

Construction and Application of Digital Teaching Resources in Regional Basic Education

—Taking Physical Education Courses as an Example

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Abstract

Digital teaching resources are the core cornerstone of educational informationization. Their construction and application level determine the pace of educational modernization. Digital teaching resources for basic education are an effective guarantee to solve the problem of educational equity in urban and rural areas and promote the co-construction and sharing of high-quality scientific and technological education information resources. Based on the reality of uneven distribution of basic education resources in different regions of China, taking physical education courses in Yueyang District of Hunan Province as an example, this paper studies the problems existing in the construction and application of digital teaching resources in regional basic education, and puts forward corresponding countermeasures and suggestions, which can provide reference for the reform and development of information-based teaching in basic education in relevant regions of China.

Keywords

Regional Basic Education, Digital Teaching Resources, Co-Construction and Sharing

1. Introduction

The report of the Nineteenth National Congress pointed out that priority should be given to the development of education and the modernization of education. Our country has a vast territory and uneven distribution of resources. The regional

differences of teaching resources in basic education are particularly prominent. On December 24, 2018, the Hunan provincial education conference was held in Changsha. When governor Xu Dazhe spoke, he pointed out that we should strive to explore the experience of deep integration of information technology and education and teaching, promote “Internet + education” and expand the beneficiaries of quality education resources. Digital teaching resources are the core cornerstone of educational informationization (Fang & Huang, 2012). Their construction and application level determine the pace of educational modernization. Digital teaching resources for basic education are an effective guarantee to solve the problem of educational equity in urban and rural areas and promote the co-construction and sharing of high-quality scientific and technological education information resources (Wang, 2016). Taking the physical education curriculum in Yueyang District of Hunan Province as an example, this paper studies the co-construction and sharing of digital teaching resources in regional basic education, and summarizes the experience in order to provide reference for the reform and development of basic education in relevant regions of China.

2. Research Objective

On September 11, 2017, the Yueyang Municipal People’s Government Office issued the Outline Implementation Plan of the Action Plan for Scientific Literacy of the Whole People in Yueyang City (2016-2020). It requires the Municipal Education and Sports Bureau and the Municipal Science and Technology Bureau to take the lead in implementing the Action Plan for Scientific Literacy of Youth. The plan should be based on the core literacy system of student development, implement the contents of technical education in primary and secondary schools, and strengthen inquiry learning Guidance to improve the consistency and integration of scientific literacy among mathematics, physics, chemistry, biology and other disciplines. The importance to the popularization and application of information technology should be attached to accelerate the informatization of education (Chen, 2015), continue to strengthen the development and application of high-quality digital education resources, and “make full use of information technology means to balance the allocation of scientific and technological education resources”. We will promote the co-construction and sharing of high-quality scientific and technological education information resources. This project investigates and analyses the current situation of the construction and application of digital teaching resources for basic education in Yueyang area, diagnoses the existing problems and puts forward some countermeasures, aiming at providing reference for the decision-making of the Party Committee and the government of Yueyang area on the informatization construction of basic education.

3. Research Object and Research Method

3.1. Research Object

This project is aimed at 65 primary and secondary schools in Yueyang. A total of

169 teachers were surveyed. This project is aimed at 65 primary and secondary schools in Yueyang. A total of 169 teachers (including resource providers, resource managers, resource platform operators, education managers and resource users) were surveyed. The coverage of the project research institute is shown in **Table 1**.

Table 1. Schools and teachers in Yueyang City covered by project survey.

