Core Issues Teaching Mode for Middle School Information Technology Course in China

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Abstract. The new curriculum reform advocates the use of information technology to carry out innovative practice, the development of the times for the students' information literacy also put forward higher requirements. This paper discusses the traditional teaching methods, the design methods of the core issues, and the teaching mode of the core issues for information technology course in middle schools, which provide references for general middle school.

Keywords: information technology; core issues; teaching mode

1. INTRODUCTION

In China, the elementary education curriculum reform is proposed by the Ministry of Education of in [1]. The integration of information technology and subject course is promoted to give full play to the advantages of information technology for students' learning and development, which provide a rich educational environment and powerful learning tools [2]. New curriculum reform is proposed for the technical field of general high school curriculum standards (information technology section) when the curriculum is described, with particular reference to the problem-solving abilities, information technology is used for innovation. In new curriculum standards, information processing and communications, information technology and social practices are regarded as the main benchmark, in which students should master information acquisition, processing, management, the basic method of expression and communication.

Some scholars study the learning effect from the thinking. Filiz Kalelioglu[3] attempts to investigate whether there is a gender difference in terms of students' reflective thinking skills towards problem solving. Students developed a positive attitude towards programming, and female students showed that they were as successful as their male counterparts, and that programming could be part of their future plans. Tiffany M et al. [4] investigate the impact of reported reflective practice using formative SETs on changes to summative SETs, typically conducted at the end of a teaching period.

Some scholars from the environment and platform study the effect of learning. Isidora Milosevic et al. [5] examine the attitude of students towards Facebook as virtual classroom, through consideration of its acceptability level, purpose and education in using, also shows how students use Facebook in order to improve education. Qiyun Wang et al. [6] describe the perceived useful components of Facebook and its possible ways for teaching and learning. Also felt that Facebook could be potentially used for learning assessment, self-directed learning, collaborative learning, and as a learning management system. A pre -

programmed work environment called BIKE (Batch Information and Knowledge Editor) was developed [7]. This desktop environment works also as a teacher's personalized knowledge management system. The outcomes into teaching bachelor students are implemented directly into the classroom. An online information ethics course designed based on Bloom's taxonomy of educational objectives and Bird's 3C model (Content-Construction-Consolidation). The goal of this study is to better understand how the study participants' cognitive discourse is displayed in their learning transaction in an asynchronous [8].

Others from the teaching idea and assessment study the effect of learning. In recent years, the need for greater accountability and improvement in teaching's quality has become a major issue in higher education.an approach for a more objective evaluation of university teachers is proposed [9], one which is based on previously obtained conjoint analysis data concerning criteria importance from a student's point of view. Engida Gebre et al. [10] examine dimensions of student engagement in technology rich classrooms and the relationship of this engagement to professors' conceptions of effective teaching. The study has implication on design and assessment of technology-rich learning environments and on faculty development programs involving technology use in their teaching. Technology-Enabled Active Learning (TEAL) is a pedagogical innovation established in a technology-enhanced multimedia studio, emphasizing constructivist-oriented teaching and learning. It is also found that teachers' teaching beliefs and desire to change greatly affected their classroom practices and technology integration [11]. Examples of proposals are given to demonstrate the value of such an approach to teachers, and ultimately to the learning experiences of the students themselves [12].The teaching philosophy and experiences of the instructor are reviewed. Challenges and solutions related to teaching a large class are discussed [13].

Along with the reform and innovation of teaching methods, information technology is widely used in teaching, including construction of a new teaching model, cultivating and improving students' learning ability, thinking, scientific research capacity and ability, which are worth exploring.

2. CORE ISSUES DESIGN

The quality of student activities, and its depth of experience acquired in activities should be determined by the core issues design. Problem solving problem is more suitable for information technology teaching. "Problem teaching" with a core issue as the main thread throughout the whole teaching activity can effectively mobilize the students thinking, helping students achieve knowledge construction.

Optimize the course content. Information technology is a very practical subject, course knowledge and skills need to be abstracted from the practical application of situation, while in practice to concrete life situations. Core issues design of information technology in the classroom, emphasis Combined with high school students' life and learning practice, for students to master the application of information technology to solve practical problems in the process of activities, So as to experience the process, the knowledge and the method of the subject, and then develop the students' information literacy.

Create a learning environment. The ideal learning environment includes situation, cooperation, communication, meaning construction, etc. In Information technology subject the information technology is

used as a student's cognition of the object as well as a cognitive tool. Through the research, exploration and combing various learning environment to cultivate students ' ability to integrate theory with practice, and further develop the students ' creative personality.

