

Research on the Teaching Design of Junior High School Information Technology Courses Based on the Concept of Maker Education

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Abstract

Maker Education advocates the principle of "innovation is learning" in education. Through the analysis of the case of "Audio Acquisition and Processing Instructional Design", combined with the "Information Technology Curriculum Guidance Outline for Middle Schools", through the practice of situation creation, brainstorming, cooperative creation, sharing and communication, and diversified evaluation in teaching design, it is possible to achieve Maker education innovation, action and sharing.

Keywords

Maker Education; Junior High School Information Technology Course; Instructional Design.

1. Introduction

With the promulgation of the document "Information Technology Curriculum Guidance Outline for Middle Schools" (trial), the Ministry of Education, under the guidance of the core competencies of information technology, has made a detailed assessment of the curriculum tasks, teaching objectives, teaching content, class schedule, teaching evaluation, etc. new requirements have been put forward. It requires cultivating middle school students' interest and awareness in information technology courses, mastering basic knowledge and skills, learning to apply digital tools, using learning resources, and completing teaching tasks through independent study and group cooperation, and then cultivating middle school students with innovative thinking and innovative ability. As an intermediate stage between primary school and high school, the junior high school plays a role in linking the previous and the next. It can be seen that the importance of the junior high school information technology curriculum cannot be ignored.

At present, traditional junior high school information technology courses have problems such as backward hardware equipment, single teaching method, only focusing on the training of students' basic knowledge and skills, ignoring students' individual differences and the cultivation of innovative thinking. Therefore, it is necessary to integrate the concept of maker education into the junior high school information technology curriculum.

With the rise of the concept of maker education in the education world, it has attracted more attention from front-line teachers and scholars. "Maker Education" is a combination of maker culture and education, based on students' interests, using digital tools, advocating creation, encouraging sharing, and cultivating interdisciplinary problem-solving skills, teamwork skills and innovation skills. quality education [1]. Therefore, it is more conducive to the cultivation of information talents to integrate the "Maker Concept" into the information technology courses of junior high schools, and provides new ideas for the teaching of information technology in junior high schools.

2. Makers and Maker Education

The English word "Maker" is the origin of "Maker", which means innovation derived from interest and innovation of hobbies. It is a person's efforts to transform his own hobbies and other innovative ideas into reality [2]. Maker education is the product of the "collision" between the maker movement and education. The rise and development of the maker movement affects traditional educational concepts, organizations, models and methods [3]. At present, many scholars have made a conceptual definition of maker education, among which Zhu Zhiting defines maker education from the perspective of maker spirit and maker literacy, as shown in Figure 1 [4]. From the perspective of creativity-based learning, Zheng Yanlin believes that "whole person development" is based on the development of creativity. Whole person learning includes: subject knowledge, innovation and creativity, self-knowledge, cooperation, effective communication and sense of responsibility [5].

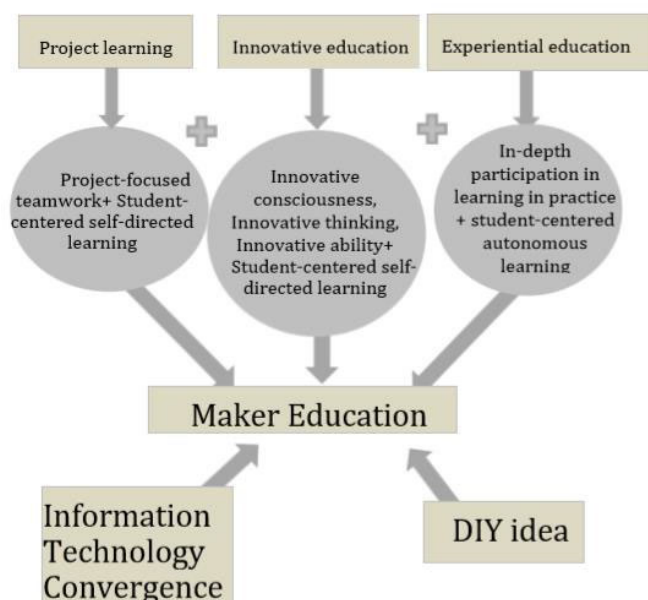


Figure 1. Constituent elements of maker Education

Based on the research and summary of predecessors' thinking on maker education, at the educational level, maker education is "maker's education", which integrates the concept of maker with the teaching of various disciplines, and is student-centered. Under the guidance of teachers, it is an educational form that uses digital tools to cultivate innovative talents.

