CSCanada
Higher Education of Social Science
Vol. 7, No. 3, 2014, pp. 66-70
DOI:10.3968/5731

ISSN 1927-0232 [Print]
ISSN 1927-0240 [Online]
www.cscanada.net
www.cscanada.org

Research of Micro-Courses Construction Based on Knowledge Map

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Received 16 July 2014; accepted 5 October 2014
Published online 26 November 2014

Abstract

In recent years the micro-courses are quickly received extensive attention of the general education workers across the country, the establishment of micro-courses network, micro-course competition and so on marks the arrival of the era of "micro-learning". However, now the largest difficulty in improving students' learning efficiency by Micro-course lies in that micro-courses readily accessible to students are disorderly scattered on the Internet and it is difficult for students to choose from these courses with varying quality, rather than the limited resources of micro-courses. This article is intended to study these fragmentation forms of micro-course by using the knowledge map in order to build it into the curriculum system which can really develop micro-course into self-determination study courses.

Key words: Micro-courses; Construction; Knowledge map; Fragmentation

Zhou, X. J., & Dai, Y. T. (2014). Research of Micro-Courses Construction Based on Knowledge Map. *Higher Education of Social Science*, *7*(3), 66-70. Available from: URL: http://www.cscanada.net/index.php/hess/article/view/5731
DOI: http://dx.doi.org/10.3968/5731

INTRODUCTION

Micro-course is rapidly concerned by the vast majority of educational workers in recent years, it is the direct product of current education driven and catalyzed by "micro-era" development (Liu & Zhu, 2013). History is into the 21st century, all areas of social life are undergoing profound changes, development of network and communication technology has spawned new media ecological environment (Zhu, Zhang, & Gu, 2008), and micro-course wins in dapper (Huang, 2013). Undoubtedly, it caters to many people living in a society where a rapid, efficient and fast food-like culture prevails, but it also features with fragmented knowledge.

1. FRAGMENTATION AND THE CURRICULUM SYSTEM

In the application of existing micro-course resources, the most important thing is not too few resources available, but there is no existing micro-courses resources organized for effective use. In today's micro-courses construction there are generally issues like excessive dispersion, fragmentation, no systematic, low knowledge repetition utilization rate. Students cannot find effective micro-course resources in a timely manner when required, which is a waste of time. And because the content of micro-course is not systematic, it cannot be directly used as a self-study method for extracurricular learning. According to the constructivism learning theory, learning itself should be a constructive process, which not only has difficult point of knowledge, but also has general knowledge points to built difficult points support, and new knowledge learning is established on the basis of the old knowledge.

Actually in the traditional classroom learning, the content of each lesson is equivalent to a separate piece of knowledge. But in each lesson, the teacher usually reviews the learned knowledge at first, which is to build support, and then the interpretation of the new content. Although the content of each lesson is fragmented, the overall course is coherent. The presentation of knowledge follows the arrangement of easy issues before tough ones and depending on each other. Now the problem we need

to solve is to use some method to filter and collate the existing a large number of knowledge scattered debris on the network, and organize together to form a certain form of curriculum, to facilitate students' self-learning and reduce energy waste.

2. WHAT IS KNOWLEDGE MAP

In simple terms, knowledge map is a context diagram to show the hierarchical relationship between knowledge points, which not only can guide the student to study in order, but also can express interdependencies between knowledge points from ease to difficulty. Knowledge map is different from the concept map or mind map, because it is mainly used to illustrate the connection between the knowledge points, as well as the relationships among the difficult degrees of knowledge points. Actually, each micro-course video involves in a knowledge point. And it is not very mysterious to conclude various knowledge points into an organized system. The author argues that a system can be automatically built by sorting all micro-course video in a logical order and marking their relations with several lines. Therefore, a knowledge map is exactly what we need.

