# Research on Level-based Homework of College Physics

**Lulu Zhao[1], Huanlin Lv[1], Xiuguo Bi[1], Xiuli Ge[2]**

[1]Department of Basic Education, Dalian Polytechnic University, Dalian, China

[2]Southampton International College Dalian Polytechnic University, Dalian, China

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**Abstract:** As one essential part of College Physics teaching and learning, homework plays a key role in knowledge consolidation and ability cultivation. Students can further understand the knowledge through doing their homework. Teachers can make corresponding changes to teaching based on the students' learning situation. However, the wide range of College Physics and the different levels of students' academic performance, homework of College Physics has drawbacks in many aspects. Teachers can't assign the same homework and use uniform standards to evaluate the students' performance. Therefore, it is very necessary to have level-based homework of College Physics. Based on the research on homework of College Physics and level-based homework, this article focuses on the current status of homework of College Physics and acceptance of level-based homework by teachers and students. It is hoped that this research can provide guidance for College Physics teachers, and help them integrate level-based homework with College Physics teaching and achieve better teaching results.

## 1. Introduction

Basic education embodies national educational policies and plays an important role in enhancing students' morality. Higher education is a key part of basic education, focusing on the improvement of students' comprehensive quality and the development of core accomplishment. It aims to improve students' ideals, beliefs and the sense of social responsibility since college students need to have scientific and cultural literacy, lifelong learning ability, and the ability of independent development, communication and cooperation [1]. As a basic course in the field of natural sciences in Chinese colleges and universities, College Physics plays an important role in cultivating students' inquiry spirit, practical ability, innovative consciousness, proper understanding of the relationship between science, technology, society and environment. Based on the research on homework of College Physics and level-based homework, this article will focus on the current status of homework of College Physics and the understanding and acceptance of level-based homework by teachers and students. It is hoped that this research can provide guidance for College Physics teachers, and help them integrate level-based homework with College Physics teaching and achieve better teaching effects.

## 2. Previous research about Level-based Homework

In the past two decades, domestic and foreign experts have done a lot of investigations on college students' homework, and conducted comprehensive research on its purpose, function, form and content from the perspective of psychology and pedagogy [2]. The idea of "level-based education" in China can be dated back to the competency-based teaching system put forward by Confucius during the Spring and Autumn and Warring States period. It advocates the teaching teachers should adopt different approaches according to differences in students' learning ability, cognitive level, and their own qualities. Various teaching methods can then give play to students' strengths, stimulate their interests in learning, make up for their shortcomings, and promote their all-round development. Until the 1980s, some scholars in China put forward the idea of level-based homework, which can also be called diversified homework, individualized homework, independent homework and flexible work,

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etc. The common features of these forms of homework lie in the improvement of its effectiveness by optimizing multiple aspects of homework.

In 2004, Ye Xiaoyun of Nanjing Normal University proposed that level-based homework should follow the principle of subjectivity, hierarchy, diversity, openness and fun. Among them, the principle of subjectivity refers to the changing attitude of students towards homework. The principle of hierarchy refers to the design of homework based on students' academic performance of different levels. The principle of diversity refers to the diversified forms of homework and the principle of openness refers to the unlimited requirements of homework and the multiple possibilities of answers. The principle of fun is to set the content of homework in a form that is familiar to students in order to stimulate students' interests in learning [3]. In 2014, Jie Ruiming of Northwest Normal University proposed that level-based homework should follow the principle of typicality, systematicness, openness, and fun. The principle of typicality means that the task should be representative. The principle of systematicness means that the assignments are set according to the degree of difficulty. The principle of openness refers to the diversity of conditions and answers. The principle of fun refers to the integration of emotions, methods, spirit, attitudes and the latest knowledge [4]. In 2015, Guo Huan of Shanxi Normal University proposed that the implementation of level-based homework should divide the students into several groups for the first step and the division should be based on students' own will and regularlly changed according to their individual needs [5]. In 2016, Ren Tingting of Xinjiang Normal University found that level-based homework of College Physics could increase students' interests in learning and improve teachers' teaching quality [6]. In 2019, Guo Yinhua and Li Yajie proposed that the implementation of level-based homework should consider students' individual differences, the changes of homework forms, and the practice of reducing students' burden [7].

