The Study of Fluid Learning Styles under Open Education

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Abstract

As human beings enter an information era, open education has achieved an unprecedented progress with sharing and integration of global education resources, and combination of information technology and learning. Nowadays people can learn from anywhere and at any time. Learners have more choices provided by different learning modes. With the development of open education, independent learning has become more flexible and convenient and develops itself into fluid learning while high-quality courses are emerging and learning styles are diversifying. This paper analyzes the features of fluid learning based on its conception and connotation. It also brings up technology development as a support for fluid learning and discusses the application scene of fluid learning from the perspective of rich media technology, learning analytics, multi-screen technology, information retrieval technology, and so on. In order to provide reference to other researchers and course designers, this paper uses constructivism, humanism, and other learning theories to explore the design of fluid learning model, system and serving pattern over the basis of the optimization of U－Learning, mobile learning, collaborative learning, and other learning styles.

Keywords: Open education, fluid learning, learning style, distance learning, collaborative learning.

1. Introduction

As we enter the 21st century, learning is changing constantly with the technological development of cloud computing, learning analytics, information retrieval, and so on. The emergence of a variety of network learning platforms, learning courses, and learning tools has provided a good condition for the development of open education. Learners can access high-quality resources conveniently because of the rapid development of open education technique, public video courses, MOOCs, and other high-quality courses. Due to the popularity of the Internet, rapid development of tablet computer, and the emerging of learning concept based on big data mobile learning, geography-based learning, and seamless learning, a good learning environment has been created for learners to make use of technologies and resources efficiently.

However, there are still lots of issues unsolved while resources are richening and technologies are being developed. For instance, the retrieval of learning resources is usually not easy; the record of a whole learning process is incomplete; learning achievements accreditation system is not perfect; learning support service system is deficient. These issues have discouraged autonomous learners and reduced the influence of open education that is not a new concept at all. Obviously, the creation and sharing of knowledge by learners enrich the connotation of open education. The arrival of information age, which has injected new blood and features to open education, also generates new learning approaches and modes. Fluid learning mode, a totally brand new learning mode, was born under the influence of open education. This learning style was built mainly based on learners' autonomous learning, featuring relevance and sociality, and it is consistent with learners' lifelong learning.

2. Theoretic Basis

Every learning mode is based on a learning theory to a certain degree. Thus constructivism, humanism, and other learning theories all serve as the basis of fluid learning mode. Fluid learning mode emphasizes the initiative of learners and focuses on learning process. It is considered that learning process, which means learners accrue new knowledge, integrating it with their current understanding, is significantly effective. Fluid learning mode pays attention to the psychological factors of learners and the influence of learning environment. In the meanwhile, it emphasizes deep integration of information technology and learning experiences.

2.1 Constructivism Learning Theory

Constructivism belongs to a branch of Cognitive psychology. The principal exponents are J. Piaget, L. Voetstoots, O. Kernberg, R.J. Sternberg, D. Katz, etc. The main idea of Constructivism are: instead of receiving information passively, learners construct new knowledge and information actively by integrating existing knowledge; learners integrate new knowledge with existing one through assimilation and adaptation; learners achieve meaningful learning through a repeatedly, two-way interacted process concerning new and existing knowledge; context, collaboration, discussion, and meaning construction[1] are the four essential factors of learning environment.

2.2 Humanism Learning Theory

Humanism learning theory emerged in the United States as an important education philosophy at the late 50s to the early 60s of the 20th century. The primary representatives are A．H．Maslow, G．W．Allport, C. R. Rogers, etc.[2] The main idea of humanism learning theory are: This theory stresses human factor in learning, as well as learner-centered education; It emphasizes learner's psychological factor in learning and also pays attention to the learners' inner world; meaningful learning, autonomous learning, and conscious learning are promoted among learners; It values learning process, and advocates to learn how "how to learn" and "how to adapt" during the learning process. The learning goal advocated by humanism learning theory is to cultivate an all-round human being, not just to impart objective knowledge.

