards are the subject of the stimulus, so learners will use the Chinese character cognitive cards (CCCC) and usage behavior (UB). The SOR model is used mainly in psychology to study social game user behavior. Network externality and satisfying demand are the main reasons users participate in social games (Dutot et al., 2019; Kim et al., 2018; Wei & Lu, 2014).

The TAM model combined with the SOR model was studied to determine how students' PU and PEU affected their e-learning acceptance (Jang et al., 2021). The results show that PU and PEU positively affect attitudinal technology use and behavioral intention. Teacher technology can improve learning strategies and student achievement (Park et al., 2012). Learners need to promote the benefits and advantages of mobile learning in the learning and teaching process, examinations, group discussions, and assignments, ensuring that the development of mobile learning applications should be designed with user-friendliness in mind (Chen & Tseng, 2012; Do et al., 2020). To determine the factors affecting the acceptance of e-learning, one must look at the relationship between three external variables. The PU and PEU show that e-learning can help improve

students' cognition. The influence mechanism of teacher support on the willingness of MOOC learners should be considered regarding the ease-of-use factors perceived by learners. The content and tasks suitable for learners' current development level should be well designed, and the activities should be provided to stimulate learners' interest and learning involvement (Ge et al., 2020).

Based on the above discussion on the influence of learning tools and strategies on learners' success, there have been many empirical studies on Ebbinghaus' FC (Kang et al., 2007; Pillay & James, 2014; Roediger & Butler, 2011; Soderstrom & Bjork, 2015). However, several factors affect users' willingness to use and satisfaction with the FC. SPIRE model[1] theory is usually used as the analysis model in other studies of the FC. However, studies have yet to explore this topic through TAM and SOR models. In this study, the TAM and SOR combination theoretical model is used to explore the factors affecting Chinese character memory, the relationship between the three external variables of Chinese character cognitive card functionality, PEU and perceived usefulness, and the relationship between the intention to use the FC, user behavior, and satisfaction, to improve the Chinese character memory ability. The assumptions tested by the framework are shown in Figure 2.

H1: A significant relationship exists between PEU and the use of FCs.

H2: A significant relationship exists between PU and the use of FCs.

H3: There is a significant relationship between Chinese character cognitive cards and usage intention.

H4: A significant relationship exists between PU and willingness to use.

H5: There is a significant relationship between the FC and the intention to use it.

H6: There is a significant relationship between the use of the FC and the ability to remember Chinese characters.

H7: A significant relationship exists between using the FC and user behavior.

H8: There is a significant relationship between Chinese character memory ability and usage behavior.

H9: There is a significant relationship between use intention and use behavior.

H10: A significant relationship exists between PEU and learner satisfaction.

H11: A significant relationship exists between using the FC and learner satisfaction.

H12: There is a significant relationship between Chinese character memory ability and learner satisfaction.

H13: There is a significant relationship between user behavior and learner satisfaction.

H14: There is a significant relationship between the Chinese character cognitive cards and PEU.

H15: There is a significant relationship between PEU and PU.

H16: There is a significant relationship between Chinese character cognitive cards and PU.

