The Effect of Learning Strategy and Self-management on Learning Efficiency: Empirical Analysis from Universities’ students in Taiwan

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ABSTRACT

In recent years, undergraduate students have shown low academic motivation and low academic performance in Taiwan. How to enhance the student’s will to learn and improve their academic performances becomes an important issue. This study used “management theory” and modern psychology theory of “cognitive strategy”, to exploring the relations of strategy, management and study performance on the period of academic learning. A total of 283 undergraduate students from Taiwan were voluntarily participated this study, and Structural Equation Modeling (SEM) was used to verify its overall model and to assess the modeling fit of Structural Model and Measurement Model. The research results showed that (1) self-management had a positive direct and significant effect on students’ learning efficiency (2) learning strategies had a significant, positive effect on learning efficiency and; (3) learning strategies and self-management had an interaction effect with respect to learning efficiency effectiveness. Conclusively, all of the findings in this study would provide a reference for student’s learning, and organization learning.

Keywords: learning strategy, self-management, learning efficiency, organization learning

INTRODUCTION

In recent years, learning efficiency has emphasized that individuals’ strategies and managements play an important role in learning approaches and learning outcomes (Tsai & Lin, 2008). How to improving the learner’s learning skills, and in advance to raise their outcomes is not only the organization manager needed to argue but also the school educators should be issued (Liao, 1999). Otherwise, from the university aspects, students could be regarded as the Organization employee, they also need adopting an efficient learning strategy to finish their academic leanings. The theory that used in student’s learning would be seemed variable utilization in the business enterprises.

In recent years, undergraduate students in Taiwan have shown low academic motivation and low learning efficiency that caused the decreasing in academic performances. The reasons may be due to the large number of universities, the high rate of admissions (Table1), and lack of individual management learning. The high rate of admission has caused reductions in student quality, and has decreased student’s wills to learn. Higher education is imperative in enhancing the student’s will to learning and improve their academic performances. This study adopted “management theory” and modern theories of “cognitive psychology” to depict a learning model to exploring how the individual personal learning strategies and self-management skills affects the learning efficiency in the period of university academic learning. Clearly, the purpose of this study investigated the causal relationship between learning strategy, and
self-management and learning efficiency. The findings would be provided the references for student’s learning, and organizational learning.

Table 1: Rate of admissions of university students in Taiwan

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate of admissions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>61.3%</td>
</tr>
<tr>
<td>2002</td>
<td>80.4%</td>
</tr>
<tr>
<td>2003</td>
<td>83.2%</td>
</tr>
<tr>
<td>2004</td>
<td>87.1%</td>
</tr>
<tr>
<td>2005</td>
<td>89.1%</td>
</tr>
<tr>
<td>2006</td>
<td>90.9%</td>
</tr>
<tr>
<td>2007</td>
<td>96.2%</td>
</tr>
<tr>
<td>2008</td>
<td>97.1%</td>
</tr>
<tr>
<td>2009</td>
<td>97.1%</td>
</tr>
<tr>
<td>2010</td>
<td>94.7%</td>
</tr>
</tbody>
</table>

LITERATURE REVIEW

Learning Efficiency

Organizational learning is the base of organization innovation. Basically, organizational effectiveness is a powerful and problematic concept (Kuo et al., 2011). Efficient organizational learning in business, managers must concern properly two perspectives, learning content and learning method, in which employees could take action to learn. Efficiency of learning method was one of the most important factors that affect the organization learning. In order to improve the learning efficiency, managers in business and educators in school must be firstly considering the progressing to promote the learning method which would be then affected the learning outcome.

Learning management has established itself as a new field in management and organizational studies over the last 40 years (Steve, 2009). The influence of the idea of learning as a fundamental organizational process has been remarkable, as has the speed of its development and spread (Robert & John, 1996). There were many learning models depicted to explore the learning efficiency/outcome during last four decades. Tsai and Lin (2008) argued that learners’ conceptions of learning play an important role in learning approaches and learning outcomes. Otherwise, understanding and seeing in a new way to improve ones learning efficiency were probably the management strategies used to assess his/her outcomes.