Baiyangpo Primary School (1)	Qianlianghu Mingde Primary School (5)	Station Primary School (1)	Kangyue Primary School (1)
Beigang Primary School (2)	Qiaoxi Primary School (1)	Yueyang No. 1 Middle School (8)	Yueyang Foreign Language School (1)
Binhu Primary School (1)	Youth Road Primary School (3)	Yueyang No. 2 Middle School (4)	Yueyang Yali Experimental School (1)
Chaoyang Primary School (26)	Wang Jiahe Primary School (1)	Yueyang No. 6 Middle School (7)	Miluo Leishi School (1)
Chenglingji Primary School (1)	Wangyue Primary School (1)	Yueyang No. 9 Middle School (29)	Dongting Lake School (1)
Dongcheng Primary School (2)	Culture Road Primary School (1)	Yueyang No. 10 Middle School (3)	Pingjiang Siyuan Experimental School (3)
Dongfanghong Primary School (4)	Wuli Primary School (2)	Yueyang No. 12 Middle School (2)	Yunxi Middle School (1)
Dongfeng Lake Primary School (1)	Pioneer Road Primary School (1)	Ruxi Middle School (1)	Beigang Middle School (7)
Maple Elementary School (1)	Xincheng Primary School (2)	Sanyang Middle School (2)	Fifth Middle School of Huarong County (1)
Guiyuan Primary School (1)	Xinkou Primary School (1)	Shiqiao Middle School (1)	Junshan Middle School (1)
Guoxing Primary School (1)	New Wall Central Primary School (3)	Changling middle school (9)	Linxiang Ruxi Middle School (3)
Huabanqiao School (2)	Sunrise Primary School (4)	Pingjiang Qiming Middle School (3)	Liutang Middle School (1)
Huaguodian Primary School (2)	College Road Primary School (14)	Pingjiang No. 10 Middle School (1)	Fourth Middle School of Miluo City (3)
Golden Owl Primary School (1)	Yanshou Primary School (7)	Pingjiang Shimao Middle School (2)	Primary and Secondary Schools in Nanhu New Area (1)
Jinheng Primary School (1)	Yanglin Central Primary School (1)	Yueyang Huzhou School (1)	Lengshuipu Primary School (1)
Jiuhuashan Primary School (1)	Zhandong Primary School (1)	Yueyang Qiming Middle School (1)	Changsha Primary School (1)
Qianlianghu Experimental Primary School (1)			

3.2. Research Method

Questionnaire survey and interview were used in this study. Questionnaires were made through the questionnaire star website. QQ group and Wechat group were used to send websites or two-dimensional codes. 155 valid questionnaires were collected, covering 20 curriculum categories in primary, junior and senior middle schools. The current situation of resource application, access to resources, quality of resource types, use of resources, resource demand and other aspects were investigated. By interviewing the principals of primary and secondary schools and the directors of the Information Technology Center of the Bureau of Education, we can understand the policy formulation and implementation effect of information-based teaching, the realistic demand of digital teaching resources in primary and secondary schools and the bottleneck of its development.

4. Construction and Application of Digital Resources in Regional Basic Education

4.1. Analysis of the Current Situation of Digital Resources Construction of Basic Education in Yueyang District

Statistical analysis of 155 valid questionnaires collected from 65 primary and secondary schools in Yueyang area. There are differences in the construction and application of digital teaching resources for 20 courses in primary, junior and senior middle schools. Among them, sports and health accounted for 57, accounting for 36.77%, and extra-linguistic courses accounted for 17.42%, mathematics 23 for 14.84%, and English 9 for 12.26%. According to the survey sample data analysis, the construction and application of digital teaching resources in basic education in Yueyang City are unevenly distributed. Physical education and health courses are generally better, and some achievements have been made in addition to the number of languages. Other courses are still in the initial stage (as shown in **Figure 1**).