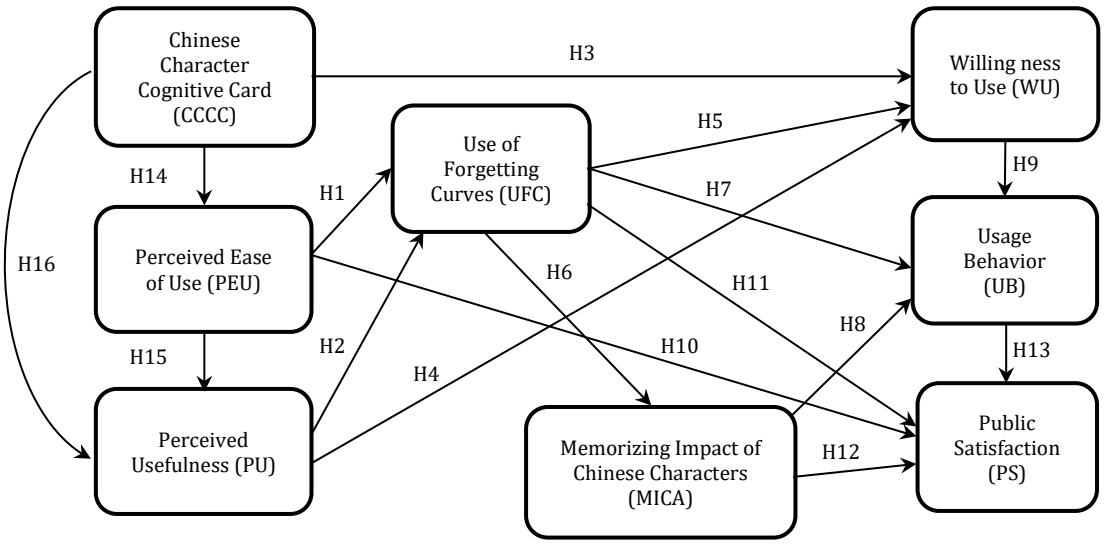

Figure 2: Research model

[1] The SPIRE model is a comprehensive framework primarily used to guide personal growth and holistic development across five key areas. SPIRE stands for "Spiritual," "Physical," "Intellectual," "Relational," and "Emotional." The goal of this model is to help individuals find balance in their lives and achieve overall happiness and success.

3. RESEARCH METHODS

This study utilized a mixed-methods approach to explore the impact of the FC on enhancing the cognitive ability of 10 to 12-year-old children in learning Chinese characters. A random sample of 556 students from Nanchang's private primary schools was surveyed using a 5-point Likert scale to gather data on variables such as FC usage and PU. Data was collected via an online questionnaire in February 2023 and analyzed with SPSS and AMOS. The model's reliability and validity were confirmed through expert feedback and a pilot test, although its limited geographic scope was noted as a potential constraint on broader applicability. The study rigorously adhered to ethical standards and aimed to provide insights into effective Chinese character learning strategies for children (Hair et al., 2012).

3.1 Sample characteristics

The researchers selected the schools and potential interviewees to participate in this survey by stratified random sampling. In order to improve accuracy, the data were selected from public primary schools in Nanchang High-tech Zone, and the survey objects were all primary school students aged 10 to 12 years old in Nanchang High-tech public primary schools. A total of 18 questions were included in the questionnaire. Two invalid questions were removed through expert review, leaving 16. In total, 632 questionnaires were sent out, of which 556 were returned, with a return rate of 87.9%. Among the 556 respondents, 312 (56.1%) were boys, and 244 (43.9%) were girls. Most respondents (64.1%) had used the Ebbinghaus FC, while the rest (35.9%) had not. Finally, 556 questionnaires were collected and input into SPSS.

3.2 Data collection and measurement

As mentioned, in February 2023, 632 questionnaires were distributed to the public, of which 556 were available for analysis. According to Ajjan and Hartshorne (2008), incorporating FCs into children's learning strategies can improve the perceived quality of children. Through the role of children's participation and learning cognition, it is shown that perceptual diathesis promotes children's active memory, is a crucial aspect of resisting forgetting, and can improve learning cognition (Oliver, 2014; Rese et al., 2014; So & Brush, 2008). The above description applies to PEU, usefulness, and FCs (Kim, 2008). The perceived quality of the public leads to the public's willingness to use and use behavior and ultimately produces satisfaction (Schunk & Hanson, 1985). Therefore, through the above factors, the FC can improve the optimization of primary and middle school students' learning of Chinese characters. Chinese character card effect-optimization affects children's behavior by taking three measurement models (Schunk & Hanson, 1985), using behavior to generate public satisfaction by taking four measurement models, followed by PEU and usefulness using Kim's (2008) four measurement models. The FC was also used through four measurement models, which Kim adopted. Finally, the cognitive effects of Chinese characters were formed through four measurement models.

4. RESEARCH RESULTS

This section presents the analysis of the measurement model, the results of hypothesis testing, and the design of Chinese character cards based on FCs. First, the study analyzed the measurement model. It tested the hypotheses through AMOS software, and the results showed that the model was well-fitted and that the data were suitable for factor analysis. Second, the results of hypothesis testing showed that PEU and PU significantly influenced the willingness and behavior to use the FC. Third, the design of the Chinese character cognitive cards incorporated the principle of the FC, which was aimed at learning Chinese characters for 10 to 12-year-old children and could improve children's long-term memory.

