Application Research on the Construction of Digital Literacy and Skills Smart Learning Micro Ecosystem for Higher VocationalEducation Students and Teachers

Ruifang Zhang

Guangzhou City Polytechnic， Guangzhou, Guangdong Province, China 511370

Abstract

This study is based on the exploration of the cultivation and acquisition of digital literacy and skills for teachers and students at Guangzhou City Polytechnic. The WeChat Work and Tencent LearnShare of Tencent smart education ecosystem, and the online learning platform and Xuexitong of Chaoxing online education ecosystem are used to build a digital literacy and skills smart learning micro ecosystem within the school that can achieve digital demand mining, learning and training support, meaningful interactive communication and discussion , competition and activity organization, digital resource accumulation, and digital ability certification. It also supports the provision of high-quality MOOC digital resources for digital literacy and skills education and training for all citizens.The constructed smart learning micro ecosystem not only mobilizes the initiative of teachers and students to become the masters of digital literacy and skills improvement, but also can be able to initiate digital literacy and skills learning and training activities across teachers and students throughout the school, breaking down the information gap barrier of teachers' prior knowledge of digital literacy and skills to force teachers to enhance their digital literacy and skills.By efficiently connecting human to human, human to resources, and human to technology, the average participation in the cultivation and acquisition of digital literacy and skills can be easily increased to hundred person-visits.It can provide great convenience for the organization and implementation of learning and communication activities, allows more time and energy to focus on digital problems encountered in work and study, improves the production efficiency of high-quality digital learning and training resources, solves digital problems encountered in work and study, meets the digital needs of teachers and students and promotes the true acquisition of digital skills and the cultivation of digital literacy.

Keywords：digital literacy, digital skills, smart learning micro ecosystem

1 Research background

Popularizing and enhancing citizens' digital literacy[1] is an important part of building a digital China, and higher vocational and technical colleges should actively undertake and explore effective paths to cultivate digital literacy and skills for their teachers and students. The main ways to cultivate digital literacy and skills for teachers at Guangzhou City Polytechnic include organizing online course designing and creating training, organizing vocational education

professional teaching and learning resource library designing and creating training,and providing specific types of digital resources training such as micro-course development training, new-form digital teaching materials training, arranging teachers to participate in the ICT(short for information and communications technology)-integrated teaching contest organized by higherauthorities or relevant business departments, and organizing teachers to participate in related contests.The main ways to cultivate digital literacy and skills for students at Guangzhou City Polytechnic include studying information technology general education courses and specialized courses related to information technology, participating in contests related to information and communications technology technology . To encourage faculty to participate in digital literacy and skills training and contests, and to enhance the ICT-integrated teaching competence, Guangzhou City Polytechnic incorporates training credit hours and competition outcomes as criteria and benchmarks for faculty professional qualifications advancement and performance appraisal incentives. Achieving high scores through course assessments serves as the primary driver for motivating students to proactively improve their digital literacy and skills.

In fact, it is often faced with the problem that even if the results of the competition are linked to the promotion and reward system, most teachers gradually become physically and mentally exhausted and unwilling to participate in the increasingly involutionary and high-effort, low-payoff competition; The observable and perceptible improvement in digital literacy and skill level obtained through training or competitions has not been applied and reflected in daily teaching without technical service support; Although the study of information and communications technology and related courses, as well as information literacy contests held by Guangzhou City Polytechnic Library, the students have achieved good results, they cannot escape the trap of exam-oriented education. Essentially, these are still behaviorist learning methods, and once the students encounter digital problems in authentic work-study-life situations situations, they are helpless and have not internalized the ability to solve digital problems.Only by solving the above problems can we effectively enhance the digital literacy and skills of teachers and students.

2 Research ideas

Since traditional training and competitions of digital literacy and skills for teachers and students are detached from authentic work-study-life situations, teachers and students lack motivation to participate. The digital skills are pre-defined standardised operating method and procedures that come with step-by-step instructions and constant technical support and coaching during practice, leaving little room for learners' own inquiry, experimentation or reflection. Consequently, these skills rarely become an integral part of the participants' personal digital competence.