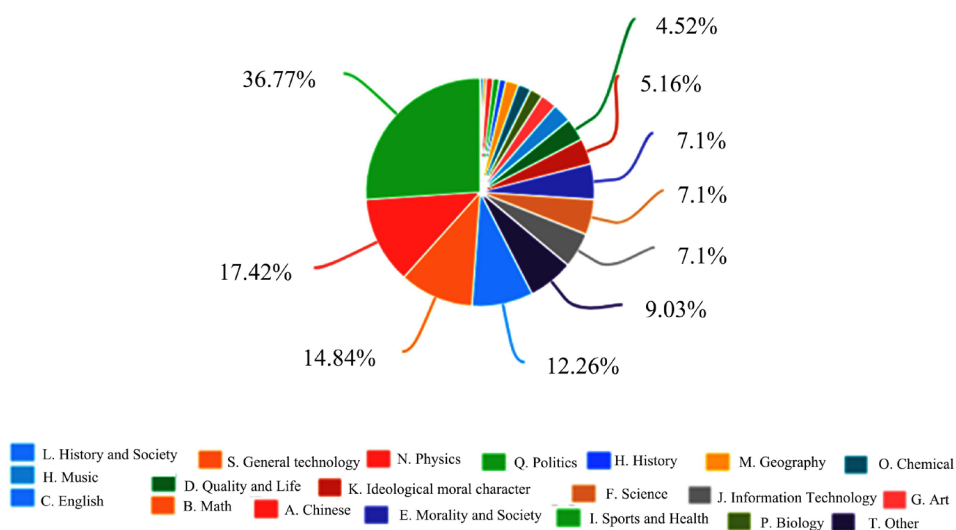


Figure 1. Questionnaire relevant to the curriculum of primary and secondary schools.

Further interviews revealed that on November 5, 2013, Yueyang Education Bureau launched the activity of “Identifying the First Batch of Famous Teachers’ Studios in Primary and Secondary Schools in Yueyang City”. On February 20, 2014, Yueyang Education Bureau forwarded “Innovating the Teaching Implementation Scheme of ‘Phonology, Physical Fitness’ in Rural Primary and Secondary Schools by Using Network Learning Space” and “Sports, Music and Beauty in the Second Primary and Secondary Schools in Hunan Province”. The announcement of the organizational plan of the network course resources evaluation activities for technical and health education teachers shows that the activities carried out by local educational administrative departments have played a positive role in promoting the construction of digital teaching resources for basic education.

4.2. Problem Diagnosis of Digital Resources Construction of Physical Education Courses in Primary and Secondary Schools in Yueyang Area

The construction of digital teaching resources in basic education has gone through many forms. Famous teachers’ studios based on network environment, network learning space and network curriculum resources are all the specific types of digital teaching resources. Teachers are the concrete builders and applicators of digital teaching resources. Physical education teachers’ personal information literacy has a direct impact on the construction and application of digital teaching resources. Teachers in the field of basic education need to improve their own information literacy.

Judging from the results of this survey, most teachers in the field of basic education in Yueyang City pay more attention to their own information literacy learning and upgrading. They study independently through national education resources platform (61.94%), regional education resources platform (47.1%), school-based digital resources (46.45%) and commercial search engine (54.19%) and so on. These are also the numbers they use in teaching. The main source of the teaching resources of Chinese characters. At the same time, most primary and secondary school P.E. teachers also pay attention to learning from each other and improving the community through teacher/teaching and research group sharing (61.94%) in their daily work. The use of digital teaching resources in teaching is relatively small (30.32%) by individuals and 32.26 by individuals, which may be related to the relevant policy support and financial input of schools. For example, Dongfanghong Primary School signed a contract with Tencent to build a smart campus with remarkable results, because the school leaders attach importance to and try to use limited funds for information construction (**Figure 2**).

4.3. Demand Analysis of the Application of Digital Resources of Physical Education Curriculum in Primary and Secondary Schools in Yueyang

Digital teaching resources are a new form of teaching media (**Chen, 2015**).

Compared with traditional teaching resources, digital teaching resources have many advantages, such as shortening the cycle of knowledge updating, widespread sources of teaching resources, diverse forms of teaching media, and two-way interaction of teaching process. To a certain extent, teachers can stimulate students' interest in learning, improve teaching efficiency and improve teaching level by using digital teaching resources to assist teaching practice.

