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Adaptive Learning Model Building Method

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***Abstract**: Online education as the change of learners' needs continuous development and progress, the adaptive learning platform gradually arisen, it emphasizes the service oriented, through data collection and analysis provide students with personalized learning content, enhance the pertinence and efficiency of student learning, to improve college students' learning experience and experience, indicate the direction for the future of higher education, meeting the needs of the current college students' learning and personality development. However, the development of adaptive learning platform is still in its initial stage. The strategies of constructing the self-adaptive learning platform for college students mainly include: clarifying the key technologies and core theories of platform construction, constructing the benign development environment and evaluation system, and exploring the corresponding learning service and guidance mode. This paper attempts to systematically study motivation and engagement on the basis of social-cognitive motivation theory and achievement orientation theory as a means of unifying substantive and empirical claims.*

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I. INTRODUCTION

With the rapid development of the Internet and information technology, the learning style of college students is gradually changing, and the traditional classroom teaching is facing the challenges of computer, multimedia, network classroom and other online education. As one of the most influential constructs in educational psychology, academic motivation represents individuals' drives and energies to learn. as an emerging construct attracting increasing interest, engagement manifests individuals' drives and energies, such as the use of self-regulation strategies [1]. However, little existing research simultaneously considers these two groups of constructs within one framework, or takes their antecedents and outcomes into account, especially in regards to Chinese university students. To accomplish these purposes, two studies, each with two parts, have been conducted with Chinese university students as participants. In Study One, Part One explores the factor structure of several instruments–including the Motivation and Engagement Scales-University/College (MES-UC), the Goal Orientation and Learning Strategies Survey (GOALS-S), the Scale of Institution Integration (SII) and the Academic Satisfaction Questionnaire (ASQ) – in half the sample (426 cases). Cross-validation with the other half of the sample is then undertaken (423 cases) [2-4]. Part Two investigates a process model, which includes student multiple motivational beliefs, engagement and educational outcomes through path analysis. The results suggest that students' work avoidance goal predicts their academic dissatisfaction directly and indirectly via maladaptive engagement. Their social concern goal indirectly predicts intellectual development via adaptive engagement. Their social approval goal directly influences achievement. and student engagement mediates the impacts of other motivational beliefs on their academic dissatisfaction, intellectual development and achievement. Furthermore, social concern, social approval, social status goals and work avoidance goals are significantly related to motivation and engagement. In Study Two, Part One cross-validates the MES-UC instrument in a new independent sample (836 cases) of Chinese university students. Other instruments including the Motivated Strategies for Learning Questionnaire (MSLQ) and the Patterns of Adaptive Learning Survey (PALS) are also validated. Part Two investigates a process model, which includes classroom goal structure, motivational beliefs, engagement and achievement through path analysis [5,6]. The results find that the classroom mastery goal structure predicts adaptive and maladaptive engagement via adaptive motivation, and the classroom performance-avoidance goal structure affects maladaptive engagement via personal performance-approach goal orientation and maladaptive motivation In summary, by considering the classroom goal structure as a contextual antecedent and a variety of motivational beliefs as individual antecedents, as well as achievement-related constructs as outcomes, the thesis finds the mediation effect of motivational beliefs between classroom goal structure and student engagement, as well as the mediation effect of engagement between motivational beliefs and achievement-related outcomes. The thesis also summarizes the main contributions, and implications, noting the limitations and pointing out some directions for future research in the field of student motivation and engagement [7,8].With the rapid development of the Internet and information technology, the learning style of college students is gradually changing, and the traditional classroom teaching is facing the challenges of computer, multimedia, network classroom and other online education [9]. Online education as the change of learners' needs continuous development and progress, the adaptive learning platform gradually arisen, it emphasizes the service oriented, through data collection and analysis provide students with personalized learning content, enhance the pertinence and efficiency of student learning, to improve college students' learning experience and experience, indicate the direction for the future of higher education, meeting the needs of the current college students' learning and personality development. However, the development of adaptive learning platform is still in its initial stage. In recent years, an adaptive learning platform for college students has been introduced, including the key technologies and core theories of platform building, the construction of a benign development environment and evaluation system, and the exploration of corresponding learning services and guidance models [10]. With the development of learning analysis technology, big data and other related fields, online education institutions have developed a mature adaptive learning platform by using the rich educational resources owned by the institution and advanced adaptive technology, which provides a development platform for exploring practical and breakthrough technology theories. This study item response theory, the social comparison theory and metacognitive theory as the adaptive learning system design theory instruction, completed the framework design of adaptive learning system for learning experience, on the basis of domain knowledge model was constructed, focusing on the two core components of the framework: the learner model were studied, and the teaching model and learning from metacognitive experience, social comparison learning experience, learning behavior analysis and subjective evaluation to evaluate four aspects.