At present, homework of College Physics in China usually has one-size-fits-all form, that is, all students are assigned the same assignments, using the same evaluation model, and rarely taking into account differences in students' learning level and abilities. As a result, students with better academic performance need extra exercise and academically poor students find it difficult to do the tasks. What's more, plagiarism occurs frequently since homework is too complicated. As an essential part of the learning process, homework requires the active participation of students. The traditional mode of homework restricts students' thinking to some extend and it is also against the goal of promoting students' overall development.

In the process of learning College Physics, teachers need to consider the differences of students' learning abilities and allow different students to receive appropriate instruction. The level-based homework of College Physics is based on students' individual differences. The multi-level homework can help to meet the needs of students at different levels of physics learning. Students can also choose the physics homework that suit them, experience the joy of success or accomplishment, and make progress in continuous success.

From the above research, it can be seen that level-based homework reflects the teacher's respect for students' differences. It also reflects that students are the main body of learning, the performer and beneficiary of homework. By setting up scientific, reasonable and appropriate level-based homework, teachers can satisfy the psychological and learning needs of students at different levels, and improve students' initiative, enthusiasm and creativity in learning, which can further promote students' growth and progress, and improve teaching efficiency and quality. Therefore, considering the characteristics of college physics, it is of great significance to carry out systematic research on level-based homework of College Physics.

## 3. Research Background of Level-based Homework of College Physics

This article takes level-based homework of College Physics as the research object, and the main research contents are as follows. Firstly, it sorts out the related research results of homework, level-based homework, level-based homework of physics and level-based homework of College Physics. Then it expounds the concepts and theories related to level-based homework.

Homework is an independent learning activity carried out by students in order to complete the learning task. It is also a learning task designed by the teacher in line with the purpose of helping students review the knowledge. Homework plays an important role in the learning process of students, which can strengthen the knowledge of classroom teaching and is also an effective channel for communication between teachers and students.

Homework of College Physics refers to the learning tasks assigned by teachers and completed by students after class. Most of these learning tasks are written assignments and exercises in the corresponding chapters of the textbook and workbook. The purpose of this kind of homework is to allow students to review and strengthen the theoretical knowledge in the books.

Hierarchy is an important concept of system theory. It refers to the discernible differences between the various subsystems and their elements that make up a large system. The purpose of hierarchy is to realize the coordinated development within the system. Level-based homework is a branch of hierarchical teaching. It means that teachers assign different levels of homework to the same teaching content according to the learning situation of students at different levels. Students can choose their own homework form or content according to their own abilities and achievement corresponding achievements.

Level-based homework of College Physics refers to the assignment designed by the teacher based on the students' knowledge level and acceptance ability. The assignments are of various difficulties and focusing points. Students can choose the tasks according to their abilities and improve their learning efficiency by completing it independently. Level-based homework of College Physics can be divided into pre-class work, in-class exercises and after-class homework. This article mainly focuses on the after-class level-based homework.

It is important to respect students' self-esteem, which is crucial in students' academic and psychological development. Therefore, teachers should respect students' individual differences in the teaching process and they can't discriminate any student. Actually, it is really necessary to bring a sense of security and dignity to the student, which is the prerequisite for promoting the development of the students' intelligence and potential ability. Level-based homework is a concrete manifestation of teachers' respect for individual differences of students and implementation of the teaching mode of teaching students in accordance with their aptitude. The whole process needs to consider students' conditions, take homework as the main method, and the students' development as the goal.

## 4. Questionnaire Design on the Homework of College Physics

The survey is conducted to investigate the current situation of College Physics homework among university teachers and students in the form of questionnaires. In order to fully understand the problems existing in homework of College Physics and college teachers and students' views on level-based homework. This article carries out a questionnaire survey among teachers and students in colleges and universities. Based on the survey results, the feasibility and effectiveness of level-based homework applied to college physics teaching are analyzed to provide the proof for the design principles, design strategies and evaluation strategies of level-based homework of College Physics. The respondents of this research are freshmen and teachers of Department of Basic Education of Dalian Polytechnic University. Table 1 is a questionnaire for students with 11 questions and Table 2 is a questionnaire for teachers with 10 questions.