The cultivation of digital literacy and skills should aim to solve the digital problems of teachers and students in the authentic work-study-life situations. We should adhere to the attitude of continuous training and long-term effort to make it a normalized habit of discussion and learning actions in the area of digital literacy and skills. We should organize specialized personnel to respond to the digital needs of teachers and students in real time, independently develop video tutorials, and accumulate to form a school-based digital literacy and skills learning digital resource knowledge library. We should systematically introduce and push high-quality digital resources to all teachers and students in the school. Through organizing competitions, experiences and other activities, we can create opportunities for training experts, technical personnel, and teachers and students to deeply communicate.We should use smart education ecosystem tools to create a smart learning micro ecosystem for the cultivation and acquisition of digital literacy and skills, gradually expanding the diameter of the ecosystem and playing its role in promoting lifelong digital learning for all[2] .

3 Building a smart learning micro ecosystem

The digital literacy and skills smart learning micro ecosystem is composed of four core elements: human, resources, technology and activities including competitions, training,interaction and certification.(as shown in Figure 1) People primarily refers to teachers and students in higher vocational and technical colleges, as well as social citizens.Resources primarily refers to various digital resources such as electronic documents, videos, and multimedia files encompassing all digital resources in the knowledge library used for teaching, training, and learning, as well as the tacit knowledge and experience generated and accumulated during activities participated in by teachers or students. Technology comprises the digital platforms and tools that enable the construction and operation of the ecosystem. Activities are the online and offline exchange, discussion, and learning actions that connect human, resources, and technology into a coherent, purposeful learning experience.

The digital literacy and skills smart learning micro ecosystem should be able to achieve functions such as achieve digital demand mining, learning and training support, meaningful interactive communication and discussion , competition and

activity organization, digital resource accumulation, and digital ability certification within the school, and have the possibility of breaking through the micro ecosystem and promoting it to the whole society . Practice has proven that the construction of a micro ecosystem can be developed by the collaborative use of WeChat Work (short for WeChat for business) and Tencent LearnShare (a internal collaboration and learning platform) of Tencent smart education ecosystem, and the online learning platform and Xuexitong (a mobile learning application developed by Chaoxing) of Chaoxing (short for Chaoxing Group Limited Company, a company whose business encompasses the research and development of smart teaching systems) online education ecosystem.

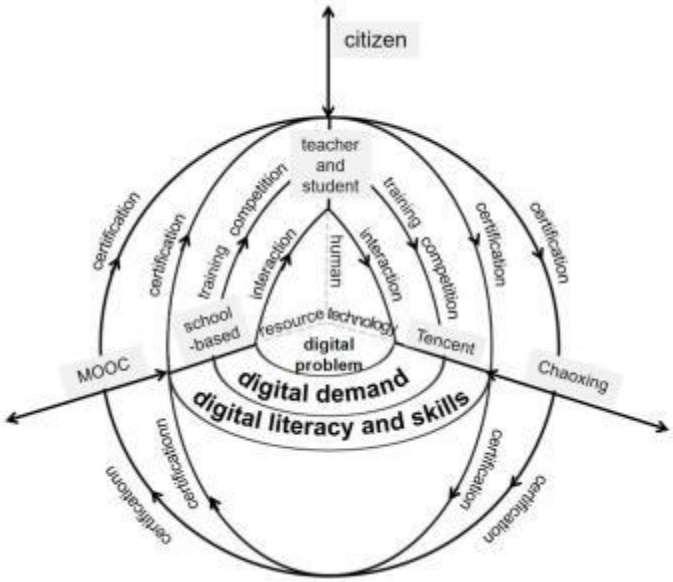

Figure 1. diagram of digital literacy and skills smart learning micro ecosystem

Both WeChat Work, Tencent LearnShare and Chaoxing online learning platform adopt a real name registration system, which enables accurate matching and precise services with individuals in offline environments. As of 23:43 on June 18, 2025, the Huawei (Huawei Technologies Co.,