Learning Strategy

Learning strategy is about all the activities that learner used to promote their learning outcomes and to finish their goals. There were many theories that depicted for learning strategy. Learning strategy can be divided into two categories, cognitive strategy and meta-cognitive strategy.

Cognitive strategy

Cognitive strategy may be one of the familiar learning strategies that depicted in cognitive psychology. It has adopted from the information-processing approach (Anderson, 1990). Information-processing theory argues that human learning is through the two processes, information-transmit and information-receive to acquire new knowledge. Cognitive strategy is therefore through the cognitive-process to strengthening the learning efficiency. Tsai & Lin (2008) identified six categories of conceptions of learning management,
including memorizing, testing, applying, gaining higher status, understanding and seeing in a new way. Memorizing and applying are the two important cognitive strategies which were used in academic learning many years (Mayer, 1986; Garcia & Pintrich, 1995). Araujo (1998) argued that most studies of organizational learning were underpinned by individual cognitive metaphors and rely on a topographic view of organizations, conceived as containers of knowledge and a locale of learning. Cognitive metaphors are the contents of cognitive strategy.

According to the student’s degree, cognitive strategy can be divided into two categories, the basic and complicated (Weinstein & Mayer, 1986). For example, rehearsal is one kind of basic strategy. Mayer (1986) argued that the rehearsal, organization, and elaboration were three kinds of reading strategies that could help cognitive learning. Critical thinking is another cognitive strategy. Critical thinking is the process that learner used previous knowledge to evaluate and to critic his/her new learning contents. Implement of critical thinking could help reader to strengthen the new content steadily (Garcia & Pintrich, 1995). Summarily, the above views of the scholars, cognitive strategies have seemly including, rehearsal, organization, elaboration, and critical thinking.

Meta-cognition strategy

Other cognition strategy is meta-cognition strategy. Meta-cognition is a “cognitive awareness”, and a capacity that learner is able to know and to use their own “knowledge and cognitive strategies”. Weinstein and Mayer (1986) indicated that students used meta-cognition strategy to control and adjustment their learning strategies. Therefore, the meta-cognition should be included plan, monitor, and adjustment (Garcia & Pintrich, 1995). Gray (2007) argued the critical reflection, however, is not a process that comes naturally to many managers and may have to be learned or facilitated, either in formal classroom contexts, or through learning processes such as coaching, mentoring and action learning. Critical reflection is approximately one of most important meta-cognitive strategies in the learning processes.

There were many empirical researches described that learning strategy were had a positive effect on academic achievement (Lent, Brown & Larkin, 1984; Hirumi & Bowers, 1991; Macnab & Johnstone, 1990; Pintric, 1986, 1987; Pokay & Blumenfeld, 1990; Prinric & De Groot, 1990; Qingquan, Chatupote & Teo, 2008; Wilhite, 1990; Shell, & Husman, 2008; Trawick, 1988; Zimmerman & Martines-Pons, 1990).

Self-Management

Self-management is one of factors that can affect the learning efficiency. Self-management strategies can be divided into two categories, resource management and time management. Catherine et al. (2006) argued that learning is not just about the acquisition of knowledge but is an activity contributing to change and enrichment of the individual. Efficiency learning needs to builds on the interrelationships between three themes: individual and collective learning in groups; conversational learning; and the role of technology as an aid to learning. In other words, Efficiency learning needs to seek outside resources and peer’s cooperation. There strategies are categorized as self-management.

Resource management

From the direction of learning behavior, another management strategy, known as the resource management. Such strategies are the resources available to students for environmental management (Corno, 1989). For example, individuals arrange time, master managing lessons, and seeking support for
learning. Cortese (2005) indicated that the utilization of internal resources were to be found in the current method of planning managerial training. Utilization of internal resources was one of the important individual self-management strategies used in learning (Corno, 1989). Roseth et al. (2008) used Meta-analysis to review 148 independent studies comparing the relative effectiveness of cooperative, competitive, and individualistic goal structures in promoting early adolescents’ achievement and positive peer relationships. Finally, they indicated that higher achievement and more positive peer relationships were associated with cooperative rather than competitive or individualistic goal structures. Also as predicted, results show that cooperative goal structures were associated with a positive relation between achievement and positive peer relationships. Peer cooperative learning is the one of self-management strategies in used. Garcia & Pintrich (1995) proposed resource management strategy should include four items: time management, hard work, peer learning, and studied for assistance.

