



Exploration of Integrating “Technology+” Swimming Course Teaching for College Students

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Abstract. Swimming is a compulsory course for survival, and in the university life where spare time is more adequate, more and more college students join swimming lessons, and then the teaching quality for swimming courses needs close attention. This article adopted the “technology+” deep learning method to improve and upgrade the teaching methods of swimming courses for college students, and compared the results with traditional teaching methods to obtain results. In the experimental results, the average teaching quality and average learning quality using deep learning methods were improved to 85 and 86 points, respectively. Compared with the upgraded double 79 points using traditional methods, it has increased by 6 points and 7 points respectively. The results indicated that the “technology+” method, which focuses on deep learning, can effectively improve the teaching quality of swimming courses and the quality of students’ learning.

Keywords: Swimming Course Teaching · “Technology+” · College Students · Deep Learning

1 Introduction

In modern society, more and more college students are paying attention to physical exercise, and swimming, as the most satisfying exercise method for cooling and relieving heat in summer, is loved by many college students. However, swimming is not universally known, and there may be a large number of people who do not know it. Therefore, it is necessary to research the teaching of swimming courses for college students.

Many scholars and researchers around the world have gained a deep understanding of swimming as a sport. Johnson, Norah L evaluated the mental health and challenging behavior of parents in children with autism before and after the swimming program. The preliminary results indicated that children’s behavior and parents’ understanding of overall health have improved [1]. Willcox-Pidgeon, Stacey M conducted a cross-sectional retrospective analysis on the swimming and water safety skills acquired by a group of children (5–12 years old) who participated in commercial swimming courses in three Australian states. The conclusion was drawn that “swimming classes must include a wide range of swimming and water safety abilities to ensure that children have the skills necessary to reduce drowning, especially those deemed to be at increased risk” [2]. Roure, Cédric determined the profiles of four different students through cluster

analysis of the students who participated in the swimming class, which represents a continuum from “very low personal interest and triggering situational interest” to “well developed personal interest and actual situational interest” [3]. Allen, Georgia applied Bourdieu’s concepts of capital and habitus to understand the motivation of parents to take their infants or young children to organized swimming classes, and concluded that “consumption of these activities reflects a view of good parenting, and supports the development of physical and social capital, and forms of family class differentiation from an early age” [4]. Musiyenko, O. V conducted teaching observations and experiments on autistic children swimming. The results indicated that for children with autism, individual swimming courses can be recommended as an effective means of adaptive swimming education [5]. Although the above research has great scientific and social value, there is a lack of exploration of swimming courses for contemporary young college students.

As a continuous output of talents, college students play a significant role in the development of the entire society. They not only contribute to promoting social purchasing power and promoting the growth of national GDP, but also provide a large number of talents for major employers and enterprises, playing a crucial role in the future development of the entire society. Therefore, it is necessary to focus on cultivating the physical fitness of college students. This article uses deep learning to explore the teaching aspects of college students’ swimming courses.

2 Significance and Value of Swimming Teaching

Swimming is a technical behavior in which a person floats or moves forward on the water surface through the force generated by the movement of their limbs and the water [6]. It is a sports activity closely related to human life. With the development and progress of human society, swimming has become increasingly popular among people. Therefore, for beginners, how can they start learning swimming more effectively and safely?

Beginners of swimming can gain a better understanding of water temperature, resistance, and buoyancy by walking around in the water, but training should be based on the students’ level. It takes step-by-step seduction to learn to walk in the water and build confidence. It should be noted that first, the center of gravity should move forward, and the forward inclination angle of the body should be greater than the angle on the ground. It is necessary to lift your legs, bend your knees, and stride forward, such as walking along a wall with your hands on the pool, holding hands with two people, driving a train (walking in a row with your shoulders crossed), walking forward and backward on your own (generating forward force in conjunction with your palm’s water movement), and competing faster [7].

The pressure in water is much higher than in air, so holding and breathing in water is not as natural as on land. The longer you hold and exhale, the more helpful it would be for other subsequent movements. To suffocate in the water, it is usually to hold your hand against the edge of the pool, a companion, or a coach’s hand. It’s necessary to bury your head in the water to practice holding your breath. After a period of time, one stood up and exercised on his own without any protection. It is necessary to remain silent as much as possible. If you feel uncomfortable, you should stop practicing to avoid injury. Breathing in the water also requires both hands to support the wall, or squatting down,

burying your head in the water, and slowly breathing through your nose and mouth. After a while, you can slowly stand up [8]. In the water, it is necessary to exhale as much as possible without pausing (otherwise, it may choke). As shown in Fig. 1, it is the appearance of beginners practicing suffocation.

