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# *From Set to Adaptation: An SMA Flipped Classroom Teaching Model for Action Skills*

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***Abstract:*** In traditional physical education, differences in students' physical quality, learning ability, posture, coupled with the relatively fixed classroom arrangement, result in considerable uncertainties in students' learning effect of action skills. Although the flipped classroom model can offer "personalized teaching" for students in certain disciplines, it has poor applicability in physical education as it focuses on the “cognitive domain” of Bloom's taxonomy of educational objectives. On basis of behaviorist learning theory, Skinner programmed teaching theory and the "psychomotor domain" of Bloom's taxonomy of educational objectives, this paper designs a flipped classroom teaching model suitable for motor skill learning. It can fundamentally eliminate uncertainties in the learning effect of motor skills in traditional physical education.

## 1. Preface: Pain Points in Traditional Physical Education

### 1.1 Uncertainties in Learning Effect of Motor Skills

In traditional physical education (the "traditional physical education" here is different from the innovative physical education model), the curriculum can be generally divided into sections of explanation, demonstration and practice, each with a fixed duration. Under such a framework, different students in the same teaching unit will present completely different learning effects.

Take a football course as an example. If the "pass-and receive combinations" is to be taught, then the primary factor for students' learning effect is the mastery of basic motor skills for this action, which include dribbling, ground pass, cross pass, short pass, etc. However, uncertainties in the learning effects of different students in the previous course result in different levels of mastery of the basic motor skills. Additionally, the fixed and long duration of explanation and demonstration sections in the curriculum will inevitably lead to different difficulties for students to understand and master new actions. If a student performs well in basic motor skills, he/she can learn new actions easily. On the contrary, if a student performs poorly in basic motor skills, he/she will find it very difficult to learn new actions. The mastery of basic motor skills will greatly affect the learning effect of subsequent motor skills.

Moreover, different students will show different learning effects in the explanation and demonstration stages of fixed duration. For example: student A has a strong ability to learn motor

skills, so he/she can master the motor in the early stage of teacher's explanation and demonstration. In the rest of the time, student A is likely to feel bored and become absent-minded. On contrary, student B has poor ability to learn motor skills, so he/she cannot master the actions in the stages of explanation and demonstration. Therefore, in the subsequent practice stage, he/she needs to make up for the deficiency in the previous stage. However, the fixed duration of the practice stage offers limited time for his/her own practice, thus reducing his/her learning effect. Long-term teaching reveals that, in a particular teaching unit, only a few students' learning effects of motor skills can highly match with the curricula of physical education teachers.(See Figure 1)

