

Based on the Primary and Secondary School Teachers TPACK Informationization Teaching Ability Ascension Path to Explore

Shasha Liu ^a, Haixi Guo ^b

School of Information Science and Technology, Yunnan Normal University, Kunming, 650500, China

^a 3229154005@qq.com, ^b 2319112391@qq.com

Abstract. Under the current situation, how to improve teachers' level of information technology, to improve the level of teachers' information technology has a very important role. Therefore, in the process of teachers' information technology education, carries on the thorough theoretical analysis and practical exploration, has the very vital significance. TPACK framework teachers information technology teaching, based on the ability of interpretation theory, combined with the effect and influence of information literacy in the whole teaching process, from the information technology teaching design ability, the informationization teaching ability, information, information integration ability to teach students to learn the evaluation ability, informationization teaching research ability five aspects to explore the connotation of the theory of primary and secondary school teachers' information technology teaching ability and knowledge can deconstruct changes, and put forward the planning guide promote informatization instructional design ability, and dig dug the informationization teaching conformity ability. Assignment of smelting technology can improve the informationization teaching ability and multi-dimensional teaching evaluation ability, improve the information science and education integration to strengthen information countermeasures and suggestions of teaching research ability, to explore the new era of university teachers' information technology teaching ability of optimization path to provide theoretical reference.

Keywords: TPACK; Primary and Secondary School Teachers; Information Technology Teaching Ability.

1. Introduction

The teacher education revitalization action plan (2018-2022), "pointed out that" for a new round of primary and secondary school teachers in the IT application ability training, guidance and guide the primary and secondary school teachers in the education teaching and school management, efficient use of the new technology "[1]. In information technology teaching ability, the informatization instructional design ability is the core part, improve the ability of junior middle school teachers' information technology teaching design, is the realization of teachers' professional development, promoting the teaching informationization is an important step in the leather and as a result, the primary and secondary school teachers to the influence factors of the informatization instructional design ability analysis, both practical value, also has theoretical value.

2. TPACK and Information-based Teaching Ability

2.1. Theory of TPACK

TPACK's full name is "technology public and content", is a comprehensive professional education of technology knowledge, it is by the university of Michigan PangYa mishra and Matthew keller put forward in 2005. TPACK knowledge framework mainly includes seven elements, they respectively are: TK (technology), PK teaching method (knowledge), CK (subject content knowledge), PCK (subject teaching knowledge, TCK (subject matter knowledge integration technology), TPK (integrated technology, the teaching method of knowledge), TPCK (science research method of

knowledge integration technology). CK, PK, TK is nuclear element, TPK, TCK, PCK and TPCK is a synthetic element [2].

2.2. The Informationization Teaching Ability

In the field of education technology, teachers' information is a very important topic, many scholars from different angle to discusses the necessity and importance of teachers' information. Based on the actual work of the remote education, I think, distance education teachers information technology teaching ability refers to the distance education teachers engaged in distance education teaching demonstrated in the course of comprehensive practice ability, is under the condition of information technology teachers engaged in distance education teaching must have the core competence, information relevant content and teachers will be implemented to the key of the remote education teaching. Distance education teachers should in concept, organization, content, mode, technology and evaluation, the environment and a series of factors related to teaching, carry on the design and reform[3].

2.3. TPACK and Information-Based Teaching Ability

TPACK knowledge framework by TK, PK and CK base layer, PCK, TCK, TPK development knowledge and TPCK integration layer knowledge of three levels, three levels of knowledge layer cascade folds, progressive, step by step to the teachers' professional development provide a comprehensive reference. To learn the knowledge is the teacher and the teacher only teaching knowledge of learning, internalization, and fusion, it can be expressed. Teachers' teaching ability is derived from teachers' teaching knowledge, and teachers' teaching ability depends on teachers' teaching knowledge[3]. TPACK knowledge architecture is a basic element of TK, it emphasizes the technical knowledge in one of the important role. TPACK knowledge structure, and need to science and technology as support, to packaging and the content of the course teaching method. TPACK is the basic concept of application of information technology to classroom teaching, and supported by information technology, to improve the quality of classroom teaching[4].

