评委一评分，签名及备注	队号： 50037	评委三评分，签名及备注
评委二评分，签名及备注	选题： C	评委四评分，签名及备注

题目:Research about Public Elementary Teachers for Vocational Education

Abstract

In recent years, the research of teachers professional development focuses on the "Double Teachers" training. But with the rapid development of vocational education, public university teachers professional development courses which is researched relatively small are put on the agenda. Basic courses as students' comprehensive professional competence courses also need to have a high level of specialized teachers. Therefore, it is necessary to research the professional growth of teachers in public basic course and analyze the new training model and the situation of basic course teachers so as to explain specialized growth strategy of basic course teachers.

For the first question, we analyze the data and regard the coverage of departments obtaining the teachers and professional approach degree as the first, second objective function, which includes coverage of the departments of the ministry of the total number and distribution of bias. We regard the number of teachers as the constraints to establish the public basic course teacher specialization allocation model. Then considering the difference between full-time teachers and external teachers, according to the different goals, we set different weights to correct models. Using MATLAB software, depending on the priority, firstly, we solve the largest professional approach degree of 197.8, and then adjust the second objective function as constraints, solved using LINGO software, teachers get optimal allocation scheme, the department of the ministry of coverage and distribution of the total number of deviations are 5.9 , 0.0251, professional approach degree to 183.5.

For the second question, the analysis can reflect several representative indicators of the status situation of public basic course teachers : teacher structure and professional competence of teachers, professional level, training and training situations and job burnout. Carrying out deep analysis, each indicator is designed specifically to investigate the problem of scoring, then each section can get the total score and we establish assessment model of public elementary course of teachers and grading. Then we conduct a survey and the score is 0.831 rating for the first-class university, which is consistent with facts proving the reliability of the questionnaire. For the survey of public basic course requirements for university teachers' professional ability, we investigate it through our professional ability questionnaire where questions have various levels which can fully reflect the requirements for teachers and composition.

For the third question, combined with real life and problem analysis, considering time and money constraints, we design the rational and detailed plan and then work out the economical and reliable budget plan according to the market price.

For the fourth question, we analyze the meaning and necessity of university public elementary course teacher professional development, and propose a method of diluting public discipline system linking basic teaching system and practice systems with specialized courses and changing traditional teaching concepts. From teachers, universities and students we analyze public basic course teaching and propose the method of improving the professional competence of teachers in public basic course improving the overall quality of students and the practical basis for reform and teacher in public basic course teaching.

Finally, we analyze, evaluate and promote the model in our paper.

Key words: Professional Growth Strategy Allocation model Evaluation scale Reasonable plan

1. Analysis of the Problem

1.1 Analysis of the problem 1

The problem 1 acquires for reasonable allocation for public elementary teachers. We take these factors into consideration : the coverage of departments obtaining the teachers (especially the full-time teachers), whether the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on. Firstly, we give the correlation coefficient matrix that is about elementary courses and employment.

1.2 Analysis of the problem 2

In order to investigate the current situation of teacher team working on the PECs (teacher structure, vocational ability, specialization level, cultivating and training, job burnout and so on) and consider the requirement of the universities for the vocational ability of teachers, we are required to design a questionnaire which is comprehensive, reliable and convincing.

1.3 Analysis of the problem 3

We need to draw a research plan and the corresponding appropriation budget (the total time: one year, the total funds: 4500 RMB). The plan consists of three stages: earlier stage, middle stage and later stage. The main tasks are preparations, actual inspection, and result analysis which are allocated to the three stages.

1.4 Analysis of the problem 4

Professional training of the teachers specialized in PECs is to learn teaching skills, achieve professional autonomy and reflect the professional ethics by professional training to improve teaching quality and become professional educational workers in their teaching life. The connotation includes professional spirit, professional ethics, professional intelligence, professional autonomy and professional organization. The ability contains general ability, specialized academic ability, professional capacity to act, educational research capacity and self development capacity.

2. Assumptions and Symbol Description

2.1 Assumptions

Accuracy assumption : We have assumed that the data given by the problem is accurate and believable.

Ideal assumption : We have assumed that the teachers are completely obeyed the allocation who are not influenced by the external factors.

Exclusive assumption : The other public elementary teachers and the allocation in other departments are not considered.

2.2 Symbol Description

Symbol	Description
a_i	whether the teachers are allocated into the certain department
b_i	the proportion of the number that the teachers are assigned to the department
k_i	the ideal proportion

f_{ij}	the number that the teachers teaching the j public elementary course are assigned to the i department
c_{ij}	the extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on
n_j	the teachers' number who teach the j public elementary course
n	the total teachers' number

The other symbols are given in the following.

3. Model and Solution of the problem 1

3.1 Analysis of the problem 1

The problem 1 acquires for reasonable allocation for public elementary teachers and provides the total numbers of every subject, but the numbers of teachers every major needs are not given. So we need to at first figure out the equations of the coverage of departments obtaining the teachers and the correlation coefficient of elementary courses and employment, which are the objective function . And we regard the teachers' total number as the constraints. According to the priority, we write different algorithms and acquire two different allocation plans and discuss then modify.