Ltd.) AppGallery (Huawei devices official App distribution platform) shows that WeChat Work and Xuexitong have been respectively downloaded and installed 3 billion and 900 million times, such large-scale usage provides the foundation and support services needed to enable secure, reliable, and highly efficient connections between people and people, and between people and resources. In this study, WeChat Work and Tencent LearnShare were mainly used to provide services within the school (within the micro ecosystem), while Chaoxing network learning platform and Xuexitong were mainly used to provide services between the school and society (outside the micro ecosystem), which can ensure the privacy and security of school data and achieve a certain degree of open sharing throughout society.

3.1 Structural and open requirements research and mining creation

Faculty and students of Guangzhou City Polytechnic as WeChat Work institutional users have implemented real-name authentication based on institutional affiliation, and the message function of WeChat Work can be used to initiate both single person and group chats. The news announcement system, collaborative electronic documents and smart sheets in WeChat Work and the content that can be pushed in Tencent LearnShare can be pushed to each user in the form of messages without discrimination. It can also provide real-time viewing and interaction information of the recipient, quickly and efficiently establishing connections between people, human and activities, and human and resources.

The smart sheets function module in WeChat Work can collect various types of information from users, such as text, options, images, numbers, dates, files, etc. It can perform AI (short for artificial intelligence) field intelligent analysis, preprocess the results, and view the submission status and results in real time. This feature can be used to achieve structured requirement collection with pre-set objective options, or semi open requirement collection with subjective textual explanations. The "Voting" function in Tencent LearnShare can also organize structured requirement research through preset multiple commonly used question types. For digital demand research with time requirements, structured demand research can be conducted using preset options such as form collection and voting in WeChat Work. The statistical results are generally used as the basis for planning and carrying out activities at a certain stage.

Tencent LearnShare can connect to the WeChat Work workbench module and integrate with it. The LeWen Q&A Feature in Tencent LearnShare can initiate subjective open-ended demand research in the form of questions, which can be directly pushed to each individual user for flat information flow. Users can browse question and answer information, like and comment on each other. The LightShare Feature in Tencent LearnShare can share multimedia content, allowing participants to visualize and concretize digital demands, improve the efficiency of demand communication and confirmation, support participants to voice opinions through voting, and can be used to achieve fully open demand mining anytime, anywhere. Through sufficient interactive communication and more vivid description of demands, precise topic selection and demand boundaries can be provided for digital literacy and skills training support services. Long term continuous digital demand mining can be achieved through the use of text, file, and image options in LeWen Q&A, LightShare, and smart sheets. It is usually used for normalized learning communication and the independent development of high-quality digital learning resources in schools.

3.2 Dynamic lightweight publishing of knowledge content and multi-threaded interactive communication

The Document and Classroom functions in Tencent LearnShare can carry out fragmented and serialized knowledge content sharing. Document function in Tencent LearnShare can share knowledge of document and image types, while Classroom function in Tencent LearnShare can organize and create chapter based and independent courses, respectively to achieve series theme based and micro topic based audio and video learning content sharing. Not only does it support the creation of knowledge content in multiple formats, but it can also implement timed-specific push of learning content and real-time editing and modification of content in the publishing state. Web link based forwarding, QR Code (short for Quick Response Code) sharing, bookmarking, and discussion can be carried out for the smallest granularity resources such as a document or video, achieving real-time interaction between people on a one-to-one, many to one, and many to many basis. This solves the traditional problem of separating learning content and communication channels in online courses, and teachers and each student conducting one-to-one asynchronous closed interaction through assignments, creates a deep, real-time, and multi-directional interactive learning environment.