4.1 Analysis of measurement model

In this study, AMOS software was used for analysis. The measurement model was evaluated with maximum likelihood estimation to check whether the path was correct, the variable coefficients significant, and to verify the hypothesis. Hair et al. (2010) and Kline (2011) proposed that goodness of fit criteria should be used to evaluate the degree of fit of the model to judge whether the model is suitable for use. There were ten fitting indexes in this study: the Chi-square value to freedom ratio (CMIN/DF), generalized fitting index (GFI), adjusted generalized fitting index (AGFI), root mean square residual (RMR), mean square error approximation index (RMSEA), normalized fitting index (NFI), improved fitting index (TLI), compared fitting index (CFI), relative fitting index (RFI), and cumulative fitting index (IFI). These were concluded by analyzing the above fitting index, CMIN/DF < 5; RMR, RMSEA < 0.08; GFI, AGFI, NFI, TLI, CFI, RFI, IFI > 0.90. It can be seen that the econometric model fits well. The data are shown in Table 2.

Table 2: Confirmatory factor model fitting analysis data

Fitting index	Fitting standard	Fitting result	Fit evaluation
CMIN/DF	1~5	1.196	Perfect fit
GFI	> 0.90	0.966	Perfect fit
AGFI	> 0.90	0.953	Perfect fit
RMR	< 0.08	0.025	Perfect fit
RMSEA	< 0.08	0.019	Perfect fit
NFI	> 0.90	0.966	Perfect fit
TLI	> 0.90	0.993	Perfect fit
CFI	> 0.90	0.994	Perfect fit
RFI	> 0.90	0.957	Perfect fit
IFI	> 0.90	0.994	Perfect fit

A standard evaluation measurement model was adopted in this study (Fornell & Larcker, 1981). The data are shown in Table 3 and Table 4: The KMO was 0.927, which is greater than the significance level of 0.6, and therefore met the prerequisite requirements of factor analysis. Moreover, the data passed the Bartlett sphericity test ($p < 0.05$), indicating that the study data are suitable for factor analysis. The load of each factor was above 0.6, indicating that the data has a good measurement relationship. Mean-variance extraction (AVE) values were all greater than 0.5, and combination reliability coefficient (CR) values were all greater than 0.7, indicating that the analyzed data had good convergent validity. Cronbach's coefficient of all dimensions were greater than 0.7, indicating that the measured variables were consistent among the items in this study. The square root of AVE between the dimensions was greater than the correlation coefficient, indicating that this study conforms to the measurement of discriminative validity.

Table 3: KMO and Bartlett tests

KMO-value		0.927
Bartlett sphericity test	**Approximate chi-square**	6265.669
	df	231
	***p* value**	0.000

As seen from the above table, the KMO is 0.927, greater than 0.6, which meets the prerequisite requirements of factor analysis, meaning that the data can be used for factor analysis research. The data passed the Bartlett sphericity test ($p < 0.05$), indicating that the study data were suitable for factor analysis.

Table 4: Reliability, convergence validity, and discrimination validity

	CCCC	PEU	PU	UFC	PS	WU	UB	MICA	AVE	CR	α	Coding	LF
CCCC	0.80								0.62	0.78	0.78	CTF1	0.79
												CTF2	0.81
												PEU1	0.82
PEU	0.43	0.80							0.65	0.85	0.85	PEU2	0.78
												PEU3	0.82
												PU1	0.81
PU	0.41	0.47	0.78						0.62	0.83	0.83	PU2	0.77
												PU3	0.77
												UFC1	0.82
UFC	0.4	0.46	0.49	0.80					0.63	0.84	0.84	UFC2	0.76
												UFC3	0.80
PS	0.46	0.44	0.46	0.50	0.79				0.62	0.76	0.76	US1	0.79
												US2	0.78
												UI1	0.80

Table 4: Reliability, convergence validity, and discrimination validity (continued)