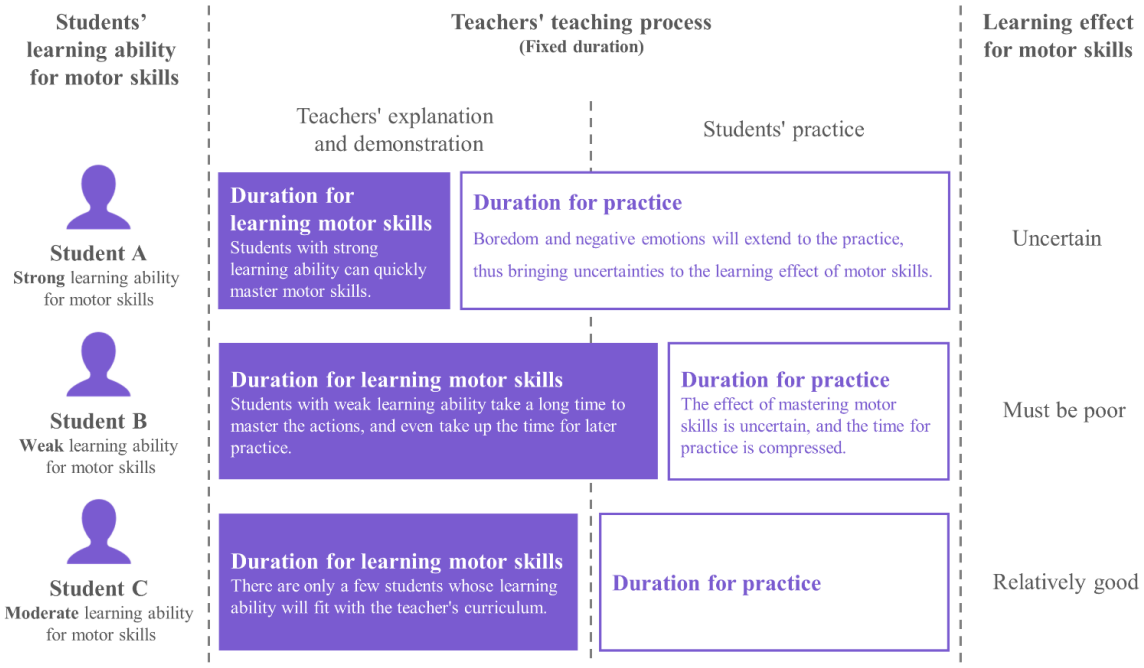


Figure 1: Uncertainties in the learning effect of motor skills

Therefore, in traditional physical education, differences in students' learning ability for motor skills will greatly affect their learning effect of motor skills. To solve this pain point, we need to analyze the causes first.

## 1.2 Analysis of the Causes for Uncertainties

### 1.2.1 Differences in students' physical fitness resulting in uncertainties in learning effect

Table 1: Factors resulting in differences in the quality of students' actions

| Factors | Aspects |
|---|---|
| Physical quality | Strength, speed, endurance, flexibility, suppleness |
| Character | Outgoing, introverted, accepting new things |
| Body shape | Tall, short, fat, thin, stout, well-built |
| Cultural background | Nationality, religion, social status, economic situation |
| Emotion | Irritability, excitement, fear, happiness |
| Physical fitness | Low, medium, high |
| Learning style | Visual, auditory, sports |
| Development | Not yet developed, moderately developed, mature |
| Motivation | Low, medium, high |
| Social experience | 1-to-1, small group, large group |
| Sports experience | Leisurely, educational, competitive |

For all subjects, there are multiple factors in the teaching process that determine students' learning effect, such as intelligence, personality, hobby, learning style, learning ability[3]. In physical education, in addition to the above-mentioned factors, there are more complicated determinants for the learning effect of motor skills, such as students' body shape (tall, short, fat, thin), physical fitness (strength, quality, endurance), and even gender. (See Table 1)

### 1.2.2 Teacher-centered method: same teaching method for different students

In traditional physical education featuring collective teaching, teachers adopt a unified method and content to teach in unified students a unified time and space, so that they make unified progress and are evaluated in a unified manner. Therefore, it is difficult for teachers to discover the individual differences of students and to teach them in accordance with their aptitude[5]. Simply put, the traditional physical education is a one-way transmission of information, where students are viewed as participants in the learning process, not recipients of information. Although the traditional physical education boasts high efficiency, it is not conducive to the development of students' ability and generates great uncertainties to students' learning effect.

### 1.2.3 Basic motor skills relevant to teaching effect

In addition to the above two factors, students' mastery of basic motor skills also result in uncertainties. Tobias, a famous educational psychologist, once pointed out that, students' prior knowledge determines about 2/3 of the teaching effect. In traditional physical education, the acquired motor skills will become the basic motor skills for subsequent new actions. Differences in students' learning ability, personality, physical fitness, coupled with teachers' fixed curriculum arrangements, lead to great uncertainties in students' mastery of leading skills before learning new actions, thus influencing the learning effect of new motor skills. (See Figure 2)