II. KNOWLEDGE GRAPH

Knowledge graph is a structured semantic web, which is used to describe knowledge entities and their relationships in knowledge engineering in the form of graph.Here is the guide Enter three tuples "entity relationship entity" or "entity attribute value" for knowledge representation [7], each entity can be globally unique ID identification, attribute value describe the internal characteristics of knowledge entities, and knowledge entities form a network of knowledge structures through relationships. In the process of learning, curriculum is the smallest unit of knowledge system, so the authors will curriculum entities as research objects build Knowledge graph.Set the triplet form used for knowledge expression as $\mathrm{T}_F = \{E, R, E_T\}$, where E is all the set of course entities, R is the set of relationships between entities, E_T is the set of courses The internal attribute set of the process entity. Connections between entities can be complex. The network structure of is shown in Figure 1, where E_i means specific Course entity. R_{ij} refers to the relationship between course entity E_i and E_j, and is set R. E_{T_i} represents the internal attribute set of course entity E_i. The initial construction process of map recognition is used to realize the function of dynamic update of knowledge model. First of all, determine the knowledge field and the knowledge of this field Data is extracted from entities, relationships and attributes, which can also be collectively referred to as information extraction to form highly structured data. Finally, the specific concepts approved by the audit are added to the ontology database to form Initial Knowledge graph. In order to guarantee the systematization of knowledge model, it is necessary to iterate new knowledge concepts on the basis of existing Knowledge graph. Before the concept is introduced into the model, the data should be structured, it should be fused with the knowledge concept of the existing Knowledge graph to remove the coincidence or confidence degree Low knowledge concept to avoid data redundancy. In addition, we need to pay attention to the adaptation of the new knowledge concept and the original ontology mode, and pass the As the latest knowledge model after quality assessment.

III. ASSOCIATION RULES MINING ALGORITHM

Growth algorithm is a kind of association analysis algorithm[13], also known as association rule mining algorithm without candidate set, which was proposed in 2000. The following is the specific meaning of relevant terms in the algorithm in the knowledge model.

(1) Project set. Let $E = \{E_1, E_2, \ldots E_m\}$ is a collection of many course entity items.

(2) Transaction database.The set of transactions or learning path database, recorded as

$D = \{D_1, D_2, ... D_n\}$. It is a series of learning paths Each learning path D_i is a subset of E.

(3) Frequent itemsets. It frequently appears in the set of course entities in learning path database D at the same time.

(4) Association rules. The form is like the implication of $X \Rightarrow Y$, where X and Y belong to E and the intersection of X and Y is empty, indicating the relationship between two curriculum entities There is a strong correlation. X is the antecedent of the association rule and Y is the consequent of the association rule.

(5) Support（$\mathrm{R}_{\mathrm{support}}$）. At the same time, the learning path that includes course entity X and Y accounts for the percentage of all learning paths, that is, probability $P(X \cup Y)$ or $R_{\sup port} = {(X \cup Y)}/{N}$, where $X \cup Y$ refers to the number of times course entities X and Y appear in database D.

(6) Confidence $(R_{confidence})$ .The number of learning paths containing both course entities X and Y in the learning path database only includes the course reality .The percentage of the number of learning paths of body X, that is, $R_{confidence} = {(X \cup Y)}/{X_{count}}$, or conditional probability $P({X}/{Y})$, is used to indicate the existence of rules Effectiveness.