3. TPACK Horizon, The Ability of Primary and Secondary School Teachers Should Possess

TPACK horizon, to ensure that information technology teaching ability of comprehensive promotion, teachers to improve professional abilities from the following four aspects, in order to ensure the teaching efficiency of ascension as a whole[4].

3.1. Information on the Teaching Design

Teaching design is to ensure that the important link in the teaching activities smoothly, is the basis of teaching. Informationization teaching request, the teaching design more scientific and accurate, requires teachers to grasp the key point of teaching content, the teaching of the scene design, the use of the media plan in advance, to ensure that the full use of teaching resources[5]. To teach design information needs of teachers can apply information technology to integrate the resources combined with students' individual character point, analyze the data of teaching, perfect teaching design scheme is put forward, to ensure that the teaching activities to achieve expected goal[5].

3.2. On the Teaching Informatization

Under the TPACK horizon, more emphasis on the importance of teaching practice. Cheng restricted by conditions of primary and secondary school nursing profession practice lesson, class hours less than theory course, how to break this limitation by information technology, to ensure that students master the practice content, become the difficult point of teaching. Application of multimedia, AR and VR technology, the virtual teaching scenario, can make students more intuitive understanding of the teaching content, and can be done by AR simulation technology to simulate the possible situation,

guide the student to carry on the solution, promote the students' practical ability and ability to respond. This is for teachers to master all kinds of information technology, and flexible application of it[5].

3.3. Realize Informationization on Teaching Evaluation

Evaluation way under the new curriculum reform has changed, the evaluation main body more diverse, more sample evaluation way. Teachers in teaching evaluation of informatization, ensure comprehensiveness, objectivity and accuracy of the evaluation. One is the students' evaluation in classroom. Through the participation of the scale effect of the classroom evaluation way, need to set reasonable class indicators, including the participation, the depth of knowledge, knowledge is difficult, etc[6]. Finally through the multidimensional data analysis, statistics a classroom situation. Secondly, teachers to evaluate students, including the knowledge skills, performance hall, and other aspects. Scores of two main body to students and teachers, encourage students to objectively understand their own classroom performance[6].

3.4. Realize Informationization on Teaching Reflection

On the teaching reflection, teachers can form in teaching evaluation data to research the teaching situation; And combined with large data collected, the content of the network courses understand the strengths of same kind of classroom teaching activities, and targeted to improve their own teaching activities, enhance the level of teaching and improve teaching efficiency[7].

4. Informationization Teaching Status Quo of TPACK Horizon, Primary and Secondary School Teachers

TPACK horizon, professional teachers of primary and secondary schools at the present stage of teaching activities is a series of problems, such as the importance of informationization teaching insufficiency, the acceptance is poorer, the teaching idea can't keep pace with The Times, the application of informatization in teaching uneven distribution, theory and practice of phase separation, etc.[7]. Specific analysis is as follows.

4.1. Teaching Ideas Can't Keep Pace with the Times

Part of the elementary and high school teachers of colleges and universities while understanding the importance of informationization teaching, failed to update teaching ideas, not formed a consistent use of information technology teaching idea, caused the informationization teaching difficulties, out of step; Teacher training behavior depend entirely on wishes, informationization teaching approach can not be fully implemented[8]. By the professional course is more, some subjects using the informationization teaching, some failed to use, this kind of mode is bad for students, in particular to master professional knowledge[8].

4.2. Lack of Emphasis on Information Technology Teaching

TPACK belongs to the education for primary and secondary school teachers in teaching is relatively novel theory, and the application of information technology for teachers also need to systematically study and mastering, this is part of TPACK concept teaching way is more difficult to accept, especially old teachers, solid professional knowledge, but the mastery of modern information technology ability is very weak, it even more difficult for teachers promote application information technology teaching ability, does not favor the letter of interest teaching[9].