**Time management**

Time is the most valuable asset. Management guru Peter Drucker said: “time is the shortage of resources, unless it is managed, otherwise nothing management”. Time is the most limited human resources, used properly can increase our productivity. Time management is the significance of self-management in education (Mudrack, 1997). Martin & Osborne (1989) indicated that time management strategy should be included, setting up personal goals, taking into account their priorities, decision time frames for completion at all stages, using the stage plan calendar, complete the priority objectives at all stages, in order to reduce the waste of time to a minimum. Time management directly related to the level of academic achievement (Moor, 1994; Trueman & Hartley, 1996).

**RESEARCH METHOD**

**Framework of the Research**

According to literature view, this article sets up a structural framework, as shown in Figure 1. This framework explored the causality relationship among learning strategy, self-management and learning efficiency, and was further used as the basis for LISREL model testing (Jöreskog & Sörbom, 1993a, b). This study explored the relationships of 3 latent variables and 6 observed variables. The three latent variables are Learning strategy (Ls), Self-management (Sm), and Learning efficiency (Le). The six observed variables are cognitive strategy (CS), and meta-cognitive strategy (MCS), resource management (RM), time management (TM), academic records (AR), and course pass credits (CPC).

![Figure 1: Proposed linear structure relationship model](image-url)
Hypotheses
H1: Self-management has a positive effect of learning strategy.
H2: Learning strategy has a positive effect of learning efficiency.
H3: Self-management has a positive effect of learning efficiency.

Sample and data collection
The effective numbers of subject for this study in LISREL testing were 283 which were drawn from Taiwan Shoufu University. Subjects were voluntarily participated this study. They had taken at least one semester course in Undergraduate School. Data was collected using a questionnaire designed according to a combination of past research studies (Mayer, 1986; Corno, 1989; Martin & Osborne, 1989; Garcia & Pintrich, 1995). The content of the questionnaire consisted of four parts; “Learning Strategy”, “Self-management”, “Learning Efficiency”, and “Subject Information”. The central goal of the questionnaire was for understanding the general situation of the learning strategies used in the period of semester academic learning. Questionnaires were scored by means of a Likert 5 point scale. The questionnaire consisted of 70 items, divided into 4 parts, 31 learning strategy items, 29 self-management items, 3 learning efficiency items, and 7 subject information items.

Data Analysis
Data analysis was used SPSS 17.0 and LISREL 8.2 statistical software package (Jöreskog & Sörbom, 1998). Analysis content was categorized into reliability, validity, subject information, and Structural Equation Model testing. Questionnaire reliability analysis used Cronbach’s Alpha to judge the consistency of items. Questionnaire validity was created by item content validity. Subject Information analysis used percentage and frequency to show the distribution of samples on demography. Correlation analysis used Pearson-product moment correlation coefficients to discuss the relevant relationships among the Learning strategy, Self-management, and Learning efficiency.

RESULTS
Reliability and Validity
Questionnaire reliability was used Cronbach’s Alpha (α) to present the internal consistency of items. Nunnally (1967) noted that of Cronbach’s questionnaire, less than 0.35 displaying low reliability, should be rejected. Reliability level in the questionnaire required higher than 0.5. The coefficient of internal consistency of four sub-questionnaires of this research, cognitive strategy, meta-cognitive strategy, resource management, and time management were .911, .783, .755, and .692, respectively. All reliabilities are higher than 0.50. More specifically, the reliability of sub-questionnaires were seemingly excellent.

