

# The Application and Analysis of Multimodal Learning Theory in the Experiment Teaching of Computer Graphics

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**Abstract:** This paper describes the concept of computer graphics, analyzes the principle and key points of multimodal learning science theory, explores the multimodal learning theory applied in "computer graphics" in the experimental teaching of "computer graphics" in order to provide some references for experimental teaching.

## 1. Introduction

The course of computer graphics covers an extremely rich teaching content, with great theoretical difficulty and remarkable practical characteristics. At present, the teaching of computer graphics has paid more attention to the effective development of experimental teaching. The multimodal learning theory is of great significance to the experimental teaching of computer graphics. Therefore, it is necessary to strengthen the application of multimodal learning theory in the experimental teaching of computer graphics.

## 2. An overview of computer graphics

Computer graphics refers to the transformation of two-dimensional and three-dimensional graphics by related mathematical algorithms, so that it can effectively transform the form of computer display raster. In short, computer graphics mainly study the algorithms and principles of computer graphics representation, calculation, processing and display. Computer graphics is committed to the scientific construction of effective visual communication. It has been widely applied in many fields, such as computer aided design and production, computer-aided instruction, computer animation and so on. [1]

## 3. Summary of multimodal learning theory

The multimodal theory of learning attaches great importance to the study of the learner's learning behavior. According to this theory, learners interact with all kinds of external environmental factors through various senses, namely modality, such as visual sense, hearing and sense organ. All kinds of modality are [2], a good communication channel between learners and external environment. In learning practice, all kinds of learning contents contained in the external environment achieve effective entry into the learner's mind with various modality. Learners can transform their learning contents from external environment to their own knowledge through effective processing within the brain. The interaction between the single sense and the external environment is called the single mode, and the interaction between the senses and the external environment is called multimodal. Usually, the human visual sense, the auditory sense, the tactile sense, the olfactory sense, and the taste sense are used as the basic senses, or "5 modes". Each mode has the corresponding submodes, and the modal receptor consists of two internal and external types. The internal receptors mainly receive timely and effective information about the body's internal information, and the external receptors

mainly receive and process interactive information in time. Each mode has the corresponding primary area division in the human brain, and a few modes even have the assistance of the corresponding secondary areas. Multimodal learning theory emphasizes the effective and coordinated use of all kinds of human body's modes, so as to achieve effective improvement of learning effect and promote [3]. At present, relevant scholars mainly use various psychological knowledge, such as cognitive psychology and educational psychology, to explain scientifically the specific principles of multimodal learning theory. Among them, Mayer's multimedia cognitive learning theory, Roxana's cognition and affective learning theory are most representative. The above theory holds that learners' learning motivation, learning emotion and other factors have a crucial impact on learning effect.

The main points of multimodal learning theory mainly include the following contents: (1) all learners have the corresponding senses, which can effectively deal with all kinds of modal related information, and all kinds of senses have some limitations in cognitive ability. (2) effective interaction between modes can significantly improve the learning effect, for example, children can effectively acquire good language ability in daily life interaction. (3) in the study and practice, strengthen the effective control of the sound information and silent information, so that the two keep synchronization in time, at the same time, the silent information synchronization in space, can realize all kinds of sensory cognitive load is greatly reduced, thus significantly improve learning effect. (4) in the learning practice, the learners consciously choose and optimize the new and old knowledge in order to enhance the significance of learning. (5) learning motivation to increase or decrease the cognitive effort presented by the learners to influence the learning effect. (6) metacognitive factors affect the learning effect by adjusting the cognitive emotion presented by the learners. (7) the level of prior knowledge and related abilities of the learners themselves will have an important impact on the learning and mastery of specific knowledge content [4].