3. Concept and Contents

3.1 The Concept of Fluid Learning

The concept of fluid learning was first introduced in "Vision Paper of 2030 Open Education in Europe" <Fluid Learning: Vision for Lifelong Learning in 2030> by Isobel Falconer, Allison Littlejohn, and Lou McGill from Glasgow Caledonian University, UK[3]. They believe that fluid learning means autonomous learners can make choices about their own learning. Furthermore, they proposed the vision for fluid learning in a society that requires the following conditions: The learner can control the choice of his/her learning; learning contexts change continually in flux; formal education organizations radically open up; involvement in learning should be increased in the types of non-education organizations; a new assessment and accreditation system should be established as learning broadens.

From our point of view, fluid learning means that learners can make choices about their own leaning by using open learning platform, courses, recourses, tools, and other learning objects and services. It suggests that learners should pay more attention to choosing the right time and places to learn and use suitable facilities which provide helpful learning contents, support, and atmosphere.

3.2 Fluid Learning Characters

Fluid learning is a new stage of learners' autonomous learning, as well as a new trend in lifelong learning development. It is a transformation of learning pattern and a reversion of learning essence brought by technology development in a global context of knowledge.

In the learning context that learners choose, they can switch smoothly between individuals and society, structured and unstructured context. The primary concern of fluid learning is how to control autonomous learning to optimize the learning result, and choose helpful learning recourses at an appropriate time. During the learning process, learners explore how to study, construct meaningful knowledge, and apply learning outcomes effectively through selecting suitable learning tools and supporting services. The characters of fluid learning are as follows:

3.2.1 Suitability

It indicates learning support must be suitable to learners. It is up to the learners to select learning environment, recourses, and tools. The choice that learners made may not be the best. However, this choice is made based on learners' past learning experience, according to their own learning feature, cognitive level, and learning habit. Therefore, the choice must match learners' learning intention and inner motive.

3.2.2 Continuity

Leaners' learning process is continuous. Leaners' learning context usually extends to various life scenarios not only limited to fixed locations. Learning contents can be recorded by technical approaches so it is not necessary to convert learning contents when learning terminal or context changes. The whole learning process can remain intact by recording learners' dynamic learning process including learning behavior, learning support, and accreditation in an intelligent way.

3.2.3 Diversity

Learners have diversified learning approaches. Learners acquire knowledge and enhance skills primarily by autonomous learning, and also based on self needs, through diverse learning approaches, such as offline learning, online learning, collaborative learning, and many other ways. Additionally, learners choose different ways to solve different problems and use various technical means to conduct their leaning.

3.2.4 Intellectuality

Learners' learning context is intelligent. Under such learning context, learners' learning archives can be established automatically by technical means. The provision of personalized learning recourses, optimization of learning process, and self-surveillance learning services could be implemented through a large amount of data collection, storage, and analysis on fine-grained learners' learning behavior.

4. Technology Support Development

4.1 Good User Experience for Learners

Rich media includes video, audio, images, text, animation, and other media as well as interactive information and communication technology [4]. In terms of interactivity and responsiveness, the applications developed using rich media are richer and more convenient, which can improve users' experience and increase their engagement. Currently, HTML5 is a main form of rich media technology. It is recognized as the next generation of Web language, and is compatible with Apple iPad, Google Chrome, and Microsoft IE9. HTML5 can push the data timely, which provides powerful support for Web-based instant messaging. Rich interactions of HTML5 such as dragging, canceling previous operation, vector plotting, web editing, etc. make learners' operation fast and convenient. In addition, Semantic tags, audio and video compatibility, geo-location, multithread processing, offline storage and other functions of HTML5 make web applications rich, and provide good user experience for learners as well.

4.2 Support for Learning Personalization

Learning analytics is the measurement, collection, analysis, and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and the environments in which it occurs[5]. It is believed in NMC (New Media Consortium) Horizon Report 2013 (Higher Education Edition) that learning analytics will be widely adopted in the next 2-3 years. Through analyzing learners' learning behavior, learning contents and activities, their social network, and other information, learning analytics provides a visual interpretation of the data, which make learning and accreditation easier. It can, predict learners' further learning intention by analyzing learner's emotions, attitude, social connection, learning behavior, etc.; effectively guide learners by pushing timely personalized recourses and information ; apply the targeted learning intervention including encouraging and helping learners after discovering their learning difficulties by effective tracking and analysis of their learning process.

Learning analytics makes it possible that learners can personalize the learning process and content, and get timely feedback and advice, thereby enhancing learners' learning motivation and efficiency.