Questionnaire validity was used content validity to present the item validity. The content validity was used Two-way Detailed Catalogue Table (TDCT) method to construct the questionnaire validity. TDCT method was firstly defined the meaning of the variables of cognitive strategy, meta-cognitive strategy, resource management, and time management, and then list the corresponding items of questionnaire. Finally, checking and refining the definitions and items by three experts to finish the reasonable questionnaire content validity.

Subject Information
Subject Information was statistically presented by distribution of subject’s demography. The total
The number of samples was 283 (148 male and 135 female). Distribution of age levels were found to lie between 17-31 years. The sample was comprised of all departments and all grades’ student in School. Subject’s reading time per week, 1-3 hr/week accounts for the most, constituting 42.0%; less than 1 hr/week accounted for 39.6%. Subject’s preparing examination, “reading text book” showed the most, constituting 82.0%; “reading notebook” was next, constituting 79.5%. Average of academic performance, 80-90 point level was the most, constituting 43.8%; 70-79 point level was second, constituting 34.6%. As the subject’s demography showed, the distribution of samples based on gender, age, grade, and department were seemingly balanced. It was comprised of various levels of population; the sample seemly satisfied statistical demands. It is suitable for use on the linear structural relation model testing.

LISREL Model Testing

The LISREL analysis inquired about the reciprocated and complementary influence effect of three variables, Learning strategy, Self-management, and Learning efficiency (Jöreskog & Sörbom, 1993a). Concerns about multifactor causality relationships were suitable for utilizing the LISREL instrument (Jöreskog & Sörbom, 1993b). LISREL outputs were described as below, including the overall model and internal model fitting, as well as analysis of the discussion of test result. In addition, discussion of the actual example was presented.

The Overall Model-Fitting Test

The proposed model and hypothesized paths were tested on the survey data collected. The measurement and structural models were tested using the LISREL 8.2 structural equation analysis package (Jöreskog & Sorbom, 1993a). The maximum likelihood method of estimation is utilized to analyze the data. Overall fit of the structural model were checked initially by examining the $\chi^2$ statistics. A significant $\chi^2$ statistic indicates an inadequate fit, but this statistic is sensitive to sample size and model complexity. Therefore, rejection of a model on the basis of this evidence alone is inappropriate. Other measures of fit compensating for sample size are also applied. They include goodness of fit index (GFI), normalized fit index (NFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) (Yang, 2010). The recommended acceptance of a good fit to a model requires that the obtained GFI and NFI, CFI values should be greater than or equal to .90. In addition to that, an acceptable value of RMSEA should range from .05 to .08 (Hair et al., 2010).

The structural model postulated in Table 2. There were tested by using the five constructs of interest. By using the covariance matrix among 6 measurement variables, SEM analysis was performed against the proposed conceptual model. As for the validation of the three hypotheses in this study, results depicted are \( \chi^2 = 7.17 \) and \( p = 0.066 \), GFI = 0.99, NNFI = 0.97, CFI = 0.99, and RMSEA = 0.070 for relative fit measures.

<table>
<thead>
<tr>
<th>Fit statistics</th>
<th>Criteria</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$</td>
<td></td>
<td>7.17</td>
</tr>
<tr>
<td>GFI</td>
<td>0.9</td>
<td>0.99</td>
</tr>
<tr>
<td>NNFI</td>
<td>$\geq 0.9$</td>
<td>0.97</td>
</tr>
<tr>
<td>CFI</td>
<td>$\geq 0.9$</td>
<td>0.99</td>
</tr>
<tr>
<td>RMSEA</td>
<td>$\leq 0.08$</td>
<td>0.07</td>
</tr>
</tbody>
</table>
This research used the maximum likelihood method to carry out the LISREL program (Jöreskog & Sörbom, 1998). The output of the overall model-fitting diagram is shown in Figure 2. As shown in the outputs, the fit indices for this model, chi-squared ($\chi^2$) was 7.17 with 3 degrees of freedom; $p$-value=0.06659, and root mean square error of approximation (RMSEA) = 0.070. Hence, this model fits the data very well (Jöreskog & Sörbom, 1993a). In conclusion, the fit estimates were all ranged within a reasonable scope (Schumacker & Lomax, 1996; Hair et al., 2010). The overall model fit the data very well.

