A Teaching mode on network cloud Project-based Learning in ship design and manufacturing

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Abstract: Network cloud is changing the way industries and enterprises do their businesses in that dynamically scalable and virtualized resources are provided as a service over the Internet. This model creates a brand new opportunity for enterprises. In this paper the main purpose of this study was to develop interdisciplinary project-based learning and investigate the process and effectiveness of project-based learning involving undergraduate students in the Naval Architecture and Ocean Engineering in a college in Taiwan. The theme of this research project was "ship design and manufacturing." This study used the revised PBL model to design the project activities and integrated the learning of the following three courses: "Operation and application of 3D boat mold design software," "Boat building," and "Boat parts design and building practices." During the project, hands-on tests and experiments of were performed, and the students eventually completed ship design and manufacturing. This study selected a total of 97 students as the subjects and conducted text analysis, a questionnaire survey, and interviews to collect data. The research results showed that project-based learning in combination with hands-on learning could guide students in completing the design and building of a real boat. This learning method provided students with brand-new experiences, enabled them to experience the pleasure of boat design, and effectively elicited a positive attitude toward boat-building engineering and learning effectiveness. Moreover, this study proposed suggestions for the project process that could inform future interdisciplinary project-based learning in colleges.

Keywords: Network cloud, project-based learning, ship design and manufacturing

Introduction

In educational reform for modern technological and vocational education, the famous educator John Dewey (1859-1952) applied the idea of Pragmatism, which originated in the U.S., to the field of education and further enriched the concept of Progressivism. His educational method of "Learning by Doing" has directly or indirectly affected modern education. One of Dewey's students, William H. Kilpatrick (1871-1965), was strongly affected by Dewey's philosophy and developed the reform of student-centered curriculum, which became the theoretical foundation of "project method." Project method is the direct application of Dewey's theory of knowledge. Rather than offer a direct hint to learners through knowledge and skills, this method designs courses based on the activities that learners prefer. To put each course design into practice, students are forced to learn various knowledge and skills required by the course design. Such knowledge and skills are also verified and assessed during the process and practices of course design.

Because of the collaboration, the Internet of Things and cloud has been identified as critical business technology trends will reshape the global enterprise [1]. The manufacturing sector due to changes in information technology and related smart technologies, the cloud system is one of the smart technology. The cloud system the main goal is to provide on-demand computing services, high reliability, scalability and availability in a distributed environment. Cloud systems is defined as the ubiquitous, convenient use of on-demand network users configure the computing resources sharing pool (such as network, server, storage, applications and services), you can quickly configure and publish interactive smallest management orservices.

The output of the shipbuilding industry varies with Baltic index and economic prosperity. However, the crisis of talent cultivation, especially a shortage of talent and aging issues, generally exists in shipbuilding and yacht-related industries. Therefore, there is an urgent need to cultivate boat design- and building-related professionals, and naval architecture-related colleges are responsible for educational reform that responds to this current trend.

1. The PBL learning model of the network cloud

1.1 Significance and characteristics of the network cloud

The basic features of cloud computing are presented and compared with the original “Grid Computing” technology [2]. They introduced new services that will replace many types of computational resources currently used. In that perspective, they also consider that grid computing will play a fundamental role in defining how cloud services will be provided. SaaS, the software deployment service provided by the Internet Service Providers (ISP) and the carrier companies is expected to change the current system architecture of the organizations and thus is accepted as another innovation for the network society [3]. In the software-as-a-service (SaaS) cloud model, service providers supply the hardware and software products and interact with the user through a web portal. Services can be anything from Web-based email to inventory control and database processing [4].

1.2. The architecture and function of network cloud learning

Cloud system, everything will be regarded as services (ie XaaS), for example: SaaS (software as a service), PaaS (Platform as a Service) and IaaS (Infrastructure as a Service). (Figure 1.) services of these cloud systems, the formation of a layered architecture [5]. In the cloud system infrastructure, processing, storage, networking and other basic computing resources is defined as the standardization of services on the network. The cloud services, users can deploy and run the operating system and software, their own basic cloud facilities. If the cloud is the middle layer to provide testing, deployment, hosting, maintenance of the application abstract and services, integrated program development environment that PaaS development. The application layer to provide a complete application of SaaS set belongs. At the top of the user interface layer, so that the seamless interaction of all the underlying called the XaaS [6].

