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Practical training mode for a digital media major

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ABSTRACT: With the continuous development of the computer industry, the digital media industry is also changing constantly, and this has resulted in growing numbers of vacancies for digital media engineers. It is apparent that the existing training mode for digital media engineers cannot provide an adequate number of digital media professionals for this industry. A new approach to training digital media engineering professionals, based on teaching and industry, is proposed and discussed in this article. First, the general policy of having digital media engineers' training based on formal teaching and industry training is explained. It would connect school and enterprise better, promoting the continuous development of the digital media industry by conveying digital media professional engineers from school to society. Second, outside-school practice based on a model of four *fusions* is proposed after the formal teaching of digital media is completed. Finally, the effect of proposed teaching/training mode is evaluated.

INTRODUCTION

With the continuous development of the digital media industry, and with the help of a digital and information platform, digital media technology has become the main form of social media for digital information, built on a combination of art design and technical language [1]. The requirements of the digital media industry for better-educated professional engineers are very high. In the context of the development of science and technology; the adequate training of engineers has become vitally important as engineers play a critical role in the wellbeing of any society [2].

Many experts and scholars have researched the training of engineers, and have done a considerable amount of work. Yang carried out a case analysis of American undergraduate training targets, teaching approaches and course content, and summarised it as the engineers' training mode [3].

Zhang carried out comparative in-depth analysis of the engineers' training mode in the United States, Germany and Japan at the end of the 20th Century, and expressed a view that developing engineers autonomous learning ability and innovation ability must be based on social reality [4]. Gu has analysed the American policies relating to engineering training, summarised reform policies relating to training of engineers and put forward a rationalisation proposal for their courses and resources [5].

He et al summarised the reform and development of the American engineering training in the 21st Century on the basis of engineering practice and put forward strategies based on cooperation expansion and popularisation of engineering education, etc [6]. In this context, Jin et al reformed Chinese engineers training courses and the university-enterprise cooperation pattern on the basis of studying foreign engineers training mode [7].

Jin and Xu have drawn lessons from excellent foreign engineers' training modes and put forward an engineer talent cultivation system, which accords with the situation in China [8]. Wang et al think engineering training in China has been out of kilter and is not closely linked with engineering practice [9]. After analysing the problems of engineering training in China, they put forward a reform strategy for engineering training [9].

To train the innovative ability of engineers, Zhou et al have proposed strategies, such as strengthening autonomous learning, increasing the chance of learning practice, improving the professional curriculum design, etc [10].

From the perspective of an engineer training course, Li has developed an improvement strategy for the development of engineering practice with the guidance of advanced theory [11]. Lin and Liu have proposed the paralleled development of the engineering education platform of construction knowledge and skills, from the perspective of curriculum system construction [12]. Finally, Wu et al have observed that the teaching pattern of professional engineers' training is to integrate theory with practice, to focus on entrepreneurship education and production-study-research cooperation according to the needs of the discipline by using materials science as an example [13].

Although many scholars in China and abroad have conducted a considerable amount of research on engineering training modes, in general, there is a lack of research specifically focused on training for digital media engineers. Taking into account the demand for talented engineers in the digital media industry and considering the present status of digital media training, and the engineers' training mode, the authors of this article put forward a model for *teaching and industry* digital media engineers to enhance students' abilities and professional competitiveness.

TARGET AND TALENT DEMAND OF ENGINEERS TRAINING IN DIGITAL MEDIA SPECIALTY

Talent Demand of Engineer Training in Digital Media Specialty

With the continuous development of digital media technology and the expansion of this branch of industry, the social demand for talented engineers in the digital media is increasing gradually, resulting in new challenges for education and training in this area. According to research statistics from the Chinese Ministry of Labour and Social Security, the talent gap in Chinese digital media engineering was about 15 million people in 2013.

With the related enterprises survey in Hangzhou' digital media technology industry, the engineers' talent demand for the digital media specialists can be summarised in the following respects:

- Having certain professional accomplishment and abundant professional knowledge;
- Being proficient in the application of professional knowledge to practice and having the ability to converse between theory and the actual practical situations;
- Having strong innovation ability and certain divergent thinking;
- Having strong team working ability, understanding and communication skills.

Among these requirements, the most significant ones are innovation ability and practical ability. It has been observed that most current graduates lack these abilities or that their abilities are not good enough to perform their duties, which also leads to the growing talent gap among digital media engineers.

