Historical retrospect and future prospect of research on effective teaching in China——Knowledge mapping analysis based on the research over the past three decades (1986-2016)

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Abstract: This paper takes China National Knowledge Infrastructure (CNKI) as its literature data sources, and uses Bicomb and SPSS software to draw knowledge mapping for the hot spots of 290 papers about effective teaching in China from 1986 to 2016, so as to visually show the hot issues and development trend of effective teaching over the past three decades in China. The research shows that hot issues in effective teaching research over the past 30 years mainly fall into the following three categories: First, effective teaching studies on classroom teaching activities (from the perspective of teachers); Second, effective teaching studies under the background of new curriculum reform (perspective of curriculum reform); Third, effective teaching studies on students' self-learning (from the perspective of students). Effective teaching research in China in the future should grasp the following trends: Firstly, expansion of concept from static definition to dynamic understanding. Secondly, change of research perspective from focusing on teachers' teaching behavior to students' learning process and learning situation. Thirdly, deepening of research content from macro expound based on new curriculum reform to medium and micro research that combines core competence development of the students, the discipline core quality formation, and the implementation of specific curriculum standards. Fourthly, concordance of research methods from theoretical speculation and qualitative analysis to comprehensive study blending multiple research methods.

Keywords: effective teaching; knowledge mapping; co-word visualization

1. Preface and Literature Review

Although noticeably affected by western effective teaching concepts, and adducing many western research achievements, studies on effective teaching in China actually derive from the reflection on teaching quality and attention to teaching efficiency after the reform and opening-up in 1978. That year, an eminence Linguist published an article titled Two Urgent Issues in Current Chinese Language Teaching on China Daily, indicating the low efficiency of Chinese language teaching in primary and secondary schools which arouses extensive attention and in-depth discussions on the teaching efficiency in the education circle (Lu, S. X. 2002). In 2001, in order to respond to the new curriculum reform of elementary education implemented nationwide by Ministry of Education, researchers elaborate the concepts and strategies of effective teaching, as well as its origins and development. They thought that effective teaching is one of the ways to address current teaching issues in primary and secondary schools and is helpful to the constant deepening of the new curriculum reform (Zhong, Q. Q., Cui, Y. H., & Zhang, H. 2001). Under the influences.
and promotion of new curriculum reform, studies on effective teaching constantly increase and become a hot topic in the teaching and research field.

For thirty years, effective teaching concepts have led the constant deepening of teaching practices and effective teaching studies have achieved fruitful achievements. Scholars previously reviewed, summarized, and proposed future expectations on effective teaching studies, based on literature analysis methods. Based on the analyses on literature during 1997-2007, WANG and SHEN defined the research phase and characteristics of "effective teaching", summarized hot issues about effective teaching studies, and pointed out major issues existing in effective teaching studies (Wang, J., & Shen, Q. Y. 2008). LU collected literature on effective teaching studies during 1998-2008, and summarized major contents in effective teaching studies, introspected major issues, and proposed directions for future studies (Lu, S. J. 2009). SU has collected effective teaching studies since 1980s, summarized characteristics of effective teaching studies at different phases, and pointed out issues existed in the study and future trends in her master's thesis (Su, F. G. 2009). FAN and YE analyzed the history of "effective teaching" studies since 1990 and put forward the development trends of effective teaching studies against the backdrop of curriculum reform (Fan, W., & Ye, B. 2010). However, with respect to studies' time span, the above literature mainly focuses on the background of curriculum reform and summarize effective teaching studies from the perspective of a certain phase rather than the whole history; with respect to research methods, the above literature mainly adopts the literature analysis method, so the impacts of personal and objective factors are unavoidable and the systematically quantitative analyses are insufficient; and with respect to research conclusions, the above literature evaluates hot issues according to their classifications, but the classification standards are inconsistent and dynamic relationship among research topics is not comprehended.