According to **Figure 3**, the survey shows that primary and secondary school teachers in Yueyang area need more digital teaching resources (85.16% of the total). 32.9% of teachers use digital teaching resources in almost every class, and it is common to use them once or twice a week (25.16% of teachers often use them and 27.1% of teachers sometimes use them). This shows that the use of digital teaching resources to assist teaching has basically become the normal behavior of most primary and secondary school teachers in Yueyang, but there are still some teachers who rarely use or never use digital teaching resources.

In order to better understand the situation of primary and secondary school PE teachers in Yueyang area using digital teaching resources to assist daily teaching, we designed some specific forms of digital teaching resources in the questionnaire survey (such as PPT courseware, micro-lessons, teaching video, lecture video, case studies, test papers, online courses and teaching space, etc.). The results of the survey, such as **Table 2**, are shown in preparing lessons. PPT courseware occupies the mainstream in 71.61% and 76.13% of classroom teaching. Digital teaching resources such as micro-lesson and video are vivid and intuitive, and they have basically become the basic components of other forms of digital teaching resources. The proportion of micro-lessons, videos, cases, online courses and teaching space used by physical education teachers in preparing lessons is about 50%. In classroom teaching, resources such as micro-lessons, videos and cases are also widely used. In contrast, the digital teaching resources mentioned above are less used in experiments, homework corrections, examinations and research links, which may be related to different types of courses taught by different teachers.

Using digital teaching resources to assist teaching needs necessary teaching software, teaching platform and other tools. The survey also focuses on the use of digital teaching tools by physical education teachers in primary and secondary schools in Yueyang City (as shown in **Table 3**). The data show that in each teaching link, teachers use different teaching tools, including specialized subject teaching software, multimedia courseware making tools, digital teaching resources platform, network teaching and research platform and network teaching platform. Lesson preparation and classroom teaching are mostly used (accounting for more than 50%). The second is the use of marking tools (38.06%) in the examination process, and the use of instant messaging tools (QQ, Wechat, etc.) in teaching and research (34.84%). With the popularity of smart phones, teachers will use some assistant teaching apps in preparing lessons, classroom teaching, experiments, homework corrections, examinations and teaching and research.

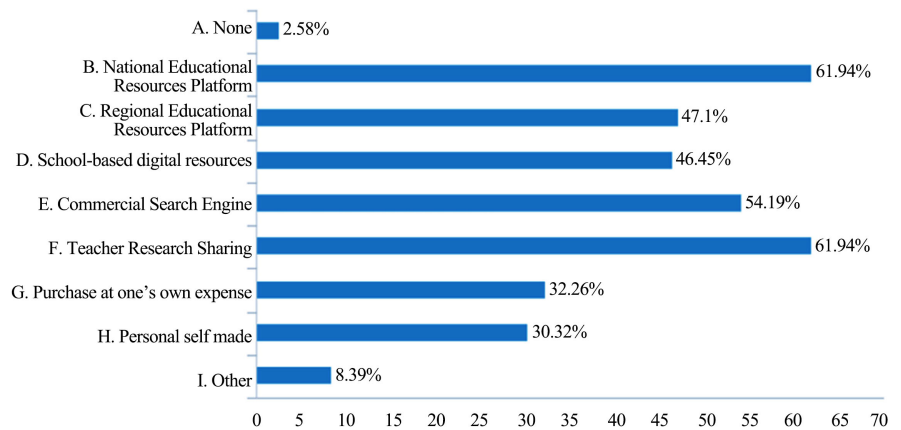


Figure 2. Construction of digital resources of physical education courses in primary and secondary schools in Yueyang Area.