Location of Engineering Training in Digital Media

Starting from the social needs of digital media professional engineers, the location of engineering training in the digital media must be secured in universities and industry. The engineer's pertinence and adaptability to the digital media specialty should be based on professional quality and innovation ability, and the advancement of society must be taken into account.

Therefore, the authors of this article strongly advocate the objectives of engineering training in digital media to produce professional engineers with comprehensive professional knowledge, innovative ideas, talent and practical abilities and skills, as well as a strong ability of social adaptation.

ENGINEERS TRAINING MODE OF DIGITAL MEDIA SPECIALTY BASED ON TEACHING AND INDUSTRY

Training Mode Design based on Formal Teaching and Industry Training

Based on the current social demand for digital media professional engineers, it is proposed that the training be based on formal teaching and industrial training according to the digital media professional talent training objectives as indicated above.

Teaching and industry training refer to the mixture of the actual requirements of teaching and practice in digital media, which would be reflected in the design of a training mode of formal classroom teaching of theory and application, as well as industrial training guided by practicing specialists.

Formal teaching means letting students be taught by teachers at school, learning related professional knowledge, skills and attitudes related to digital media technology. Industrial training enables students to learn the way to transform theoretical knowledge into practice through an actual industrial project or a project carried out outside the school practice area. Industrial training is often realised through productive labour, so that to a great extent, it develops, improves and extends the students' practical ability and skills, as well as the students' adaptability to society after graduation.

Construction of a Curriculum Group Knowledge System

According to this, engineers should be trained in digital media based on teaching and industry. The authors of this article endeavour to optimise the teaching curriculum system and propose a knowledge system based on a *curriculum group*.

The knowledge system based on a curriculum group is different from the traditional one. The setting for the digital media specialty course is based on the needs of professional industry as the guidance, and its teaching plan is based on the job demand of the digital media specialty, highlighting its practicality.

For example, in the digital media mobile game development course, the traditional knowledge teaching system, basically, can be divided into two parts; namely theory and application. The former interprets the mobile game development theory, and the latter explains the application of mobile game development technology that leads to the exposure of inexperienced and unskilled students to abundant knowledge, and the development of practical abilities and skills.

In this mode, the knowledge system is based on a curriculum group, in view of the goal of education and students' employability, pays more attention to the students' application of practical skills and abilities. For example, the mobile game development knowledge system based on the curriculum group can be divided into three courses: scene design; human-computer interaction technology; and three dimensional animation game design.

Three dimensional animation game design, as a kind of general technology, can be used to guide the scene design course, and can also be used to guide the human-machine interaction technology. Both the scene design and the human-machine interaction technology exhibit the so-called *theory plus practice* teaching manner, under which half of the courses are taught by the teacher in the classroom, and half are carried out in the laboratory for practice.

It is helpful for students to have real environment theoretical guidance and practical development technology by using development tools, such as a teaching platform to guide students to use mobile phone game development principles to develop mobile games. There are many options for development tools on the market, and one should take the market as the guide and select the widely used tools as a teaching platform.

Teaching Process Design based on Teaching and Industry

On completion of the construction of the digital media knowledge system, the authors have used the digital media mobile game development course as an example, and propose that the teaching process be based on formal teaching and industry practice, the main steps of which are as follows:

Choose appropriate teaching materials and arrange the teaching process reasonably. The choice of appropriate teaching materials in a mobile phone game development course must be based on the demands of the market and knowledge of the demand for talented engineers in mobile game development through market research in the current society. The selection of appropriate teaching materials may include such publications as *Android Game Development Practice Guidelines* written by Rick Rogers in 2012, *Unity 3D Mobile Game Development* written by Jin Xi in 2013 and so on, and should not include old or outdated texts.

Take practice as main teaching method in classroom teaching. For classroom teaching in the mobile game development course, one should reduce the interpretation of theoretical knowledge and increase more hands-on activities by focusing on individual examples and instances. The teacher can explain or demonstrate through the use of multimedia courseware several concepts and ideas, except for some contents that cannot be done with computer operation, and that contents should be left for the students to achieve the goal of learning through practice by themselves.