Therefore, based on co-word analysis and knowledge mapping, this research tries to conduct visualization research on hot topics in China's effective teaching studies from 1986 to 2016 to reveal the deep relationship and development trends among hot topics in effective teaching studies.

2. Research Methods

(I) Data sources

Research data come from China Academic Journal Network Publishing Database. a total of 658 relevant papers are obtained by defining the journal publishing time as "1986-2016", journal category as core journals and CSSCI source journals, search condition chosen as subject terms, and search contents as effective teaching or words containing effective teaching and effective classroom.

In order to ensure the reliability and effectiveness of studies, literature unrelated to effective teaching, and non-research literature such as meeting minutes, profiles, and newspaper comments are further deleted, and 290 effective papers are obtained. On such basis, key words in effective literature are standardized, for example, "high-efficient teaching" is combined into "effective teaching"; "student learning" and "learning behavior" are combined into "learning activity".

(II) Research tools

The research tools include the Bicomb co-word analysis software and SPSS17.0 statistic software. Basic operation steps of Bicomb are as follows: selecting research data; collecting and sorting the data, and converting the collected CNKI database literature into ANSI-coded texts that can be read by Bicomb; conducting statistics on key word through the Bicomb; extracting statistic results; and conducting co-word matrix analyses on key words and exporting the co-word matrix (Cui, L. 2011).

(III) Research process

First, create a new project in the Bicomb co-word analysis software, with the format type "CNKI. Chinese. <TXT>"; second, choose 291 effective literature and input them into the "selection content"; third, conduct statistics on key words, obtaining 1005 results, and then, for the purpose of studies, extract 38 key words with frequency greater
than 5 as high-frequency key words; fourth, establish a co-word matrix of high-frequency key words; fifth, obtain a cluster tree graph by system clustering; sixth, conduct multiple dimensional analysis on the co-word matrix; seventh, draw a mapping knowledge domain on hot topics about effective teaching studies, and analyze this knowledge mapping.

3. Research Results and Analysis

(I) Frequency statistics and analyses on high-frequency key words

As the most visualized form of literature research contents and research methods, key words are summarized from studies on the literature. Based on the frequency statistics method of key words, literature information can be transformed into quantitative data for analyses. The frequency of key words can fully reflect the attention paid by the subject. Therefore, high-frequency key words are usually used to determine the hot topics in the research field.

Statistics on key words in China's effective teaching research literature and their frequency and percentage distribution are shown in Table 1:

<table>
<thead>
<tr>
<th>SN</th>
<th>Key word</th>
<th>Frequency</th>
<th>Percentage</th>
<th>SN</th>
<th>Key word</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Strategy</td>
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</tr>
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<td>0.36</td>
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<td>Teaching assessment</td>
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<tr>
<td>6</td>
<td>Teaching behavior</td>
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<td>26</td>
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<td>6</td>
<td>0.36</td>
</tr>
<tr>
<td>8</td>
<td>New curriculum</td>
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<td>0.60</td>
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<td>Effective teaching</td>
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</tr>
<tr>
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<td>9</td>
<td>0.54</td>
<td>28</td>
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</tr>
<tr>
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<td>0.54</td>
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<tr>
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<tr>
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<tr>
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<td>34</td>
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<td>Three-dimensional target</td>
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<tr>
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<td>Effective teacher</td>
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<td>0.30</td>
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</tbody>
</table>

Table 1. Statistics on High-frequency Key Words

As seen in Table 1, the accumulative percentage of 38 high-frequency words is up to 28.33%, making a certain contribution to the key word sample. Besides the effective teaching, the top 9 hot key words are: class teaching (30), learning process (21), teaching effect (21), learning activity (11), teaching behavior (11), teacher (10), new curriculum (10), self-studying (9), and teaching strategy (9). Such result preliminarily shows the studies on effective teaching in China mainly focuses on classroom teaching activity, teacher behavior and student activity in the teaching process. However, the statistical analysis on high-frequency key words is difficult to find the relationship among key words, the co-occurrence technology on key words is also needed to dig out the important information hidden among key words.