First compress and store the transaction data set and build fP-tree, then use fP-tree Get all frequent itemsets and association rules. The pseudo code implementation of FP-Growth algorithm is as follows:

Input: learning path database, minimum support min _ Sup, Output: fP-tree

1）Scan database D, calculate the support degree of each course entity and obtain frequent 1-item sets, and then rank the frequency in descending order according to the support degree Complex item set table L.

2）Create tree root node T, marked as "null".

3）Each learning path D_i in for database D；

4）According to the sequence of frequent itemsets L, the frequent itemsets of $[p/P]$ format are obtained for the course entities in each learning path D_i, where P is the first course entity and P is the item table composed of the remaining course entities in the frequent course entity itemset table after P is removed.

5）Call function insert_tree($[p/P]$, T), where insert_tree($[\mathrm{p}/\mathrm{P}]$, root) is as follows:

(1) If (root has child node N and N .item. Name = = p.item. Name) N .count + +.

(2) Else {create new node N . N .item.name = p.item.name. N .count = 1. p.parent = root. point N .node.link to the node of the same course entity in the tree.}

(3) End if

(4) If $P \neq \varnothing$ {Assign the first course entity of P to P and delete it from P. call recursive function insert_tree($[\mathrm{p}/\mathrm{P}]$, T)

(5) End if

By calling fP_ growth (tree, α) implementation. The process is implemented as follows.

Input: constructed tree, min support min _ Sup, Output: frequent item set L

1）Set the initial value of L as null

2）If (tree only contains a single learning path P) for each combination of course entities in path P, recorded as β {

3）Generate curriculum entity set $\alpha \cap \beta$, whose support degree is the minimum support degree of curriculum entity in β；

4）return $L \cap$ support is greater than min_ Sup Item set $\alpha \cap \beta$.}

5）Each frequent item in the header table of else for tree is α_f {

6）To produce a curriculum entity set $\beta = \alpha_f \cup \alpha$, whose support degree is equal to α_f support degree

7）The conditional pattern base B of β is constructed, and the condition tree_β of β is solved according to the conditional pattern base.

8）If ($tree_\beta \neq \varnothing$) call fP_ growth($tree_\beta \neq \varnothing$， β) . }

9) End if

The data used by the author are all from the online learning platform of the school. Taking the learning path data in Table 1 as an example, the FP growth algorithm The process of mining association rules is described. Each course entity has a unique ID, so the course entity involved here uses its ID replace.It can be known from the fact that the support of the course entity is equal to the percentage of the number of learning paths including the entity in all learning paths. The support of a body is directly proportional to the frequency of its occurrence. To simplify the calculation, the support is equivalent to the frequency of its occurrence.Set the minimum support as 2, according to the construction process of fP_tree. It includes frequent course entities and their support in fP_tree. the node chain indicates the specific content of a course entity in fP_tree location, then, based on the newly constructed fP_tree, the course entities are associated. mining rules, according to the excavation process, from top to bottom. each course entity of the head node table is traversed twice, and frequent modules are mined and stored. Table 1 is the conditional modules of all frequent course entities formula basis and condition fP_tree.

Table 1 Conditional pattern base and condition fp-tree

Frequent item	Condition pattern base	condition FP-Tree
38	{（29-31-28-27:2). (31-14:1)}	{(31:3)}|38
27	{（29-31-28:2). (29-31-28-14:1)}	{(29:3, 31:3,28:3)}|27
14	{（29-31-28:1). (29:1),(31:1)}	∅
28	{(29-31:3). (29:1),(31:1)}	{(29:3, 31:3)}|28
31	{(29:3)}	{(29:3)}|31
29	∅ ∅	

Subject and difficulty level are two attributes of curriculum entity, respectively with circle Color and number are used for identification. according to the time sequence of the two courses in the learning process, the relationship between the course entities is divided into the first Repair relation and juxtaposition relation, in which the first repair relation is represented by the directed line segment. It can be proved that FP_Growth algorithm has a good effect on the dynamic update of knowledge model

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