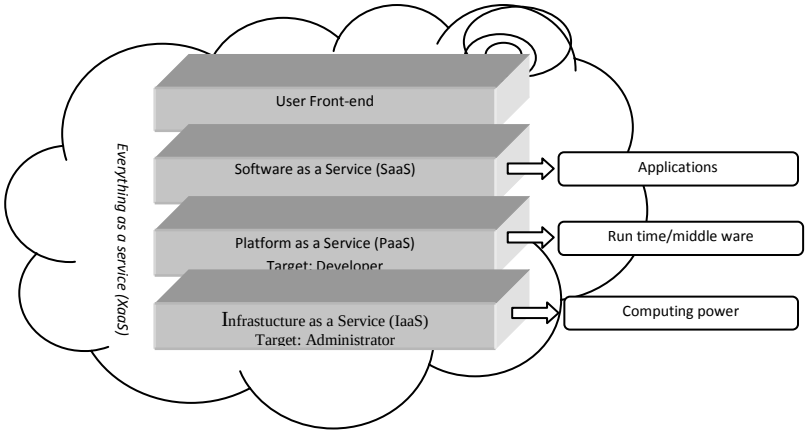

Figure 1. Cloud system: everything is a service [6].

1.3. Requirements

Previously considered to be expensive, can't use many of the techniques now use the Internet cloud web browser way, you can achieve cloud computing or other of the problem. Cloud computing platform, website, blog, video sharing, music sharing, social sharing, collaboration software, edit the presentation and publication. The students have been able to use these technologies in their personal lives. So, we should demand that our education system should take this same trend will enrich our students' technology enables the advantages of education. The model should be easy to meet the executive education, training and research related to the needs of demand (students, students and academic staff, especially the affairs of educational institutions, finance and accounting, procurement and purchasing). Perform all the necessary stages in order to build a cloud computing infrastructure, as teaching the appropriate network design, and shall require the responsible units to optimize all the requirements. (Figure 2.) The need for computing resources Network cloud infrastructure scale should be appropriate to enhance these needs. e.g. processor, memory, storage, bandwidth, etc.

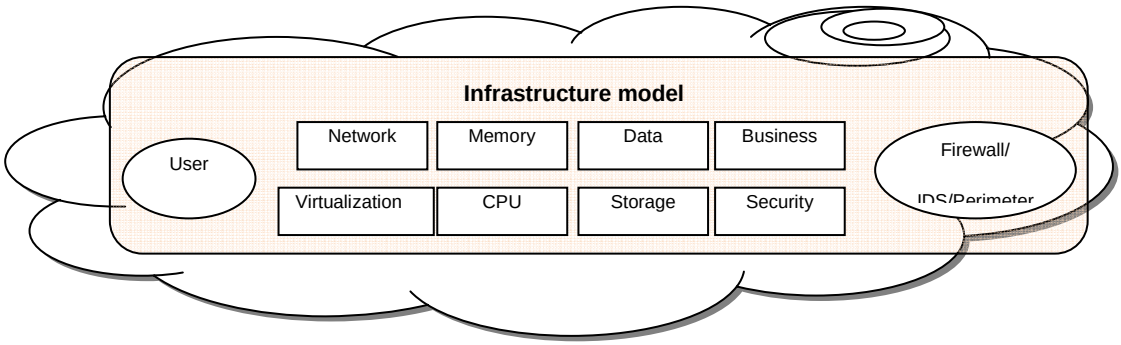

Figure 2. Required infrastructure model

Cloud offer a variety of applications, the most important is the availability and scalability. Interface to be able to use friendly, necessary to enable users to easily expand their computing environment [7]. Cloud computing platform for the contents of the application, rather than the application itself the center. Content of the original system, the user can quickly build and solve the problem. Cloud covers the science and social studies, such as art, opinions, textbooks and encyclopedias, the system service provider to the user to be able to control and improve the data mining technology to filter and find the requested content to help students. (Figure 3.)