	CCCC	PEU	PU	UFC	US	WU	UB	MICA	AVE	CR	α	Coding	LF
WU	0.51	0.47	0.47	0.52	0.49	0.79			0.62	0.83	0.83	UI2	0.76
												UI3	0.79
												UB1	0.76
UB	0.45	0.47	0.50	0.54	0.51	0.51	0.78		0.61	0.82	0.82	UB2	0.77
												UB3	0.82
												CMA1	0.89
MICA	0.42	0.46	0.47	0.46	0.47	0.49	0.47	0.80	0.64	0.85	0.85	CMA2	0.82
												CMA3	0.79

Discriminant validity analysis for the Chinese character card design revealed that all factors' AVE square root values exceeded the maximum correlation coefficients between factors, demonstrating good discriminant validity. Specifically, PEU scored 0.807, PU scored 0.784, the FC's use scored 0.796, public satisfaction was 0.786, intention to use 0.786, and usage behavior 0.780, all indicating distinct factors. The cognitive impact of Chinese characters had an AVE of 0.802, suggesting strong validity. With all factors' CR values over 0.7 and reliability coefficients above 0.7, the data's overall reliability was confirmed for further analysis.

4.2 Results of hypothesis testing

The structure of the model was tested and fitted as in the previous section, and the results were consistent with the measured model. The analysis results show that the model structure fits well with the measured data. The statistical significance of the path coefficients between variables was tested to test the hypotheses. According to the path analysis results in Table 5 and Figure 3, the standardized path coefficient of the Chinese character cognitive cards for PEU and PU was 0.56 ($p < 0.000$) and 0.53 ($p < 0.000$), indicating that hypotheses H14 and H16 were confirmed. The Chinese character cognitive cards have a significant positive effect on the PEU and PU. Hypotheses H1 and H2 confirmed that PEU and PU have a significant positive effect on the intention to use the FC, with a normalized path coefficient of 0.36 ($p < 0.000$) and 0.45 ($p < 0.000$). When the forgetting function of the Chinese character cognitive cards have higher PEU and PU, children have a higher willingness to use the FC. The FC has a significant positive effect on the intention to use, the user behavior, the satisfaction, and the memorization ability of Chinese characters. Hypotheses H5, H7, H11, and H6 were confirmed with a standardized path coefficient of 0.37 ($p < 0.000$), 0.39 ($p < 0.000$), 0.29 ($p < 0.000$), and 0.62 ($p < 0.000$), which indicates that the use of FC has a higher effect on Chinese character memory ability, but a weaker effect on children's satisfaction.

The normalized path coefficient of cognitive cards and PU to intention to use was 0.37 ($p < 0.000$) and 0.16 ($p < 0.011$), indicating that the hypotheses H3 and H4 were confirmed, and the cognitive cards and PU of Chinese characters had a significant positive effect on the intention to use. However, the cognitive cards of Chinese characters had a more substantial effect, and the PU had a weaker effect. The standardized path coefficient of PEU and Chinese character memorization on satisfaction was 0.17 ($p < 0.003$) and 0.18 ($p < 0.002$), confirming hypotheses H10 and H12, that PEU and Chinese character memory ability has significant positive effects on satisfaction. The standardized path coefficient of Chinese character memory ability and willingness to use on usage behavior was 0.16 ($p < 0.003$) and 0.62 ($p < 0.000$), confirming hypotheses H8 and H9, that Chinese character memory ability and use intention have significant positive effects on use behavior, and use intention has a more substantial effect. The standardized path coefficient of user behavior on satisfaction was 0.25 ($p < 0.000$), confirming hypothesis H13, that user behavior significantly positively affects satisfaction. The standardized path coefficient of PEU to PU was 0.57 ($p < 0.000$), confirming hypothesis H15, that it has a significant positive effect, and the effect is strong.

Table 5: Hypothesis testing results

H	Independent	Relationship	Dependent	Estimate	S.E.	C.R.	P	Result
H1	PEU	→	UFC	.36	.053	6.63	.000	Supported
H2	PU	→	UFC	.50	.057	8.03	.000	Supported
H3	CCCC	→	WU	.37	.051	6.61	.000	Supported
H4	PU	→	WU	.16	.062	2.55	.011	Supported

Table 5: Hypothesis testing results (continued)