Innovate to teaching method. Teachers set up the appropriate core issues in the center of the students, Create a certain problem situation to arouse the students ' interest and guide students to a better understanding of the core issues, to provide guidance and support through learning resources, learning perspective and exploring ways. Students study by themselves through the group cooperative learning and other ways to explore the problem, and then solve the problem. The teachers and students jointly carry out the evaluation and feedback, and realize the knowledge internalization and the meaning construction.

3. CORE ISSUES TEACHING MODE

Create problem situation. The core problem designed and be put forward According to the actual situation after a thorough analysis of the contents of the materials and the students' situation by the teacher. Create reasonable problem situation which can stimulate students' interests in exploration, students are encouraged to adopt a proactive attitude in active participation in information activities.

Explore thinking activity of the solution to the problem. The essence of the teaching process is that teachers and students can cooperation explore in problem situations and discover the unknown. Classroom instruction this link is not the simple accumulation of knowledge, containing new and old knowledge and experience conflict-induced of cognitive structure of restructuring is the interaction of learners and the learning environment. Students in the use of information technology in the process of dealing with practical problems, access to insights of knowledge, and skills upgrading, so as to promote the achievement of its subject accomplishment, and obtain the satisfaction and achievement feeling, So as to cultivate the spirit of independent exploration, the courage to forge ahead.

Evaluate and promote. Students should be consciously guided to enhance the knowledge of evaluation and summarized through a variety of ways and means of classroom assessment organized by teachers. Pay attention to students' understanding of various phenomena, Think about the origin of ideas and lead students to enrich and adjust their own interpretation. The evaluation of the results of the study will be beneficial to the students' thinking, broaden their thinking and promote the further internalization of its knowledge.

Feed back to application. End of the learning process is completed the construction of knowledge. Self-feedback in the learning process to help students on the nature of things, rules and internal relations of things to achieve a deep understanding and form the meaning construction of knowledge. Teacher detects and grasps the degree of compliance of the teaching objectives through the application in the class and the form of extra-curricular activities which close connected with the teaching objectives of the course, Promote the development of students ' Metacognition, enable students to master problem-solving strategies to improve students ' ability to analyze and solve problems.

4. CORE ISSUES TEACHING PRACTICE

Taking the high information technology course "modular programming design" as an example。 Students are required to have some programming knowledge, further understanding of top-down, modular programming for stepwise refinement. The basic idea of the algorithm is programming idea. It is the mathematical knowledge, computer operation, computer language integrated together, is the soul of the program.

Create situation and put forward the problem. Teachers and students test the interesting program "Joseph link" by playing games interactive session, put forward the core issues to find the game interactive link and to draw program design ideas flow chart. Allow each student to participate in the games and experience the interaction with the program, experience the relationship between the operation of program and design idea.

Explore solutions. By teachers to provide the students with the relevant clues to solve the problem, guide the students to discuss the interactive link of the game, review the process the process of using computers to solve problems, analyze the design ideas to draw flow chart and can mark the main module of the program, experience the thinking method of the design of the modular programming.

Evaluate on effectiveness. Guide students to discuss and collaborate in groups to evaluate program design ideas flow chart. To interact and communicate through the confrontation of different opinions, add, modify, and enhance each student's understanding of current issues. Reverse think about the general method of solving the problem and the idea of modular programming.

Apply feedback task: Draw the classic small game "angry birds" design ideas flow chart, and in the figure indicate the program's main module.

Develop thinking: How to establish the communication network between n cities under the premise of the most savings.

Parsing problem: Connect the communication network of n city only need $n-1$ line. Assume that each line can be set between the two cities, will have to pay a financial price accordingly, N cities can set up $n(n-1)/2$ lines, how to select the $n-1$ line in the overall least-cost?

N cities and the possible lines between n cities can be expressed as a connected network, the vertices of the mesh representing the city and intercity lines giving the right value represents the cost. Connected network with N vertices can build many different spanning trees, each tree can be a communications network. A weight to a spanning tree by computing the sum of the weights of the edges in that spanning tree. You want to select a total least-cost spanning tree. This question is a connected network of minimum cost spanning tree (referred to as minimum spanning tree) problem. A connected network is shown in Figure 1.

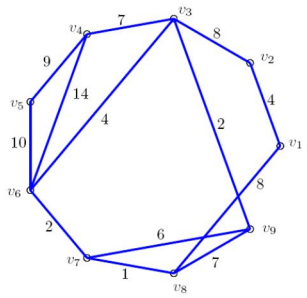


Fig.1 The connected network

Therefore the core issues of this course presented: The sum of the cost of the spanning tree is the least (the minimum spanning trees).