3.3 Development of an open, independent, and theme focused learning garden

The K Bar (short for Knowledge Bar) function in Tencent LearnShare allows each user to build a teacher-student interest group focused on specific digital themes, and independently configure applications in Tencent LearnShare such as LeWen Q&A and Voting, creating a more dynamic and focused efficient organizational learning collaboration platform. The Forum function in Tencent LearnShare can also achieve lightweight implementation of multimedia deep interactive communication on a certain topic. In addition, creating group chats through WeChat Work not only allows for multimedia information exchange such as text, images, voice, and video, but also enables real-time interactive communication such as voice and video calls, online meetings, and training live broadcasts. The Group Dashboard function in WeChat Workcan can add collaborative electronic documents, files stored in the Micro Disk, and various collaborative office and learning applications to support deep interaction. In addition, it also supports cross language translation of chat content, image text conversion, audio and text recognition, etc., all of which provide powerful functional support for the digital learning interest circle of teachers and students.

3.4 Support the creation of blended activity organizations throughout the entire process

The Activity function in Tencent LearnShare is highly compatible with the needs of organizations such as training and competitions, providing functions such as event registration, push notifications, one click group building, QR code sign-in, and on-site interaction. When used in conjunction with Project Management in Tencent LearnShare and Messages in WeChat Work, it can complete various tasks

covering the entire process of pre planning, activities follow-up, and implementation. It can not only cooperate with offline training, competitions, etc., but also complete online activities through online meetings, course live broadcasts, etc. The tedious and fragmented task of using different applications or mini programs to complete each stage of the activity organizer not only improves the efficiency of the activity organization, but also lays the foundation for the extraction, storage, analysis, and mining of relevant data after the event ends.

3.5 Points-based qualification certification for digital action

The points or certificates function in Tencent LearnShare supports administrators to flexibly set points rules, honor certificates, and qualification certifications. It can not only certify the qualifications of rigorous and standardized courses and exams, but also assign points and honors to high-quality content and actions that are particularly recommended and top ranked in digital actions. Digital literacy and skills ultimately represent digital habits and behaviors. Encouraging and regulating digital behavior among teachers and students through the establishment of scoring rules is essentially enhancing their digital literacy and skills levels. In addition, it also provides a certificate editor to quickly generate certificates, providing solutions for certificate production and issuance for relevant business departments, allowing them to focus their time and energy on effectively improving the digital literacy and skills levels of teachers and students.

3.6 The creation of high-quality digital training courses open to the entire society

The Chaoxing online learning platform includes the on campus private course Fanya online learning platform and the Xueyin online MOOC (short for massive open online courses) learning platform. The online courses in the Fanya online learning platform can be pushed to Xueyin online and opened to the whole society if they meet certain construction quality requirements. Learners complete course learning tasks by joining different classes under a certain course. By using the message function of Xuexitong, learners can participate in class group chats and one-to-one communication. Learners can also join the learning interest circle through the group function and engage in interactive communication with learners who share the same learning vision and goals. The organizers and participants of the group can post and engage in interactions such as following, forwarding, commenting, liking, etc. They can also store and share files through the group cloud disk. This can form a more open and shared digital literacy and skills intelligent learning ecosystem for the whole society.

4 Practice of cultivating digital literacy and skills for teachers and students

The emphasis and organizational form of cultivating digital literacy and skills for teachers and students are different. The training for teachers mainly aims to solve the digital problems they face in their work, and generally focuses on demand

research and mining. Based on this, customized training and autonomous learning are organized, supplemented by Guangzhou City Polytechnic Innovation Contest for Teachers' Integration of Information Technology in Instruction as incentives; The cultivation of students for digital literacy and skills mainly aims to enhance their digital learning and practical abilities, and through Guangzhou City Polytechnic Student Digital Literacy and Skills Competition, cultivate their ability to produce and publish multimedia information in the digital age.