4.3 Support for Learning Continuity

"Triple-play" mainly refers to the integration of three networks: telecommunication network, radio and television network, and the Internet. Screens-play means a wealth of information is provided for PC, mobile phone, and TV terminal users through a unified Internet delivery platform [6]. In "triple-play" and "screens-play" context, a continuous learning support is ensured because of the integration of learning applications on PC, TV, smart phone, IPAD, and other terminal devices. Learners can choose different terminal device according to their learning context to get continuous learning content, support service, and knowledge management. A more humane and free learning environment is built under the support of screens-play to solve "learning restart problem" caused by changing time and space. Learning contents, interactive activities, learning guidance, and learning assessment are all consistent and coherent. These meet learners' needs and improve learning efficiency.

4.4 Effective Learning Support for Learners

Due to heterogeneous learning recourses and redundant searching results, learners are often confused with overloaded information. However, by using text-mining, knowledge base, semantic analysis, and other technologies, learning recourses which are stored, retrieved, and extracted by cloud computing system, can be accurately provided according to learners' needs and then serve as an effective learning support. Text-mining technology can help learners retrieve learning recourses through mining the categories, subjects, keywords, authors, and other information which interest learners. Knowledge base technology improves the retrieval result of learning resources and facilitates learners to acquire and use resources by researching and using ontology base, general knowledge base and domain knowledge base. Semantic analysis technology assists learners to retrieve, manage, and use learning recourses effectively through analyzing unstructured learning resources and extracting their semantic content.

5. Fluid Learning Pattern Design

Pattern means a model or a form representing activities and processes based on theory. Learning pattern refers to a stable learning activity structure based on a corresponding theory in order to achieve a certain goal [7]. Fluid learning pattern mainly relies on learners' autonomous learning. Through learners' independent selection of learning channels, learning plans, learning resources, and learning assessment, fluid learning pattern matches learners' needs by dynamic professional learning approach and creates new knowledge beneficial to learners' future by conducting open learning practice.

5.1 Model Design

Fluid learning is a systematic process in which there are several key factors: learners, learning helper, learning recourses, learning environment, and supporting service. The fundamental difference between fluid learning, a new learning pattern, and others is that fluid learning acquires appropriate learning rather than any learning. The designing of fluid learning model starts from the characters of learning. It systematically analyzes learning needs and defines learning tasks. Furthermore, through analyzing learning contents and learning environment, as well as designing fluid learning model, learning goals, learning strategies, learning channel, and learning support, screens learning resource can be identified and study plan can be made that will be conducted through autonomous exploration, collaboration, mutual assistance, and discussion. In the final step, it comes to formative and summative evaluation and the learning outcome can be accredited through the assessment of learning performance. The fluid learning model design is shown in Figure 1. This model can achieve seamless connectivity, omnidirectional interaction, pushing according to needs, scientific analysis, and evaluation of fluid learning.
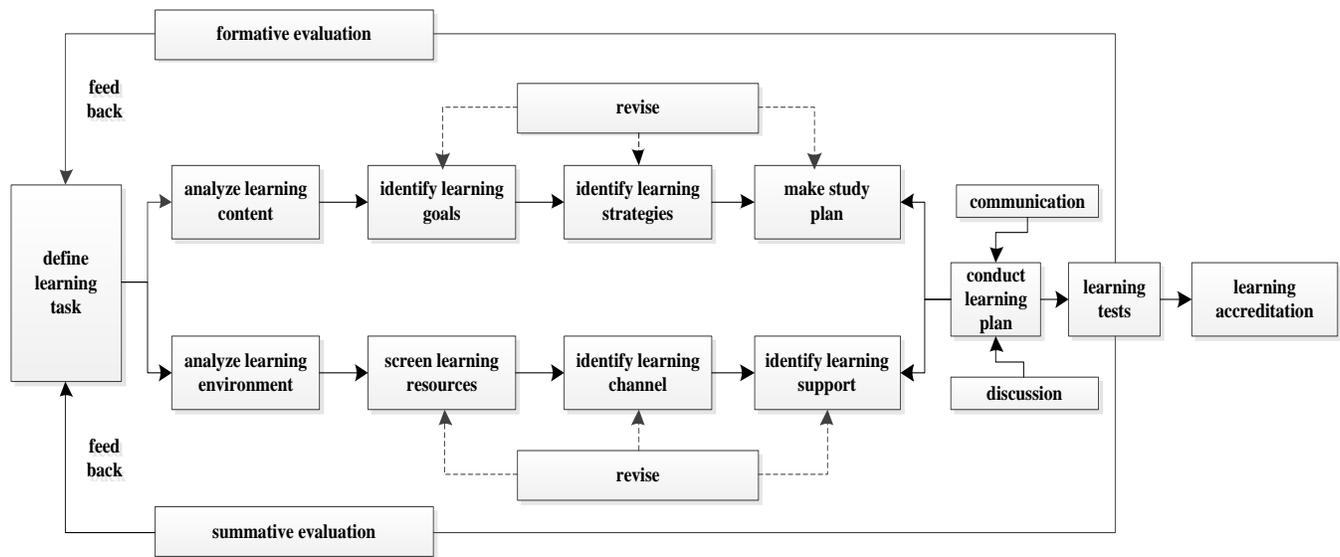
Figure 1: The fluid learning model design