Solve the problem. A minimum spanning tree is a spanning tree of a connected, undirected graph. It connects all the vertices together with the minimal total weighting for its edges. There are many algorithms for finding a minimum spanning tree. Most of the algorithms use the following properties of the minimum spanning tree, which is referred to as *MST*: Assuming $N = (V, \{E\})$ is a connected network, U is a nonempty subset of the vertex set V. Suppose that (u, v) is a minimum weight (cost), while $u \in U, v \in V - U$, there is a minimum spanning tree that contains edges (u, v). Students inspired to think about ways to solve problems from the following aspects: how to find the minimum cost tree edge from a vertex of the net; how to select the edge of the minimum spanning tree from the edge of the net; Reverse thinking about the nature of a spanning tree (there is a ring to add an edge to a spanning tree).

In this process, teachers guide students to positive thinking, from a different perspective to look for the solution of the problem, after you select observed the action state change and the effect of operation to next step, modify the conditions until the problem was resolved. Let the students follow the route of "problem analysis, algorithm design, program implementation", to experience the whole process of solving the problem. Students have relevant life experience for minimum spanning tree. In this design process, Students can further experience the correlation between the module level and the correlation between the module and the diversity of the algorithm, Expand students' thinking space, compare algorithm and its application. Refine the problem from the life and apply it to life, so as to mobilize the enthusiasm of the students, improve classroom effectiveness.

Organize students to discuss in groups, analyze, evaluate and summarize the scheme. The first algorithm: Starting from an arbitrary vertex S of the graph , Select the edge with the minimum weight of the associated to s to join the MST, Assume that the end point of the edge is T , Then the MST is initialized to (S, T) Known as the "current MST ". Next, select the edge with the minimum weight of the left edges associated to vertexes in the current MST and added to the current MST. This process iterates until all vertices are added to MST so far.

In the iteration, assuming current MST Vertices in the form collection V_s , Then for Each v_i in the V_s,

Loop through all the edges of adjacent, and find the right value.

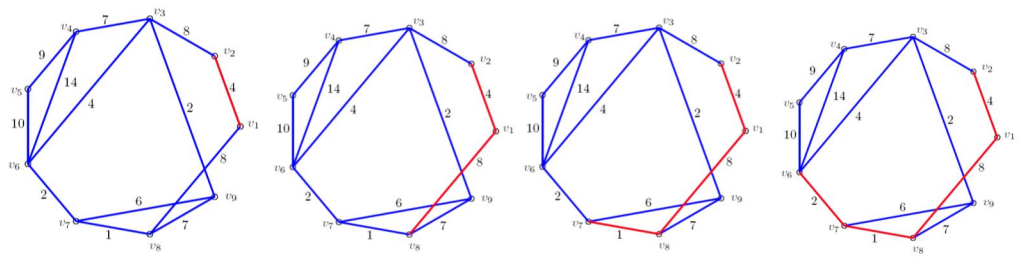
Analysis is summarized as follows: Classic Prim Algorithms are the most simple of all MST, be suitable for dense graphs. Basically, it grows the MST (T) one edge at a time.

a) Let $N = (V, \{E\})$ is a connected network, TE is the collection of edges in the minimum spanning tree of N.

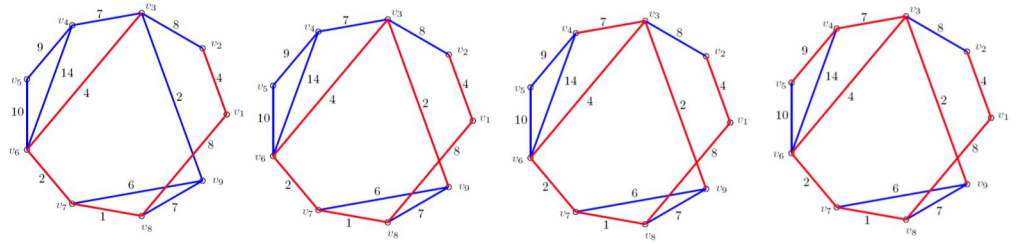
b) Initialize $U = \{u_0\}(u_0 \in V), TE = \{\}$, repeat the following:

Look for a minimum cost edge (u_0, v_0) in all (u, v) while $u \in U, v \in V - U$, Incorporate them into collections TE While v_0 Incorporated into The collection U. When $U = V$ the iteration stops, there must be $n - 1$ edges in TE. $T = (V, \{TE\})$ is the Minimum spanning tree of N.

As shown in Figure 2, start from the vertex v_1 to solve the minimum spanning tree. According to the program, the construction process of MST is shown as the following figures (a-h).