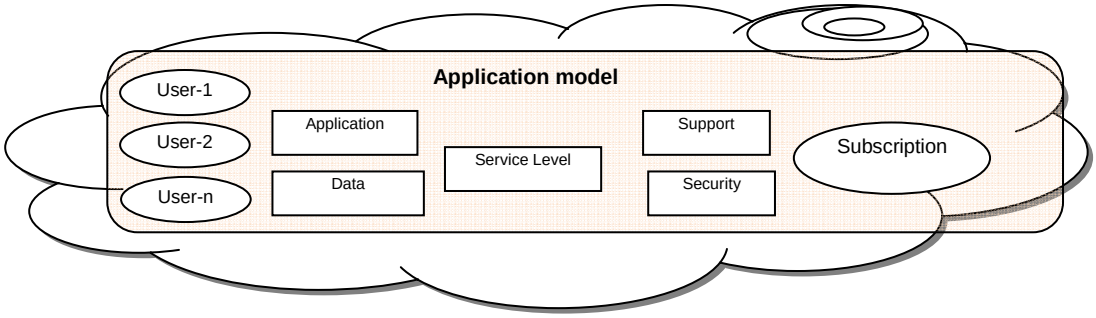

Figure 3. Required application model

Sometimes the cloud system as the integration of disciplines, research areas is the future trend of the evolution and convergence of results such as the Internet, "to pay you / utility computing, flexibility, virtualization, distributed computing, storage, content outsourcing, Web2.0 and grid cloud computing can be thought of many ways the evolution of the trend of interdisciplinary applications [8]. Implementation of the IT infrastructure of cloud computing, computing power, data storage and service outsourcing supply unit to the system, more and more companies are taking advantage of cloud systems, one of which is the NEC. For the form of a cloud service platform solutions in the transformation of enterprise systems play an important role to help reduce costs, and flexible service deployment, expanded flexibility and increased productivity [9]. Cloud computing has also been used for other commercial and scientific fields, such as the associated e-commerce [10]. Various scientific meetings and discussion, the formation of consensus [11] and information sharing [12].

2. The teaching strategies of Network cloud ship design and manufacturing

2.1 Project-based Learning in ship design and manufacturing

PBL (Project-Based Learning) is a systemic teaching method, which integrates the course contents of various subjects and enables students to ask questions and investigate various issues in real life. Because the teaching materials of various subjects are integrated, students can comprehensively learn new knowledge and skills by probing into complicated issues and carefully planned tasks [13]. U.S. educators have always attached importance to PBL for the following reasons: 1) the findings in both brain science and psychology showed that direct instruction, which places emphasis on instruction provided by teachers and student learning, restricts the development of knowledge, thinking, and implementation among learners, and 2) the development of modern technology forces educators and schools to make adjustments. Therefore, students not only have to be good at workplace planning and familiar with the mechanism of teamwork, but they also have to develop excellent communication skills. Such abilities cannot be completely developed by traditional teaching methods [14]. Consequently, the purpose of PBL is to provide real contexts to help develop learners' abilities to discover problems actively, communication and coordinate, and solve problems [15]. Krajcik et al. suggest that the purpose of PBL is to pose to students an exploratory question that is real and meaningful. During the exploration process, students have to try to find the answer to the question, cooperate with other students, make use of technological tools, and eventually develop an artifact. The teaching involved in this process must be interdisciplinary because the contexts of real life are integrated and cannot be clearly understood from a single perspective [16]. Therefore, in PBL courses, the final project work cannot be completed until teachers design the interdisciplinary, hands-on learning and implement the teaching of project, and students

