# Research on Educational Informatization Based on E-Context Theory: Taking Higher Mathematics as an Example

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## Abstract

The Internet context has presented significant challenges to education today. Higher education is characterized by complex educational relationships, diverse educational subjects, and virtual and realistic educational contents. As a basic public college course, advanced math is also beset by many problems like outdated educational resources, monotonous explanations, limited teaching methods, and low learning interest. It is therefore necessary to speed up the informatization of educational resources centered on micro-lecture resources, set up a SPOC teaching model based on the Internet context, and strengthen the systematic guidance to educational activities, in order to enhance education informatization in the Internet context.

**Key words:** E-context theory; Educational informatization; Higher mathematics; Countermeasures

## INTRODUCTION

Context refers to all information that can be used to determine the context in which the current subject such as person, place, object, etc. is located. The concept and model of E-learning Context was proposed by Zheng Yanlin et al. and a framework description of E-learning Context was proposed, that is, E-learning Context covers all elements defining e-learning scenarios, such as from physical environment to virtual space, from personal knowledge interest, knowledge background to social and cultural background, from explicit communication to implicit cognition, from technology to media to emotional state, etc. (Zheng, Li, & Wang, 2007, pp.17-21) The research on university education informatization based on E-context theory can better meet the requirements of the Ministry of Education's Quality Project on university education informatization, provide direct and objective practical basis for the design and organization of higher education interaction activities under the resource sharing environment, effectively accelerate the process of education informatization construction, and promote the networking and digitalization of modern education technology in university teaching and management.

## 1. EDUCATIONAL CHARACTERISTICS UNDER E-CONTEXT THEORY

### 1.1 The Complexity of Educational Relations

Dialectical materialism tells us that everything is in universal connection, and that things exist in a systematic way and are also connected with each other in a systematic way. In today's society, profound changes have taken place in world multipolarization, economic globalization, political democratization, value pluralism, secularization

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of life, people's ethics and moral consciousness. With the continuous progress of globalization, the existence and communication between people are becoming more and more diversified, and the responsibility highlights its moral value and social value in regulating interpersonal relationships. The independence of human beings based on the dependence of things has formed a universal social material transformation, a comprehensive relationship and a multi-dimensional system of needs. This system makes individual social relations more complicated and some of the connections revealed by education are more multilateral. In addition, the emergence of the network also makes the relationship between people more dynamic and randomized, which also leads to the complication of the individual education relationship. In 1998, Watts and Strogatz first introduced the Small-Wolrd network model and described in simple terms the fact that the number of relationships can be small but can connect the world, just as the relationship between people is relatively small compared to the whole social network, but other people who are far away and unrelated can be found through the nodes in the network *(Watts &* Strogatz, 1998*)*. This feature makes the educational relationship in the new era more complicated than the traditional educational relationship.

## 1.2  The Pluralism of Educational Subjects

In the broad relationship between subject and object, people and objects can be both subjects and objects. "Human beings, without exception, are part of the ecosystem. Everything is both subject and object, and human beings are no exception" (Griffin, 1998, pp.152-153). No matter how smart, rich and powerful human beings will become, in the broad coordinate system of subject and object, human beings are still without exception in the universal interaction of the physical world (Guo, 2011, pp.9-11). In the broad coordinate system of subject and object, the subjects of responsibility are more diversified, including individual subjects, group subjects, human subjects and objects. In addition to the substantive activity intermediary, there are also a large number of informational activity intermediaries among the multiple subjects, which are informational activity intermediaries used by human beings to express concepts, judgments, reasoning and other ideas using symbolic systems such as languages, words and numbers. In the complex network, the dynamic nature of the intermediary of information activities makes the education subject more diverse. In 1999, Barabassi and Albert pointed out in Science that the connectivity distribution of many practical complex networks is not of obvious characteristic length and is non-uniform, and such networks are also called scale-free networks (Barabasi & Albert, 1999). Small world and scale-free are the most representative characteristics of complex networks. The number of nodes in a complex network is huge, the network structure is complex, the connections are diverse, and the connection weights between nodes are also different, and there may be directionality.