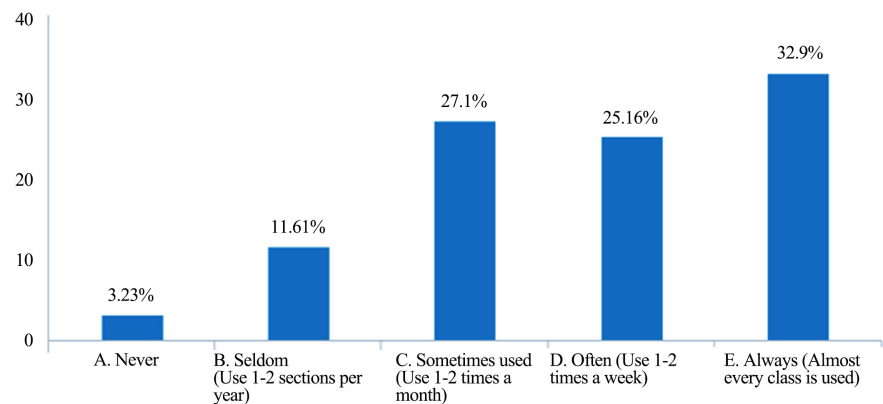


Figure 3. The application demand of basic education digital resources in Yueyang.

Table 2. Types of educational digital resources used in physical education courses of primary and secondary schools in Yueyang Area.

Item	Lesson preparation	classroom teaching	experiment work	correction	examination	teaching research
PPT	111 (71.61%)	118 (76.13%)	30 (19.35%)	21 (13.55%)	27 (17.42%)	57 (36.77%)
Micro lesson	77 (49.68%)	81 (52.26%)	32 (20.65%)	17 (10.97%)	15 (9.68%)	34 (21.94%)
Teaching Video	74 (47.74%)	88 (56.77%)	27 (17.42%)	20 (12.9%)	16 (10.32%)	38 (24.52%)
Speaking Video	81 (52.26%)	62 (40%)	24 (15.48%)	21 (13.55%)	15 (9.68%)	51 (32.9%)
Example	90 (58.06%)	83 (53.55%)	26 (16.77%)	22 (14.19%)	19 (12.26%)	47 (30.32%)
Test Paper	70 (45.16%)	55 (35.48%)	22 (14.19%)	31 (20%)	71 (45.81%)	19 (12.26%)
Online Course	82 (52.9%)	70 (45.16%)	29 (18.71%)	18 (11.61%)	19 (12.26%)	39 (25.16%)
Teaching Web Space	83 (53.55%)	68 (43.87%)	26 (16.77%)	22 (14.19%)	19 (12.26%)	46 (29.68%)

Table 3. Types of educational digital resources used in physical education courses of primary and secondary schools in Yueyang Area.

Item	Lesson preparation	classroom teaching	experiment work	correction	examination	teaching research
Special Subject Teaching Software	97 (62.58%)	90 (58.06%)	27 (17.42%)	20 (12.9%)	23 (14.84%)	38 (24.52%)
Multimedia courseware making tools	105 (67.74%)	100 (64.52%)	26 (16.77%)	11 (7.1%)	14 (9.03%)	34 (21.94%)
Digital Teaching Resource Platform	87 (56.13%)	76 (49.03%)	34 (21.94%)	19 (12.26%)	21 (13.55%)	38 (24.52%)
Network Teaching and Research Platform	93 (60%)	73 (47.1%)	28 (18.06%)	18 (11.61%)	13 (8.39%)	51 (32.9%)
Network Teaching Platform	86 (55.48%)	78 (50.32%)	28 (18.06%)	14 (9.03%)	18 (11.61%)	45 (29.03%)
Marking tool	50 (32.26%)	45 (29.03%)	27 (17.42%)	38 (24.52%)	59 (38.06%)	22 (14.19%)
Achievement analysis tools	52 (33.55%)	43 (27.74%)	22 (14.19%)	30 (19.35%)	72 (46.45%)	20 (12.9%)
Instant Messaging Tools (QQ, Wechat, etc.)	85 (54.84%)	73 (47.1%)	24 (15.48%)	38 (24.52%)	34 (21.94%)	54 (34.84%)
Smartphone APP	89 (57.42%)	68 (43.87%)	27 (17.42%)	31 (20%)	27 (17.42%)	43 (27.74%)