3. Research Status of the Integration of Maker Education Concept and Junior High School Information Technology Curriculum

Regarding the research on information technology courses under the concept of maker education, the author used "maker education" with "information technology" as the key word in HowNet, and found that since February 2015, many scholars have put forward the research on "maker education" + Research on "information technology" has gradually increased, with the number of publications increasing from 4 in 2015 to 18 in 2017, 24 in 2019, 35 in 2020, and 11 related papers in 2021, although The number of published papers has decreased, but it does not mean that maker education and junior high school information technology classrooms have been fully integrated, and there are still many problems.

3.1. Outdated Textbooks and Lack of Innovation

Through the review of literature research results, it can be seen that the teaching materials of junior high school information technology courses have not changed for many years and lack new ideas. Teaching according to this situation and following the steps will seriously affect the quality of teaching, and at the same time, it will not meet the requirements of today's society for the training of information talents.

Based on the concept of maker, teachers should "use teaching materials" instead of "teaching materials", and should carry out innovation and reform to establish an open and dynamic textbook system. Teaching content should be continuously optimized, and attention should be paid to the combination of teaching content and reality, close to students' life, and keep up with the trend of modern teaching. In particular, disciplines like information technology, which are developing rapidly, must keep pace with the times. In the teaching process, we still have to pay attention to the teaching materials, but we should carry out teaching with the method of "expansion as the main factor and teaching materials as the supplement" instead of being the porter of the teaching materials.

3.2. The Hardware Equipment Is Backward, and the Teaching Mode Is Single

Information technology teaching must use multimedia equipment, but there are still many middle schools that are not equipped with perfect hardware equipment or backward hardware equipment, which leads to teachers unable to complete teaching tasks and students unable to operate or difficult to operate. In the teaching process, many teachers adopt the method of "teaching students to practice". The teaching method is too simple, lacking inspiration for students' creative thinking, students cannot participate in it, and students are not the main body.

Maker-style information technology teaching should change the single teaching method, and use digital tools to present teaching content in a variety of ways, so that boring knowledge becomes vivid and interesting. Therefore, in classroom teaching, teachers should take the initiative to provide a learning platform to help students obtain learning resources related to teaching content efficiently and quickly, effectively carry out autonomous learning, find problems, analyze problems, and solve problems in the process of autonomous learning. The group cooperates to complete the task together, and then submits the works to the learning platform, conducts other evaluation, self-evaluation and teacher evaluation, and votes for outstanding works. Because diversified evaluation methods are more fair and equitable, students can correctly examine their own creations. Finally, students improve and optimize their own creations according to the suggestions made by others and teachers, and they can also use other people's source files to create again.

3.3. Too Much Emphasis on Test-taking Ability, Ignoring Individual Differences Of Students

Traditional teaching, especially in information technology subjects, places too much emphasis on test-taking ability. Since the subject of information technology is not included in the senior high school entrance examination, the information technology level test will only be carried out in the junior high school entrance examination, so it is not taken seriously by the school. All the content involved in the examination will be taught and practiced repeatedly. Because we only focus on the explanation of knowledge and the training of skills, we often ignore that each student has its own unique personality, and there are differences in psychology and physiology. Satisfying students' learning needs cannot stimulate students' interest in learning, thus weakening the cultivation of students' innovative ability.

The education under "Maker" not only emphasizes the training of knowledge and skills, but also emphasizes the teaching methods of individual tutoring or group teaching according to the

individual differences between students to promote the development of students' personality. In the learning process, we should pay attention to the individual differences among students, not to let off any creativity and ideas of students, and under the correct guidance of teachers, we will turn our creative ideas into reality like a maker.

4. Teaching Design of Junior High School Information Technology Courses under the Concept of Maker Education

4.1. Design Mode of Junior High School Information Technology Curriculum Based on Maker Concept

In order to better integrate the concept of maker education into information technology courses, many scholars have put forward their own views. On the basis of summarizing the experience of predecessors, this paper proposes four teaching design modes based on the concept of "wanting to learn", "able to learn", "imitation learning" and "creating learning".

4.1.1. "Want to Learn"—Create A Situation and Introduce A Topic

The creation of the situation is conducive to stimulating students' curiosity, mobilizing students' interest in learning, and making students "want to learn". At the same time, the situation created needs to consider the experience, ability and interest of the students, and combine examples, close to life, have real feelings, make students resonate, mobilize all positive factors to cultivate students' cognitive ability and association ability, and then strengthen students' creative thinking 's cultivation.