share with their peers the challenges they encounter and work in a competitive relationship. This interactive model of learning enables teachers to develop new teaching perspectives and enrich their PBL-oriented teaching concepts. The main conceptual change is that teachers' roles are transformed from information providers to learning assistants that help students seek external organizations or resources, establish partnerships, and apply new technology to PBL. Moreover, PBL emphasizes that the questions explored by students must reflect real-life situations or problems and that students must have access to the tools used in real communities. Therefore, PBL can circumvent situations in which students are unable to apply what they have learned in real life; it also can increase students' motivation to learn. These characteristics of PBL are consistent with situated learning theory, which puts emphasis on the connections between learning, environmental context, and the use of knowledge; promotes dynamic learning; and encourages teachers to enable learners to choose their own projects to make learning become a purposeful activity [17][18]. Thus, PBL is a construction-oriented learning method, which provides students with complicated and authentic projects to enable them to find a theme, design a project and plan for action, collect data, execute problem-solving, establish decision-making actions, complete an exploration process, and exhibit the learning method of their work. PBL not only puts emphasis on "learning by doing" but also "learning by studying" to cultivate students' problem-solving ability [19]. To students, PBL is a learning strategy. To teachers, PBL is a teaching strategy for transforming the activities of traditional classrooms into the environment of active learning. Lou et al. suggested that PBL enables students to analyze questions, discuss their ideas with others, design projects or experiments, gather information, collect and analyze data, reach conclusions, communicate with others about their ideas and discoveries, and eventually solve problems by exploring real or meaningful questions. Students can actively engage in relevant work, complete real products, and announce their learning process within a defined period of time [20].

Based on the characteristics of PBL described above, the ship design and manufacturing course in this study is a student-centered PBL system in which teachers can instruct students and students can initiate group discussion to learn ship design and manufacturing and verify the actual practices of the trade. In a PBL system, students can cooperate and compete with one another and jointly complete the design and building of a boat according to the objective of a project. Students can learn practical knowledge, skills, and the spirit of teamwork through the PBL system. Therefore, the main purposes of this study were to investigate the feasibility of applying PBL to college-level ship design and manufacturing courses and analyze the implementation procedures, effectiveness, and student learning satisfaction levels to inform future naval engineering education.

2.2 The concept of cloud ship design and manufacturing

Network cloud of ship design and manufacturing concept is new, but the enterprise applications and distributed manufacturing concept has been for some time, it is recommended that the cloud system and carry a framework for design, there should obviously choose the image. Brecher, etal. [21] that the production environment in an information-intensive applications can be organized in a service-oriented approach. They proposed a module-based configuration platform, interoperable CAD-CAM CNC programs. Our goal is uneven along the chain, CAD-CAM-NC against software problems. This method is called to open a computer-based manufacturing (OpenCBM the) (Figure 4.) to be supported in the collaborative process planning.

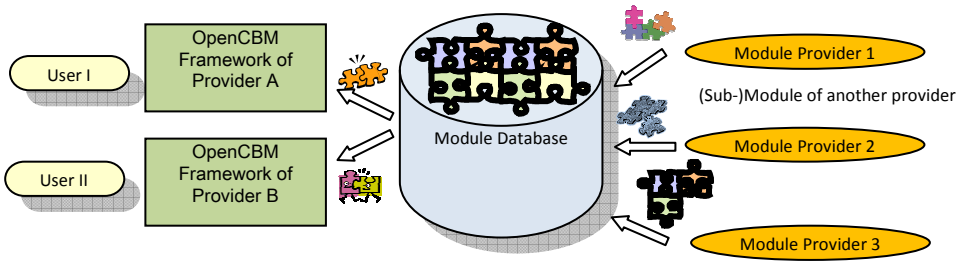

Figure 4. Module users and providers of the OpenCBM approach [21].

To perform the structure of the network cloud 10 inspection tasks should be integrated into the processing sequence of operations, engineering design and analysis phase of the online consultation, to STEP graphics file specifications, you can ensure that the manufacturing process [22]. Commonly used architecture the organization OpenCBM platform specific modeling tools, information and connectivity model [23]. The application of a single component to achieve, as an integrated system of services to ensure that the system's modularity and reusability.

