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Influencing factor analysis and practice to college students specialized course learning interest

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ABSTRACT

The learning interest plays an important role in the specialized course teaching activities, and it is also one of the most important parts which the teacher should pay attention. This paper gets related data through questionnaire survey, analyses the relationship between students' interest of specialized course and its influencing factor by using of rough set theory and provides theoretical foundation for how to improve students' interest in specialized course teaching activity by analyzing the importance degree quota of all the factors. My RS results show that teaching level of professional course is the most important factor to improve college students' learning interest. Using the analysis result about the influence on college students specialized course learning interest, A novel teaching model can be established on the course of Digital Signal Processing Technology. Through contrast on the actual teaching situation between traditional teaching class and experimental teaching class, as well the results of questionnaire survey. The paper analyzes with the old and new teaching model, the students' changes from their specialized course learning interests, the actual testing scores, professional characters results, etc. The experimental results show that in this item, the analysis about the influence on college students specialized course learning interest is very important to improve college students specialized course learning, which are in accordance with the theoretical analysis.

KEYWORDS

Specialized course learning interest; Specialized course teaching; Digital signal processing technology; Rough set.

INTRODUCTION

Psychologists believe that interest and love are the tendency of awareness and activities associated with a joyful mood. The interest is the primary form of values accompanied by positive emotional experience, and has a huge role in promoting the individual activities, particularly, the individual's cognitive activities, and gradually developed into the internal motivation of the individual activities[1]. Physiologically, the interest can lead to exciting, and excitation can promote secretion of the thyroid increasing amounts of glucagon in the blood in order to accelerate the metabolism and enhance mental and enrich the learning energy, thus creating a material basis to improve the learning efficiency. Psychologically speaking, the generation of interest stems from the cognitive surprise and the emotional attraction. A surprise occurs when the current conception is similar and related to the past experience but cannot assimilate the already established cognitive structure, which gives rise to curiosity and conflict in concept [2].

Many Chinese and foreign educators have noted the role of interest in teaching activities[2]. Czech educationalist, Johann Amos Comenius pointed out in "Didactica magna" that, "A good learning method should be motivating children to seek knowledge and study with all possible ways, but not forcing children to learn, which is greatly harm to them"[3]. It is very important that high school seniors who are learning specialized fundamental course and professional course have interest in learning course, in order to achieve outstanding academic performance and improve the ability of engineering practice.

On the one hand, learning interest can improve the perceived quality of professional knowledge. Because the interest is an important aspect of a motive, which learning has explicitly orientated. Learning interest becomes an important source of motivation and generates awareness of the internal driving force, which shows prolonged attention spans, increased persistence and enhanced memory. On the other hand, learning interest in specialized course can have a positive emotional experience, and reduce fatigue. High school seniors develop a passion for specialized knowledge, and form the positive searching desire because of learning interest in specialized course. Once the problem is solved, high school seniors should produce relaxed and content emotional experience to create the necessary. Reference[4-6] concluded that the learning interest of the students is the most active element in the results based on influencing factor analysis of college students' academic performance. This paper analyzes and concludes the importance degree index of various factors using Rough Set Theory and MyRS tool in influencing factor of specialized course learning interest.

THE ROUGH SET THEORY

The Rough Set Theory (RST) was proposed by Professor Pawlak in 1982. RST has been widely used in artificial intelligence, machine learning, knowledge acquisition, decision analysis and pattern recognition because of its many advantages. RST can be applied in "rough classification" problems to handle imprecise interclass boundaries. The method philosophy is based on the assumption that every object can be associated with some information. Objects that are characterized by the same information are indiscernible in view of the available information. The indiscernibility relation that is generated in this way is the mathematical basis for the rough set theory. When decision-making is based on the rough set theory, the valuable information was gathered from the given data set and a reasonable decision scheme was reached according to data compression, reduction and analysis of importance attributes[7].