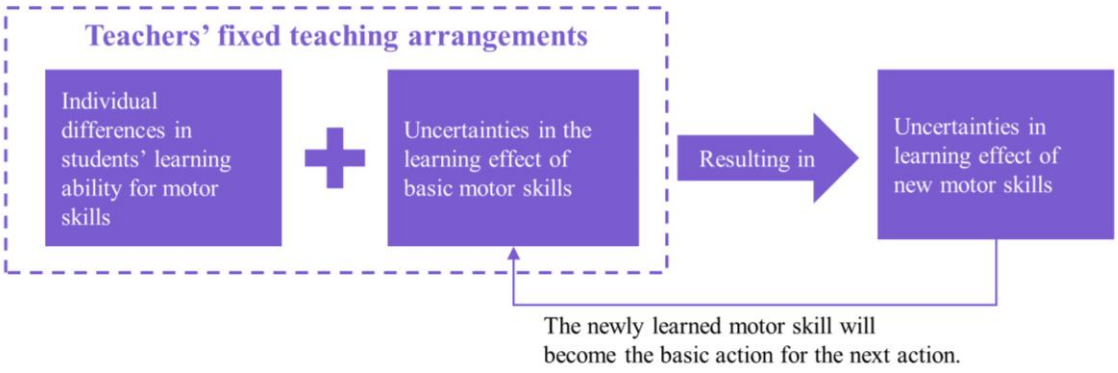


Figure 2: The factors that lead to uncertainties in the learning effect of motor skills

## 2. Physical Education and Flipped Classroom

To sum up, a new physical education model that can suit students' personalized needs in the learning of motor skills is needed, so that students can adjust their learning progress of motor skills according to their own learning ability and physical fitness and teachers can customize their teaching activities according to students' learning situation and preferences.

Currently, the flipped classroom model has been widely recognized and applied by the education community. Although the flipped classroom model offers students with personalized teaching and changes some teachers' teaching concepts, it falls short in developing students' learning ability for motor skills. Therefore, it does not fit with the complexity of physical education.

It is because most of the innovative teaching methods and models focus on the "cognitive domain" of Bloom's taxonomy of educational objectives, while the objectives and stratification of motor skill learning are completely different. In fact, Bloom's taxonomy of educational goals not only includes the "cognitive domain", but also "emotional domain" and "psychomotor domain"[2]. The objectives of motor skills should fall into the "psychomotor domain", because there are fundamental differences between the psychological process of internalizing knowledge and the physiological process of forming muscle memory. No muscle memory can be formed through "exploration and discussion", and it must be achieved by a lot of practice. (See Figure 3) The flipped teaching model directly applied to the "cognitive domain" in physical education will inevitably lead to a break in the learning process of motor skills - cognition, set, guidance, and mechanism[4]. This is why a new flipped classroom model cater to physical education is needed.

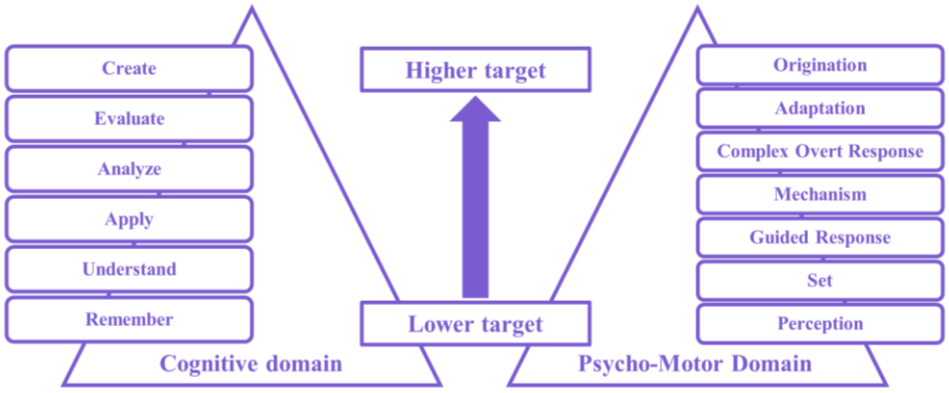


Figure 3: Bloom's taxonomy of educational goals - cognitive domain, psychomotor domain

## 3. The proposal of SMA model

### 3.1 Principles for the Model

The behaviorist learning theory emphasizes that learning is the connection between stimulus and response, and that behaviors should be formed or changed through reinforcement and imitation[7]. Reinforcement is essential to learning success. The process of learning is gradual, and the process of understanding is usually from part to whole. These are consistent with the general principle of physical education. Additionally, the basic principles of Skinner's programmed teaching theory are applicable to physical education, such as dividing knowledge points (actions), releasing teaching content on a regular basis, conducting exercises in the middle or after each instructional video, emphasizing the principle of reinforcement, etc. These pedagogical principles can be applied to physical education, on basis of the "psychomotor domain" in Bloom's taxonomy. Bloom's taxonomy describes the hierarchy of educational goals in the "psychomotor domain" and the path to achieve higher goals - lower goals serve as the basis for the realization of higher goals[8].