## **4. The application of three and multimodal learning theory in the experimental teaching of computer graphics**

### **4.1 The content of the experiment**

Multimodal learning theory shows that learners can exhibit relatively limited cognitive ability to each mode within a certain period of time. Learners' prior knowledge and related abilities have an influence on the learning and grasping of specific knowledge content. Therefore, when carrying out experimental teaching of computer graphics, we can take the following measures to effectively protect students' experimental time in specific hours, and achieve effective mastery of related experimental contents. (1) based on the "computer graphics" teaching materials, by OpenGL APL and GLUT software for the experimental teaching of interactive programming environment settings, brief introduction of computer graphics technique and algorithm etc., will focus on the content of OpenGL as programming learning, change the principle of scientific application of OpenGL APL technology in computer graphics in detail [5]. (2) in order to ensure that students' cognitive load of computer graphics is greatly reduced during the limited experimental time, students can have enough time to learn and master OpenGL APL technology, and enhance the in-depth understanding of the related algorithm principles. At the same time, we provide the corresponding program framework for most experiments, and guide students to have a deep understanding of each program framework, and add or modify the relevant codes appropriately. (3) scientific gradation of related experiments of computer graphics ensures effective completion of basic experiments. On this basis, students are encouraged to actively explore and complete contents of selected experiments.

### **4.2 The organization of the experimental class**

The traditional "computer graphics" experimental class organization, usually by professional teachers of the relevant experimental tasks book of the scientific design, to assign students experimental course related questions and content, students of organizations after the code was written, and the related algorithm and principle for verification [6]. Each student operates the

computer independently and completes the related debugging. In the experiment classroom teaching, the professional teacher carries on the real time guidance to the student, answers the student's difficult problem accurately. The above teaching methods show significant monotonicity. When the number of students is relatively large, professional teachers in experimental classroom teaching can only guide a very small number of students. At the same time, the traditional experimental teaching is not easy to avoid students plagiarism through experimental reports, so it is difficult to achieve good teaching results. The application of multimodal teaching theory, the following measures can be taken to solve the above problems are: the implementation of the grouping of experimental class all the students, can be set for a group of 6 people, each elected a experimental class leader, the group leader to the experiment of dynamic real-time reporting of this group of professional teachers.

### **4.3 Experimental preparation**

The multimodal learning theory shows that the prior knowledge can significantly influence the learning effect. Therefore, in the "computer graphics" experiment teaching, we should formulate a scientific preview system and guide the students to carry out pre class preview. In the first experiment, experimental teaching before the report submitted by the professional teachers detailed examination of each experimental group, and asked the students in the experimental teaching before the start of the experimental teaching content, correlation algorithm and principle was completed ahead of schedule, and related issues are the problems and the experimental process to the experimental group in the experimental report on the question. The experimental group report and leader answer score as a benchmark scores between the experimental group. The group with poor benchmarks needs to make up for the results effectively in other experimental teaching links.

### **4.4 Classroom instruction**

Multimodal learning theory shows that effective and effective guidance for learning can enhance students' scientific selection and systematic organization of related old knowledge, and effectively integrate relevant new knowledge, so as to achieve effective promotion of learning [7]. For the effective protection of class all the students are able to get the full and effective teaching instruction in experimental teaching practice, can arrange two graduate students as teachers, teachers with professional experimental teaching guide of the class, to guarantee to each student's experimental teaching guide effect. In the specific experimental teaching guidance, three teachers are responsible for several experimental group teaching guidance work, and focus on each group leader, and strengthen the test score of each experimental group. The experimental groups were represented by the group leader, and the questions were asked by the group.