(II) Similarity matrix and analyses of high-frequency key words

In order to verify the relationship among key words, a word context matrix of 10 high-frequency key words are
created by Bicomb, and a co-word similarity matrix (10 × 10) is transformed from this word context matrix through SPSS17.0

<table>
<thead>
<tr>
<th></th>
<th>Effective teaching</th>
<th>Classroom teaching</th>
<th>Learning process</th>
<th>Teaching effect</th>
<th>Teacher</th>
<th>Learning activity</th>
<th>Teaching behavior</th>
<th>New curriculum</th>
<th>Teaching strategy</th>
<th>Self-study</th>
</tr>
</thead>
<tbody>
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<td>Effective teaching</td>
<td>1.000</td>
<td>0.086</td>
<td>0.000</td>
<td>0.085</td>
<td>0.248</td>
<td>0.000</td>
<td>0.094</td>
<td>0.049</td>
<td>0.156</td>
<td>0.000</td>
</tr>
<tr>
<td>Classroom teaching</td>
<td>0.086</td>
<td>1.000</td>
<td>0.120</td>
<td>0.159</td>
<td>0.105</td>
<td>0.110</td>
<td>0.055</td>
<td>0.173</td>
<td>0.000</td>
<td>0.243</td>
</tr>
<tr>
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<td>0.000</td>
<td>0.120</td>
<td>1.000</td>
<td>0.048</td>
<td>0.000</td>
<td>0.197</td>
<td>0.066</td>
<td>0.069</td>
<td>0.000</td>
<td>0.218</td>
</tr>
<tr>
<td>Teaching effect</td>
<td>0.085</td>
<td>0.159</td>
<td>0.048</td>
<td>1.000</td>
<td>0.000</td>
<td>0.066</td>
<td>0.132</td>
<td>0.069</td>
<td>0.000</td>
<td>0.073</td>
</tr>
<tr>
<td>Teacher</td>
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<td>0.000</td>
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<td>0.000</td>
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<td>Learning activity</td>
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<td>0.094</td>
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<td>0.095</td>
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<tr>
<td>New curriculum</td>
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<td>1.000</td>
<td>0.000</td>
<td>0.105</td>
</tr>
<tr>
<td>Teaching strategy</td>
<td>0.156</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<td>0.201</td>
<td>0.000</td>
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</tr>
<tr>
<td>Self-studying</td>
<td>0.000</td>
<td>0.243</td>
<td>0.218</td>
<td>0.073</td>
<td>0.000</td>
<td>0.000</td>
<td>0.105</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 2. Similarity Matrix on High-frequency Key Words

As seen in Table 2, the correlation of each key word to "effective teaching" from the highest to the lowest is "teacher" (0.248), "teaching strategy" (0.156), and "teaching behavior" (0.094). In addition, the correlations between key words "classroom teaching" and "self-studying" (0.243) as well as "self-studying" and "learning process" (0.218) are also very high. Such result shows, researcher, based on the classroom teaching activity, focuses on teachers' teaching activity and teaching strategy and considers students' self-studying at the same time. The co-word analysis based on matrix is able to provide the generally identical statistics on relationship among key words, however, it can’t reflect the real degree of dependence among key words. So, the system cluster and multiple dimensions are further needed for displaying the specific hot fields.