4.4. Restrictive Attribution of the Application of Digital Resources of Physical Education Curriculum in Primary and Secondary Schools in Yueyang

In traditional teaching, teachers dominate the teaching process and students passively accept indoctrinated education. The use of digital teaching resources has changed the role orientation of teachers and students. In the process of teaching and learning based on digital teaching resources, physical education teachers often play the role of guide and organizer, while students become the main body of learning. In addition to direct classroom teaching, there are also many channels to use digital resources for independent learning. In the era of digital learning, teachers are facing greater challenges. Physical education teachers' own information literacy has become a restrictive factor affecting digital teaching.

According to this study, most students will use digital teaching resources in

pre-class preparation (55.48%), classroom activities (48.39%), extended reading (44.52%) and after-class review (43.87%), as well as extracurricular activities (31.61%), teacher-student interaction (41.94%) and homework/examination/test (38.71%) through digital resources. Thus, teachers and students in primary and secondary schools in Yueyang enrich the teaching content and expand the teaching time and space with the help of digital teaching resources. Compared with traditional teaching, digital teaching resources make teaching and learning more lively and interesting (**Figure 4**),

Using digital teaching resources to carry out teaching activities has higher requirements for teachers' information literacy. Teachers need to constantly learn and improve themselves in order to better adapt to digital teaching. According to the survey (shown in **Figure 5**), most of the PE teachers in primary and secondary schools in Yueyang City will watch online courses (79.35%), browse teaching and research activities (63.87%), participate in famous teachers' classes (54.19%) and carry out interactive research (42.58%). Teachers' continuous learning and improvement lay the foundation for effective digital teaching.

Teaching work requires the joint efforts of students, teachers and parents, especially in basic education. In traditional teaching, home-school communication has a certain impact on the cultivation of students. Under the background of digital teaching, information technology and information equipment provide convenience for home-school communication. With the help of some digital means, home-school communication can be effectively promoted. This study intentionally understands some communication channels between primary and secondary school teachers and parents in Yueyang City based on digital means (as shown in **Figure 6**). We found that at present, Wechat (88.39%) is the most frequently used home-school communication, followed by telephone (59.35%) and home-school communication platform (43.87%) and QQ (40%) are more common. Therefore, in the future, if we can integrate Wechat, QQ and home-school communication platform with the construction of digital teaching resources in primary and secondary schools, we may better promote the construction and application of digital teaching resources.

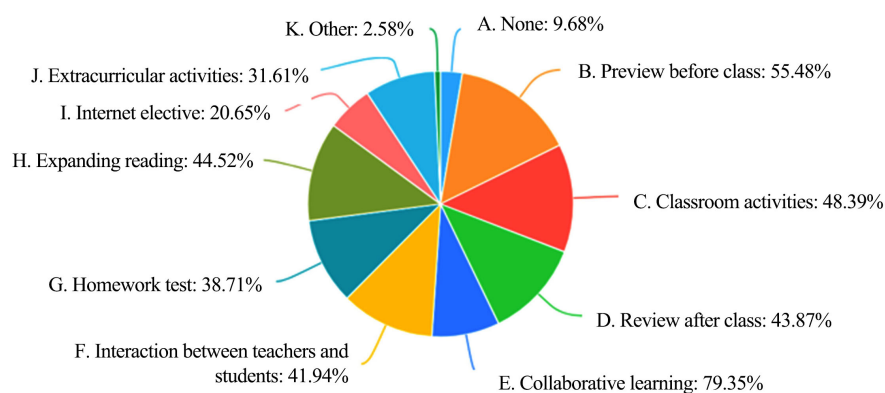


Figure 4. Digital learning of primary and secondary school students in Yueyang Area.