3. HOW TO INTRODUCE THE KNOWLEDGE MAP INTO MICRO-COURSES CONSTRUCTION

Using knowledge map into the study of micro-courses construction is not initiated nowadays. Currently the most famous one should be Khan Academy's knowledge map undoubted. Khan Academy knowledge map was shaped like some galaxies which links knowledge points among disciplines, and each discipline form a galaxy. Link law follows the interdependent relationship between the knowledge points, each micro-course is classified according to the hierarchy and the type of content. Take math for example, if students begin to learn from the most basic elementary mathematics, then they can click the knowledge map on the top left. Mathematics knowledge of general layout will be displayed, and students can choose according to their own needs to start watching a video clip. Each knowledge point contains multiple video clips, according to the order from ease to difficulty. Once one knowledge point is finished, a prompt to the next point will show on the bottom of the screen. Students can view their browsing history after logging into the website. While Khan Academy is currently quite popular in the world, they are not suitable completely on the current situation of Chinese compulsory education. Firstly, the language barrier, English interface and interpretation way is not a low threshold to the compulsory education stage students especially in the lower grades. Although the NetEase open class and Ku6 have translated part of the Khan Academy's courses and the Khan Academy itself has also translated some of its courses into Chinese, the blackboard text in translated video is still in English without Chinese explanation of the human voice, which is still difficult for some learners who read and understand slowly, to understand. Secondly, the subject of video content and the interpretation of the order is different from the China's education plans and steps, so the author thinks at least each subject in each school district is necessary to set up their own micro-courses network according to the school district's own learning situation, and build a knowledge map according to subject teachers' own understanding in each school.

It's not difficult to practicethe formation of micro-course by taking advantage of the knowledge map. Teachers can use tools such as Flash or PPT to do it. The first it is necessary to build the knowledge map. Take high school physics compulsory textbook 1 for example, the content is divided into four chapters, they are "The description of the motion", "The study of the uniform variable rectilinear motion", "Interaction", "Newton's laws of motion". In the actual construction of knowledge map, context of knowledge presentation doesn't distribute in sequence like in books, but stagger complex crisscross in summary or even less knowledge point and connect with each other, therefore, in the construction of knowledge map the fixed sequence of textbook should be broken to some extent and dig its true intrinsic link. So we can get the rid of chapter headings and present by summary titles or smaller titles, chapter title is dispensable and only used to divide

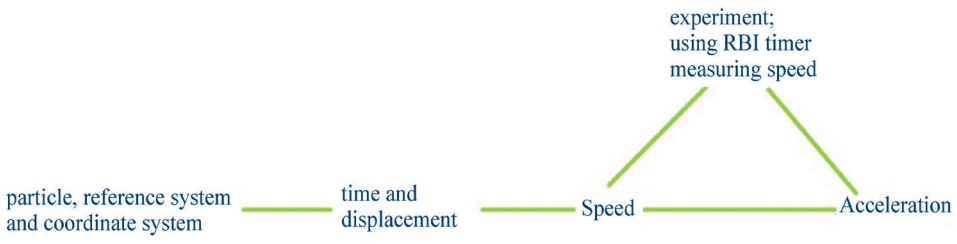

Figure 1
Formation of Knowledge Map

area where each knowledge point is located. From the first chapter of "1.1 particle, reference system and coordinate system" to "1.2 time and displacement," and "1.3 speed", overall showing progressive relationship, and the later knowledge point's content is rely on the understanding of previous content, so they are connected with a straight line in the sequential order. Section 1.4 "experiment: Using the RBI timer measuring speed" is teaching students to use the RBI timer, and as speed and acceleration measuring tools, this leads to 1.5 "description of the velocity change speed—Acceleration", therefore, the experiment, velocity and acceleration should be connected to each other, and place the experiment between the velocity and acceleration. Formation of knowledge map is showed in Figure 1.

Similarly, according to the intrinsic link of knowledge content, the second chapter 2.1 "experiment: To explore the rule of vehicle velocity change over time" is a transition for further study of uniform variable rectilinear motion after former learning of RBI timer and acceleration. Uniform variable rectilinear motion is divided into three sections discussing the relationship among "velocity and time", "displacement and time" and " velocity and displacement", so these three parts should be connected to each other, and are connected to 2.5 "free-fall motion". Free-fall motion is also involved in acceleration's learning, so back to be connected with the acceleration of 1.5. Continuing this process, the general law is not too much bounded to the order of textbooks catalog, but showing the real relationship between each knowledge point. After all, the existing of knowledge has always been connected and interdependent to each other, one knowledge point may be connected with several or even dozens of point. For example, in 3.1 "the interaction of forces" connecting knowledge points are as many as seven, because gravity, elasticity, friction forces are all involved in the interaction of forces, only a thorough understanding of forces interaction can make student understand the physical phenomena and regularity of gravity, elasticity and friction correctly. And the fourth chapter Newton's laws (include the first, second and third) are all generated based on the principle of forces interactions, so although they are in tandem position on category, the "forces interaction" should be connected with others as the center in the establishment of knowledge map.