4.3. Information in Teaching the Application of Distribution Imbalance

In daily teaching activities, teaching mainly is divided into four stages: teaching design, teaching implementation, teaching appraisal and teaching reflection, but most of the teachers' information technology application will be mainly carry out in teaching implementation, for the other three aspects of the information technology application is less, this kind of situation will cause the

informationization application function limited, can't give full play to the advantages of information technology teaching[9].

4.4. Phase Separation Theory and Practice

Part in the teaching of primary and secondary schools colleges, although use TPACK idea and the informationization teaching principle, but in the specific implementation, the original failed to update the teaching concept, teachers' understanding of the informationization teaching idea there is a deviation, causing the informationization teaching ability training become a mere formality. Although teachers responded to an appeal by the school to participate in training activities, but lack of correct understanding of the training, can't apply the informationization teaching specific to teaching practice work, cause theory and the practice phase separation, is not conducive to the development of information technology teaching[10].

5. Based on the Primary and Secondary School Teachers TPACK Informationization Teaching Ability Ascension Path

5.1. Concept Lead, Practice Innovation, Pushing the Depth of the Education of Information Technology in Teaching

Under the background of education informatization, informatization of teaching reform of primary and secondary schools is necessary. To promote into teachers should know the importance of informationization teaching ability promotion, to promote the practice to explore, based on the theory of the TPACK promote primary and secondary school teachers to profoundly understand all kinds of information technology and the means in the important position in the education teaching, admit they have a lot of traditional teaching methods irreplaceable advantage[11].

The depth of the information technology and curriculum integration is the trend of education development of information age. Primary and secondary schools to teach teacher TPACK not simply information means and technology in the teaching of the single overlay, but into the subject teaching. Primary and secondary school teachers should actively explore represented by TPACK information teaching ability of ascension[11]. TPACK in teaching does not exist a kind of fixed mode, different disciplines, curriculum, and implementers, under different technical environment, or even a technical means to implement the adjustment of the order will bring different teaching effect. Therefore, teachers should have the courage to innovation, ascend in the teaching quality as a fundamental, active learning, dare to practice, improve teachers' information technology literacy and ability[11]. According to subject characteristics, class characteristics, give full consideration to the conditions of learning, cognitive habit, and the objective respect their knowledge structure, teaching characteristics and habits, Have technical conditions, teaching resources, teaching place and social environmental factors, such as elaborate organization, implement information-based teaching, evaluation and reflection, create conditions to improve the teaching quality[11].

5.2. Incentive Policy Guidance, System, and Constantly Strengthen the Support of Information Technology Teaching

Primary and secondary colleges should strengthen the support and the support of information technology teaching, the main should do well in the following several work. First, the school actively implement the informationization teaching related policy[12]. School leaders and teachers learning seriously grasp the relevant state of the reform and development of education informatization policy documents, and clear the informationization teaching is the trend of future education[12]. Office, teacher development center and other functional departments of education teaching new requirements, new forms and new needs to keep highly sensitive, intensify propaganda and promote, in the teaching system files to the informationization teaching new agent to make clear rules, clearly the current and future a period of time the focus and direction of the education teaching reform, the expression of positive guiding role, the development of teachers, curriculum construction request a certain goal[12].

Second, the school actively provides information technology curriculum integration training. Should rich information in the form of teaching training teachers and makes teachers have the opportunity to participate in all kinds of special industry of modern information technology training, curriculum and effective integration of special training, etc. Teach teacher development center and other departments take the lead in hosting the informationization teaching workshops, to make teachers communicate with each other, complement each other, constantly improving the existing knowledge and skills system progress. To complete technical training Jie Ye Zhe give spiritual encouragement and recognition[12]. Third, add the informatization in the teachers' teaching ability examination module for examination and assessment of teaching ability. Now, the elementary schools in a new round of teaching reform, including teachers' teaching evaluation.