Definition 1[8] assumes that U is the universe of discourse which is a nonempty finite set, and $R \subseteq U \times U$ is a binary equivalent relation on U, and then $A = (U, R)$ is approximation space which [x] is R equivalence class in the object, For any of the X which is $X \subseteq U$, X can be represented by $\underline{R}X$ and $\overline{R}X$. $\underline{R}X$ and $\overline{R}X$ can be denoted by

$$\begin{aligned} \underline{R}X &= \{x \in U \mid [x] \subseteq X\} \\ \overline{R}X &= \{x \in U \mid [x] \cap X \neq \phi\} \end{aligned} \quad \textbf{(1)}$$

Where $\underline{R}X$ is lower approximation and $\overline{R}X$ is upper approximation. The elements in can be classified as members of X by the knowledge in R. However, the elements in can be classified as possible members of X by the knowledge in R. The set X is referred to as a rough set which is approximated using information contained in R by constructing lower and upper approximation sets. Hence, positive field $pos_R(X)$, boundary region $bn_R(X)$, and negative field $neg_R(X)$ defined as

$$\begin{aligned} pos_R(X) &= \underline{R}X \\ bn_R(X) &= \overline{R}X - \underline{R}X \\ neg_R(X) &= U - \overline{R}X \end{aligned} \quad \textbf{(2)}$$

Definition 2[9] The rough set method is a series of logical reasoning procedures for analyzing an information system; an information system can be seen as a decision table, denoted by $S = (U, A, F)$, where U is a limited object set, represented by $U = \{x_1, x_2, \cdots, x_n\}$, A is a limited attribute set, called $A = \{a_1, a_2, \cdots, a_n\}$, F is a correlation set between U and A, that is $F = \{f_i \mid j \le m\}$, where $f_i : U \to V_j, j \le m$, V_j is called the domain of a_j, and the value of V_j can be quantitative value or qualitative value. F(x) reflects complete information of object x in the system S, and then F(x) is often called the information function. For this information system, each subset of attributes $B \subseteq A$ could define a binary equivalence relation R_B on the universe of discourse U, that is

$$xR_B y \Leftrightarrow f_j(x) = f_j(y), \forall a_j \in B \quad \textbf{(3)}$$

In the rough set, A is a set of primitive features, and are two subsets of features, assuming that $C \cap D = \Phi$, where C is called the condition feature, and D is the decision feature. The information systems A is called the decision table, and often noted for $(U, C \cup D, F)$. R_c is generated by U, defined as $U / R_c = \{C_1, C_2, \cdots, C_i\}$, and R_D is generated by U, defined as $U / R_D = \{D_1, D_2, \cdots, D_J\}$. C positive field of D is expressed by $pos_C(D)$, denoted by $pos_C(D) = \bigcup_{j=1}^{J} \underline{R_C}(D_j)$ and $\gamma_C = \left| pos_C(D) / |U| \right|$, where $|X|$ is the number of elements in the set X, U is the universe of discourse.

Definition 3[10] Assume that $(U, C \cup D, F)$ is a decision table, where C is caled the condition attribute set, and D is the decision attribute set, and then the importance of attribute subset $C' \subset C$ for D is

$$\sigma_{CD}(C') = \gamma_C(D) - \gamma_{C-C'}(D) \quad \textbf{(4)}$$

Where $\gamma_C = |pos_C(D)| / |U|$, particularly, when $C' = a$, the importance of attribute $a \in C$ for D is

$$\sigma_{CD}(a) = \gamma_C(D) - \gamma_{C-a}(D) \quad \textbf{(5)}$$

IMPORTANT FACTOR ANALYSIS OF LEARNING INTEREST

The collection of raw data

Undergraduate students with random sampling in Grade 3 in Xijing University were investigated on the factors of learning interest influencing specialized course by questionnaire. After handing out 110

questionnaires to the students, and taking back 104 valid questionnaires, the recovery rate is about 95%.

Firstly, the mapping relationship was established between the professional course learning interest and its influencing factors according to the student paper information. Secondly, the influence degree of the various factors on the decision attribute was analyzed based on rough set theory.