(III) Cluster graph and analyses on high-frequency key words

Cluster results are able to reflect the closeness degree among key words and further reflect the hot topics for studies on effective teaching. The cluster analysis on key words uses the following principles: taking the occurrence frequency of key words in a same article in pairs (co-word) as analysis object, using the statistical method of cluster, and concentrating closely related key words to form a clustered word group. During the cluster analysis on key words, the most influential key word (seed key word) is used to form a cluster, and then the seed key word in the cluster and its adjacent key word are combined to form a new cluster. The higher similarity degree two key words show, the shorter their distance is; otherwise, their distance is longer.
Figure 1: Tree cluster graph of key words

The cluster results are obtained after importing the similarity matrix into SPSS17.0 for cluster analysis, see Figure 1. According to the straight-line distance of clustered word groups shown in cluster analysis results, we can visually find that high-frequency key words in studies on effective teaching can be divided into three categories: Category I is effective teaching studies on classroom teaching activity (from the perspective of teachers); Category II is effective teaching studies under the background of new curriculum reform (from the perspective of curriculum reform); and Category III is effective teaching studies on students' self-learning (from the perspective of students).
Category I: Teacher, student, effective teaching, teaching design, teaching assessment, effective learning, effective teacher, teaching strategy, teaching feature, and teaching for knowledge

Category II: New curriculum reform, teaching quality, teaching activity, teaching thought, teaching process, teaching idea, three-dimensional target, teaching effect, teaching efficiency, and teaching study

Category III: New curriculum, cooperative research, classroom teaching, teaching situation, educator, curriculum standard, problem solving, learning process, effective teaching strategy, teaching feedback, self-studying, value orientation, and self-learning

Table 3. Cluster table of key words

Category I focuses on the effective teaching studies on classroom teaching activities (from the perspective of teachers), including such key words involved in the core elements of classroom teaching activities as teacher, student, effective teaching, teaching design, teaching assessment, and teaching strategy. Effective teaching refers to the effective, beneficial and efficient teaching in accordance with teaching rules. The teaching effectiveness is affected by many factors, among which teacher is a key factor (Liu, Y. Z., & Li, R. M. 2009), so the key of effective classroom teaching is to improve the quality of teachers (Zhou, X. Y. 2008). As targets of effective teaching are consistent with students' learning demands, so the foundation of establishing effective teaching targets is to improve students' thinking ability, satisfy students' learning interests, and establish trust and respect between teachers and students (He, L. J., He, L. X., & Tang, Y. G. 2006). However, effective teaching cannot happen by chance, and teaching design is the bridge of effective teaching concepts and practices. Teaching design should follow the target of promoting student progress, begin with analyzing students' learning demands and deciding teaching objectives, strive for conducting thorough analyses and proposing effective teaching schemes, use the tools of reasonably selecting teaching methods, properly adopting teaching media, flexibly formulating teaching strategies, conduct monitoring and regulation based on the objective, scientific assessments and reflections on teaching activities, and reach the final purpose of win-win results between teachers' teaching quality and effective teaching. Therefore, a scientific and reasonable teaching design is the requisite for effective teaching (Dai, F. M. 2012). Effective teaching strategy has been a hot study topic recently, especially the teaching strategy for self-learning, cooperative learning and inquiry learning (Yang, L. Q., & Fu, C. Q. 2008).

Category II is about the effective teaching studies under the background of new curriculum reform (from the perspective of curriculum reform), including key words as new curriculum reform, teaching quality, teaching activity, teaching thought, three-dimensional target, teaching idea and so on. The new curriculum reform is a comprehensive concept reconstruction of the complicated teaching activity, covering curriculum orientation, textbook selection, classroom teaching strategy, specific teaching methods, teachers' teaching behavior, and students' learning behavior. Against this backdrop, more and more teachers gradually understand and update their concepts on curriculum and teaching, and put the "inquiry, cooperative and open teaching and learning methods" into practice (Li, R. C. 2009). The teaching quality idea is not only a concept reflecting the current education reform, but also a practice affecting the direction and quality of effective teaching in primary and secondary schools. The reshape of teaching quality idea has become a key to the improvement of teaching effectiveness in primary and secondary schools, so the value goals should shift from the single-pole orientation to integration orientation which greatly differs from the former one regarding to thinking mode and contents. Establishing the integration-orientated teaching quality idea needs to follow the innovative logic of concept-action interaction and improve teachers' professional ethics based on their responsibilities (Liu, W. H. 2012). The new curriculum reform emphasizes an independent, cooperative and inquiry learning way, and requires changing the indoctrinating teaching into an experiential, participatory, and self-regulated learning, so as to highlight students' self-studying and self-regulated abilities in learning, establish a classroom where students are vigorous, and enhance the effectiveness of classroom teaching. Teachers should change the traditional conducts and concepts of "teaching before study" and establish the effective teaching idea of "teaching after study" (Han, L. F. 2008).