(a) (b) (c) (d)



(e) (f) (g) (h)

Fig.2 The construction process of *MST* of Prim algorithm

The second algorithm: The initial state is a forest that includes N trees (Each tree consisted of a single vertex). And then complete the operation of merging two trees (using the shortest edges connecting them) until there is only a tree and the tree is the ultimate MST tree.

Analysis is summarized as follows. The Kruskal algorithm is to find an edge to continue building MST, but is different from Prim Algorithm, it to find an edge connecting two trees, the two trees in the isolation of a MST tree in the forest, which MST tree will continue to grow, be suitable sparse graphs.

a) Assume that $N = (V, \{E\})$ is a connected network, the minimum spanning tree of the initial state is only the n vertices with non-connected graph $T = (V, \{\})$, each vertex in the graph as a connected

component.

b) Select the least costly edge in E, if the vertex falls in different connected components on T, the edges will be added to the T otherwise discard this edge to choose the next one of the minimum cost, and so on until all the vertices of the T are in the same connected component.

As shown in Figure 3， the gradual implementation of the Kruskal's algorithm operation, how the never connected subtree forest how gradually evolved into a tree. The edges are added to the MST in the order of their length, so the vertices of the forest are connected to each other by a relatively short edge.

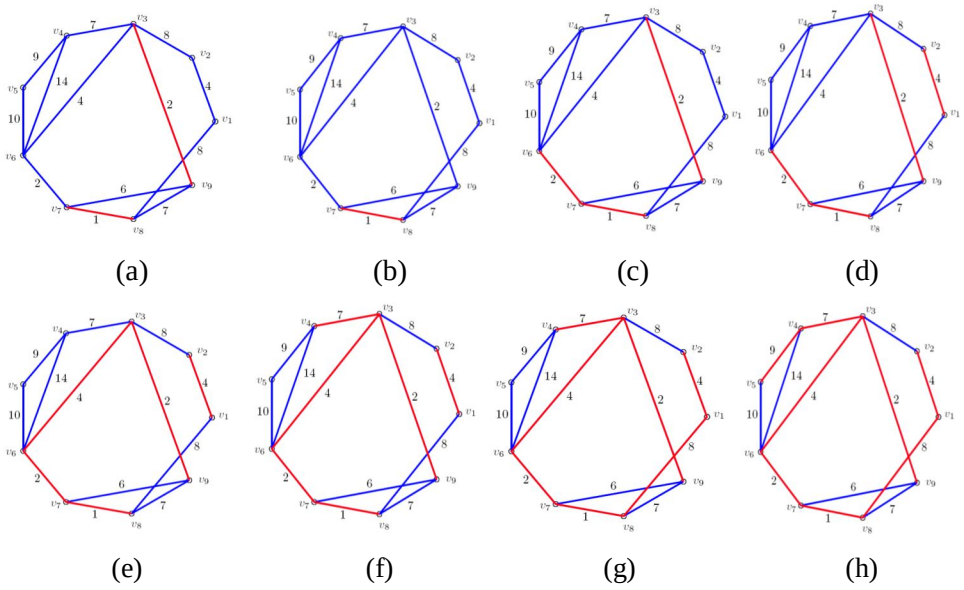


Fig.3 The construction process of *MST* of Kruskal algorithm

The third algorithm: the maximum weight edges which in a ring of the connected network are deleted in proper order, until the no-ring network that is the minimum spanning tree.

Finally, guide the students to analyze the applicability of the above three algorithms and summarize: all algorithm is a greedy algorithm, they run in polynomial time, finding such a tree is FP and related decision problems, such as determining whether a given edge MST or in the P determine the minimum total weight exceeds a certain value of problem.

Core issue teaching is a teaching mode which takes students as the main body, According to the contents of the teaching, the teacher extracts a reasonable core issue, creating the problem situation, to help students to explore the knowledge, construct knowledge in the process of solving the problem. Regardless of whether it is a student's independent exploration, cooperative learning or teacher's counseling, the design of the whole teaching activity is closely around the center of issue teaching, shall be beneficial to complete and deepen the meaning construction of knowledge.

5. CONCLUSION

The design of the core issue should take into account students' information knowledge level and the differences between students' application ability, issue to have a reasonable challenge, is conducive to students to accept it, obtain the same level of satisfaction in the problem solving process, fully to mobilize the students' interest. This paper attempts to construct the core issue teaching mode in improving the classroom efficiency, so that students in the acquisition of knowledge and skills at the same time get the development of discipline, and then have a sustainable lifelong learning ability.

Acknowledgement

The work is partly supported by the teacher education curriculum reform project of Henan Province in China (2016-JSJYZD-027)

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