3. The plug-and-play framework strategies of Network cloud

To achieve a run-time configuration integration environment for engineering simulations, van der Velde [23] reported a plug-and-play framework for the construction of modular simulation software. In this framework. (Figure 5.)

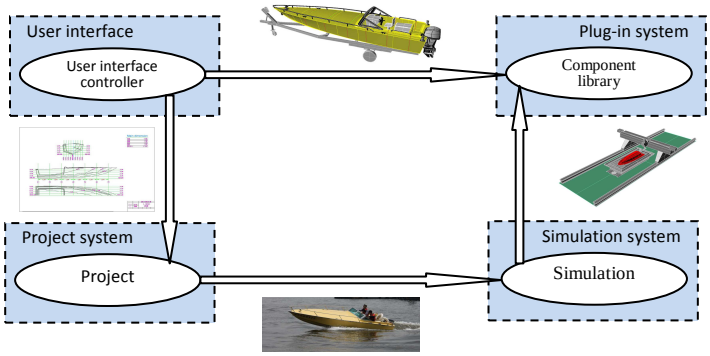

Figure 5. Main elements of the plug-and-play framework.

The user (at the Application Layer as in a cloud ship design and manufacturing system) is allowed to select a target of simulation and assign the performer of the simulation called ‘‘component’’before running the selected components. These components are effectively software entities (orotherwise known as SaaS as in cloud computing/manufacturing). They can be modulated, self-contained, mobile and pluggable. After the simu lation, the output is post-processed through the components. In such architecture, software modules are detected, loaded and used at run-time with the framework (i.e. the Global Service Layer) needing no prior knowledge of the type and availability of components, thus providing true plug-and-play capabilities. (Figure 6.)

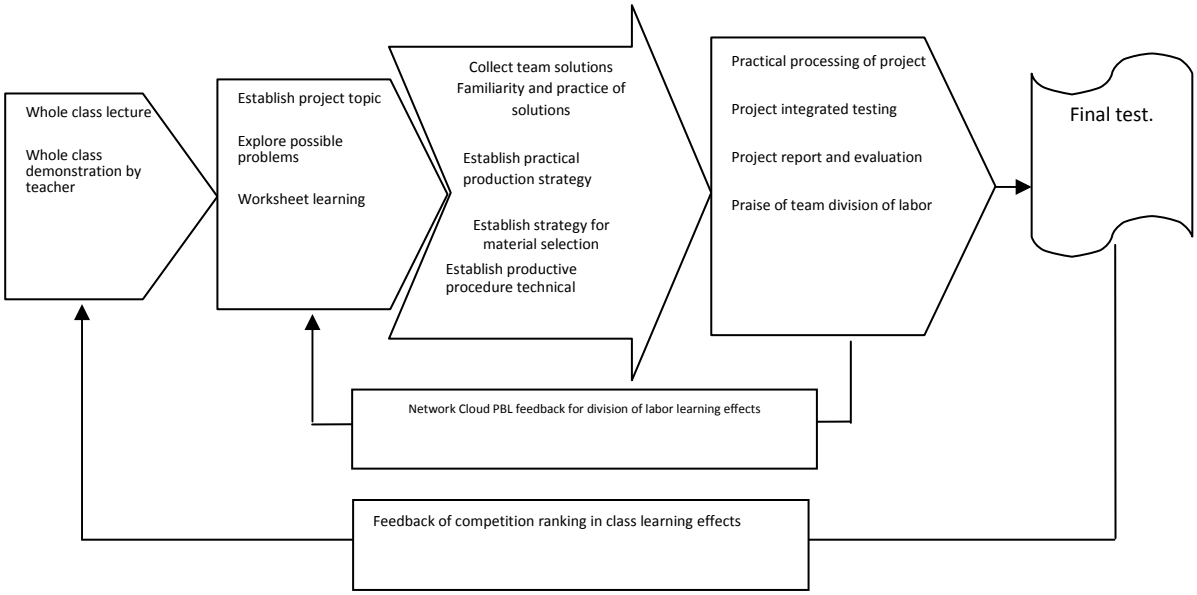

Figure 6. Network cloud PBL learning strategies.