### **4.5 Classroom interaction**

Multimodal learning theory shows that students' learning emotion, learning motivation and related social interaction will have an important impact on learning effect. Through in-depth reflection on related problems, we can achieve the optimization and integration of new and old knowledge. Professional teachers make clear and scientific explanations for all kinds of questions raised by students, which can promote students' deep understanding of learning contents and significantly reduce their corresponding cognitive load [8]. Therefore, "computer graphics" teachers in the experimental teaching, should be based on the experimental teaching content, scientific setting on the reward, and formulate the corresponding experimental task, according to the situation of the students to complete the task, reward the students, and with various external conditions, the formation of effective stimulus to inspire students, effective interaction between teachers and students, between students and students and Realization of learning content, effectively to stimulate students' desire for knowledge and learning enthusiasm, realize students' learning efficiency greatly. In addition, in the specific process of experimental teaching, professional teachers should thoroughly investigate the experimental conditions of each experimental group, randomly put forward various problems, guide students to think deeply about problems, and organize students to carry out positive discussions and inquisition, and promote students' interaction and interaction.

#### 4.6 Performance assessment

The traditional "computer graphics" experiment teaching test students' achievements, usually the experimental report as the main basis. There are many disadvantages in this way, especially it is difficult to avoid the plagiarism of students. Related teachers only rely on the reports submitted by students, making it difficult to make accurate judgments on students' plagiarism and even to plagiarize students with higher scores, which will affect the fairness of performance assessment and crack down on students who independently completed the examination. Therefore, it is necessary to carry out scientific reform on the evaluation method of the evaluation of computer graphics teaching results based on the theory of multimodal learning. From the perspective of teaching hours, "computer graphics" theory and experimental teaching have the same class hour. Therefore, the achievement of "computer graphics" should consist of 50% theoretical and experimental results. In the "computer graphics" experiment results, the experimental preparation results occupy 30% of the total score of the experiment; the experimental process results occupy 50% of the total score of the experiment; the result of the experiment occupies 20% of the total score of the experiment. Among them, the experimental preparation results, mainly through the experiment report, the experimental group submitted to the group leader. Scores of each group member for scientific evaluation results. The results of the experiment are mainly evaluated by the actual experimental conditions, the completion of the experimental tasks, and the award awarded by the experimental teams. The results of the experiment are mainly evaluated by examining the standardization and completeness of the experimental reports submitted by the experimental group and the accuracy of the result analysis. The professional teachers should inform the students about the final assessment results in time, and accept the feedback from the students, and make reasonable adjustments and amendments according to the actual situation.

#### 5. Conclusions

To sum up, "computer graphics" has significant practicality, and carrying out effective experiment teaching is of great significance for improving the teaching effect of computer graphics and improving the teaching level of computer graphics. The multimodal learning theory is of great significance to the experimental teaching of computer graphics. Therefore, to strengthen the multimodal learning theory in "computer graphics" experimental teaching experimental contents, classroom organization, test preparation, classroom instruction, classroom interaction and performance evaluation and other aspects of the application, in order to strengthen the "computer graphics" experimental teaching reform, improve the effect of "computer graphics" experimental teaching.

#### References

- [1] Huang Xiaosheng, Cao Yi pro. The application of multimodal learning theory to the experimental teaching of computer graphics [J]. experimental technology and management, 2012, 29 (4): 162-165.
- [2] Zhang Yan, car winter Juan. Computer graphics teaching mode discussion and improvement [J]. computer age, 2016 (11): 80-82.
- [3] Qian SuBin. Research and practice of computer graphics "experiential" teaching system [J]. computer age, 2013 (11): 63-65.
- [4] Lei Yun. Computer graphics experimental teaching discussion [J]. computer disc software and application, 2014 (9): 221-221.
- [5] Zou Kun, Xu Xiang, Yang Liang. The teaching reform of computer graphics course oriented to application ability training [C]// higher education Polytechnic teaching seminar. 2012.
- [6] Zhao Zhi, Chen Bing. Exploration of Virtual Experiment Teaching Forum [J]. education course of computer graphics, 2017 (23): 273-274.

- [7] Han Feng, Ning chuan. "Computer graphics" classroom teaching methods reform and innovation [J]. Education: Abstract version, 2016 (5): 00047-00047.
- [8] Liang Lixiang, Liang Jianbo. Teaching reform of computer graphics course exploration [J]. computer knowledge and technology, 2015 (3X): 199-200.