4.1.2. "Can Learn" - Brainstorming, Path Analysis

Brainstorm, analyze the feasibility of the project to be discussed, and realize "learning". During the project analysis, all the students brainstormed and guided the students to analyze the problems to be solved, the tools used in the process of solving the problems, and the ideas and effects of solving the problems, so as to gradually decompose the big problems into small problems, and the ideas gradually changed. To be clear, to further clarify the way to solve the problem.

4.1.3. "Imitation" - Independent Learning, Collaborative Creation

According to the learning platform provided by the teacher and the relevant resources published on the basic knowledge question and answer website, carry out self-study and master basic knowledge and skills. After clarifying the problem, the students first study independently, and then the group cooperates to assign tasks according to the characteristics of the students, and cooperate to solve the problem. In this process, teachers should not participate in the process, leaving enough space for students to think, divergent thinking, and "imitation learning".

4.1.4. "Creating Learning" - Sharing and Communication, Optimizing Creation

After the project is completed, the works can be submitted through the learning platform to achieve "learning creation". Watching group works, self-evaluation, other evaluation and teacher evaluation during the viewing process, put forward opinions, share and exchange, select excellent works, and give students affirmation and recognition. Then students make appropriate revisions according to the suggestions made by others, and can also use other people's source files for re-creation and optimization, so as to stimulate students' enthusiasm for creation.

4.2. Teaching Design Case: "Acquisition and Processing of Audio"

This paper takes the course "Acquisition and Processing of Audio" in the seventh grade of Yunnan Province's experimental textbook as an example, integrates the concept of maker

education, and analyzes the learning situation, teaching content, teaching resources, teaching objectives, teaching difficulties, and teaching links. and design, as shown in Figure 2.

subject	"Acquisition and Processing of Audio"		
Teaching object	first day	class	2 hours
Teaching content analysis	It involves the acquisition methods and methods of sound files, understands common sound file formats, and masters the playback, conversion and editing of sound files. Large capacity of knowledge and strong practicability		
education resources	Multimedia room, teaching courseware, learning platform, basic knowledge Q&A website, teaching materials, lesson plans		
teaching objectives	<p>1. Knowledge and skills (1) Understand the types of audio files and how to obtain them (2) Learn to use GoldWave software for simple audio editing (remove blanks, noise reduction, etc.)</p> <p>2. Process and method This class analyzes the general production process and method of sound works by assigning character dubbing to the animation "My Neighbor Totoro". Then, through brainstorming, path analysis independent learning, cooperative creation sharing and communication, optimizing the creative process, acquiring knowledge, mastering skills, and cultivating students' ability to process digital audio, so that students can actively construct general ideas and methods for processing audio files, and make certain innovations on this basis.</p> <p>3. Emotional Attitudes and Values (1) To mobilize students' enthusiasm for learning, and cultivate students to actively use multimedia processing tools to process and express information according to actual needs. (2) Cultivate students' innovative thinking, stimulate students' creative enthusiasm, and improve students' aesthetic taste and artistic accomplishment.</p>		
Difficulties in teaching	<p>1. Teaching focus: (1) Acquisition of audio files and common formats of audio files. (2) How to use GoldWave to edit and synthesize sound.</p> <p>2. Teaching difficulties: Use GoldWave for efficient editing on a task-by-task basis.</p>		
The first lesson in the teaching process			
Teaching link	teaching activity	plan for design	
1. Create a situation and introduce a topic	<p>Teacher's operation: Play a short animation clip of "My Neighbor Totoro" (remove the dubbing and background music in advance).</p> <p>Teacher: Okay, students have finished watching, do you know which anime this is? Student: "My Neighbor Totoro"</p> <p>Teacher: Yes, this is from Mr. Hayao Miyazaki, a famous Japanese animation director and manga artist. I'm sure everyone has seen this anime. Did you find any flaws when watching the short clip of "My Neighbor Totoro"? student: no sound Teacher: yes</p> <p>Deliberately questioning, leading to the content to be learned today - "Audio Acquisition and Processing"</p>	At the same time, the video is used to attract attention, and at the same time, design defects, stimulate students' imagination and learning interest, and lead to the learning theme of this lesson.	
2. Brainstorm, path analysis	<p>Teacher: First of all, please think about a question. If you were asked to dub the music for the anime clip of "My Neighbor Totoro", what steps would you divide to complete it? Student: [thinks and answers]</p> <p>Teacher: Yes, the students have considered it very comprehensively. To dub and compose music, we must first obtain the sound material we need. If the length or effect of the obtained sound material does not reach what we want, we can The material is processed, and after the processing is completed, the style of the animation "My Neighbor Totoro" can be reproduced.</p>	<p>Let the students brainstorm through each question, so that the big problem is gradually broken down into small problems, and the ideas gradually become clear.</p> <p>Let students understand the methods and ways of acquiring sound file materials.</p>	