On basis of the behaviorist learning theory, Skinner's theory of programmed teaching and the "psychomotor domain" of Bloom's taxonomy of educational goals, this section proposes the teaching model as shown in the figure below. This is an SMA teaching model, which facilitates the transition from set to physical adaptation. The objectives of in Bloom's psychomotor domain run through the entire model. The process of "knowledge transfer → knowledge internalization" in the flipped classroom is transformed to "establishing a set → physical adaptation", while the stage of "explanation and demonstration" is replaced with "students' practice". In the traditional physical education, teachers explain and demonstrate actions in class and the students practice them after class; in the SMA teaching model, students learn actions before class and practice them in class. (See Figure

4) This eliminates the uncertainties in learning effects caused by students' different learning abilities. The process is designed with reference to the mainstream flipped classroom model of O-PIRTAS[5].

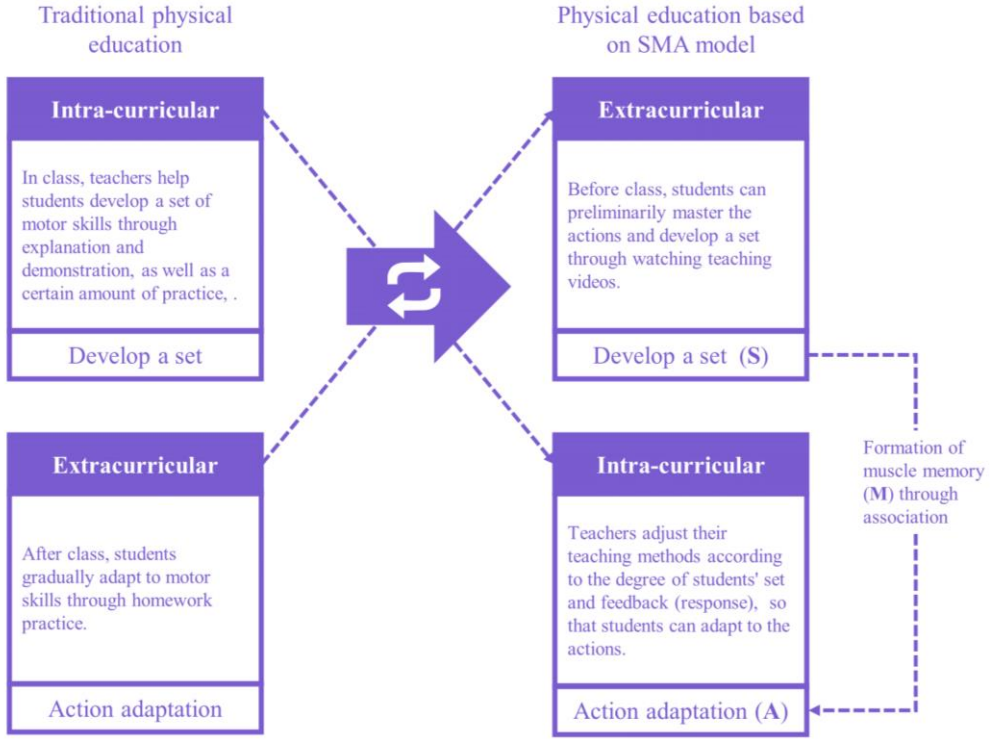


Figure 4: Schematic diagram of SMA flipped teaching model

### 3.2 Major modules of SMA model

In order to demonstrate that the SMA model, in line with the general teaching and learning rules, is an effective methodology, rather than an empty and unrealistic theory, eight major modules are designed in the model, all of which correspond to the "psychomotor domain" in Bloom's taxonomy of educational goals and each module bears its significance.