## 1.3  The Two-phase Nature of Education Content

The scale-free and complex nature of E-context makes the education content also show the two-phase nature of reality and reality. If the education content dominated by massive open online course is the "virtuality" of the education content in E-context, then the real society still has the educational content formed by the ties of classroom education and campus culture, which are the "reality" of the educational content in E-context. The reality and virtuality of the education content in E-context will have various complicated influences on the individual education. As a special public space, cyberspace can not only effectively build a platform for public discourse, provide an open dialogue mechanism, but also have a strong role in radiating and strengthening public opinion. The content of education can be quickly spread and discussed by means of network public events, and thus can be identified and characterized. Therefore, cyberspace should permeate and embody the spirit of justice, fairness and openness. However, there are some problems in the real network space, such as the information is mixed and the authenticity is difficult to distinguish; Positioning entertainment and eroding moral bottom line; Alienation phenomena such as excessive commercialization and malicious distortion of facts. In the network space, the universality of the participants brings the diversity of opinions, among which the virtual self brings some irrational expressions, all of which make the content of education more elusive.

## 2.  PROBLEMS EXISTING IN THE PRESENT TEACHING SITUATION OF HIGHER MATHEMATICS UNDER THE THEORY OF E-CONTEXT

As a public required course for most majors in colleges and universities, Higher Mathematics has a far-reaching influence on the study of subsequent courses during the university period, and also plays an important role in cultivating students' logical thinking. However, in the actual classroom, the teaching content of higher mathematics is too much and the class hours are too tight, forcing the class contents to be arranged tightly. Teachers often cannot spend too much class hours dealing with knowledge beyond the teaching requirements. There are still some problems in teaching, such as dull theoretical explanation, single teaching means and low interest in learning. Therefore, it is necessary to re-examine the era context of university teaching according to the E-context theory and better promote the improvement of teaching level in the informatization construction of education.

Essentials of Education Informatization in 2016 issued by Ministry of Education points out that it is necessary to strengthen the development and application of high-quality digital education resources in higher education and promote the digital transformation of higher education courses. Micro-lesson is a digital teaching and learning resource which takes teaching video as the main carrier and teaches a single knowledge point or breaks through a certain teaching problem. The construction of foreign micro-lesson resource websites is relatively new and perfect, which has been applied in daily teaching. However, the practical application of domestic micro-lesson resources in teaching is still at the exploratory stage. Despite the emergence of many excellent single micro-lesson courses, there are few self-contained micro-lesson courses, and the single micro-lesson has little effect on the reform of university education informatization and the improvement of teaching quality.

# 3. COUNTERMEASURES OF EDUCATIONAL INFORMATIZATION BASED ON E-CONTEXT THEORY

## 3.1 Speed up the Informatization Construction of Educational Resources Centering on Micro-Lesson Teaching Resources

The foundation of education informatization based on E-context is the research and development of digital teaching resources. The research and development of Higher Mathematics micro-lesson resources is conducive to improving teachers' digital teaching resources construction level and professional level. It promotes teachers to dig more deeply into teaching resources, fully study teaching materials, promote construction through research and reform, and thus better promote the construction of mathematics teaching resources in Higher Mathematics. Micro-lesson is not a simple repetition of classroom teaching, but a deep processing of teaching materials. By building a new bridge of communication between teachers and students, starting with cultivating students' individual and autonomous learning in our school, we will manage and control teaching activities from all levels, strengthen application, strengthen practice and pay attention to actual effect, so as to achieve the sharing of resources between teachers and students. The construction of micro-lesson resources should follow the following steps: (a) Research and development of micro-lesson teaching topics. Conduct in-depth analysis of the syllabus and teaching materials of Higher Mathematics, combine the students' feedback information with their own teaching experience, design two major subject micro-lesson, namely, differential calculus and integral calculus. Each topic identifies 10 difficult and confusing points, a total of 20 micro-lesson resources, providing a good basis