The teachers use the information method integration curriculum teaching design and implementation of the income of the ability of assessment index. Formulation and implementation of information technology teaching achievement incentive system, to make achievements and contributions in the informationization teaching reform of the teaching teacher to give a certain reward[13]. Encourage teachers in the teaching process actively carry out information-based teaching research and practice, to participate in provincial and national teacher teaching ability competition, informationization teaching ability contest, small game and so on have made the grade teacher to give material and spiritual rewards. At the same time, in the school to build "advanced with junior" good atmosphere wai, spur unused information technology teaching means or use the effect is not obvious on teachers head-on[13].

5.3. Team Building, Team Collaboration, Construction of Teachers' Learning Community

Around the theme of the information technology and curriculum integration, the construction of teaching team, the interest group in the form of teacher learning community, through the group discuss internal strengthen the informationization teaching exploration and practice[14]. Teaching team of the same subject or course teachers' collective lesson preparation, learn from each other, and unified ideological understanding, agreeing on a key difficulties of teaching content, the choice of teaching methods and use each other, inspire each other. To use modern technology, extensibility, construction of teaching resources to carry out the co-construction and sharing activities. Through open discussion, combined with the teaching characteristics of students and teachers teach lesson class specialty, form the characteristic of the informationization teaching plan[14].

Through the communication within the team, after the completion of teaching tasks, self-reflection and others help, etc., fully excavate the potential of its own modern technology application and promoting the integration of technology, curriculum, teaching ability to the next level. Teachers team construction is the key to the new era, innovation and development of primary and secondary school education[15]. With the advent of the era of information 2.0, education information become a important direction of the reform of primary and secondary school education. Promote vocational colleges teachers information technology teaching ability, is to improve the teachers of primary and secondary schools colleges construction level, the surest way to promote the connotative development. Primary and secondary school teachers should be advancing with The Times, more new things with an open mind towards education field, devoting themselves to their informationization teaching reform, positive description TPACK theoretical connotation, effectively promote the informationization teaching ability, realize effective integration of information technology and course teaching, improve teaching quality[15].

5.4. To Promote the Informationization Teaching Junior High School Teachers Design Thinking Ability of Ascension

This article attempts from the influence factors of teachers' information technology teaching design ability, reflect on the current information technology teaching reform. This article from the perspective of action strategy, and put forward the improve the level of middle school teachers' information technology teaching design countermeasures[16].

5.4.1. Attaches Great Importance to Teachers' Ability and Promote Skills Upgrading One is Changing the Original Teaching Design Idea

Teaching design is a kind of education idea of external performance, it reflects the teachers to education content knowledge, thoughts, etc. Therefore, teachers need to consciously and actively learn the new curriculum concept, from the emphasis on teacher's teaching, turn to the students' learning. At the same time, teachers also need to change our concept of education technology application, let it send out a bigger role. At the same time, to realize the importance of informatization instructional design, strengthen its information teaching design of line power[16].

5.4.2. Improving Teachers' Knowledge Structure

Teachers to the optimization of active subject knowledge structure and perfect, can improve their cognitive ability of teaching, so as to enhance the inner motive power of development of informatization instructional design ability. Mutual discussion between teachers, teaching research group within the professional communication, as well as their own learning, to enrich and perfect the system of 10 points and significance of knowledge[16].

5.4.3. Teaching Reflection Consciousness and Methods

Regular teaching reflection, can promote the junior middle school teachers give full play to their own subjectivity. On the one hand, in order to pass the view, the discussion of outstanding teachers teaching, writing teaching journal, reflection, and utilization of practice, education narrative forms, such as to promote teachers consciously in the normal course of study and research activities such as reflection. On the other hand, also should make full use of information technology means and tools, to record the process of teaching, and to rethink the problems in classroom teaching. Through self-reflection, teachers can reflect on their own by the problems in the design of information technology in teaching, and then look for ascension in the direction of the[17].