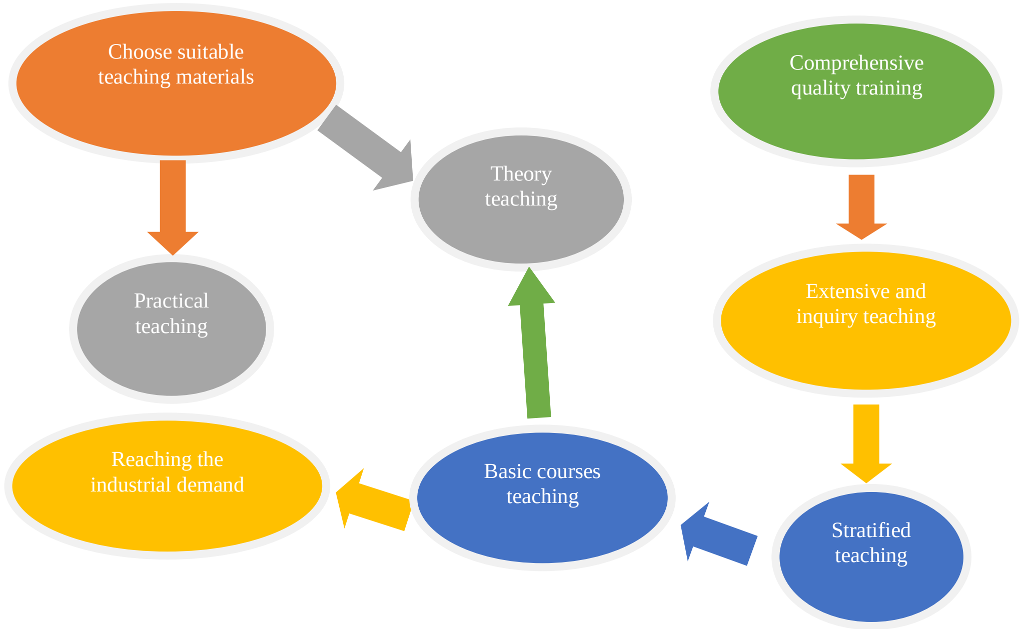

Figure 1: An education process based on the *teaching and industry*.

The teacher mainly plays the role of a guide, leading, organising and controlling the entire teaching process. His or her responsibility should be to arouse students' interest and initiative in learning, develop their ability to identify and solve problems, and let students focus on *how to do it* rather than *why*. Teachers should also face up to the challenge of identifying students' characteristics with stratified teaching, and focus on both ends in the teaching process.

For students with an intellectually high starting point and strong ability, teachers should increase the expansive and innovative teaching content; thereby, cultivating their wide-ranging quality and the understanding of, and appreciation for, sustainable development, whilst emphasising the innovative development capabilities of mobile game development. While some may place particular stress on theory, skills training should be strengthened, as repeated training can cultivate students' most basic mobile game creation skills to satisfy the demand of industry (shown in Figure 1).

Outside School Practice Mode based on Four Fusions

For outside school practice in the training mode of digital media engineers, one can adapt to the social demand for talent and realise the cooperation between school education and industrial training by facilitating school-enterprise principles and operation; hence, realising the supply of talent to society.

The school should develop teaching according to the double loop of *learning-practice* for students, by hiring industry project managers as supervisory teachers. It, then, realises the improvement of students' knowledge, skills and attitudes in actual and natural contest for better employment by setting up an *internship company*, and tests the teaching level through an interview for the enterprise or business practice. This is shown in Figure 2.

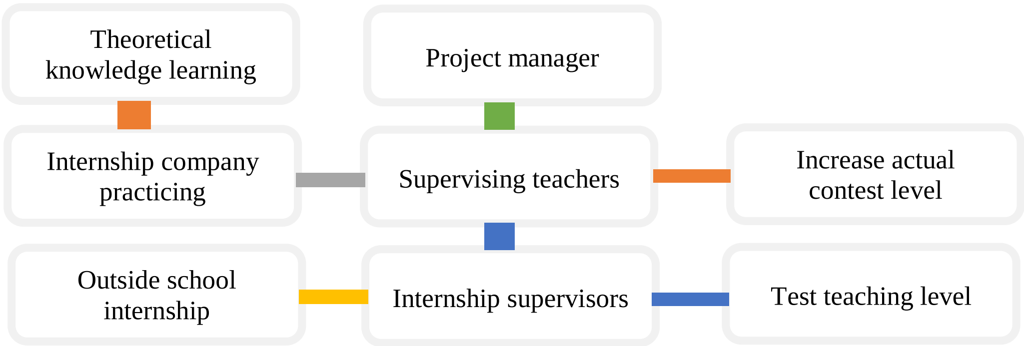

Figure 2: Outside school practice process.