	<p>Teacher's summary: acquisition of material - sound processing - finished product</p> <p>Teacher: To complete the task of dubbing and soundtracking, what sound materials do we need to prepare?</p> <p>Student: vocals, background music</p> <p>Teacher: How would you obtain these two materials?</p> <p>Student: We can record the vocals by ourselves, and the background music can be downloaded from the Internet, recorded by ourselves, obtained from the original video...</p> <p>Teacher: Yes, the students are very right. There are many ways to obtain sound files. You can not only obtain them through the Internet, but also record them yourself. Then the teacher will summarize the methods and methods for obtaining sound files.</p> <p>Teacher summary:</p> <p>Vocals: Voice Recorder Dubbing</p> <p>Background music:</p> <ol style="list-style-type: none"> 1. Online download 2. Get it from the original video 3. Read from CD 4. Mobile phone recording 	
3. Independent study, cooperative creation	<p>Have students learn how to use a voice recorder by referring to the basics quiz site on their own.</p> <p>Teams work together to make matching dubbing and background music for the animation clips, and play the original sound for students to make basic reference and be innovative.</p>	<p>Give students time for independent study.</p> <p>Creativity can start with imitation, and then innovate through imitation.</p>
4. Sharing and communication, optimizing creation	<p>Improve and optimize group works, such as recording vocals multiple times to make the vocals sound smoother, more natural, and full of emotion</p>	<p>Give students time to communicate</p>
The second lesson of the teaching process		
Teaching link	teaching activity	plan for design
1. Review the old knowledge, review the old and know the new	<p>Teacher: The task I assigned to everyone in the last class was to dub and score a small clip of "My Neighbor Totoro". We made matching vocals and background music, and obtained sound materials. Let's take a group now and listen to their group's recorded vocals.</p>	<p>Review old knowledge and prepare for the explanation of new knowledge.</p>
2. Brainstorming, Path Analysis	<p>Teacher: Okay, after listening, did you find any problems?</p> <p>Student: Recording is choppy, not smooth, has spaces in between, and is noisy (murmur)</p> <p>Teacher: Then what should we do?</p> <p>Student: Record several times, re-record, reduce noise...</p> <p>Teacher: Yes. I heard some classmates say that we can re-record, and the language can be fluent in multiple recordings, but there is still no guarantee that the re-recorded sound will be noise-free, and multiple recordings will waste a lot of time. At this time, we need to use our sound processing and editing software GoldWave to denoise the vocals we recorded.</p>	<p>Identify problems, solve problems, and make ideas clear.</p>
3. Self-directed learning and collaborative creation	<p>1. Referring to the demonstration video of the GoldWave usage method recorded by the teacher on the learning platform, the group will work together to edit the recorded sound appropriately (remove blanks, reduce noise), and mix the edited vocal with the background music.</p>	<p>Provide students with time for independent learning and innovation.</p>

	<p>2. Groups with spare capacity can try to add special effects (such as fade-in, fade-out, etc.) to the produced audio to make the work more perfect</p> <p>3. Self-study common sound file formats on the basic knowledge question and answer website.</p>	
4. Sharing and communication, optimizing creation	<p>1. Enter the work submission page to submit the works completed by the team, and self-evaluate and peer-evaluate other people's works according to the evaluation form, put forward suggestions and vote, select excellent works, and use other people's source files for re-creation and optimization.</p> <p>2. In the online forum of the learning platform, focus on the subject project of "audio acquisition and processing", and share their own experiences and insights in the process of dubbing and scoring the small clip of "My Neighbor Totoro".</p>	Effective use of learning platforms for sharing and communication.

Figure 2. Teaching design case

5. Conclusion

Based on the concept of maker education, this paper analyzes the current educational status of junior high school information technology courses, and concludes that the application of the maker concept and junior high school information technology teaching is a measure for the in-depth development of maker education. Therefore, based on the concept of maker, the author proposes four teaching design modes: "want to learn", "able to learn", "imitation learning", "creative learning", and carry out teaching design, hoping that this teaching design can really stimulate students' learning. Learning interest enables students to quickly engage in learning, and continuously improve their practical ability, innovation ability and information literacy in the process of inquiry and creation, so as to further optimize and improve information technology teaching.

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