#### 3.2.1 Preparation

Before class, teachers should integrate the teaching concept of flipped classroom and develop the curriculum according to teaching content, students, teaching objectives, teaching environment, teaching resources, teaching tools, teaching evaluation, management methods, etc. At this stage, teachers should also incorporate sports consciousness into the curriculum. In addition to regular preparation, teachers should change their mindset on curriculum design - from "how I teach" to "how students learn".

#### 3.2.2 Instructional video

Instructional videos enable students to have a preliminary understanding of what they will learn in the upcoming lesson, which corresponds to Bloom's taxonomy of educational goal from perception to set. In the SMA model, videos of motion learning are different from those of cognitive learning. Existing MOOC resources cannot be used directly. For example, long instructional videos for motor skills have fixed explanation time, which will affect the learner's learning efficiency. Due to the different learning abilities of learners, they need to play back the actions and learn them repeatedly. This inconvenience will dampen learners' enthusiasm. The videos based on the SMA model should

have the following characteristics: 1. the goal of the video is to help learners establish perception and set; 2. the video should indicate the basic motor skills to be mastered before learning new actions for the convenience of learners; 3. a single long video should be divided into several short videos, so that learners can repeat individual parts if necessary. Generally, the instruction video of motor skills can be divided by angles (front, side, mirror), decomposition and completeness, explanation and demonstration, etc.; 4. the video should not only explain the actions, but also encourage learners to practice them, so that learners can develop a set of motor skills; 5. teachers should collect feedback from learners to make a diagnostic evaluation of their set after they complete the video learning[6].

### 3.2.3 Review

Review is a diagnostic evaluation method, which helps students form a correct set and solve the problems in the instructional video learning. Through a diagnostic evaluation of the content submitted by students, teachers divide students' problems into common problems and individual problems. For example, if 60% students ask the same question over a certain action in a class, then this problem is regarded as a common problem and needs to be solved by teachers in class. Common problems will also affect teachers' subsequent curriculum design for the guidance and practice stages. However, teachers can solve the individual problems raised by a small number of students in other stages[10].

### 3.2.4 Guide

Teacher guidance enables students to have guided response in motor skills learning, thus promoting the transition from lower goals to higher goals (from set to mechanism). In the video course, teachers can demonstrate how to do the action (HOW), while in the guidance stage, they can explain why to do so (WHY), what benefits will the action bring to the project, the team and to the body. This also allows some students with strong learning ability for motor skills make improvements in class.

Additionally, teachers should customize the teaching arrangement in the classroom according to the diagnostic evaluation of the students in the review stage. For example, there are more male students in engineering classes and more girls in art classes. The problems they encounter in the video learning stage must be different. Therefore, teachers should adopt targeted guidance methods to different students.

### 3.2.5 Exercise

The formation of mechanism through practice is to form muscle memory. The key difference between learning motor skills and developing cognition lies in that the mastery of motor skills requires a lot of practice. Teachers should provide customized exercises for students through guidance according to students' feedback. The principles for designing exercise are the same as those of physical education: from simple to complex, from easy to difficult, from slow to fast, from static to dynamic, from complete to detailed, and from abstract to concrete[11].

### 3.2.6 Activity

The grouping and activity lead to the gradual generation of complex overt response through the internalization of motor skills. There is a phenomenon in traditional physical education: students can complete the actions well in group practice, even if they do not refer to the teacher's demonstration or other students' actions, but it is difficult for them to complete the actions smoothly when practicing alone. Therefore, it is necessary to put students into group practice after collective practice. In group practice, students can conduct self-examination and mutual examination of learning effect. What's more, there are various ways of interaction, such as allowing students to complete actions in specific

scenes (games, competitions), or to deduce new actions by themselves based on the actions they have learned.

### 3.2.7 Evaluate

Full evaluation is to help students adapt to the newly learned motor skills. The evaluation of SMA model should run through the whole teaching process, from the diagnostic evaluation after the instructional video, to the progress evaluation at the guidance, practice and activity stages, to the formative evaluation to verify the learning effect. Due to the particularity of physical education, students need to carry out a large number of exercises before achieving the ultimate learning goal. Therefore, great importance should be attached to the practice of motor skills and it is necessary to evaluate students' practice all the way along the process.