H	Independent	Relationship	Dependent	Estimate	S.E.	C.R.	P	Result
H5	UFC	→	WU	.37	.056	6.19	.000	Supported
H6	UFC	→	MICA	.62	.051	12.19	.000	Supported
H7	UFC	→	UB	.39	.064	5.35	.000	Supported
H8	MICA	→	UB	.17	.049	2.98	.003	Supported
H9	WU	→	UB	.30	.056	5.13	.000	Supported
H10	PEU	→	PS	.17	.055	2.99	.003	Supported
H11	UFC	→	PS	.29	.082	3.33	.000	Supported
H12	MICA	→	PS	.18	.056	3.06	.002	Supported
H13	UB	→	PS	.25	.074	3.68	.000	Supported
H14	CCCC	→	PEU	.53	.043	10.17	.000	Supported
H15	PEU	→	PU	.53	.045	10.09	.000	Supported
H16	CCCC	→	PU	.51	.039	9.08	.000	Supported

It can be seen from the above table that all path coefficients are significant ($p < 0.05$).

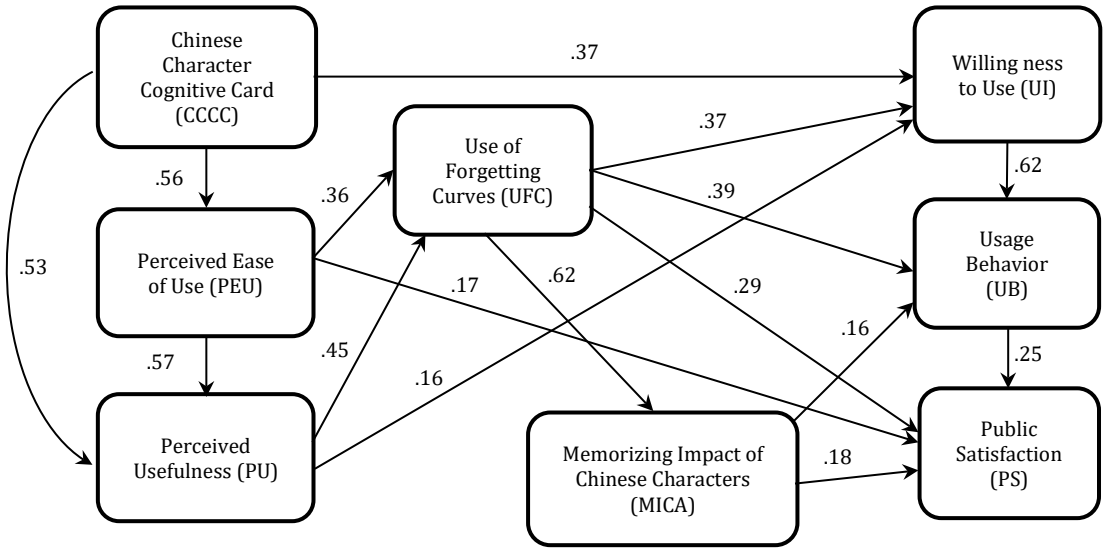

Figure 3: Structural equation model

This chart shows a simplified structural equation model (SEM) that describes the relationship between the Chinese character cognitive cards (CCCC), PEU, PU, UFC, memorizing impact of Chinese character (MICA), WU, UB, and public satisfaction (US). The arrows represent the predicted directional effect, while the numbers on the arrows represent the path coefficient, which is the degree to which one variable influences another. For example, the path coefficient of the influence of the Kanji cognitive cards on the FC use is 0.56, indicating a positive moderate-strength relationship. This model can assess how different factors affect learning behavior and satisfaction, especially when learning Chinese characters using an FC.

4.3 Chinese character card design using FC

The study meticulously evaluated the structural equation model using AMOS software to validate the hypotheses concerning the FC's impact on Chinese character cognitive learning. The analysis, grounded in the maximum likelihood method, confirmed the model's appropriateness through fit indicators like Confirmatory Factor Model.

In alignment with the research objectives, the design of the Chinese character cognitive cards were refined to embody the FC principles, effectively enhancing memory retention. This design approach segmented the memorization process across seven days, integrating review sessions to solidify learning, thus directly addressing the study's aim to augment cognitive abilities in Chinese character learning for children aged 10 to 12.