Table 1 Questionnaire for Students

| Question | Corresponding question number |
|---|---|
| Purpose of homework | 1 |
| Homework form and content | 4, 9 |
| Problems in homework | 3 |
| Effectiveness of homework | 2, 5 |

| | |
|---|---|
| Homework evaluation | 6, 7 |
| Attitudes towards level-based homework | 8, 10, 11 |

Table2 Questionnaire for Teachers

| Question | Corresponding question number |
|---|---|
| Purpose of homework | 1 |
| Source and form of assignment content | 2, 3 |
| Effectiveness of homework | 4 |
| Homework evaluation | 5, 6, 7 |
| Attitudes towards level-based homework | 8, 9, 10 |

## 5. Analysis of the Survey Results

### 5.1 The Analysis of the Purpose of College Physics Homework

The investigation of the purpose of the homework includes the purpose of the students to do their homework and the purpose of the teacher to assign the homework. The purpose of the survey is to understand whether students and teachers can correctly understand the purpose of the homework, as shown in Figure 1.

It can be seen from Figure 1 that 43% of teachers believe that the purpose of assigning homework is to consolidate knowledge and help students achieve better learning effects. In addition, 28% of those respondents believe that homework is only one part of the teaching process. What's more, 22% of them think that the purpose of homework is to cultivate students' learning methods, habits and attitudes. Lastly, 7% of them assign homework for other reasons. As shown in Figure 2, 35% of students do their homework for the purpose of improving their academic results, while 30% of them are just for the teacher's inspection. 21% of them do their homework to cultivate their learning methods, habits and attitudes. 14% of the students haven't expressed clear views about the purpose of doing homework.

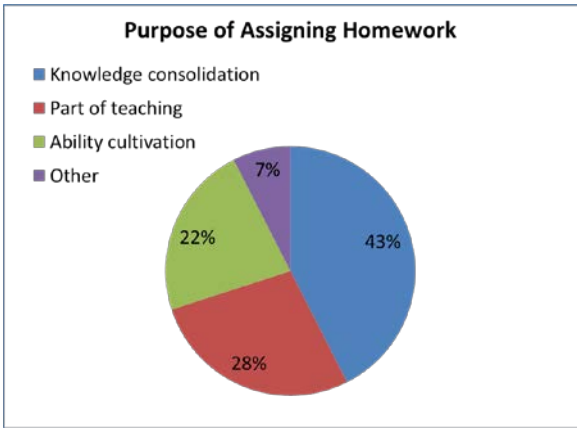


Figure1 The purpose of assigning homework for teachers

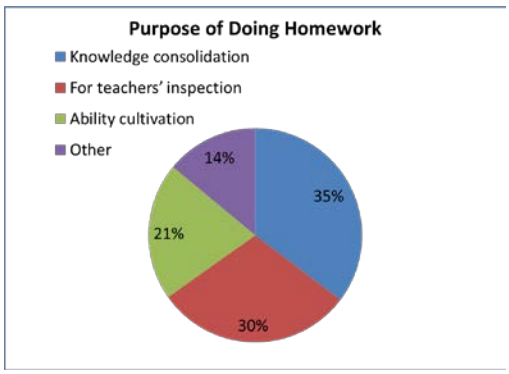


Figure 2 The purpose of doing homework for students

From the above analysis, it can be seen that some students and teachers lack a correct understanding of the purpose of homework. Some students do not fully understand that homework is an important part of the learning process and some teachers are not clear about the true purpose of homework.

### 5.2 The Analysis of the Source and Form of College Physics Homework

The purpose of investigating the students' satisfaction towards the source and form of homework is to understand the students' acceptance of the current form of homework of College Physics.