4. Conclusions

Based on the findings discussed above, this study offers the following conclusions and suggestions. The PBL course in boat design and building required diversified prior knowledge and practical techniques. During the learning process of the boat design and building project, teachers and teaching assistants could immediately deal with the difficulties encountered by students through careful instruction. Moreover, they also could provide students with adequate assistance and inspiration if students raised any questions during the project and jointly seek solutions to further improve students' abilities to solve problems actively. After the completion of the PBL project practice, students could achieve more recognition and admiration in the delivery of their presentations and exhibitions. This process helped students increase their interest in learning and accumulate more learning energy. Moreover, the analysis of the questionnaire on students' learning effectiveness showed that most of the students affirmed the learning effectiveness of the project. After participating in the practical learning of PBL in boat design and building, students obtained a great deal of knowledge about the subject as well as valuable personal experiences because they actively overcame difficulties and frustrations during the project and eventually completed the verification and the tasks. Although it was a difficult process, students were extremely satisfied and delighted and suggested that their efforts were worthwhile as they saw the presentation of their achievements on the project. Students also suggested that they learned how to integrate their knowledge of the course subject matter with their practical and personal experiences and to present their learning achievements through a project report and presentation. In sum, PBL can help students understand the interdisciplinary knowledge system and develop comprehensive problem-solving abilities.

It was less possible to control the individual factors of students in this PBL system. For example, it was less possible to take into account the personal preference of the few students whose willingness to learn was low, to adjust the contexts and contents of instruction. Moreover, there were few teaching resources required by the course, including "hardware", such as materials and equipment, and "software", such as expert knowledge and professional techniques. Consequently, when determining the theme of a project, teachers are advised to include advanced planning that takes into account both internal and

external environmental factors, especially restrictions on time, for the availability of teaching resources and expert support, and student problem-solving ability. Furthermore, during the implementation process, a student feedback mechanism and teacher consultation system should be established to facilitate communication and interaction between teachers and students so that instructors can understand students' learning processes and provide remedial instruction if necessary. By implementing these suggestions, the application of PBL to relevant interdisciplinary courses can achieve high teaching effectiveness. From the perspective of students, the characteristics of small group team game tournament cooperative learning technological practice include principles such as: 1) learner-centered; 2) encouragement of division of labor and cooperative learning; 3) allowing students continuous improvement of their works or accomplishments; 4) designing tasks so that students can actively operate and not learn related knowledge; 5) requiring that students can output works, reports, and accomplishments; and 6) cultivating capabilities that are challenging and focused on higher levels. From the perspective of the teachers, its characteristics include principles such as: 1) having genuine content and purposes; 2) applying genuine evaluations; 3) the teachers are assistants of learning rather than direct instructors; 4) having clear educational objectives; 5) basis in constructivism; and 6) the teacher can also become a learner. Thus, from the deductions of this study, it is known that: small group team game tournament cooperative learning technological practice has students as subjects, and they are helped to learn from daily life and to resolve actual problems. The role played by the teacher is the designer of the curriculum and assistant in learning, while at the same time the evaluator and joint learner of the group process. Teachers can see curricular design, instruction, and evaluation as three-in-one, with the ultimate purpose of helping students to dispel the phenomenon of rigid knowledge after learning, and to train students to become adept at problem-solving. The key of exploration in cooperative learning emphasizes that issues relating to daily life would guide learners into a real context. The design of driving questions, usage of technology and engineering as cognitive tools, and scientific methods are used to resolve questions to help students perceive problems, summarize key concepts, and accumulate procedural knowledge, while at the same time guiding them to connect school knowledge and real experiences for effective learning.

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