**The Internal Structure Model-Fitting Test**

The outputs of the internal structure model-fitting test can be expressed by estimates (See Table 3). The parameter of Gamma ($\gamma$) and Beta ($\beta$) expressed the relationship between latent variable and latent variable. The parameter of Lambda ($\lambda_\alpha$) and Lambda ($\lambda_\gamma$) expressed the relationships between latent variable and its observed variables. The internal structure model fit the data very well. As the output shows, 6 parameter coefficients of completely standardized solutions very nearly fitted the indices. Thereby, indicating the internal structure model fits the data well.

![Diagram of LISREL model testing output](image-url)

**Figure 2: Diagram of LISREL model testing output**

**Table 3: Parameter estimates of LISREL model**

<table>
<thead>
<tr>
<th>LISREL parameters</th>
<th>Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma($\gamma$) (Sm→Ls)</td>
<td>0.74</td>
</tr>
<tr>
<td>Gamma($\gamma$) (Ls→Le)</td>
<td>0.21</td>
</tr>
<tr>
<td>Beta($\beta$) (Sm→Le)</td>
<td>0.19</td>
</tr>
<tr>
<td>Lambda($\lambda_\alpha$)Sm→RM )</td>
<td>0.45</td>
</tr>
<tr>
<td>Lambda($\lambda_\alpha$)Sm→TM )</td>
<td>0.48</td>
</tr>
<tr>
<td>Lambda($\lambda_\gamma$) (Ls→Cs )</td>
<td>0.44</td>
</tr>
<tr>
<td>Lambda($\lambda_\gamma$)Ls→MCS )</td>
<td>0.40</td>
</tr>
<tr>
<td>Lambda($\lambda_{31}$)Le→AR )</td>
<td>0.89</td>
</tr>
<tr>
<td>Lambda($\lambda_{41}$)Le→CPC )</td>
<td>0.08</td>
</tr>
</tbody>
</table>
Brief Summary

The study used the LISREL method to test the proposed model. As the output shown that the overall model-fitting test and the internal structure model-fitting test were all fit the data well. In summary, the hypothetical model, Figure 1, that this study has proposed, tested by LISREL instrument, concluded a correct verification. This result entirely conformed to hypothesis (H1-H3). That means the casual relationship model among learning strategy, self-management, and learning efficiency is liked Figure 1 shown. Otherwise, from the internal structure model-fitting test output showed that learning strategy adopted the cognitive strategy and meta-cognitive strategy as observed variables being suitability; self-management adopted the resource management and time management as the observed variables being suitability; and learning efficiency adopted the academic records and course pass credits as observed variables being suitability.

CONCLUSIONS

This research intended to take Taiwan domestic Students as example; comprised of 283 subjects in the Taiwan Shoufu University; to discuss the learning strategy, self-management and learning efficiency causality relationships. Researchers utilized LISREL instrument to test the proposed model. The verification results of LISREL testing showed that the overall model fitted the data very well (chi-square is 7.17 with 3 degrees, goodness-of-fit index (GFI) = 0.99). The internal structure model-fitting test corresponded as suitable. This result indicated that the theoretical structure of the framework of this research proposal had been verified by the data. Based on the above results, it was concluded that the learning strategy and self-management have a direct relation with learning efficiency. These findings were in accord with the results of studies by preceding authors (Wilhite, 1990; Moor, 1994; Garcia & Pintrich, 1995; Trueman & Hartley, 1996; Qingquan, Chatupote & Teo, 2008; Shell, & Husman, 2008; Tsai & Lin, 2008). At the same time, the study also found that the self-management could have an indirect effect on learning efficiency through learning strategy. Therefore, this research inferred that self-management might be the prominent factor of learning efficiency. In the student and employee’s study, wherever, self-management may be proposed as antecedents of learning strategy, with its effect on learning efficiency by learning strategy. Therefore, the results of the present study can provide a reference for student’s learning, and organizational learning.

REFERENCES