for the development of micro-lesson resources. (b) Collect resources related to micro-lesson. Make full use of the national excellent course network, love course network, national university micro-lesson teaching competition website, NetEase teaching platform, etc. to collect materials and resources related to micro-lesson topics developed by the research group. The combination of higher mathematics and real life is very close, collecting the application of higher mathematics in architecture, economy and engineering, strengthening the combination of higher mathematics teaching and mathematics history knowledge, and increasing the interest and popularity of the course. (c) Teaching design of special micro-lesson. To sort out and classify the knowledge points and materials in the same topic, sort out their logical relations, and design micro-teaching for each knowledge point to ensure its representativeness, hierarchy and systematicness. Making corresponding micro-lesson teaching resources to broaden students' scientific thinking and knowledge. (d) Complete the recording of micro-lesson. It is also applied to the classroom teaching of Higher Mathematics. Through students' feedback information, the teaching effect is analyzed and the teaching resources are continuously further improved in order to achieve a satisfactory effect and spread to other classes and colleges. (e) The application of micro-course teaching resources. Using the Duifenyi network teaching platform, upload micro-lesson teaching resources, and use the platform to carry out interactive teaching of pre-class push, online practice, interactive discussion, etc.

## 3.2 The Teaching Informatization Reform of Mixed Teaching Model for Constructing SPOC

SPOC is the abbreviation of Small Private Online Course, literally translated as small restricted online course, which was first proposed by Professor Armando Fox of the University of California, Berkeley, in 2013 (Zhang & Xiao, 2015, p.15). SPOC is conducive to overcoming the disadvantages of MOOC in the application process, such as high dropout rate and single teaching mode, and at the same time it inherits the advantages of campus courses, thus becoming a new teaching mode. The characteristics of SPOC miniaturization and privatization are particularly striking. Because SPOC limits the scale of curriculum registration, teachers have enough energy to solve problems existing in students' learning process, thus increasing teacher-student interaction. The research on SPOC mixed teaching mode in China is still in the initial stage of exploration, lacking system platform construction and resource development. In particular, the application of SPOC in higher education is relatively small and there is a great space for exploration and application. The SPOC teaching mode can stimulate students' interest in learning. It collects relevant materials from various aspects and angles to enrich the teaching resources of micro-lesson, make the boring mathematics

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curriculum vivid, enhance students' interest in Higher Mathematics, and improve students' autonomous learning ability and innovation ability. The network teaching platform also enables students to develop their learning from classroom learning to mobile learning, which better meets students' personalized learning of the knowledge points of Higher Mathematics and learning according to their needs. It can not only check and fill gaps, but also strengthen the consolidation of knowledge and promote the reform of student-centered learning methods. Through the micro-lesson video, the interactive teaching activities between teachers and students on the Internet will help to promote the generation of interactive teaching mode of Higher Mathematics. The interactive teaching model regards teaching as a dynamic process of interaction and interaction between teaching and learning. By optimizing the way of teaching interaction, it forms a harmonious interaction between teachers and students, between students, and between learning individuals and teaching intermediaries in order to generate teaching resonance and improve teaching effect.

### 3.3 Strengthen the Systematic Guidance of Educational Activities in E-context

The construction of educational informatization based on E-context can not be separated from the systematic guidance of educational activities. Only by reasonably combining online independent learning with offline learning can the effectiveness of educational informatization be fundamentally improved. First, create an online self-learning guide. The effectiveness of mixed teaching mode of SPOC requires effective guidance of students' learning through the creation of students' online self-learning guide. According to the characteristics of the course Higher Mathematics and related materials, scientific analysis and treatment of the selected knowledge of the important and difficult points are carried out to meet students' personalized learning of different knowledge points. In addition, the learning guide should be enlightening and actively guided to guide students to complete their learning tasks in an effective time with refined language and rigorous derivation. Teachers should sort out and classify the knowledge points and materials in the same topic, and design a guide to self-study for

each knowledge point to ensure its representativeness, hierarchy and systematicness, scientifically guide students' self-study and broaden students' scientific thinking and knowledge. Second, optimize the effectiveness of online interaction. The application of the mixed teaching mode based on SPOC can not be separated from the good interaction between teachers and students on line and between students. Only by making full use of interactive functions such as online discussion and evaluation can students' thirst for knowledge and initiative be better stimulated. Online interaction enables students to have multiple identities such as problem proposers, problem solvers, and enlighteners when participating in the online discussion of SPOC. Students can promote each other by exchanging experiences with each other. Teachers need to improve their participation and guidance to better optimize the effectiveness of online interaction.

## CONCLUSION

Set up a SPOC teaching model based on the Internet context, and strengthen the systematic guidance to educational activities, in order to enhance education informatization in the Internet context.

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