

# Case Library Construction of Special and Functional Paper Course

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**Abstract.** The construction of case library is the premise and foundation of case teaching, which is an interactive teaching mode different from traditional teaching. Case teaching places students in a specific background and guides students to analyze and solve problems with the knowledge they have learned. The training process through the analysis and discussion of specific case problems to find the final solution is like building a bridge between theory and practice, which has important practical significance for training composite talents and innovative professionals. The theme and number of cases should be able to focus on the main content of the course to achieve the full coverage of the course teaching to arrive knowledge goals, ability goals and quality goals. Case library is the carrier of case teaching, and case teaching can promote the updating and iteration of cases and make the case library developing dynamically, so as to make up for the deficiency of the content of teaching materials lagging behind the development of industry.

**Keywords:** Case library, Case teaching, Case writing process.

“Special Paper and Functional Paper” is a professional course for the graduate students of light industry technology and engineering in our university. Special paper and functional paper are different from ordinary paper: the produced raw materials include plant fiber and non-plant fiber; The producing methods involve to traditional paper making and special process and paper post-processing technology; Applications of special paper involve to printing, industry, agriculture, construction, medical and health, information, military and other fields. The course has the characteristics of multi-disciplinary, comprehensive, involving a wide range of industries; At the same time, it has the dual characteristics of science and engineering, and is a course that closely combines theory and practice. Case teaching is a kind of interactive teaching mode which is different from traditional teaching. Case teaching places students in a certain background and guides students to analyze and solve problems with the knowledge they have learned. The training process through the analysis and discussion of specific case problems to find the final solution is like building a bridge between theory and practice, which has important practical significance for training composite talents and innovative professionals. At the same time, in the process of case teaching, several discussions and exchanges are needed between students, between teachers and students to jointly find the best way to solve practical problems. On the one hand, students' ability to analyze and solve problems is improved, and team cooperation ability is also cultivated. Whether the effect of case teaching can be brought into full play, the key lies in the construction of case base. If the construction of case library is not good, it is difficult to realize the training of graduate students' ability of analysis, problem solving, comprehensive practice and innovation. Therefore, under the case teaching mode, it is necessary to establish and build the case library of "special paper and functional paper".

## 1. The principle of course case construction

### 1.1 Mainline principle

The construction of the case library should be following the principles that: the construction of the case base is to serve the course teaching, to guide students to conduct independent learning, learning to analyze problems, and exercise their comprehensive ability to solve practical problems with the knowledge they have learned in the teaching process. Therefore, the construction of the case base should echo the main line of the course content, and train students' innovation ability and innovation literacy to apply what they have learned in accordance with the main line of the course teaching

content, so as to meet the needs of the economic and social development in the new engineering background for complex and innovative talents.

### 1.2 Principle of typicality

The case is a typical material, and the selection of any case should be representative and reflect

The typical characteristics and common problems of this profession and this industry, the more typical the case, the greater the general significance of reference. The use of typical cases to teach, help students to establish a set of basic problem analysis, problem solving thinking mode, so that they can analyze and solve problems more scientifically.

### 1.3 Dynamic principle

The course content of "Special Paper and Functional Paper" is based on the development of paper industry, and the teaching goal is to cultivate compound innovative talents for the development of paper industry. The paper industry technology development is changing with each passing day, the technology update iteration speed is fast, which requires that the case base should also be updated in time, keep up with the pace of industry development, in order to better serve the development of the industry; Under the current situation, enterprises in various industries are facing the grim reality of survival and development, how to enhance the technical strength of enterprises, enhance the competitiveness of enterprises, and ensure the sustainable development of enterprises, among which the technical reserve of enterprises has a non-negligible impact, the technical reserve of enterprises directly determines the competitiveness of enterprises, and the technical reserve of enterprises has gradually become an indispensable part of sustainable development of enterprises Less of a necessity. Therefore, enterprises often carry out technical reserves for longer term development, that is, by cooperating with professional teachers to develop new technologies or develop new paper varieties to adapt to the development of society. On the one hand, cases come from some problems currently faced by enterprises, on the other hand, they come from cooperation projects between teachers and enterprises, which require cases to be constantly iterated and updated, so it seems that the case base has dynamic characteristics on the whole.

## 2. Case writing process

The cases should be authentic, credible, objective, vivid and diverse, and have a high degree of relevance to the teaching content. The content of the cases should be representative and universal to a certain extent, have typical significance, and have the value of popularization and reproduction. The writing process of a specific case is shown in Figure 1.