5.4.4. Improve Teachers' Enthusiasm, Strengthen its Information Technology Skills

Education administration departments and schools may carry out various kinds of teaching and researching activities, by focusing on training, experts on-site guidance, let the teachers in the design experience in problem solving, task driven activities such as the new teaching mode. At the same time, encourage the teacher to actively take part in informatization instructional design competition, micro class contest and other activities, in practice, to improve their information literacy and technology[17].

5.5. Strengthening the Education Management Departments and Schools in the Teaching and Learning of Teachers' Information Management

5.5.1. Strengthen Training Pertinence, Focus on Training the Knowledge Migration

The function of the administrative department of education mainly through the research and the quality of training for students to reflect. Before the implementation of information teaching, through investigation and research, or the use of big data technologies, the trainees behavior data mining analysis, in view of the teachers' knowledge on specific problems or lack of practical skills training. In the process of training, to create with the actual environment that meet the needs of teaching, make students better able to complete the skills learned in the process of training transfer. In addition, you can adopt the method of case study, let the teachers have the opportunity to watch simulation experiment[17]. With, can also according to the specific teaching situation, carries on the analysis, and discuss with the students, to find can be for reference of experience. At the end of the training, but also may organize experts and their teams to the school, the classroom, through lectures, classes, lectures, to help teachers better use the training in the knowledge.

5.5.2. Incentive Mechanism is the Perfect School Assessment

Schools need to build good management assessment and incentive mechanism, implements hierarchical evaluation for the new and old teachers, the grading appraisal results linked with

performance appraisal, salary, and real incentives for teachers to provide an effective outside department. Attention should be paid to build the application of information technology in teaching atmosphere[18]. School to create a better campus culture for the use of information technology, through the organization of teaching research conferences, contests, assessment evaluation of learning activities, to help teachers differentiate informatization instructional design and the traditional teaching design, let the teachers experience the new way of teaching to optimize classroom teaching effects, in order to stimulate their enthusiasm and initiative of informatization instructional design.

5.5.3. Is to Strengthen the Construction of Information Infrastructure

Projectors and other equipment, need to ensure the normal use of each class. In addition, the education administrative department should also help student proofread each discipline to improve the informatization instructional design resources, establish a good teaching design case library, and encourage teachers to participate together, so as to realize the resource sharing of high quality[18].

5.6. The Ability to Fundamentally Improve the Information-Based Teaching Junior High School Teachers

5.6.1. Planning the Forerunner Promote Informatization Instructional Design Ability

Informatization instructional design is the important way to realize the teaching process optimization. To carry out the teaching design, teachers can use the information means to students as the center, the information technology teaching, according to the course teaches the main topic, the student individual characteristics and teaching environment requirements, formulate the teaching goal, plan the teaching content, and accurately conveyed to the students[18]. At the same time, teachers can make full use of modern information technology and information resources, surrounding the topic selection, a professor teaching media support, fully mix theme design, teaching media and professor scientifically arrange every link of teaching process and elements, in order to realize the optimization of the teaching process.

5.6.2. Information Integration of Teaching Ability and Mining

Integration of information technology teaching is a key link in the process of education teaching goals. Primary and secondary school teachers by means of information technology, form "to the students' learning process as the center, the whole life cycle of course for the axis" flow range of courses, through constructing teaching platform, the sharing of teaching resources, release the teaching mission, to order after the class divide class discussion and training, the development of knowledge category "online and offline integration" measures, such as implementing "class - class - class" the whole process of restructuring and updating, promote the enthusiasm and initiative of teachers' information literacy, promote the information change means a key role in classroom teaching resources integration.