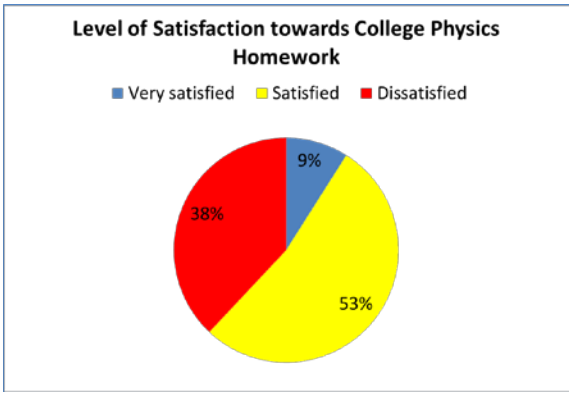


Figure 3 Students' satisfaction towards the form and content of College Physics homework

It can be seen from Figure 3 that only 9% of the students are very satisfied with the form and content of College Physics homework. 53% of them are satisfied and 38% of them are dissatisfied with it. It shows that some students do not like the form and content of their homework and they hope to have different forms and multiple sources of content of College Physics homework.

### 5.3 The Analysis of the Problems Existing in College Physics Homework

The problems that students have in doing College Physics homework are mainly reflected in the amount and difficulty of the homework. Therefore, investigations are carried out from these two aspects to clarify the students' views on the amount and difficulty of their homework. The survey result is shown in Figure 4.

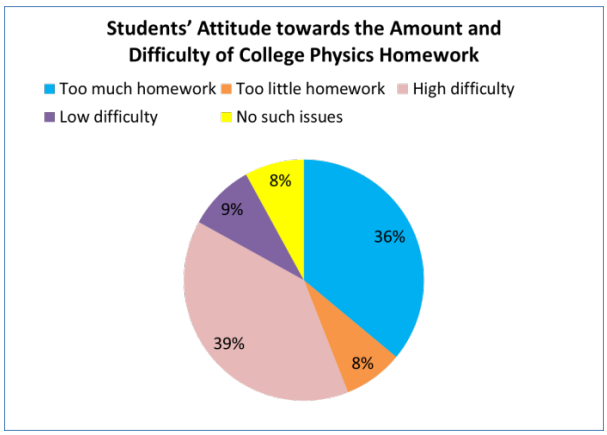


Figure 4 Students' attitude towards the amount and difficulty of College Physics homework

It can be seen from Figure 3 that the biggest problem encountered by 36% of students when doing homework is the large amount of homework. 8% of them feel that there is too little homework. 39% of them think the homework is too difficult and 9% of them believe that it has low difficulty. 8% of students have never met such issues when doing College Physics homework. From the above analysis, it is clear that students' opinions on the amount and difficulty of homework are quite controversial. Most students believe that there is too much homework and the level of difficulty of the homework is relatively high.

### 5.4 The Analysis of the Effectiveness of College Physics Homework

The effectiveness of College Physics homework is shown in Figure 5. It can be seen that 31% of students can always do their homework and 38% of students can generally complete their homework on time. 20% of students can only do it occasionally and 11% of students cannot finish it on time.

According to the analysis, due to differences in students' individual ability, the problems reflected by students doing College Physics homework are also different. Those students with stronger abilities can complete the homework with high quality. However, students with lower abilities may not finish their homework on time. As a result, students have different enthusiasm for the course and different interests in learning College Physics.

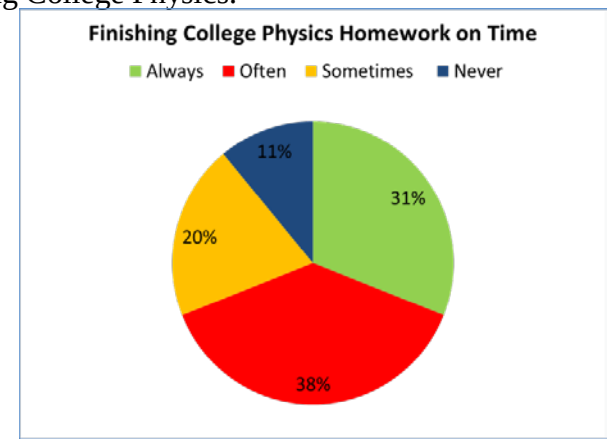


Figure 5 Effectiveness of doing College Physics homework

### 5.5 The Analysis of Teachers and Students' Attitudes towards Level-based College Physics Homework

The survey of students' attitudes towards level-based College Physics homework includes surveys of both teachers and students. The result of teachers' attitude is shown in Figure 6. It can be seen that 72.50% of teachers believe that the program will benefit students at different levels, which is conducive to students' academic performance and comprehensive development. 15% of the interviewees believe that it is likely to cause unfair learning tasks among students. 11% of teachers