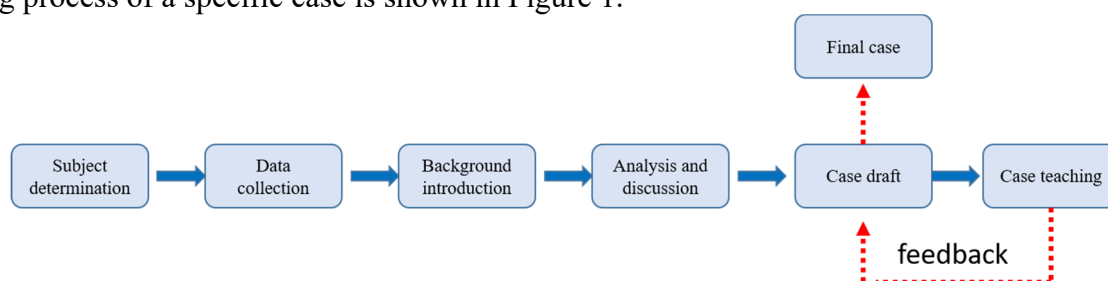


Figure 1. Case preparation process diagram

### 2.1 Determination of the case theme

Based on the teaching goal of "Special Paper and Functional Paper" for graduate students majoring in light industry technology and engineering, and focusing on the training of "new engineering" talents with innovation and entrepreneurship consciousness, digital thinking and cross-border integration ability proposed by the construction of new engineering, 11 case themes are determined as shown in Table 1 according to the main line principle and combined with the engineering practice and research hotspots of this major.

**Table 1.** "Special Paper and Functional paper" course case list

number	case theme	Background knowledge	Training goal
1	Selection and design of pigment dispersant for pigment coated paper	Pigment dispersion theory: electrostatic repulsion, steric hindrance	Practical innovation ability
2	Design and validation of pigment coating formulations	Composition of coating formula, formula design principles and steps	Comprehensive ability to analyze and solve problems
3	Control and regulation of coating rheology	The meaning of paint rheology, Impact on production	The ability to transfer and apply interdisciplinary knowledge
4	Control and design of water retention of coating	Influence of coating water retention on production process and product quality	Ability to focus and solve key problems
5	Selection and design of pigment coating method	Coating methods and their respective characteristics	The ability to apply technical expertise to solve problems
6	Preparation of microcapsules and their application in carbon-free carbon paper	The preparation of microcapsules, the structural properties of carbon-free carbon paper and the characteristics of coatings	Integration and innovation ability of interdisciplinary theory and technology
7	Application of fluorescent nanocellulose in paper anti-counterfeiting	Types and characteristics of anti-counterfeiting paper	Ability to integrate and apply key new technologies
8	Dispersion of non-plant fibers and regulation and design of paper forming	different characteristics of non-plant fiber to the plant fiber, the basic principle of dispersion	Ability of key problem solving
9	Formulation design and verification of cast coating	The formulation and technological characteristics of the casting coating	Design and creation ability for special cast-coated paper coatings
10	Regulation and design of absorptive properties of decorative paper	The factors of influencing paper absorption: from raw materials to process and equipment	The ability to integrate and control many influencing parameters
11	Regulation and design of air permeability of fruit bag paper	How to balance paper permeability and strength performance indicators	Ability to analyze and solve typical inverse problems

## 2.2 Case data collection

Special Paper and Functional paper Cases are mainly collected from the following three aspects: First, investigate some practical problems encountered by relevant enterprises in production, and refine and improve them according to the typical principle to form a complete case; The second is to sort out cases by selecting materials that are compatible with the main content of the course from the scientific research projects in cooperation with enterprises. This part of cases often has certain timeliness and needs to be updated and iterated constantly. The third part comes from the technical bottleneck information released by the industry annual meeting and the industry information platform. This part of the case has the characteristics of advanced and novel.

## 2.3 Background introduction

The specific source and formation process of each case, the industry environment at that time, the industry policy, the relevant technological development level and the national and local policies related to the industry. The introduction of the case background helps students to analyze and discuss the case immersive as the protagonist, and the solution obtained is easier to land.