Category III is the effective teaching studies on students' self-learning (from the perspective of students). The study
angle shifts from teaching to other elements related to students' self-learning, such as new curriculum, teaching situation, educator, curriculum standard, teaching feedback, self-studying, and value orientation. Since the implementation of new curriculum, numerous educators, especially front-line teachers, have conducted many positive and conducive explorations on improving the teaching effectiveness, but there still are many problems and questions. The real effective teaching requires building up the effective teaching idea under the background of new curriculum, understanding and optimizing students' physiolog, and correctly grasping the relationship between "teacher explanation" and "student activity" (Pang, H. Y. 2012). The new curriculum requires students shift the learning method from passive and dependent to positive and self-regulated. The effective teaching strategy for students' self-studying includes shifting teaching idea and building the people-oriented teaching idea; arising the internal motivations on learning and keeping a lasting motivation on self-regulated learning; developing the metacognitive strategy to help students master the self-regulated learning; strengthening the thinking training to help students build independent thinking; and optimizing classroom teaching structure to make students become masters of their studies (Li, Z. H. 2005). Effective teaching needs to distinguish different value orientations, as the education goals and effective teaching methods between different value orientations differ greatly. Effective teaching has three value orientations: scientism-based effective teaching focuses on the reception learning and repetitive training to make students master basic knowledge and basic skills in a fast and efficient way; the constructivism-based effective teaching focuses on explorations and investigations to develop students' high-order thinking skills and creativity; and the humanism-based effective teaching focuses on creating a favorable learning atmosphere to inspire students' emotional experience and arouse students' souls and spirits (Yue, X. Y., & Dong, H. J. 2014). In addition, effective teaching feedback is an indispensable part of the effective teaching process and an essential way for implementing effective teaching activities and completing teaching tasks. Only those correct, targeted, instructive, inspiring, diversified, and interactive teaching feedbacks can play their roles in effective teaching and learning (Peng, H. X. 2009).

(IV) Knowledge mapping and analysis of effective teaching research hotspots

In order to further explore the implied meaning between the keywords, effective teaching research hotspots map was drawn out by SPSS17.0, which conducts multidimensional scaling analysis on the similar matrices formed by the 38 keywords, see Figure 2. In this strategic diagram, small circles are used to indicate locations of keywords. The more related the keywords are, the closer circles locates, and vice versa.

As can be seen from Figure 2, research topics of type 1, such as effective teaching, effective teachers, effective learning, teaching strategies and evaluations locate mainly in the first quadrant. They have high density and centripetal degree, each having closer relation with others. This indicates that resourceful researches have been made on them by researchers. Research topics of type 2, such as new curriculum reform, quality of teaching, thought of teaching, teaching process and three-dimensional target locate mainly in the second quadrant, boasting active researches. However, it can be seen that teaching activity and teaching concept are in loose relation with the subject, indicating that they have difference despite their certain relations. Research topics of type 3, such as learning process, teaching situation, subjectivity, cooperative research, teaching feedback, independent learning and curriculum standards locate mainly in the third and fourth quadrants. Some of the keywords are closely related, but research results are less, and they have not been given enough importance to, being peripheral in effective teaching. Above all, Figure 2 demonstrates the rationality of three-type classification of effective teaching through a more intuitive form. Meanwhile, it indicates the future trend of effective teaching research.
4. Conclusions and Prospects