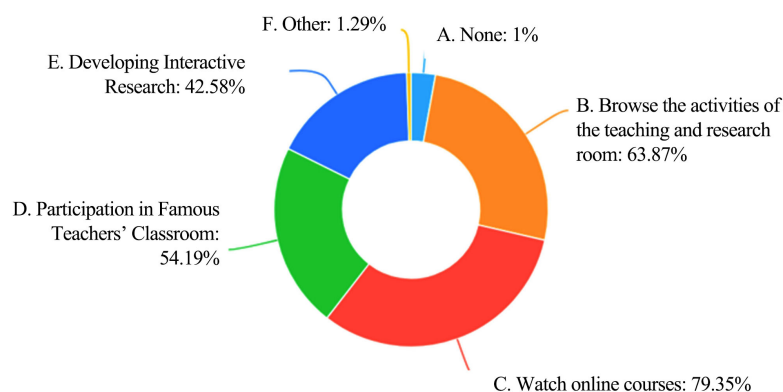


Figure 5. Digital learning of physical education teachers in primary and secondary schools in Yueyang.

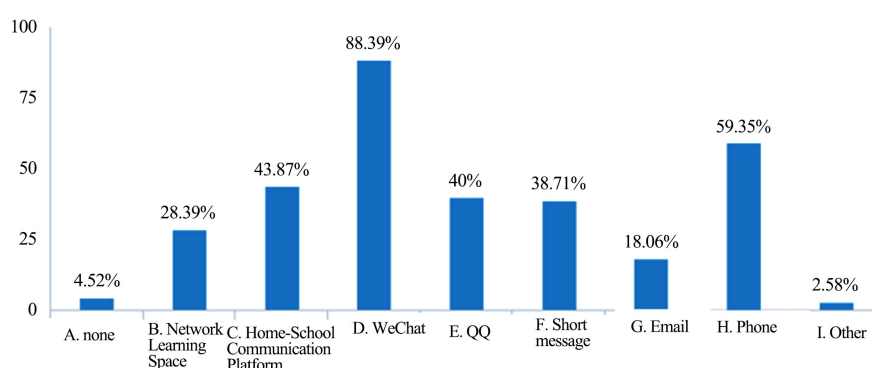


Figure 6. Application of digital resources for primary and secondary school students in Yueyang Area.

5. Problems in the Construction and Application of Digital Resources in Regional Basic Education

Information-based teaching in primary and secondary schools in Yueyang area has achieved some preliminary results. The application of digital teaching resources in schools is becoming more and more common. Teachers and students are more enthusiastic about participating in information-based teaching. Based on the investigation and study of physical education curriculum, there are still some problems in the construction and application of digital teaching resources for basic education in Yueyang area as follows. It is expected that more attention should be paid to the follow-up research and application.

5.1. Primary and Secondary School-Based Digital Teaching Resources in Yueyang Need to Be Constructed Urgently

Research and development found that a large number of external digital teaching resources were used, neglecting the digital development and application of school-based curriculum (Li, Hu, Liu, & Wu, 2012). Each school has its own faculty and curriculum system. While introducing foreign teaching resources, we should strengthen the digital construction of school-based curriculum and scientific and technological education resources, so as to better play the leading

role of teachers in our school and improve the quality and level of personnel training.

5.2. The Information Literacy of Primary and Secondary School Teachers in Yueyang Needs to Be Improved

Research and development found that a certain number of teachers rarely use or basically do not use digital teaching resources. The survey results show that there are fewer ways for primary and secondary school teachers to learn digital than students in Yueyang, which hinders the process of informationization and modernization of basic education to a certain extent.

5.3. The Awareness of Information-Based Teaching Reform in Primary and Secondary Schools in Yueyang Needs to Be Strengthened

At present, the country vigorously advocates information-based teaching reform, requests that education informationization lead the modernization of education, basic education should become the leader of information-based teaching reform, attaches importance to the advantages of information technology and network teaching in solving the problem of educational equity, and actively constructs digital teaching resources. According to this survey, the information-based teaching in primary and secondary schools in Yueyang City is basically a voluntary behavior of teachers themselves, lacking the necessary incentive mechanism and safeguard measures.