The formative evaluation mainly examines whether the students have mastered the motor skill and improve their physical quality. For example, whether students can achieve the exercise effect by completing the correct Taijiquan movements, or whether they can apply the learned motor skills in the football course to the actual competition. After class, teachers can ask students to submit videos of motor skills to check whether they have reached the level of "adaptation". The evaluation of learning effect is realized by the quantitative evaluation of teachers and the mutual evaluation of students. Finally, the evaluation should follow the principles of standardization, quantification and fairness.

### 3.2.8 Summary

The summary here refers to the teacher's summary of the teaching process after class, which also serves as the basis for evaluation of students' learning. When making a summary, teachers can evaluate whether the teaching process is "student-centered", whether it matches the learning pace of students, and whether it offers students with personalized experience. Speaking of the summary of "difficulties", the SMA model does not encourage students to put forward difficulties before class, but teachers should collect students' feedback at the end of teaching activities. Attention should be paid to "students' learning difficulties", not "teachers' teaching difficulties". When making an evaluation, students can summarize their own learning process of motor skills so as to improve their learning ability for motor skills. After-class summaries can encourage students to innovate in motor skills.

## 3.3 The structure of SMA teaching model

This chapter is mainly to explain the principles of the model, providing guidance in the promotion and use of the Model. The structure of the model mainly includes: 1. How to solve problems at different stages of physical education. 2. How to correct the learning progress of students with different learning abilities. 3. Correspondence between the SMA model and Bloom's taxonomy of educational goals. 4. The major modules in teaching, the evaluation method of teaching effect, important teaching content, etc. (See Figure 5)