The authors put forward outside school practice mode based on the *four fusions* according to the outside school practice process shown in Figure 2, which includes the following:

The Fusion of Site

Students have classroom-based theory classes, outside school practice classes, which are located in a company, and the specific training plan is made in accordance with the whole teaching plan of *teaching and industry*. Students complete professional theoretical study in the classroom, and develop and improve professional skills through outside school training in an industrial enterprise.

The Fusion of Learners

The student is a professional skills learner and, at the same time, a producer when practicing outside school, in which two roles of a student and a staff member roll into one.

The Fusion of Initiator

In the outside school practice training, the initiator/facilitator is both a teacher and the project manager of practical guidance.

Results of the Fusion

The products finished by students in the internship or practical training in accordance with the requirements and quality of the finished product can be placed on the market, and be directly exposed to the inspection and acceptance by the market.

In this way, schools and enterprises can be connected better by the outside school practice mode based on *four fusions*, promoting the development of engineer talent training in the digital media specialty.

Subjects and Method

The concepts and ideas presented in this article were verified mainly with regard to two aspects: a survey questionnaire and test scores. In this research, the two randomly selected classes from a 2013 cohort of university students were respectively an experimental group A and control group B. There were 50 students in each of the two class groups. Experimental group A adopted the digital media specialty engineer training mode based on formal teaching and industrial training, whereas control group B was educated using the traditional training mode.

Statistical Analysis of Test Results

After two years of the digital media engineer training based on teaching and industry, the experimental group and control group were appraised using a survey questionnaire and an assessment test. The authors, then, carried out a statistical analysis of the test scores.

Normality Test

The statistical results of the engineers' knowledge and skills test scores of the experimental group and control group of the digital media specialty are shown in Table 1.

Table 1: Test scores statistics.

Group	Engineers' knowledge	Engineers' skills
A	82.35 ± 1.23	81.58 ± 2.34
B	65.89 ± 2.04	62.29 ± 1.89
t	4.18	3.49
p	$p < 0.05$	$p < 0.05$

The normal distribution of the analysis of the data in Table 1 is obtained as follows normal distribution.

Table 2: Normality test table.

Group	Kolmogorov-Smirnov test		
	Statistics	*df*	*Sig*
A	0.13	50	0.36
B	0.13	50	0.28

As shown in Table 2, the *Sig* of group A and group B are greater than 0.05 in K-S check; hence, it can be concluded that two groups are normally distributed.

Homogeneity Test of Variance

The homogeneity test was carried out on the experimental data, which is shown in Table 3.

Table 3: Homogeneity of variance test.

Statistics	df_1	df_2	*Sig*	Mean square	*f*
4.12	1	92	0.11	0.368	6.12

As shown in Table 3, *Sig* = 0.11, *Sig* is, then, greater than 0.05, showing the data homogeneity of variance.

Independent Samples Test

To illustrate the different achievement of the two groups of students, statistical analysis was also carried out on the independent sample test, whose results are shown in Table 4.

Table 4: Independent-sample tests.

	f	*Sig*	*t*	*df*	Mean difference	Standard error
Equal	6.12	0.02	3.24	92	5.18	2.01
Unequal		0.01	3.24	83	5.18	2.01

As shown in Table 4, *Sig* = 0.02 in *f* test of variance as per data listed in the table, is less than 0.05; hence, the second line should be considered. Assuming that the variance is not equal, *Sig* = 0.01 under examination of the mean equation *t*, being less than 0.05, which means that there is a significant difference between the two investigated samples of the experimental group A and the control group B after two years of study.

CONCLUSIONS

With the continuous development of the computer industry, the digital media industry is also experiencing constant progress, which means that the social demand for digital media professional engineers is also increasing.

In this article, the authors propose a training mode for digital media engineers based on *teaching and industry* according to the characteristics of engineers training in the digital media specialty, through building the knowledge system of *curriculum group*, designing a teaching process for the digital media specialty, and presenting outside school practice mode on the basis of *four fusions*, so as to promote the development of the digital media industry.

The authors also put forward an effectiveness evaluation based on a survey questionnaire that investigates the training of the digital media engineers. It can be seen from the survey results that the quality of students has been greatly improved through the innovative training mode proposed and discussed in this article. It can also be seen from the questionnaire results that students are moderately satisfied with the innovative talent training mode proposed by the authors.

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