6. Countermeasure and Suggestion on Digital Resources Construction of Regional Basic Education

Basic education is the foundation project of “rejuvenating the country through science and education”, which is often related to the development of regional economy, society and the improvement of people’s livelihood. In the process of education informationization in China, digital teaching resources of basic education are the effective guarantee to solve the problem of education equity and balanced development of education in urban and rural areas (Lu & Qi, 2005). Through investigation and interviews, the Research Group believes that, the project obtained first-hand information, summarized the current situation of the construction of digital teaching resources for basic education in Yueyang City, analyzed the existing problems in the construction and application of digital teaching resources for basic education in Yueyang area, and put forward the following countermeasures and suggestions.

6.1. Recommend That Local Government Departments Issue Relevant Policies and Set Up Special Funds to Promote and Support the Construction and Application of Digital Teaching Resources for Basic Education in the Region

Informatization promotes and leads the modernization of education, which is the main trend of the development of education in China. The deep integration

of information technology and education and teaching is the major action of teaching reform at all levels and in all kinds of schools. It is suggested that the relevant departments of Yueyang Municipal Government formulate relevant policies, especially to incorporate the information-based teaching reform into the assessment of primary and secondary schools and the evaluation of teachers' professional titles. We should invest special funds, encourage inter-school cooperation, co-construction and sharing, construct a number of digital teaching resources by means of curriculum establishment and space construction, screen a number of high-quality resources by means of competition evaluation, give full play to demonstration effect, promote the construction and application of digital teaching resources of basic education in the whole Yueyang area, and promote the process of informatization and modernization of basic education in Yueyang area.

6.2. Suggest Convening a Special Working Meeting of Principals of Primary and Secondary Schools to Strengthen the Sense of Responsibility and Emphasize and Implement the Construction and Application of Digital Teaching Resources in Regional Basic Education

Digital teaching resources are new things under the background of information-based teaching. Whether they can be constructed, applied and promoted in all kinds of schools at all levels depends largely on the attention of school leaders, especially principals. From the point of view of the current pilot schools of educational informatization, it is often the principals who approve and encourage teachers to make their own characteristics. It is suggested that we should strengthen the responsibility system of information-based teaching reform of primary and secondary school principals in Yueyang by holding a special working conference on information-based teaching of primary and secondary school principals, urge them to lead their teachers, actively seek help from universities, carry out theoretical research and experience exchange, form alliances with regional primary and secondary schools, and jointly build and share digital teaching resources. Actively responding to the spirit of relevant national and provincial conferences, we should plan and implement the construction and application of digital teaching resources in our school in the long run to improve the quality and level of personnel training.

6.3. Suggestions on Setting up Information Committees for Primary and Secondary School Teachers and Carrying Out Special Activities to Enhance Their Own Information Literacy through Training, Competitions and Other Activities

The construction and application level of digital teaching resources depends on teachers' professional knowledge reserve, teaching experience accumulation and information literacy level. Primary and secondary school teachers' information literacy needs more opportunities to help improve. It is suggested that Yueyang Municipal Government Departments, relying on the Municipal Association of

Science and Technology, set up an Information Committee for Primary and Secondary School Teachers to effectively combine education with popular science work, integrate the improvement of primary and secondary school teachers' information-based teaching ability with the construction of digital teaching resources, and promote the information literacy of primary and secondary school teachers in Yueyang through training and competition activities, and actively build digital teaching resources. Using information-based teaching means to solve the problem of educational equity, through the network teaching based on flip classroom, micro-class video and other forms of teaching to solve some of the actual problems brought about by large classes, such as large workload of teachers, poor teaching effect and so on.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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