5.6.3. Refining Technology Can Improve the Ability of the Informationization Teaching

Information technology teaching is the core of the teaching goal. Using information technology means to improve teachers' classroom control, timely and effective safeguard the teacher deal with the emergency of classroom teaching and timely adjust class # content updates. Medium by using the information on the one hand, teachers teaching, adjusting teaching methods such as method, a quick fix for teaching tools such as equipment failure, software failure caused by unexpected situation; Promotion of information literacy, on the other hand, can also help teachers through the use of more diverse teaching tool, to turn better classroom, classroom to points, and other forms of interaction between teachers and students, effective guarantee course effect[19].

5.6.4. Multidimensional through Perfect Information-Based Teaching Evaluation Ability

The informationization teaching evaluation is the foundation of classroom reflection of teaching and the improvement of the basis. Using informatization technology in process evaluation and summative evaluation, timely feedback to students, to guide students to solve problems; Enough at the same time,

teachers can guide students to use information technology means to evaluate their own learning, help students adjust learning strategy optimization effect, effectively improve the teaching method of teachers and students' learning method of "point", will converge "teaching evaluation, teaching evaluation, teaching feedback, improvement of teaching".

5.6.5. Science and Education Integration to Strengthen the Informationization Teaching Research Capabilities

Teaching research is to promote informationization teaching practice to the theoretical achievements of the development platform. Effective teaching research can accumulate beneficial experience and teaching practice for teachers also give programmatic adjustment for subsequent teaching arrangement and examination opinions. Actively use information resources and methods to collect data, sorting data, and form in and out dual type teachers, on the one hand, the use of school holidays, invite industry leaders visit exchanges, promote the teachers troop to produce together. School teachers, on the other hand, teachers under the guidance of the enterprise into the enterprise communication, deepen their cognition on the professional skills needed [19]. Both sides formulate training plan and set up training base. At the same time, to send young backbone teachers overseas universities to communicate learning, improve their teaching ability, enrich their teaching content, to make it with cutting-edge technology[20].

6. Summary

Informatization is the inevitable trend of higher education transformation, can effectively improve the quality and efficiency of classroom teaching. Teachers in colleges and universities is one of the main body of higher education, professional education chief enforcer, the information-based teaching ability is related to the realization of the higher education informatization level and quality^[20]. Based on this, this article points out the university teachers' teaching ability in the resources construction, information utilization, supporting policy problems, from schools, colleges, teachers, students four aspects put forward the coping strategies. Of course there are also some limitations of this study, and future researchers necessary classification for different professional disciplines, and reinforcement theory support and so on, from which effectively promote the information technology teaching ability of ascension.

References

- [1] Zhang li lei-lei zhao. TPACK horizon, primary and secondary school teachers in information technology teaching factors affecting research - based on the investigation of J province primary and secondary school teachers [J]. Journal of open learning research, 2021, 26 (4): 8 to 15. DOI: 10.19605 / j. carol carroll nki kfxyyj. 2021.04.002.
- [2] LongXin. TPACK horizon, X city middle school teachers' information technology application ability evaluation research [D]. Central China normal university, 2021. The DOI: 10.27159 /, dc nki. Ghzsu. 2021.001384.
- [3] WenMeng MiaoXiao Qi, Du Junyan, LangXiao Ling. Higher vocational colleges of TPACK horizon, nursing teachers' current informationization teaching learning ability and improve research [J]. Journal of gansu education research, 2023 (02): 27-29. [4], zhang kai king really. Theory of TPACK framework of higher vocational teachers' information technology teaching ability and the ascension path [J]. Journal of vocational and technical education in China, 2022 (32): 79-84.
- [4] Zhang kai, the king really. Theory of TPACK framework of higher vocational teachers' information technology teaching ability and the ascension path [J]. Journal of vocational and technical education in China, 2022 (32) : 79-84.
- [5] Chang, xiao-hui Chen, Wang Yining. Teachers' information technology teaching ability evaluation research based on TPACK model [J]. Journal of modern distance education, 2017 (6) : 66-73. The DOI: 10.13927 / j. carol carroll nki. Yuan. 2017.0059.
- [6] JiCan, Zhang Hong. The TPACK framework informationization teaching ability of young university teachers cultivate [J]. Journal of adult teaching in China, 2017 (03) : 137-140.
- [7] Wen-jun Wang, Wang Weijun. Teachers' information technology teaching practice ability analysis [J]. Modern long-distance teaching education, 2012 (03) : 67-74.

