



# Cultivating Lesson Interpretation Skills of Normal Students in Physics for the Purpose of Fostering Excellent Teachers

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### ABSTRACT

Lesson interpretation is an effective teaching and research activity performed by teachers. Physics teachers' lesson interpretation aims to represent, explain or translate content and knowledge of physic by their own strategies and methods. Lesson interpretation has played a leading role in educating normal students in physics. In order to cultivate excellent physics teachers, normal universities should strengthen the teaching and practice of lesson interpretation.

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## 1. Introduction

Lesson interpretation is a teaching and research activity performed by teachers to interpret their knowledge about curriculum standards, understanding of textbooks, analysis of students' learning situation, ideas about teaching methods and overall design of teaching processes according to curriculum standards and teaching procedures of different disciplines, in order that everyone can evaluate their teaching. In essence, it is a way for communicating educational theories that ranges between lesson preparations and lecturing. By performing these peer-to-peer exchanges and interactions, education reformers hope to stimulate teachers' enthusiasm about learning education and teaching theories, share high-quality teaching resources and promote professional development of teachers. Lesson interpretation has aroused great concerns of many front-line teachers, teaching and research personnel owing to its advantages such as no venue constraints, no interference with students, simplicity, convenience and usefulness for improving teachers' theoretical accomplishments, developing abilities to grasp teaching materials and mastering presentation skills. It has become widespread in activities of primary and middle schools, including teaching seminars, teaching competitions and evaluation of teaching skills.

These years, lesson interpretation has become an important measure for employers to evaluate comprehensive qualities of students from normal universities in job interviews. It is well known the basic duty of normal universities is to cultivate superior faculty members for basic education. In other words, these universities perform the basic duty of cultivating outstanding teachers. In the modern times, outstanding teachers are supposed to be educational thinkers, researchers, practitioners and innovators of curriculum reform. Ideally, outstanding teachers shall be professional, honest and noble with a good command of professional knowledge, prominent professional competence, professional sentiments and extraordinary professional ethics.

Lesson interpretation plays critically important roles in cultivating excellent teachers as a requisite skill to students of normal universities. It is quite favorable for these students to explore research topics of teaching and to understand how to examine teaching-related topics. As one of teaching models, it can effectively improve the problem that teaching theories are isolated from practices. It is fairly practical for solving research problems about teaching topics by incorporating research topics and content of lesson interpretation into daily teaching activities<sup>[1, 2]</sup>.

In this paper, lesson interpretation theories and practices of physics majors of normal universities are investigated based on teaching characteristics of education for these students, plans for cultivating excellent teachers and practical situation of the physics education in normal universities.

## 2. Features of Lesson Interpretation for Physics

Physics teachers' lesson interpretation aims to represent, explain or translate content and knowledge of physic by their own strategies and methods. Superficially, it appears to be a simple process of converting textbooks into teachers' words. In fact, the situation is more complicated due to diversity of teaching scenarios and students. Hence, physics teachers ought to correctly translate what they understand in the form of languages, words, graphs or symbols if they expect to teach their lessons well. In general, teachers' lesson interpretation shall go through three phases as follows. In the first phase, teachers have to study content of textbooks and collect learning resources. In the second phase, they shall perform instructional designs. In the third phase, they need to reflect upon existing instructional designs to improve them.

Apart from its general features, lesson interpretation for physics has its own distinctive characteristics of the discipline. In view of natures and features of physics, its lesson interpretation is rational, methodological, process-oriented and experimental, which are distinguishing features of this discipline.

Firstly, the lesson interpretation for physics is rational. In addition to conventional "reasons" for teaching this subject,

the lesson interpretation for physics shall also attach importance to views, rules and principles of the discipline, which shall be highlighted during the lesson interpretation. The task of such lesson interpretation is not to offer teaching suggestions to the audiences based on the content of textbooks, but to summarize the critical incidents in teaching lessons, in order to deeply explore and study the lessons, which could be personal lessons, others or those that have been generated. Lesson interpretation is a process for presenting “how” and “why”. In essence, it is the result of case studies on lessons.

Secondly, lesson interpretation for physics is methodological. As a natural science discipline that focuses on rational thinking, physics covers lots of methodological content, implying numerous learning methods for general disciplines and physics. During their lesson interpretation, physics teachers have to elaborate the learning or review methods that shall be mastered by students in their lessons.

Thirdly, the lesson interpretation for physics is process-oriented. In their teaching activities of instructional design, physics teachers shall focus on introducing basic parts of the activities, fundamental inspirational tasks of students in each part, features, objectives and expectations of the activities as well as potential problems that would occur in the activities, how to solve and control problems.