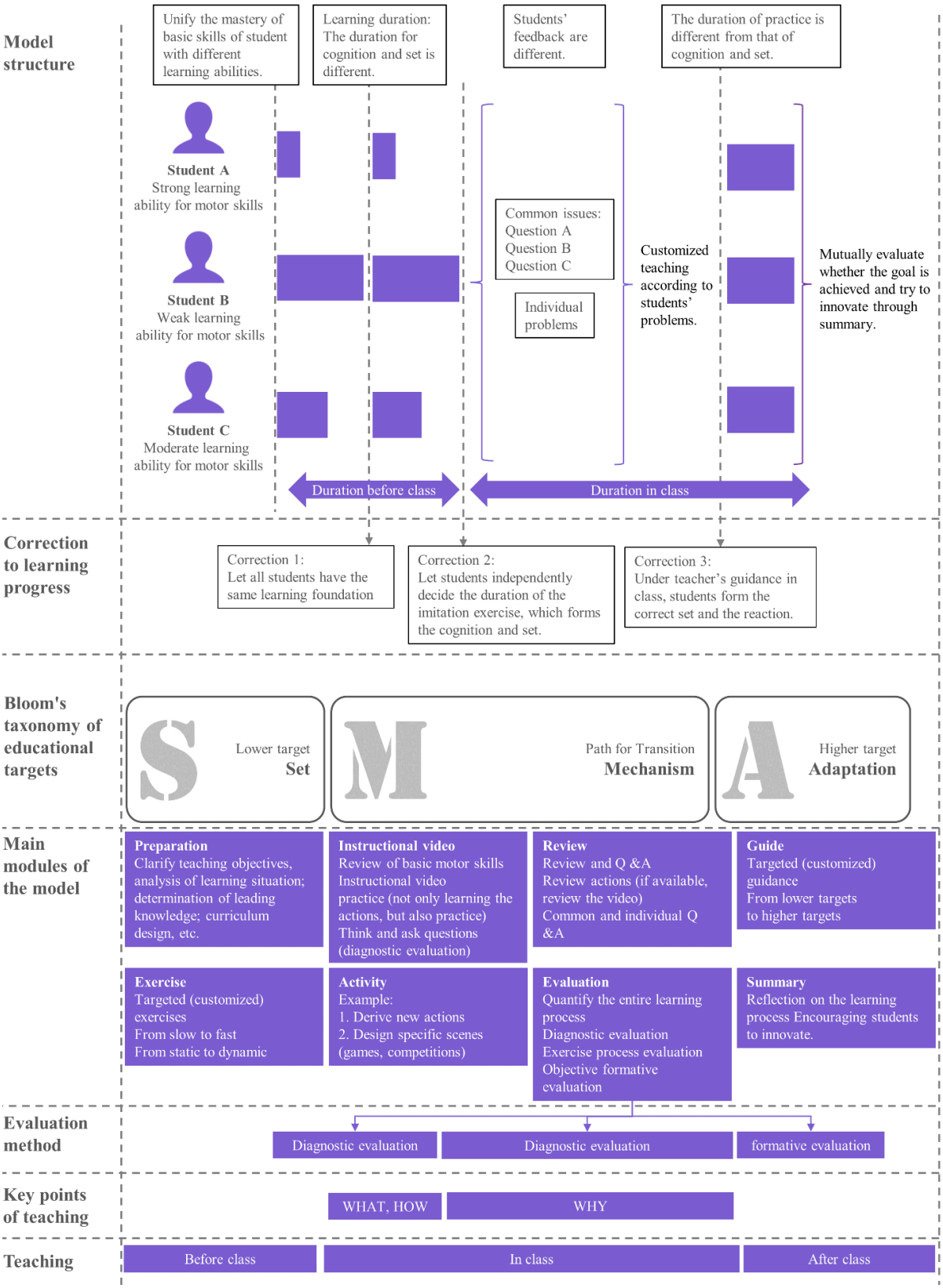


Figure 5: Structure diagram of SMA flip teaching model

## 4. General process of the SMA model

The SMA model is an out-of-the-box model for physical education. PE teachers directly apply each module in SMA model to their teaching according to the actual conditions. However, projects, conditions, students and other factors will also determine the effect of SMA model. The SMA model provides a set of general process (see Figure 6), including the whole teaching process before class, in class and after class, which is divided into different tasks of teachers and students, so as to help students master motor skills[12].