The most crucial point in swimming is to have regular breathing, which is roughly consistent with breathing in water. Regular breathing refers to exhaling air through the mouth (nose) in the water. When it comes to the surface, the mouth would make a “popping” sound, while inhaling air through the mouth requires a certain sense of rhythm and pressure from both hands. In early childhood education, due to the often imagined inability to stand at the bottom of a pool, teaching rhythmic breathing is particularly important, and coaches can use breathing as the first step. When performing underwater breathing, some coordinated movements are generally adopted, such as extending and closing both hands, diving in and exhaling, placing both hands flat on the side of the body, heading up, and inhaling [9].

Swimming has a unique meaning and value compared to other sports:

(1) Ensuring life safety

Although those who drown can swim, those who cannot swim would never enter the water. However, in the event of unfortunate falls or floods, being able to swim not only ensures one’s own safety, but also provides assistance to others within one’s capabilities. Therefore, learning to swim has become an important means of survival, and many countries around the world have made swimming a compulsory course [10].

(2) Enhancing myocardial function

In water, due to the high water pressure, swimming consumes more energy, increases heart rate, and increases heart pressure. Long term adherence to swimming exercise can



Fig. 1. Swimming teaching map

lead to increased cardiac volume, strong myocardial contractions, slower resting heart rate, increased pulse output, thickening of blood vessel walls, increased elasticity, and improved efficiency of the cardiovascular system.

(3) Enhancing resistance

The water temperature of a normal temperature swimming pool is usually between 26 and 28 degrees Celsius, which can cause high energy consumption in the water and quickly dissipate heat from the body. In order to quickly replenish the body's heat and achieve a balance between cold and hot, the human nervous system would respond quickly, thereby accelerating the body's metabolism and improving the body's adaptability to the external environment to resist severe cold. People who often participate in winter swimming are not vulnerable to wind and cold because their body's thermoregulation function has been improved. At the same time, it can also enhance the endocrine function of the body and enhance the body's resistance and immunity.

(4) Relieving spinal pressure

Mainly used to alleviate lumbar disc and other intervertebral disc compression diseases, changing posture can reduce the pressure on the intervertebral disc, thereby alleviating symptoms of the lumbar disc and cervical spine. When swimming, strong upper limb strokes can effectively exercise the shoulder and back muscles, while raising the head and inhaling can also exercise the cervical joints. In addition, inhaling with the head up and exhaling with the head down are a combination of movements that are beneficial for repairing strained muscles and ligaments.

(5) Decompression

In modern society, people tend to experience some low emotions to some extent, mainly due to the pressure of work and life. At the same time, appropriate sports activities can make people's body and mind become excited, which can improve their mental state. Running, basketball, and fitness activities can all make people feel tired, making it difficult for them to persist. Swimming is not possible. When exercising underwater, people do not feel tired, and sometimes they become more and more excited as they swim. Usually, this feeling only occurs after getting ashore. Therefore, people still need to pay more attention and engage in appropriate exercise, which can be maintained two to three times a week for a long time. Each time, it lasts from one hour to one and a half hours.

(6) Weight loss and shaping

Swimming is a kind of whole body exercise, which can promote the blood circulation of the body muscles. When you paddle in the water, it has a good effect of exercise and massage on the muscles of all parts of the body. It can improve the strength and circumference of the muscles, make the muscles more developed, improve and increase the basal metabolism rate, and help you lose weight. Regular exercise can make the body better. Although there are rumors that swimming can make the shoulders wider, who can achieve so much exercise for athletes? Swimming can exercise muscles, expose abdominal muscles, and make skin smoother.

3 Deep Learning

Deep learning is a type of machine learning, and machine learning is a necessary path to achieve artificial intelligence. The concept of deep learning originates from the research of artificial neural networks. The multilayer perceptron with multiple hidden layers is a deep learning structure. Deep learning establishes an abstract high-level attribute type or feature by combining low-level features, thereby enabling distributed feature representation of big data. Conducting deep learning is a neural network that mimics human analytical methods to understand information, such as graphics, speech, and image information.

Typical deep learning models include convolutional neural networks, deep trust network models, and stack self coding network models. These models are described below.

3.1 Convolutional Neural Network Model

Prior to the advent of unsupervised pre-training techniques, the research on deep learning techniques had always been a challenge, with convolutional neural networks being a special case. Convolutional neural networks are extracted from the human visual system. In Fukushima’s neurocognitive machine, the first computational model of convolutional neural networks was proposed. It is based on local connections between neurons and applies neurons with the same parameters to different positions in the previous layer of neural networks through hierarchical organization image transformation, thus obtaining a translation invariant neural network structure form. Later, based on this idea, some people designed and trained convolutional neural networks using error gradients, and achieved excellent performance in certain pattern recognition tasks. At present, pattern recognition systems based on convolutional neural networks have achieved excellent results, especially in areas such as handwriting recognition.