The research delved into the strategic application of the FC (RO1), assessing its efficacy in reinforcing memory retention and making the learning process more efficient (RO2). Moreover, integrating the TAM and

SOR models facilitated a comprehensive examination of how these theoretical frameworks influence children's reception towards and outcomes from using the FC method in learning Chinese characters (RO3).

The outcomes revealed that the practical implementation of the FC, underpinned by these models, markedly enhanced PEU and usefulness, motivating children's engagement with the learning method. These insights underscore the positive interplay between FC usage and cognitive gains in Chinese character learning, bolstered by empirical evidence from the study's methodological and theoretical investigations. These are shown in Figure 4.

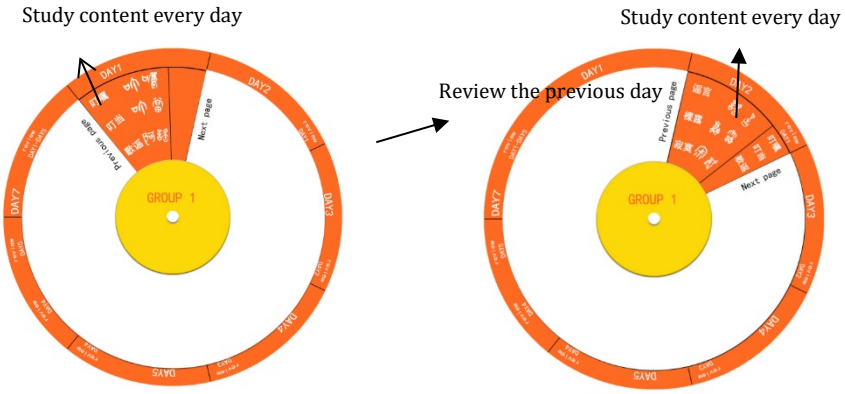

Figure 4: Optimized design of a Chinese character card using the forgetting curve

5. DISCUSSION

Through in-depth analysis of the application of an FC in the cognitive learning of Chinese characters in children aged 10 to 12, the study found that using an FC significantly improved children's learning efficiency and memory retention ability. In particular, by combining TAM and SOR models, the study reveals the positive impact of PEU and usefulness on children's use of Kanji cognitive cards, thereby improving the effectiveness of Kanji learning.

Compared with previous studies that mainly focused on applying the FC in the general learning field, this paper focuses on the unique needs of cognitive learning of Chinese characters. It introduces TAM and SOR theoretical models to analyze children's learning behaviors, filling the gaps in the existing literature. The empirical research method and the novel attempt combined with modern psychological theory in this paper provide an innovative perspective and method for Chinese character teaching.

In theory, this study validates the applicability of the FC theory in Chinese character cognitive learning. It expands understanding of factors affecting learning behavior through TAM and SOR models. In practice, the research results provide educators with a strategy for teaching Chinese characters based on the FC, which helps improve learning efficiency and memory retention, especially for child learners.

This study was limited to a sample of specific age groups and regions, which may affect the broad applicability of the results. In addition, data collection relies on self-reported questionnaires, which may be biased. Future studies should expand the sample to include different age groups and a wider geographical area to enhance the generality of the findings. At the same time, various data collection methods, such as field observation and cognitive testing, were used to reduce bias in self-reported data. Based on the findings of this study, it is suggested that future studies explore the effect of further combining the FC with other memory enhancement strategies to improve the efficiency and effectiveness of Chinese character learning. In addition, the study should consider the influence of individual differences, such as learning style and cognitive ability, on learning outcomes to provide a theoretical basis and practical guidance for personalized learning.

6. CONCLUSION

In this paper, the FC function of the Chinese character cognitive cards was investigated as the research object. The TAM and SOR theoretical models were used to build the influencing factor model of the FC on Chinese character memory ability. The model is used to analyze the influencing factors. The results show that the function of the FC in the Chinese character cognitive cards can make learners perceive the ease of use and usefulness of the Chinese character cognitive cards. The use of the FC positively affects Chinese character memory ability, and

the influence is strong. The combination model of TAM and SOR established in this paper can be generalized and applied to the factors influencing FCs to improve the memory ability in mathematics and physics. Applying the FC in learning is a wide range of learning strategies. Future research could further analyze the factors influencing distributed learning and spaced learning, and the influence of these factors on learners' memory ability in various disciplines.

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