Analysis, design, implementation, evaluation, accreditation are five key factors in fluid learning model. Thus we can divide the model into several important phases.

The first phase is need-analysis. During this phase, learners set their learning goal according to their needs, and make a careful analysis on their learning environment. Learners have a clear understanding of three main learning styles: formal, sub-formal, and informal learning, as well as five main application forms: school education, distance education, corporate training, autonomous learning, and social life. Different fluid learning forms rely on their respective media equipment and technology environments. Learners clearly define their learning tasks through analyzing their learning needs that vary from one learner to another. The learning needs can be a solution to a problem, a skill, or even an experience. Learners divide their learning needs into separate unit in which learning tasks are defined differently. In this way learners clearly know what to learn. At the same time, they make a thorough analysis of their learning environment so that they can decide to adopt e-learning via computer or learning via mobile phone. In fluid learning environment, various terminal interfaces could be accessible including mobile phone, PC, tablet computer, etc. The learning support varies with different learning environments. The feasibility and limitation of learning in specific learning environment should be considered in order to make provision of open, intelligent, accurate, convenient, and omnipresent learning support as well as the smooth transition among different possible terminals.

The second phase is learning design. In this phase, learners design their learning related factors and determine the learning plan based on their need-analysis. Learners have a clear understanding of the specific learning goal and the implementation method to that goal, as well as learning activity elements, activity process, the function of learning body and learning devices, and the layout of learning environment by analyzing learning goals. In the meanwhile, a further choice on learning resources (text, graphics, animation, audio, and video), learning strategy and learning channels (the Internet, digital TV, IPTV network, and mobile network) should be made according to the learning goal. Furthermore, learners should select appropriate learning support including managerial, academic and emotional learning support based on the goal, contents, environment, strategy and other factors. After a comprehensive consideration of various learning factors, learners choose their learning plan. Learning design makes fluid learning pattern suitable not only for the particular application environment but also for the migration of learning environment (from school education to self-study at home, from e-learning to mobile learning), and in this way ensures the smooth process of learning.

The third phase is implementation. This phase deepens and carries out the learning design. In this phase learners choose learning contents in a smaller range, optimize learning plan, and carry out the learning plan as well as learning communication and discussions according to the learning design. Learners may frequently change learning environment and learning equipment in a traditional physical space, mobile, or non-mobile information space.

In order to realize the interaction of information space and physical space, learners use electronic equipment, mobile devices, and sensors to study among multiple spaces and application situations. The whole learning process is mainly based on learners' choice. They can choose instant or non-instant communication with the others online or offline as well as collaborative learning and mutual learning assistance with the others. During the learning process, ubiquitous computing technology, as the core support for learning context, provides the most relevant and appropriate personalized learning support services for specific users in a particular scenario as needed by obtaining and using the contextual information of computer devices.

The fourth phase is accreditation. This phase is the testing of learning performance and the accreditation of learning outcomes. The testing of learning performance is a formative and comprehensive assessment based on the record of the whole learning process, self-tests, evaluations from the others, etc. The visual feedback of learning performance can be offered to learners through dynamic analysis of users' learning status through technical means. In this way, learners can have a direct and clear understanding of the learning performance, the support for their learning summary, and the guiding suggestion for their learning. Besides the formative and comprehensive assessment of learning process, in order to receive some credits or certifications, learners also take tests through professional assessment institutions and get their learning outcomes accredited. The accreditation phase intelligently analyzes learners' learning outcomes from all kinds of learning styles (including formal and informal) and provides suggestion for learners' life-long learning in the future.