The questionnaire survey with 10 questions with a 4-point Likert scale was provided to undergraduate students. (1) What do you think of the teacher's professional courses teaching attitude? (a. very serious; b. serious; c. still line; d. not serious) (2) Can teachers' praise arouse the enthusiasm of learning professional courses? (a. It can largely improve the enthusiasm of learning the professional courses; b. It can temporarily improve the enthusiasm of learning the professional courses; c. It can rarely improve the enthusiasm of learning the professional courses; d. It cannot improve the enthusiasm of learning the professional courses.) (3) what do you think of teachers' management of professional course classroom? (a. very severe; b. severe; c. less severe; d. no matter what.) (4) What do you think of the teaching level of professional course teachers? (a. very high; b. high; c. general; d. no high.) (5) What do you think of the teachers' attitudes to students? (a. very amiable; b. Amiable; c. indifferent; d. extremely indifferent.) (6) Do you think the cramming method of teaching professional courses is reasonable? (a. very reasonable; b. reasonable; c. little reasonable; d. unreasonable.) (7) Do you like your profession that you have been learning? (a. I enjoyed it very much; b. I enjoyed it; c. I prefer it; d. I don't enjoy it.) (8) Do you think the degree of employment competition is fierce on the present society. (a. very fierce; b. fierce; c. fiercer; d. be not fierce.) (9) Do you think curriculum of professional courses is reasonable? (a. very reasonable; b. reasonable; c. little reasonable; d. unreasonable.) (10) Are you interested in learning your professional courses? (a. very interested; b. interested; c. little interested; d. not interested.)

The mapping is presented in TABLE 1, which shows learning interest of 104 high school seniors and its influencing factors. In TABLE 1, C is called the condition feature set, which is composed of several attributes (that is x_1,x_2,x_3,x_4,x_5,x_6,x_7,x_8,x_9 representing 1-9 problems in the questionnaire respectively.). D is the decision feature, which is represented the 10th problem, and the answer No. represents each attribute value. Part of the student information is given due to limited space in TABLE 1.

Establishing the decision table

MyRS is a cross platform development tool system for rough set using Java programming language, which is composed of GUI and core computing of rough set. It can realize the classical algorithm about positive field, kernel, attribute reduction and rule extraction, using its many functions about input/output, data pre-processing and core computing[11].

TABLE 1 : Questionnaire of professional courses learning interest

No.	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	value of D
1	a	a	a	b	b	d	b	a	c	b
2	c	b	a	c	b	c	d	b	c	c
3	c	b	b	c	b	c	c	a	c	b
4	b	b	b	b	b	a	a	a	a	a
5	a	a	a	a	a	a	a	a	a	a
6	a	a	b	a	b	a	a	a	a	a
7	d	d	c	b	b	d	b	b	c	b
8	b	b	b	a	b	d	b	b	b	b
						……				
103	a	a	b	a	a	d	b	b	d	b
104	b	b	a	b	c	c	c	b	c	b

The data-entry file of MyRS should adopt CSV format file which can be realized by Microsoft Excel software. The decision table could be established by setting the weight for the attribute based on the importance of it, which is represented by a, b, c and d in student answers using weight 4, 3, 2, and 1.

Computing the indicators of condition attributes

The significant degree of every attribute can be calculated by MyRS tool. It represents that the attribute importance degree is high while classification variability is greatly removing this attribute, whereas the attribute importance degree is low.

The significant degree of every attribute about D is:

$$\sigma(x_1) = attr0 = \gamma_C(D) - \gamma_{C-(x_1)}(D) \approx 0.058 , \quad \sigma(x_2) = attr1 = \gamma_C(D) - \gamma_{C-(x_2)}(D) = 0 ,$$

$$\sigma(x_3) = attr2 = \gamma_C(D) - \gamma_{C-(x_3)}(D) \approx 0.029 , \quad \sigma(x_4) = attr3 = \gamma_C(D) - \gamma_{C-(x_4)}(D) \approx 0.096$$

$$\sigma(x_5) = attr4 = \gamma_C(D) - \gamma_{C-(x_5)}(D) = 0 , \quad \sigma(x_6) = attr5 = \gamma_C(D) - \gamma_{C-(x_6)}(D) = 0 ,$$

$$\sigma(x_7) = attr6 = \gamma_C(D) - \gamma_{C-(x_7)}(D) \approx 0.029 , \quad \sigma(x_8) = attr7 = \gamma_C(D) - \gamma_{C-(x_8)}(D) \approx 0.019 ,$$

$$\sigma(x_9) = attr8 = \gamma_C(D) - \gamma_{C-(x_9)}(D) \approx 0.029$$

where $\sigma(x_1)$ is the significant degree of condition attribute 1, $\sigma(x_2)$ is the significant degree of condition attribute 2, and so on.