Fourthly, the lesson interpretation for physics is experimental. In the course of such lesson interpretation, chemical experiments are further performed as carriers of teaching based on conventional media like blackboard and multimedia, so as to make the interpretation more colorful, lively and interesting. Apart from improving effects of the interpretation, it is pertinent to perform chemical experiments and highlight characteristics of the discipline, because physics is mainly taught based on experiments.

### **3. Cultivating Physics Majors' Abilities to Interpret Lessons in Normal Universities**

The lesson interpretation for physics aims at experts and teachers rather than students. For the purpose of giving lessons, lesson interpretation clarifies logics of teaching. Hence, students of normal universities are supposed to keep their students and scenarios in mind during their lesson interpretation. Research on teaching is the most crucial connotation of lesson interpretation. Thoroughly exploring local problems, the lesson interpretation is supposed to sort out and improve overall logics of teaching, integrated and associated with different elements of teaching. Hence, the overall logics of lessons are outlines and focuses on the lesson interpretation. Only if they are clear can the specific content of lessons be rich and pertinent. Following measures may be taken to cultivate physics majors' skills of lesson interpretation in normal universities.

#### **3.1. Careful Reading Physics Standards and Specific Analysis of Related Knowledge**

Physics standards are logical starting points of physics teaching. As prospective teachers, physics majors of normal universities ought to carefully read physics standards and other educational theories, which shall be further subdivided in combination with content of textbooks. Through analysis, they shall identify: (1) position and roles of lessons in textbooks. The position of a lesson in a unit, its roles in the whole textbook and the part of language learning to which the lesson belong are worth mentioning. (2) Instructional objectives. “People-oriented” concepts shall be established in the new curriculum reform to make classroom teaching

student-centered. Teaching objectives shall clarify “what standards or requirements can be met by students”, and they shall be highlighted in designing instructional processes. (3) Instructional approaches. Instructional approaches are not required to be mentioned, whereas their results must be stated. It is necessary to interpret basis of corresponding instruments. The equipment functions of schools and functions of main teaching aids shall be explained. Students of normal universities are supposed to be good at teaching with the aid of media. (4) Key and difficult points. The key and difficult points are mainly identified based on students' blind spots of knowledge, careless mistakes, and important knowledge that is difficult to master. To sum up, there is a need to understand students' learning situation. In addition to reading psychological works and understanding psychological characteristics of students, students of normal universities also have to mark students' assignments, observe students' classroom performances and record their examination results.

#### **3.2. Understanding Structural System of Knowledge about Physics by Analysing and Studying Textbooks**

To interpret lessons well, teachers shall generally analyze the textbooks. Since textbooks are basic elements of teaching, a detailed and thorough analysis of textbooks is a foundation for planning each lesson well and a basic premise for teachers to understand teaching processes to achieve the optimal teaching results. Therefore, teachers need to comprehend the intents to compile textbooks and related teaching objectives, analyze logical systems and knowledge structures of textbooks, and particularly investigate the position of a lesson in the textbook; they shall not only analyze logics, experimental activities, stylistic rules and layout as well as column features, but also have to comprehend knowledge transition and continuity<sup>[3]</sup>.

In analyzing and studying textbooks, teachers may guide students of normal universities to reflect on which knowledge is related to certain content of physics, origins of the knowledge and its position in physics or courses in the form of thinking maps. They can also figure out how a key concept is associated with its preconception and sub-concepts by virtue of knowledge packs and concept maps. If necessary, Chinese physics textbooks of different versions may be comparatively analyzed. To be sure, interpretation is not always the main approach to knowledge representation, or confined to demonstration experiments, analogies, models and graphical representations. Instead, the forms of knowledge representation can be more diverse, in order that students can be consciously or unconsciously attentive to improve their classroom learning efficiency<sup>[4]</sup>.

#### **3.3. Analysis of Students' Physiology and Features of Learning Psychology**

Students' basic learning situation may be carefully analyzed in combination with the teaching content of students, so as to make the content of lesson interpretation more pertinent. An analysis may be performed on students mainly from several perspectives, including students' existing knowledge and experiences, their understanding of concrete content, content related to their particular learning tasks and forms of knowledge representation. Students' learning of specific content may be analyzed based on complexity of what are learnt, barriers to learning and students' ways of understanding. To analyze related content of students' definite learning tasks, teachers can focus on tasks of directive learning, learning for understanding and

applied learning. Teachers shall analyze forms of knowledge representations, in an attempt to further analyze such forms of representations as demonstration experiments, interpretations, analogies, models and graphical representations<sup>[5]</sup>.