5.2 Architectural Design

The architectural design is based on the continuity of fluid learning. This continuity feature indicates that learning context, activities, and support are continuous. Connected-learning makes it possible that learners choose different terminals and learning styles from which they can still resume their previous learning. The demand of learners to learn at anytime and anywhere can be satisfied through the learning style. This style is built mainly based on autonomous learning, automatic switching among different terminals, the push of personalized resources, and the automatic learning tests. The application of fluid learning mode relies on the support of network technology and the learning system of terminal devices. The architectural design of fluid learning mode combines "triple-play" network environment with multiple terminal devices. This design is shown in Figure 2.
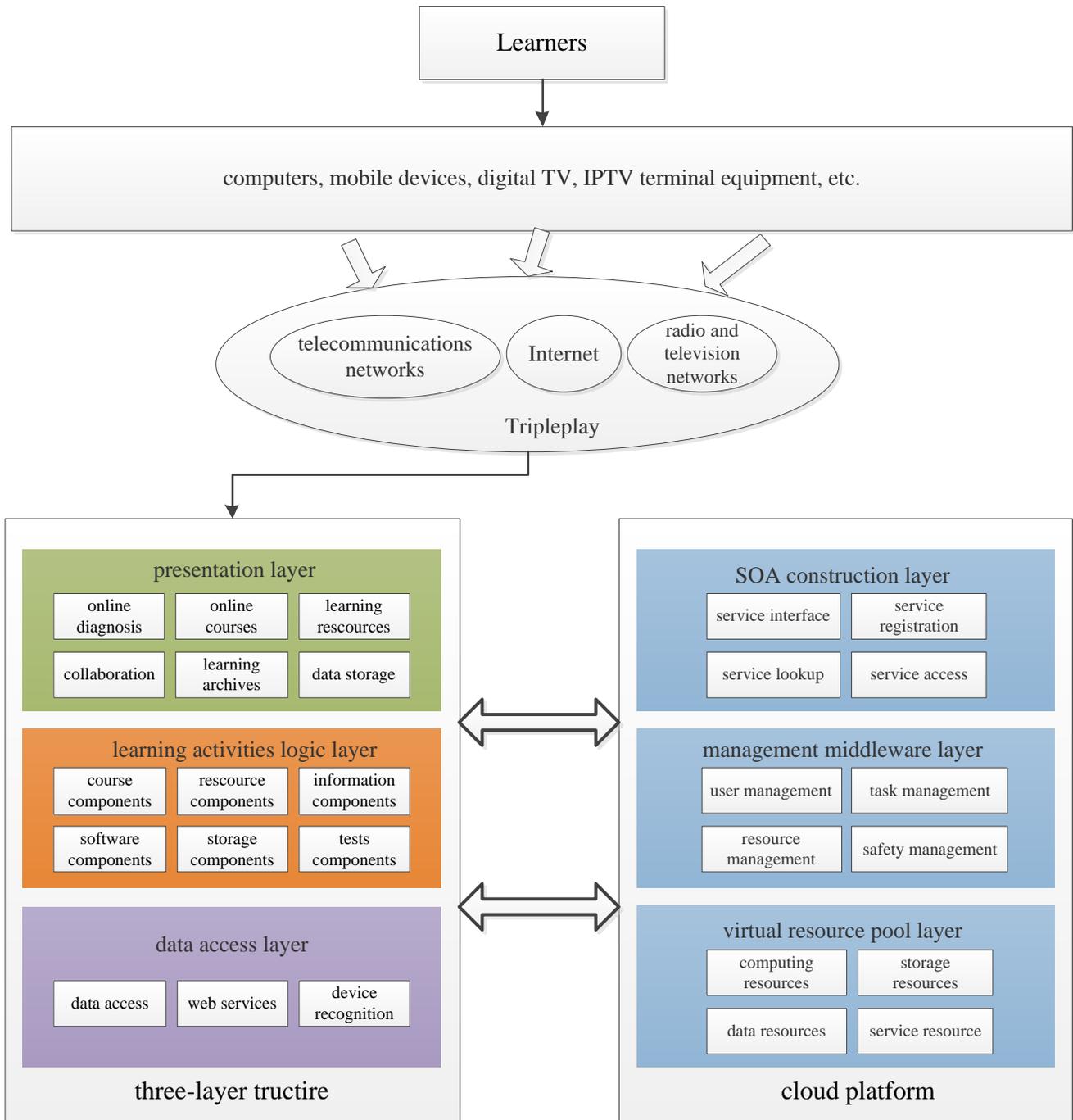
Figure 2: The architectural design of fluid learning mode