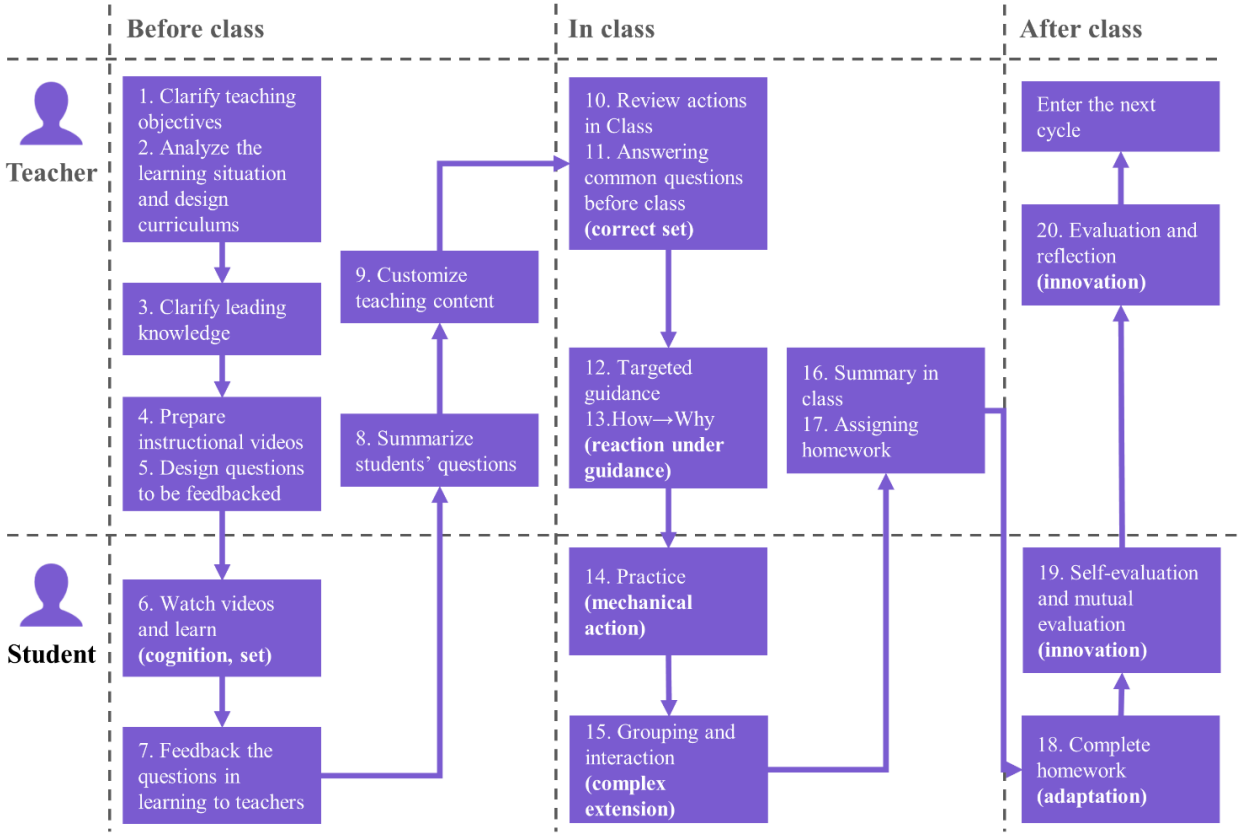


Figure 6: General process of the SMA model

## 5. Conclusion: depth and breadth of the applicability of SMA model

Although the SMA model can adapt to students' different learning ability for motor skills and eliminate uncertainties in the learning effect, it is never omnipotent. As for the depth of physical education, the goals of physical education can be divided into three levels: 1. Master an action, 2. Improve physical fitness through this action, 3. Develop the consciousness and habits of lifelong physical exercise. Obviously, the SMA model can help students achieve the goal of learning motor skills, but it cannot help students achieve the higher goal of improving physical fitness and cultivating lifelong sports awareness. As for the breadth of sports group theory (Tian Maijiu, 1990)[9], different sports classroom teaching will adopt the SMA model differently. For example, the SMA model can be widely used in courses that focus on motion learning such as skill-based difficult beauty groups (martial arts, aerobics), while it proves ineffective in courses that focus on physical fitness improvement such as physical speed events (track and field).

## Acknowledgements

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## References

*[1] Benjamin S. Bloom. Reflections on the Development and Use of the Taxonomy. Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain,1994.*
*[2] EJ Simpson. The classification of educational objectives in the psychomotor domain. The Classification of Educational Objectives, Psychomotor Domain.1972.*
*[3] Zhang Yingbo. Action learning and control [M]. Beijing Sport University Press, 2003.*
*[4] Tang Huaqing. Thinking on the classification of goals in the field of motor skills [J]. Sports Science and Technology, 2000.*
*[5] Guo Jianpeng. Flipped Classroom and College Teaching Innovation [M]. Xiamen University Press, 2018-10.*
*[6] Xie Youru. Online Open Curriculum and Teaching Innovation [M]. Science Press, March 2020.*
*[7] Zhang Junfeng. Effective learning: based on behaviorism learning theory [J]. Journal of Tianjin Academy of Educational Sciences, 2012, 000 (004): 59-61.*
*[8] Xie Yingkuan. Analysis of B. F. Skinner's Reinforcement Theory [J]. Journal of Guizhou Normal University (Natural Science Edition). January 2003.*
*[9] Tian Maijiu. Ma Xuetian, Huang Xinhe, etc. Event group training theory and its application [J]. Sports Science, 1990 (06): 29-35.*
*[10] Li Fang. Physical Education Teaching and Cultural Development [M]. Jilin Science and Technology Press. September, 2020.*
*[11] Zhang Ying, Zou Linling, Song Yan. Analysis of Physical Education Teaching Methods and Practice [M]. Jiuzhou Publishing House. 2018-05.*
*[12] Clayton M. Christensen, Michael B. Horn, Curtis W. Johnson Translated by Zhou Shuang. Innovators' Classroom: How Disruptive Innovation Changes Education [M]. China Machine Press. September, 2020.*