- [8] Wen-Tao He, Mr Brain wave, anti, nguyen peak, Shi Qian. Artificial intelligence era of primary and secondary school teachers' information technology teaching ability development present situation and the promotion strategy [J]. *Journal of modern education technology*, 2022, 32 (3): 92-101.
- [9] Xie Yan, Zhang Dong. The TPACK framework of higher vocational teachers' information technology teaching ability of investigation and analysis [J]. *Journal of vocational education forum*, 2019 (10) : 114-120.
- [10] Cheng Yana. Primary and secondary school teachers in information technology teaching ability promotion strategy research [D]. *Zhengzhou great learning*, 2021. The DOI: 10.27466 /, dc nki. Gzzdu. 2021.003465.
- [11] Wu Bian Hu Yiling, xiao-qing gu. New teachers in colleges and universities information technology and curriculum integration ability empirical research based on Shanghai college teachers' pre-service training project [J]. *Journal of modern distance education research*, 2016 (03) : 77-83 + 103.
- [12] CongBo Jin Youwei. Information 2.0 informationization of college PE teachers teaching ability raise research [J]. *Journal of shenyang sports institute*, 2021, 40 (01) : 40-48.
- [13] Huang Yingling Xie Zechen. 2.0 horizon, a primary and secondary school teachers in guangdong province education informatization informatization teaching ability survey [J]. *J: normal college learning, lancet*, 2022 (6) : 74-79 + 99. DOI: 10.19986 / j. carol carroll nki. 1007-6883.2022.06.011.
- [14] Zhang Jiyu Wu Lanan, Wang Weilu. Programming of primary and secondary schools teachers' information technology teaching ability present situation and its countermeasures, education owes the developed area, for example [J]. *Journal of education of information technology*, 2022 (05) : 49-52.
- [15] Sun Yan yan, Wu Xueqi, wang chao, xiao-qing gu. Primary and secondary school teachers in information technology teaching ability research [J]. *Open education research*, 2021, 27 (01) : 84-93. The DOI: 10.13966 / j.carol carroll nki kfjyj. 2021.01.009.
- [16] Chun-mei Wang. Based on the primary and secondary school English teachers' information technology teaching ability promotion strategy analysis [C] // Ministry of Education of basic education curriculum reform research center. 2020 "based on the core accomplishment of classroom teaching reform," paper presented set. [publisher unknown], 2020:417-419. The DOI: 10.26914 / Arthur c. nkihy. 2020.040754.
- [17] Li Jin. Primary and secondary school teachers informatization instructional design ability to ascend to discuss [C] / / China research association wisdom can learn the wisdom and innovation research committee. 2020 course teaching and management of cloud BBS (chongqing at the venue) paper sets. [publisher unknown], 2020:1120-1124. The DOI: 10.26914 / Arthur c. nkihy. 2020.042959.
- [18] Kong Xinya. The development of rural primary and secondary school teachers' information technology teaching ability strategy [J]. *Journal of papermaking equipment and materials*, 2020,49 (02): 214.
- [19] Li. Of regional primary and secondary school teachers from the TPACK informationization teaching ability evaluation and improve research [D]. *Central China normal university*, 2017.
- [20] Hester Zhu. Primary and secondary school teachers in information technology teaching ability promotion strategy research [J]. *Journal of education evaluation theory*, 2016 (01) : 116-119.