The architecture of fluid learning mode consists of unified network (learning devices, telecommunications networks, the Internet, radio, and television networks), three-layer network platform, and cloud computing platform. Learning terminals include computers, mobile devices, digital TV, IPTV terminal equipment, satellite output devices, etc. Learners can acquire learning contents as needed at any time through cloud servers. Therefore the continuity of learning activities can be ensured even if the learning device has been changed while learners always enter the same learning management system. To achieve learning continuity, the selective push of unified network and recourses are essential. The accurate push of unfinished learning contents based on the record and analysis of learning process clearly shows learners their learning status.

"Triple-play" environment mainly focuses on the unification of technologies and the integration of business application.

The information and recourses being shared through telecommunications networks, the Internet, radio, and television networks make seamless connection possible. Under "triple-play" network environment, same business applications can be displayed in a same form even on different terminals or interfaces that play a vital role in fluid learning mode.

Three-layer network platform, consisting of presentation layer, learning activities logic layer, and data access layer, uses relevant interface to get the service provided by cloud computing platform through recognizing learners' needs. The presentation layer is visible to learners. Through navigation interface, learners can get all kinds of learning services including early diagnosis, course on demand, resource view, learning test, etc. The learning activities logic layer carries the access to the data access layer or directly to cloud computing server by logic process of learning activities. The data access layer uses the relevant interface to transmit learners' needs to cloud computing platform by analyzing learning contents applicability and logical judgment from users' terminal devices.

Cloud computing platform that is mainly responsible for learners' requests analyzes, processes, and provides relevant recourses for learners. Cloud computing technology system includes SOA construction layer, management middleware layer, resource pool layer, etc. SOA construction layer consists of service interface, service registration, service lookup, service access, etc. Management middleware layer focuses on all kinds of management including user management, task management, resource management, safety management, etc. Learning archives management, curriculum management, and learning activities service management are three main parts among all the management. Resource pool layer constructs various virtual resource pools (computing resources pool, storage resources pool, data resources pool, service resource pool, etc.) with massive isomorphic or close-to-isomorphic distributed computing resources through virtualization technology.

5.3 Learning Service Design

Providing learners with a comprehensive, adequate, and effective support service is the key to ensure the smooth development of fluid learning. The service is to provide consumers with a series of activities to meet their needs [8]. In order to increase their input and achieve effective learning, we also consider that learning services mean learning providers offer a series of activities and supports to learners according to their learning needs. Learners may meet some difficulties in fluid learning, for example, unable to complete the task, unable to understand the meaning of knowledge, inadequate self-restraint ability and other issues. Learning services design in fluid learning mode mainly focuses on fixing these issues. This design is shown in Figure 3.
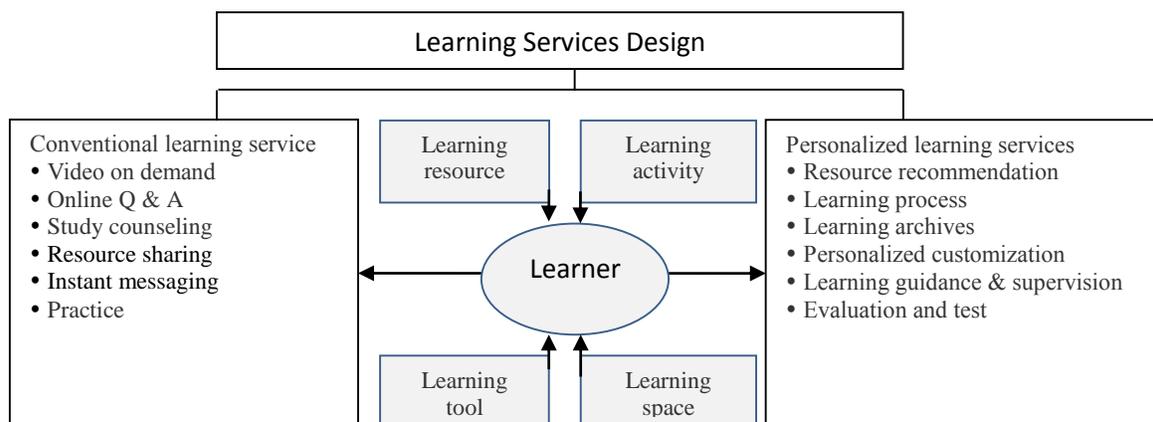