### 3.4. Instructional Designs

To make a lesson colorful and interesting, active thinking and rich specialized knowledge are necessary for teachers, who are required to adopt different teaching ideas for different lessons, in order to make the lessons interesting and enable students to master a great deal of knowledge. Before planning a lesson, teachers shall familiarize themselves with textbooks, incessantly reminding themselves of what shall be taught, which knowledge that students have acquired is associated with the content to be taught and which methods can make knowledge points more interesting. Do remember not to blindly consult materials or refer to instructional designs online, or else personal thinking will be limited within the framework of the instructional designs consulted. After all, it is others' idea when one's thinking is confined by others however he completes his instructional design in spite of some personal thoughts. Teachers will have many ideas if they repeatedly reflect on knowledge points of their texts. Then, they can record their ideas and select the best one. Subsequently, they can ponder associations between knowledge points and collect requisite materials.

### 3.5. Preparation of Manuscripts for Lesson Interpretation

To prepare manuscripts for lesson interpretation, attention shall be paid to how teachers integrate their knowledge skills with concrete teaching practices. Under concrete educational scenarios, theories shall be effectively integrated with practices. During their lesson interpretation, physics majors of normal universities can explain design reasons and theories hidden behind personal or others' lessons, in order that the underlying educational thoughts and theories can be presented. To this end, they shall explore ways and reasons for instructional design, which shall be investigated in case studies. Hence, how and why incidents happen in teaching curricular texts are just what should be presented in the manuscripts for lesson interpretation. In texts of lessons, the incidents in teaching take place in the order of knowledge development, while the main logics are explicated through different incidents in teaching. Therefore, the main logics of texts shall be described in the manuscripts for lesson interpretation. Case studies are expected to be performed to explore the main logics of the texts.

### 3.6. Giving Effective Trial Lectures for Classroom Teaching and Improving Teaching Competencies of Physics Majors in Normal Universities

Outstanding classroom teaching skills lay solid foundations for excellent lesson interpretation. The classroom teaching skills of physics majors may be trained as follows in normal universities:

On one hand, trainings on lesson interpretation may be performed in theoretical courses. In theoretical courses about "teaching theories of physics", firstly 2 to 3 hours may be spent in systematically explaining theories and methods about lesson interpretation to students, so that students may have general ideas about lesson interpretation. Next, lesson interpretation may be demonstrated in front of students by class teachers or excellent middle school teachers may be hired to give the demonstrations. In addition, students can be organized to watch videos of lesson interpretation of middle schools' physics teacher.

After the demonstration, students can be organized to discuss with each other about their experiences and gains. Then, students can be asked to complete the written assignment of preparing a manuscript for their lesson interpretation, in order to enable them to practise lesson interpretation within groups after classes. On the basis of the assignment, 3 to 5 students can be selected from volunteers or recommended students to interpret lessons in classes. After each student's lesson interpretation, teachers and students may analyze and evaluate it together.

Secondly, trainings about lesson interpretation may be performed in the course of teaching internship. In the preparatory stage for teaching internship, students can be required to interpret lessons through teaching and research in separate internship groups by discussions based on their preparations for lessons. Everyone can express their respective views, communicate with and inspire each other. Subsequently, each group can choose an intern to write a complete manuscript for the lesson interpretation in combination with all members' viewpoints and interpret a lesson in front of a class or a large intern group. Afterwards, students and teachers can analyze and evaluate the lesson interpretation.

### 3.7. Training through Competitions and Improving Lesson Interpretation Skills of Physics Majors from Normal Universities via Teaching Practices

In most cases, teaching skills can be mainly acquired through everyday learning and constant trainings, so it is necessary to strengthen routine trainings to make the training of teaching skills a routine practice<sup>[6, 7]</sup>. Students' routine trainings include trainings for classroom teaching, practices (including extracurricular and social activities), and various competitions about separate teaching skills (such as mandarin, writing skills with fountain pens, brush calligraphy, chalkboard writing skills, sketching, courseware making and self-made teaching aids). Teaching skills competition is one of important means for professional development of teachers. Competitions may be hosted to improve teaching and skills trainings. Through competitions, students can learn from each other's strong points to make up their deficiencies. At last, students of normal universities can develop their teaching skills in an all-round way. Physics majors of normal universities can strengthen standards for lesson interpretation and take special trainings (including instructional simulation and impromptu speeches) through different learning activities such as reading books, watching videos and consulting literature. Physics majors of normal universities will finally develop wisdom via learning, learn to examine themselves in trainings and introspect through competitions if they practise level by level through class selection, schools' teaching skills competitions, provincial teaching skills competitions for students of normal universities and national physics teaching skills for university students. By organizing group learning, exercises and competitions, more physics majors of normal universities may be guided to take initiatives to develop their professional competences for working as teachers.

## 4. Conclusions

Essentially, lesson interpretation is a kind of teaching and research. As an exchange and discussion for lesson preparation with the final aim of promoting professional development of teachers, it is critical for improving professional competencies of teachers.

Its quality is dependent upon lecturers' grasp of teaching theories, accumulation of practical experiences and understanding of textbooks. In general, there are some general parts but no stereotyped models for lesson interpretation.

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