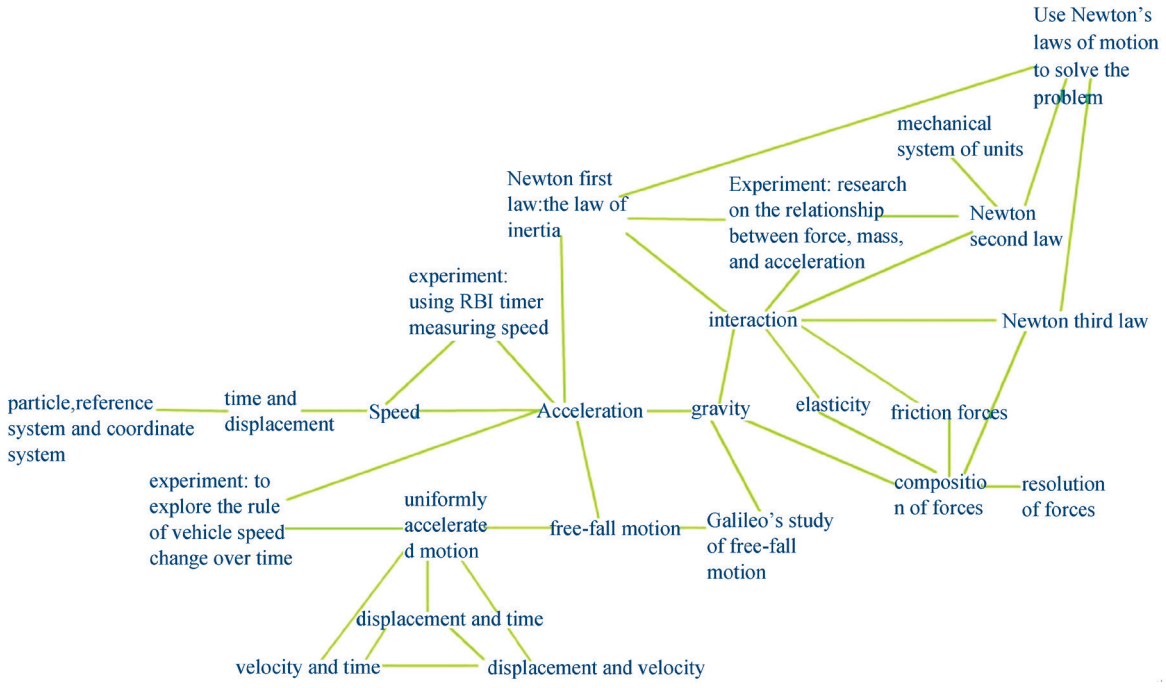

Figure 2
The Final Result of Knowledge Map

The final result of knowledge map is shown in Figure 2.

From left to right the whole map is in turn gradually from foundation to application, not only rearrangement of the materials, but also clarification of the progressive relationship between teaching material, which helps the students to understand the teaching material on the whole and enables each subordinate video not become fragmented.

Next, this knowledge map can be put in a PPT homepage and set button on each knowledge point. If a knowledge point is clicked, it will jump to another PPT page corresponding to this knowledge and the page can be embedded within the various micro-course video

gathered from the Internet. Currently there are various ways to get a great deal of micro-course resources. Teachers should usually pay attention to gather the useful and dapper micro-courses. For example, in Figure 1 "particle, reference system and coordinate system", its corresponding micro-course content can be divided into three categories—particles, the frame of reference, coordinate system. Micro-course videos corresponded by particles can be selected: a) Youku's micro teaching lesson: "particle—Author: Feng Changhe", this lesson makes a brief and thorough elaboration for what is a particle, video length is also consistent with the duration of students focused attention time; b) Youku's "online micro-course of high school physics classroom—particle model", this micro-course makes a detailed and concise instructions on how to build a particle model, which will further help the students identify meaning of particles, so as to avoid conception confusion for the students in future application. And the concept of reference frame is relative simple, generally the students can understand its meaning by reading textbooks, so it's hard to find a single and brief micro-course online about the reference frame. In the author's opinion, the micro-course does not necessarily reject textbooks, the acquisition of knowledge should be a kind of hybrid learning process to make the students not easily to be bored, and it is suggested that the students read textbooks to understand the section of reference system. If some students do not like reading and prefer to learn by watching video, teachers can also use screen recording software and other screen software or mobile phones to make a simple video for students to watch. There was a very detailed study of the concept of coordinate system in students' eighth-grade math curriculum, which is one of the teaching difficult points of the eighth-grade math. While in high school physics the concept of coordinates system is basically consistent with the one in eighth grade math, but the application of the coordinate system is far less complex. Therefore, the explanation of it in textbooks is just less than half of the page to represent this concept, which is not belonging to the teaching difficult points. Very few on-line micro-course video about high school physics coordinate system can be found on the internet, so the treatment process may be the same as the reference system. In this case there are a lot of video content, so this article will not enumerate. In general, the mixed and disorderly distributed or systematically explained micro-course resources are abundant on network at the present time, there are a lot of available micro-courses and experiments videos in the NetEase open class, Ku6, People's Education Press Website, Chinese micro-course network, Khan Academy and other networks, we can select the appropriate content according to oneself.