3.2 Deep Trust Network Model

The model is a Bayesian probability production model, which contains multiple levels of random hidden variables. This model is a stack based on construction units, which are generally a constrained Boltzmann machine. In the stack, the number of visual layers for each restricted Boltzmann machine unit is equal to the number of visual layers for previous restricted Boltzmann machine units. On this basis, based on the deep learning mechanism, the first level constrained Boltzmann machine is trained using input samples, and then the second level constrained Boltzmann machine is trained using its output. Finally, the constrained Boltzmann machine models are stacked to make them more hierarchical. This method encodes the upper level constrained Boltzmann machine, then decodes the intermediate state information, and then decodes the upper level state information for reconstruction. Constrained Boltzmann machines, as the construction units of deep trust networks, share common parameters with various levels of deep trust networks.

3.3 Stacked Self Encoding Network Model

Stacked self coding network is a structure similar to a deep trust network, consisting of multiple construction primitive stacks. The difference is that the construction primitive of the construction primitive is a self coding primitive, rather than a restricted Boltzmann machine. The self coding model is a two-level neural network, with the first level called the encoding layer and the second level called the decoding layer.

4 Swimming Teaching Experiment Integrating Deep Learning

The instructional design of deep learning is an organic whole composed of four core dimensions, namely: leading learning themes, literacy oriented deep learning goals, application oriented deep learning activities, and continuous learning evaluation methods. When determining the unit leading learning theme, the swimming coach should focus on the transmission of information and the expression of content, which is very helpful to stimulate learners' learning interest and enhance their self-confidence in the process of swimming learning. The deep learning route consists of 7 key points, namely: designing standards and courses, pre-evaluating learning outcomes, actively creating a learning culture, preparing and activating knowledge, acquiring new knowledge, evaluating students' learning effectiveness, and conducting deep processing of knowledge. Currently, with the continuous deepening of swimming curriculum reform, coaches can use exploratory and collaborative teaching activities to respond to the call for core swimming literacy. In swimming teaching, coaches should make full use of swimming teaching resources, fully leverage the role of swimming teaching, and improve the level and quality of swimming teaching. Deep learning is carried out using convolutional neural networks, as shown in Formulas (1) - (4).

$$Q^{x+1}(x, y) = [Q^x \otimes t^{x+1}](x, y) + \delta \quad (1)$$

In Formula (1), δ represents the deviation, and Q^x and Q^{x+1} represent the convolutional inputs and outputs of layer $x + 1$, also known as feature maps.

$$Z_r^x(x, y) = \left[\sum_{a=1}^i \sum_{b=1}^i Z_r^x(s_0 f + a, s_0 e + b)^n \right]^{\frac{1}{n}} \quad (2)$$

In Formula (2), the meanings of step s_0 and pixels (x, y) are the same as those of convolutional layers, and n is a pre-specified parameter.

$$W(A, B, u) = \gamma \sum \|\sigma\|^n \quad (3)$$

In Formula (3), $W(A, B, u)$ is the loss function, and γ is the regularization parameter to determine the constraint force of the regularization term.

$$K^x = i(Q^x + wQ^{x-1}) \quad (4)$$

In Formula (4), w is the conversion coefficient of the feature map. When the sizes of Q^x and Q^{x-1} are different, the conversion coefficient converts the smaller size feature map. Usually, the size of Q^{x-1} is converted to Q^x to ensure the operation of matrix elements is valid.

Before the experiment began, the research team conducted a scoring evaluation of a university’s swimming course, and the results are shown in Table 1.

In Table 1, the left side is the scoring table of the teaching quality of swimming courses under the traditional teaching methods. The highest score is 80 points from No. 3 swimming coach; the lowest score is 73 points from No. 2 swimming coach; the right side is the scoring table of the learning quality of swimming courses. The highest score is 77 points from No. 4 student group, and the lowest score is 71 points from No. 1 and No. 5 student groups. Next, the experiment would introduce deep learning into current teaching, and in order to improve the comparative effect, traditional teaching methods have also been improved and upgraded. As shown in Figs. 2 to 3, the comparison results of teaching quality and learning quality after integrating deep learning methods are shown.