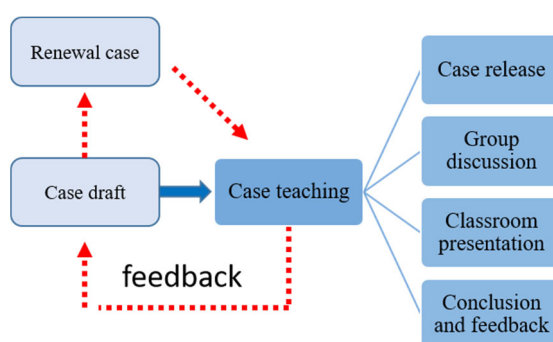
## 2.4 Analysis and discussion

The teachers analyzed and discussed the cases and came up with several methods of problem solutions. At the same time, it should be recognized that in order to achieve a truly student-centered

discussion process, students should first be able to recognize their own subject status and be willing to participate in and lead the case analysis and discussion process as a subject. From primary school to secondary school to college, students listen to teachers as learners, with low personal participation, and participation in learning is a habit that takes a long time to develop. Before students develop the habit of participating in learning, they need to analyze and discuss cases with the help of some guidance language, so as to get an effective solution to the problem.

### 3. The implementation of case teaching

Taking the case of "Regulation and design of absorptive property of decorative paper" as an example, the implementation process of case teaching is introduced in detail, which mainly includes four steps, such as case publishing, group discussion, class presentation, summary and feedback. Figure2 shows the case teaching implementation process.



**Figure 2.** Case teaching implementation process

#### 3.1 Case release

The case materials are released one week in advance, so that students have enough time to consult the materials and understand the cases, so as to discuss and analyze the cases. Published case materials include case title, case text, background introduction, guidance, requirements.

Case title: Regulation and design of absorptive properties of decorative paper

Case text:

In order to produce high opacity and high absorption paper, a company producing decorative base paper in Shandong Province selected 60% bleached hardwood pulp and 40% bleached coniferous wood paddle as fiber raw materials, and filled with 40% titanium dioxide, using PAM and starch dual retention system for retention. In order to save costs and equipment footprint, the beater is mixed with hardwood, and the beater degree is 35oSR. Long mesh paper machine with high frequency shaking and watermarking roller is used for manufacturing, and the speed of paper machine is 650m/min. At the beginning of the operation, the performance indicators of the paper were normal, but suddenly one day the opacity of the paper began to decline significantly, and it could not meet the requirements of customers. What to do?

Background introduction:

This case comes from the actual problems encountered in the production process of decorative base paper, which has certain typical and universal characteristics.

Guide words:

Explore the essence of case problems through layers of questions; Then through the analysis of the essential problems to find the specific relevant factors, listed these factors, and these factors are further divided into key factors and secondary factors; What are the enablers and hindrances of key factors? What are the promotion factors and hindrance factors of secondary factors? Solution idea: Prioritize the promotion factors of key factors, eliminate the hindrance factors, and then optimize the promotion factors to come up with a solution to the problem.

### 3.2 Group discussion

Follow the question guide to discuss, you can also add your own new questions. The discussion of each group should focus on the contents of Table 2 and be recorded in detail.

**Table 2.** The recording of Case discussion and analysis

Case number/ Group number	The nature of the case problem	Important document record	Key factor		How to solve	Other solution
			Positive factor	Negative factor		

### 3.3 Classroom presentation

The results of the discussion can be displayed, including PPT with explanation, manuscript with explanation, blackboard with explanation and mind mapping etc. Choose the form of expertise to explain the problem.

### 3.4 Conclusion and feedback

According to the class presentation process and analysis results, the good aspects will be summarized in the next case teaching program Enhanced; Find out the shortcomings, analyze the reasons, find out the reasons, and put forward specific solutions; If it is related to the case problem, modify or improve the case, so that the case becomes more perfect in the continuous update and iteration.

## 4. Conclusion

The construction of case base is the premise and foundation of case teaching, which is an interactive teaching mode different from traditional teaching. Case teaching places students in a specific environment background and guides students to analyze and solve problems with the knowledge they have learned. The process of training through the analysis and discussion of specific case problems to find the final solution is like building a bridge between theory and practice, which has important practical significance for training composite talents and innovative professionals. At the same time, in the process of case teaching, repeated discussions and exchanges are needed between students and between teachers and students to jointly find the best way to solve practical problems. On the one hand, students' ability to analyze and solve problems is improved, and team cooperation ability is also cultivated.

The topic selection and number of cases should be able to focus on the main content of the course to achieve the full coverage of the course teaching to achieve knowledge goals, ability goals, quality goals. Case base is the carrier of case teaching, and case teaching can promote the updating and iteration of cases and make the case base develop dynamically, so as to make up for the deficiency of the content of teaching materials lagging behind the development of industry.

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