Based on the above research and analysis, it can be concluded that hot topics on effective teaching over the 30 years mainly concentrate on three aspects. First, some researches of effective teaching focus on class teaching activities. This aspect starts from the basic elements and links of teaching activities and focus on teaching behavior and effectiveness of knowledge teaching. Meanwhile, they also discuss essential issues, including the meaning, features, standards and strategies of effective teaching. Second, effective teaching research under the background of new curriculum reform. This aspect examines effective teaching by putting it under the background of new curriculum reform, emphasizing the intrinsic consistency between effective teaching and new curriculum reform and concerning the attainment of three-dimensional target during the teaching process. Third, some researches on effective focus on the independent learning of students. This aspect stresses the subjectivity of students, appreciates cooperative study and problem solving, and concerns students’ learning process and specific teaching situation.

In general, thirty years of effective teaching research conforms to the practical requirement for new curriculum reform of basic education in our country and further promotes the development of practical teaching and teaching theory. In the future, the following trends should be seized in the research of effective teaching:

The first is the expansion of concept from static definition to dynamic understanding. Since the new round of curriculum reform of basic education, many researchers have been trying to define effective teaching. From “teaching performance outlook” (Cui, Y. H. 2001) on education that aims to promote students’ learning and development, to “trebling meaning outlook” (Yu, W. S. 2012), to “dynamic level outlook” (Long, B. X., & Chen, X. D. 2005) et al, scholars continuously try to define and interpret the concept of effective teaching. Many scholars query the rationality of this concept itself as well. Actually, according to the history of effective teaching research at home and aboard, effective teaching is not a fixed or static concept, but one that constantly changing as teaching practice changes (Chen, X. D., & Keith, S. 2005). Therefore, we should change our view on effective teaching from static concept definition to dynamic understanding, and expand and enrich the connotation of effective teaching through teaching practice, which should be important contents in future effective teaching research.

The second is the change of research perspective from focusing on teachers’ teaching behavior to students’ learning
process and learning situation. Teachers' teaching behavior is an important perspective of effective teaching research. Through the specific behavior of teachers, we can understand and grasp the characteristics of effective teaching, which is good guidance to effective teaching practice. However, teaching is a bilateral activity involved both teachers and students. If we simply focus on the characteristics of teachers or teaching behavior, we will ignore the subjectivity of students and fail to consider the context and complexity of teaching. Therefore, changing research perspective from teacher to student and focusing on students' learning process and situation means that effective teaching research should turn from abstract and generic strategy to specific and individual one.

The third is the deepening of research content from macro exposition based on new curriculum reform to medium and micro research that combines core competence development of the students, the discipline core quality formation, and the implementation of specific curriculum standards. The impact of the new curriculum reform is indispensable to the rise and prosperity of effective teaching research, so a lot of researchers put effective teaching under the background of the new curriculum reform, trying to fit the two aspects. It is an attempt to localize the study, and also promotes the development of the new curriculum reform. However, if we want to promote the continuous deepening of the curriculum reform of basic education, the study of effective teaching should not remain in the macro exposition under background of the new curriculum reform, which has more theoretical than practical meaning. Therefore, only by changing from theory to practice and combining medium and micro research that integrates core competence development of the students, the formation of discipline core quality, and the implementation of specific curriculum standards, can effective teaching research enjoy more vitality.

The fourth is the concordance of research methods from theoretical speculation and qualitative analysis to comprehensive study blending multiple research methods. For the research of effective teaching, domestic scholars either focus on theoretical speculation, interpretation of the meaning of effective teaching, and identifying the characteristics of effective teaching, or only conclude experience and explain the difficulties, reasons and ways of effective teaching. However, pure philosophical speculation and empirical induction are not enough to conduct scientific research. Only when qualitative and quantitative researches are combined together, can it be possible to achieve the ideal state of revealing the original appearance and nature of things. Therefore, the breakthrough and innovation of effective teaching research depends on the transformation and innovation of research methods.

References

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