From the results shown in Fig. 2, it can be seen that after the introduction of deep learning methods, Coach 3’s teaching quality improved to 89 points, which is the highest. However, Coach 1’s teaching quality improvement was not very significant, only

Table 1. Scoring table for swimming teaching before the experiment

Swimming lessons	Teaching quality	Swimming lessons	Learning quality
1	77	1	71
2	73	2	74
3	80	3	75
4	79	4	77
5	79	5	71

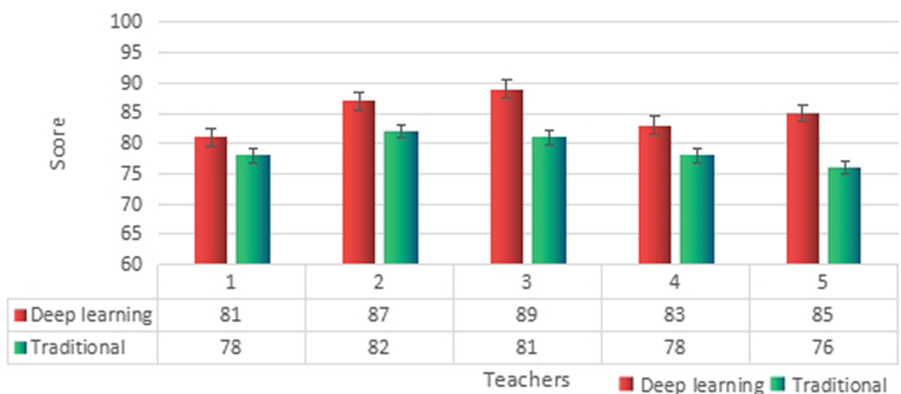


Fig. 2. Comparison results of teaching quality

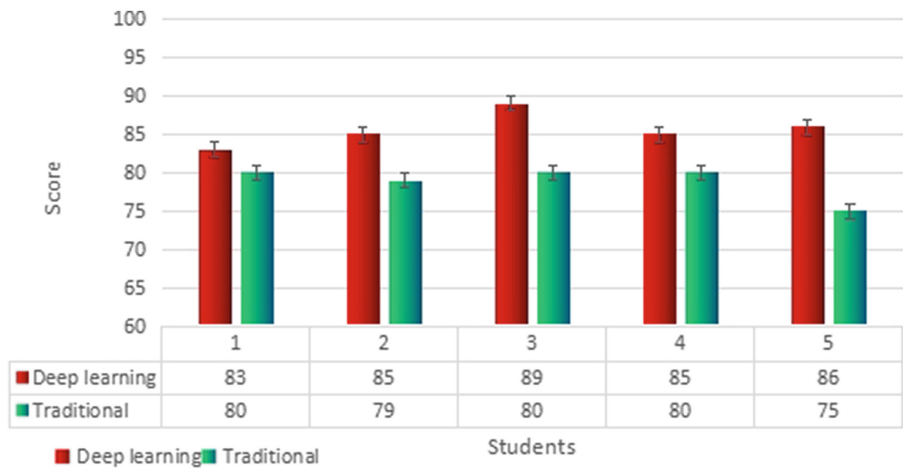


Fig. 3. Comparison results of learning quality

reaching 81 points, and the average score of the 5 coaches was 85 points. On the other hand, in the upgraded traditional teaching method, the highest number two coach only scored 82 points in teaching quality, and the average score of the five coaches was 79 points. It can be concluded that introducing deep learning can significantly improve the teaching quality of coaches.

From the results shown in Fig. 3, it can be seen that after the introduction of deep learning methods, the learning quality of the highest number 3 student group reached 89 points; the lowest number 1 student group reached 83 points; the average learning quality score of the five student groups was 86 points. On the other hand, although the learning quality scores of the 1st, 3rd, and 4th grades all reached 80 points, the upgraded traditional teaching method did not achieve as high as deep learning. The average learning quality score of the five student groups was 79 points. It can be concluded that the introduction of deep learning significantly improves the quality of students' learning.

5 Conclusions

To make swimming teaching develop towards a higher level, it is necessary to make swimming teaching develop from shallow to deep layers. From the perspective of deep learning, the teaching design of swimming courses should be guided by the reconstruction and improvement of cognitive structure, the transfer and application of knowledge, and the development and enhancement of high-level abilities, in order to achieve the mastery of knowledge, the cultivation of abilities, and the sublimation of emotions, thereby guiding students in deep learning. This article used the method of deep learning to improve the quality of swimming teaching and student learning, and believed that it can provide certain assistance for future college students and even society members in swimming learning. However, there are still shortcomings in this article. The evaluation indicators used in the study are only two, and further research would consider adding more evaluation indicators.

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