think that this will discriminate against students and should assign the same homework. Only 1% of them believe that level-based homework will not help improve students' performance. According to the above analysis, current College Physics homework does not consider the learning requirements and ability levels of different students. Most teachers hold a positive attitude towards the implementation of level-based homework and more than 70% of teachers think that it can bring positive effects to students, which shows it is feasible and necessary to implement level-based College Physics homework.

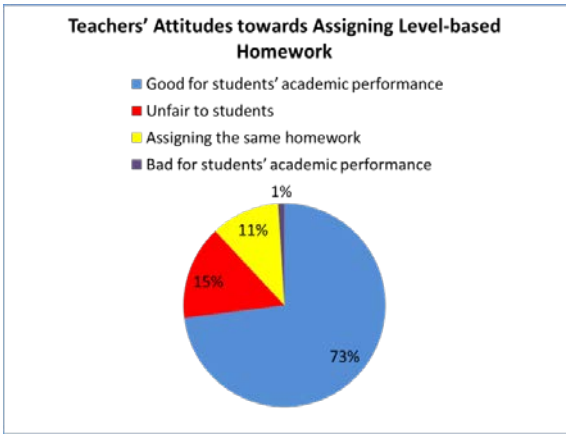


Figure 6 Teachers' attitudes towards assigning level-based homework

Figure 7 illustrates students' attitude towards level-based College Physics homework. It can be seen that 92% of students express their hope for homework based on their individual learning conditions. 5% of students said it did not matter and only 2% of students said they did not want it. According to the analysis, it can be seen that most students hope that College Physics homework can be arranged according to the actual situation of the students, and present a gradient distribution.

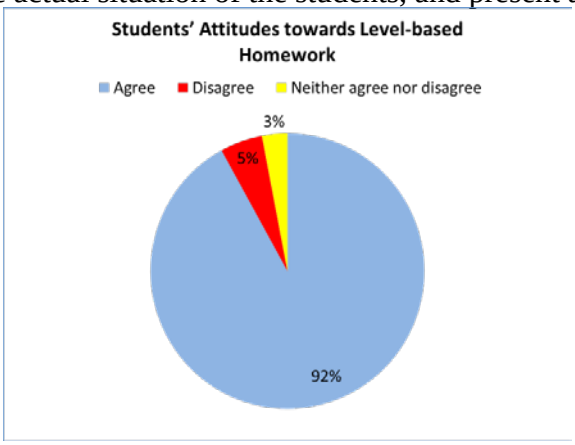


Figure7 Students' attitudes towards level-based College Physics homework

## 6. Conclusion

This article focuses on the analysis of the attitudes of teachers and students towards College Physics homework. The results of the questionnaire survey of teachers and students are analyzed to summarize the common problems existing in College Physics homework concerning the form and content, difficulty and quantity of the homework, effectiveness of the homework and evaluation methods. The survey results show that most students are not clear about the purpose of doing the homework. The results also show that some teachers are not clear about the purpose of assigning the homework. Sometimes the content and form of the homework are not in line with the students' abilities. The implementation of level-based homework is helpful to both teachers and students. To sum up, most students and teachers hold a positive attitude towards level-based College Physics

homework and believe that it can have a positive impact on students' academic performance. The reason why level-based College Physics homework is accepted by both teachers and students is that it is based on the premise of respecting the individual differences of students, and for the purpose of promoting student development. It can be scientific and reasonable in terms of the form, difficulty, quantity, and evaluation methods of homework. Overall, College Physics homework which consider the students' differences and learning needs can help to tap students' potential and give play to their strengths.

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