4.1 Research and mining of digital literacy and skills demands

The research and mining of digital literacy and skills demands can be carried out as a routine activity or concentrated at the beginning or end of the semester. For example, using the voting function in Tencent LearnShare, two voting activities were launched at the beginning of the semester to solicit digital demands: "I learn, I make decisions" and "Ideas and needs for micro course production". Within the specified time, 236 people browsed and 39 people voted. The voting results serve as the basis for determining the theme of autonomous learning content, arranging on-site experiences or practical activities, and developing and importing learning resources.

4.2 Organization of digital literacy and skills competition and activities

By utilizing the functions of WeChat Work, Tencent LearnShare of Tencent smart education ecosystem, and Chaoxing online learning platform ecosystem, a competition contact group can be created through the Messages, and participation invitations can be pushed to each WeChat Work user through LightShare. Competition briefings, learning and training can be conducted through

the Meetings, and participation works can be collected and training credit hours can be distributed through the Micro Disk. Chaoxing course system can be used to create a collection of excellent works for participants to learn from each other, and a work review website can be created for evaluator to review without logging in. The organization of the Innovation Contest for Teachers' Integration of Information Technology in Instruction and the Student Digital Literacy and Skills Competition has been successfully completed. In addition, online deep learning discussions for offline activities can be initiated through the Forum. "The 2022, Phase 2: Teacher and Student Information Literacy Improvement Plan and New Generation Information Technology Experience Activity" blended experience activity obtained 182 page views and 32 replies from teachers and students through this method.

4.3 Develop and import digital learning resources

Based on the preparatory research results, The educational technology staff independently developed micro-videos targeting specific digital work content, such as "Lottery Assistant" and "Document Attribute and Personal Information Deletion", to integrate "Common Information Office Efficiency Tool Micro

Training" using Tencent LearnShare's Classroom, and imported relevant learning resources to build "the First Micro-Course Design and Production Training Camp" and "Online Course Development and Application Training". The educational technology staff also integrated recorded school training activities into learning resources such as "Online Learning Space Competition Training Materials Collection". The series of courses with 4 themes received a total of 300 learners and 29 interactive comments, a high completion rate of learning videos, and the learning process can be dynamically tracked. In addition, text based digital learning resources can be shared and exchanged through Documents. The release of "Six Key Technologies that Influence Global Higher Education Teaching" immediately received 166 page views, 4 likes, and 4 bookmarks.

4.4 Accumulate high-quality digital resources to create MOOCs

Based on the learning and interaction situation of courses by Tencent LearnShare's Classroom, The educational technology staff selected digital resources with a large number of learners, high completion rate, and good interaction to build online courses on the Chaoxing Fanya online learning platform for teachers and students to learn autonomously. The course offered to teachers is "the Training Course for Teachers' ICT-integrated teaching competence", which includes seven modules: the theory and practice of integrated innovation in information technology for instruction, the development and application of online courses, the construction and application of online learning spaces, short video design and production training, PPT (short for PowerPoint) courseware design and production, digital resource co-creation and sharing, and the ICT-integrated teaching competence certification. It has organized personalized learning for different digital literacy and skills demands of teachers, such as all teachers, newly hired teachers, and teachers who need certification. The course offered to students is "the 2nd Digital Literacy and Skills Competition of Guangzhou City Polytechnic", which includes six customized online training videos with satisfaction rates of 98.8%, 98.7%, 100%, 96.9%, 98.2%, and 100%: "First Encounter Short Video", "Seeing the World with Photography", "Colorful Life with Camera", "Entering the H5 Integrated Media Interactive World", "How to Transform PPT", and "Improving Digital Literacy and Skills of College Students: Concepts, Methods, and Tools". Teachers and students completed a total of 4086 training credit hours of blended learning. When self-made resources reach a certain proportion and quality requirements, they can be pushed to the MOOC platform for learners from the whole society to learn.