Thus, the significant degree relationship of the factors influencing learning interest of professional course is:

$$\sigma(x_4) > \sigma(x_1) > \sigma(x_3) = \sigma(x_7) = \sigma(x_9) > \sigma(x_8) > \sigma(x_2) = \sigma(x_5) = \sigma(x_6)$$

Analyzing the significance of attribute

According to the calculation result of the conditional attribute indicators, the sort of important attribute is given, which is influencing learning interest of professional course. Teaching level of professional course is the most important attribute. Teaching attitude is more important attribute than other attributes apart from teaching level. The requirements of the classroom discipline and enjoying to learn the professional courses are less important attributes than teaching attitude. Teacher's praise and attitude are the least important attributes, which can only temporarily stimulate learning interest of professional course. Therefore, the key attributes are teaching level of professional course, teaching attitude and the requirements of the classroom discipline, which can improve learning interest of professional course.

THE ANALYSIS OF RESEARCH EFFECT

The subject was conducted in first semester of the school year 2013-2014, which singled out Class Telecommunications 1001 and Class Telecom 1002 from the department of electronic and information Engineering of Xijing University as experimental subjects. The course in research is Digital Signal Processing Technology**,** and the practicability and effectiveness of the research results are analyzed by means of “experimental comparison method”. As for the same course digital signal processing technology, the course teaching for Class Telecommunications 1001 is organized on the basis of the research results, while the course teaching for Class Telecom 1002 is organized in the form of traditional lectures and experiments. The students of these two classes have similar demographic traits,

such as family back ground, education, gender ratio and so on, and have the same counselor. Effect analysis mainly includes questionnaires, forum discussion, and actual test method

To further understand the effect of the application of new research findings on the promotion of students learning, anonymous questionnaire survey on learning interest and effect was conducted in Class Telecommunications 1001 and Class Telecom 1002. According to the statistics, in the teaching mode based on the research results, the students increased their learning interest and improved a lot in their awareness to find, solve and evaluate questions in the process of learning the course of digital signal processing technology, thus making classroom teaching adapted teaching objects better and changing the learning habits of students basically.

At the end of the semester, aiming at testing the teaching and learning effect of the course digital signal processing technology, the same questions, the same methods and the same testing standards were used for Class Telecommunications 1001 and Class Telecom 1002. The test results are shown in TABLE 2.

TABLE 2 : The test statistics of digital signal processing technology

Items	Class Telecom 1001	Class Telecom 1002	Amount of increase
Theoretical Test	Average 86.5	Average 79.6	7%
Skill test	Average 89.6	Average 75.3	14%
Comprehensive Test	Average 89.2	Average 75.1	15%
Professional Quality Test	Average 92.6	Average 72.3	20%

According to TABLE 2, under the same premise of testing means, test class (Class Telecommunications 1001) performed better than traditional class (Class Telecom 1002) in all aspects, among which the professional quality stands out. Students of Class Telecommunications 1001 far excelled their counterparts of Class Telecom 1002 in interpersonal communication, collaborative learning, discovering and solving problems, which reflects the importance and accuracy of influencing factors of students' interests in specialized courses in the subject.

In brief, in the process of organizing teaching activities of college students, firstly, importance should be attached to the professional teaching standards and the professional skills of teachers; then attention should be paid to the teaching attitude, classroom management and teaching contents setting of specialized teachers. Only in this way can students' interests in specialized courses be stimulated, thus improving learning effect and the professional quality, so as to achieve the goals of the cultivation of technical and applicable talents in higher education.

CONCLUSION

College students' learning interest is the key to improve student performance, and the teaching level of professional course and teaching attitude are the core factors to stimulate learning interest. In this paper, we showed the way to reduct rules which can classify the attribute influencing a learner's learning interest of professional course by using rough set theory. The significant degree of every attribute provides effective method to improve learning interest to each learner. The results were given by rough set decision table and MyRS and analyzing appropriate attributes.

Although the theory of rough set is used in many areas, it is not sufficiently used in learning professional course system. Therefore, this research has its significant meaning to those who have the possibility of using rough set theory in learning professional course system.

Using MyRS is to show that it presents easily the significant degree for usable and necessary data. This method is an appropriate suggestion when amounts of data are highly increased in the decision table.

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