4. PRINCIPLES OF ESTABLISHING MICRO-COURSES BY USING KNOWLEDGE MAPS

Use knowledge maps to establish micro-courses that help to resolve the contradiction between learning systematic knowledge and unorganized micro-lessons. How to effectively use a knowledge map to build a micro-course? I think that several principles are worthy of attention.

4.1 Relying on Existing Subject Knowledge Maps to Select Micro-Lessons

On a concerned subject course, many experts have already thoughtfully considered the course content and we can think that the course content is consistent with students' cognitive laws. Therefore, when establishing a micro-course, we should fully rely on the existing knowledge system of the subject and use the existing knowledge map of the subject to establish the micro-course. When selecting micro-lessons, should use original names of the subject knowledge points for the established micro-course whenever possible in order to help learners and learning assistants to clearly find the learning content and make these micro-courses become more general.

4.2 Every Point (Node) in a Knowledge Map (Knowledge Point) Should Correspond to Micro-Lessons With Different Teaching Styles

When establishing a micro-course, micro-lessons with different teaching styles should be made to facilitate learners learning. In the traditional teaching, learners are generally able to get teaching resources from a certain teacher. However, it may lead to inappropriate situations to arise because of inconsistencies between learners' learning styles and the teacher's teaching style. In the micro-course system, it provides micro-lessons with different teaching styles to facilitate learners learning each identified knowledge point. It will help learners to find micro-lessons which meet their individual learning styles and avoid those inappropriate situations.

4.3 The Complicated Content and Form of Micro-Lesson Resources Should Be Simplified

The establishment of micro-courses is based on knowledge maps. The basic elements of a micro-course are micro-lessons which are students' learning resources. These resources should be based on learning objectives. In the establishment and selection of the resources, should fully follow teaching regularities of relevant subjects and construction laws of these subject systems. It is useful to select the content of micro-lessons to be easily understood and comply with learners' cognitive characteristics and levels. According to a learner's needs, select micro-lessons for him so he can quickly achieve his learning objectives. In this way, learning becomes

relatively simple through the use of micro-courses. When the selecting micro-lessons, we do not select micro-lessons that are complicated and are difficult to understand.

4.4 Use Knowledge Maps to Find Internal Relations of Micro-Lessons

A micro-lesson is designed for a certain knowledge point and it may happen that systematic internal relations among micro-lessons are not clear. Knowledge maps provide a graphical, systematic way to express relations of different knowledge and are visual images. Knowledge maps express relations of different knowledge that are not limited to linear relations in teaching books, but the network relations. Therefore, if a learner is studying a certain knowledge point and does not understand it, he can study several other knowledge points that directly connect to the knowledge point. It not only gives the learner more perspective thinking, but can enhance the learner's impression of relations among knowledge and make the learner more easily grasp the knowledge point. At the same time, this approach also allows designers and producers of micro-lessons to become more independent when they consider content of micro-lessons and helps micro-lesson transplant.

CONCLUSION

At present, there is the famous Khan Academy on the network, online electronic textbooks of People's Education Press, the teaching resources package established in regions and schools, and there are a lot of scattered micro-course videos and teaching resources online. In learning, the acquisition of knowledge is constructed from ease to difficulty. It becomes an urgent problem to build this fragmented knowledge forms of micro-courses into a curriculum system. The author hopes the knowledge map could be used to collect scattered knowledge on the network to form an integrated system which could adapt to subject teaching. Then the students can really use it during learning, not only reduce the search time, but also improve the repeated utilization factor of knowledge. This way is convenient and quite simple, it is possible for teachers to make suitable micro-courses with flexibility for their own class, which can truly implement the constructive teaching, "one to one" teaching and autonomous learning.

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