4.5 Attempt and promote digital literacy and skills certification

On January 9, 2023, Guangzhou City Polytechnic issued "the Management Measures for the Certification of ICT-integrated teaching competence of Teachers in Guangzhou City Polytechnic (Revised in 2022)" to carry out the ICT-integrated teaching competence certification for all teachers. Based on the participation and

quality of teachers taking in information technology related training, information technology related competitions, and ICT-integrated professional course construction included in quality engineering project, the certification is recognized at three levels from high to low: A, B, and C. The certification work is organized using the homework function in the "Training Course for Teachers' ICT-integrated teaching competence" course on the Chaoxing platform and is continuing. A total of 285 teachers have submitted certification materials, and those who have obtained A, B, and C level certifications respectively account for 33.68%, 34.74%, and 31.58%. It is being promoted to be included in the Recognition of "Dual Teacher" Teachers in Vocational Education and professional titles evaluation. Currently, there is a lack of school-based certification for students' digital literacy and skills levels. Scores in information technology and related courses, computer rank examination results, award certificates from relevant competitions, and lecture hours attended in related training can all be considered for additional points in the students' comprehensive evaluation according to the regulations.

5 Research conclusion and prospect

The WeChat Work and Tencent LearnShare smart education ecosystem have powerful organizational functions, which can provide resources, activities, and interactions to every teacher and student in the school in the widest range and fastest time, easily increasing the average participation rate of digital literacy and skills cultivation and acquisition activities to one hundred participant visits; Being able to initiate digital literacy and skills activities across teachers and students throughout the school, breaking down the information barrier of teachers' prior knowledge acquisition of digital literacy and skills, enabling students to face the most authoritative, advanced, and fresh digital theories, technologies, and tools, improving the efficiency of digital literacy and skills imparting, and reverse-pushing teachers to enhance their digital literacy and skills; It can provide great convenience for the organization and implementation of learning and communication activities, allowing more time and energy to focus on digital problems from authentic work-study-life situations, improving the production efficiency of high-quality digital learning and training resources, and making teachers and students truly the masters of digital literacy and skills learning.

The Chaoxing online learning ecosystem has rich experience in large-scale online open learning technical support. On the one hand, school-based digital literacy and skills learning resources can be provided to teachers and students who did not participate in the activity in the form of courses through the Chaoxing Fanya online learning platform. On the other hand, after meeting certain quality requirements, it can be pushed to the Chaoxing MOOC platform, Xueyin Online, which is open to the whole society, forming a larger ecosystem and promoting two -way communication and interaction within and outside the micro ecosystem. It

not only provides digital resources for the social population to promote their digital literacy and skills levels improvement, but also enables the school to make timely adjustments and produce digital literacy and skills resources that are more in line with the current needs of society, making teaching more in line with social reality and promoting the cultivation of students' digital literacy and skills to meet the current society's needs for digital problem-solving, thus forming a sustained and positive interaction.

However, the construction of the digital literacy and skills smart learning micro ecosystem requires continuous technical support from WeChat Work, Tencent LearnShare, and Chaoxing online learning platform, as well as recognition from the school leadership and support from relevant departments. Once the usage trend of school technology platforms changes, related practices will face challenges and difficulties. Therefore, it is crucial to study how the digital literacy and skills smart learning micro ecosystem of teachers and students can play a role in the high-quality development of higher vocational and technical colleges.

References

[1] The Outline of the 14th Five Year Plan (2021-2025) for National Economic and Social Development and the Long-range Goals Through 2035 of the People's Republic of China[EB/OL].(2021-03-13)[2025-06-24].https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm.

[2] Cyberspace Administration of China, Ministry of Education of the People's Republic of China, Ministry of Industry and Information Technology of the People's Republic of China, Ministry of Human Resources and Social Security of the People's Republic of China. Key points for improving the digital literacy and skills of the entire population in 2022[EB/OL].(2022-03-02)[2025-06-24].https://www.cac.gov.cn/2022-03/02/c_1647826931080748.htm.

Funding

This research was supported by the :2025 Guangzhou Educational Science Planning Project:Research on the Evaluation Framework and Enhancement Pathways of Digital Competency for Higher Vocational College Teachers under the Context of Digital Transformation (Project No.: 2024110492)