Figure 3: Learning services design in fluid learning mode

Conventional learning service is to provide basic studying support and service for learners in the process of learning activities. The basic service is to solve learning difficulties that learners may encounter. In the view of learners' cognition, skills, and emotion, conventional learning services can be designed as video on demand, online Q & A, study counseling, resource sharing, instant messaging, and practice test. In addition, learning support assistance can be provided, such as learning reminder, micro-blog, electronic materials, study calendar, etc.

Personalized learning service is to provide individual support which is useful to meet the potential needs of learners. This type of service, which is a way to cultivate self-learning ability, is designed based on the analysis of learners' learning ability, learning interest, and learning style.

It can be divided as follows: personalized resource recommendation, personalized learning process, personalized learning archives, personalized customization, personalized learning guidance, personalized learning supervision, personalized evaluation, and other services. This service design in fluid learning mode is shown in Table 1.

Service Category	Description
recommendation of personalized resources	The resources recommendation is based on the prediction which shows the relation between users' learning and behavior by analyzing users' learning data.
personalized learning process	Personalized learning process allows learners to choose their learning according to their learning characteristics through a variety of learning activities which can be combined flexibly.
personal learning archives	Personal learning archives are record of learners' learning path including their learning activities, resources, comments, tests, communication records, questions, credits and so on. Personal learning archives help learners to know their learning history and status, provide a service for self-managed learning, and emphasize the process of self-reflection, self-management and self-evaluation.
personalized customization	Learners can customize functional module such as discussion board, study notes, RSS feeds, instant messaging, etc. according to their learning habits.
personalized guidance	Self-diagnosis during the learning preparation term helps learners to find their learning starting-point. Personalized learning guidance can satisfy learners from different levels and adjust to actual learning situations.
personalized supervision	Learners will receive a suitable learning supervision service according to their learning status and learning process.
personalized evaluation and test	Personalized evaluation provides an overall assessment service including self-evaluation, evaluation from others, mutual evaluation, etc. Test service is also provided and learners can acquire credits or certifications after they pass the tests.

Table 1. Personalized learning service design

Conventional learning service and personalized learning service require a good fluid learning environment. This paper discusses learning support services system from different perspectives including learning resources, learning activities, learning tool, and learning space. Learning resources are network-based and serve as the carrier of knowledge. Network-based learning resources are divided into different categories including online courses, courseware, case, documentation, resource directory, media material, tests, and so on. Learning activities consist of a series of small activities which result in successful learning. Learning activities are mainly related to the interaction of learners and learning environment. Throughout the whole learning process, learning tools can provide effective support for learners to perform learning activities. Learning tool is designed under a customized and open design idea. Learning tool provides unified access which allows learners to add and use a variety of effective learning tools. Internet-based learning tools can effectively promote communication and collaboration between learners and greatly improve the efficiency and quality of learning. In this paper, learning space, also called network learning space, is the primary personalized learning space. Learning space can meet the needs of personalized learning through learning interface, function, recording, reminder, etc. In addition, learners can create their own custom settings. In order to create independent, authentic, immersive learning environment, learning space provides comprehensive, personalized services for learners. These services include online learning, flexible testing, interactive and collaborative learning, resource recommendation, etc.

6. Conclusion

We are in a networked society. Individuals contact with each other in such a way that is node loose, overlapping, and flat connected. With the rapid development of information technology, learners' learning style is becoming more diverse and multi-channel under the open educational environment. A variety of tools, resources, and information can always be used to support learning. Learners can get information in a nonlinear way, and learning becomes more convenient. Under this background, fluid learning is proposed and developed rapidly. With development of cloud computing, this article studies the design of fluid learning model in a systematic way. This research provides design basis for the future application of fluid learning.

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