Here is the flow chart :

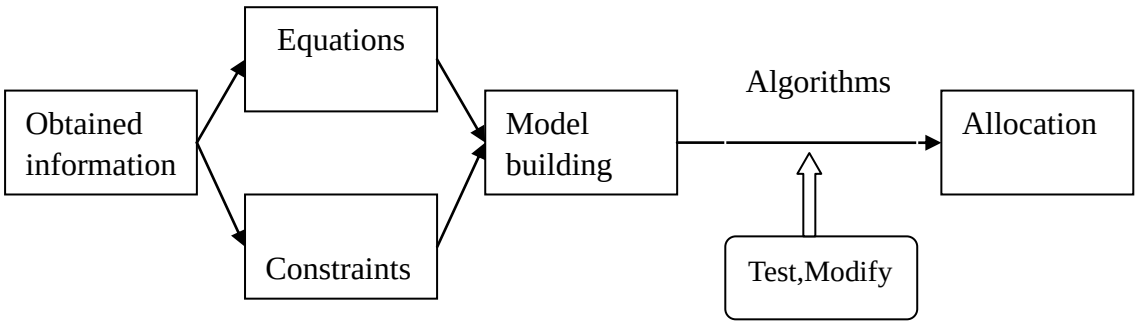

Figure 1: The flow chart

3.2 Assumption of the problem 1

We have made assumptions that the teachers teaching the same courses are the same, so are the external teachers. We have also assumed that the correlation coefficient matrix is unvaried and that the full-time teachers and the external teachers have the same impact in all the public elementary courses.

3.3 Model building of the problem 1

As the data we need to use is not provided entirely in the problem, we use parameters instead, which is easy to modify and can adapt under more conditions.

Objective function:

Considering the coverage of departments obtaining the teachers, the departments into which teachers are distributed are supposed to be more. It is computed by

$$Z_1 = \max \sum a_i \tag{1}$$

Here, a_i represents whether the teachers are allocated into the certain

department. $a_i = 1$ denotes the teachers are assigned to the department.

While, $a_i = 0$ represents the department has not obtained teachers. Z_i denotes the total number of the departments that obtained teachers.

Because the different departments have various scale and significance and different majors, so the numbers that the teachers are allocated into different majors are various. The results of our model should be close to the ideal result. Hence we find the below equation to describe the difference:

$$\mathrm{Z}_2 = \min \sqrt{\sum \frac{(b_i - k_i)^2}{(n-1)k_i^2}} \tag{2}$$

Here, b_i represents in our model the proportion of the number that the teachers are assigned to the department. k_i denotes the ideal proportion. Z_2 represents the deviation between the number of our model and the ideal number.

The extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on is unequal. The allocation should make it biggest. Therefore we use Z_3 to depict the extent.

$$\mathrm{Z}_3 = \max \sum \sum f_{ij} c_{ij} \tag{3}$$

Here, f_{ij} represents the number that the teachers teaching the j public elementary course are assigned to the i department. c_{ij} denotes the extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on.

Constraints:

Firstly, we have assumed that we have certain public elementary teachers. There are some equations to describe it:

$$\sum b_i = n \tag{4}$$

$$\sum f_{ij} = n_j \tag{5}$$

$$\sum n_j = n \tag{6}$$

Here, n_j represents the teachers' number who teach the j public elementary course. n denotes the total teachers' number.

We have assumed that all parameters in our model are integer, so we have regularization constraints as followed:

$$a_i \in \{0,1\} \tag{7}$$

The numbers of teachers who are assigned to departments are non-negative integer :

$$b_i, f_{ij} \in N \tag{8}$$

The extent, the teachers' numbers are constant:

$$c_{ij}, n_j, n \equiv cons \tag{9}$$

The total number of the departments and the total kind of the public elementary courses are known:

$$i = 6, j = 5 \tag{10}$$

According to the problem which has given that the math teachers have already been allocated into the departments, so we have the following:

$$f_{13} \geq 2,\ f_{33} \geq 2,\ f_{43} \geq 1 \tag{11}$$

In summary, we can model **the allocation of the public elementary teachers:**

$$\max \mathrm{Z} = q_1 \sum_{i=1}^{6} a_i - q_2 \sqrt{\sum_{i=1}^{6} \frac{\left(b_i - k_i\right)^2}{\left(n-1\right) k_i^2}} + q_3 \sum_{i=1}^{6} \sum_{j=1}^{5} f_{ij} c_{ij}$$

$$s.t. \begin{cases} \sum_{i=1}^{6} b_i = 67 \\ \sum_{i=1}^{6} f_{ij} = n_{j=1\sim5} = 14,18,20,7,8 \\ a_i \in \{0,1\} \\ b_i,\ f_{ij} \in N \\ c_{ij} > 0 \\ f_{13} \geq 2,\ f_{33} \geq 2,\ f_{43} \geq 1 \end{cases} \tag{12}$$

Here, Z is the objective function. We use q_1, q_2, q_3 to weight the sub-objective function.

3.4 The adaptive correction of Model 1

The model above do not consider the difference of full-time teachers and external teachers. But, we are supposed to consider the full-time teachers prior in the allocation. So we modify the coverage of departments obtaining the teachers:

$$\mathrm{Z}_1^{'} = \max \sum_{i=1}^{6} (\lambda_{1i} a_{1i} + \lambda_{2i} a_{2i}) \tag{13}$$

$$\lambda_{1i} + \lambda_{2i} = 1 \tag{14}$$

Here, λ_{1i} represents the extent to the coverage of departments obtaining the teachers for full-time teachers. λ_{2i} represents the extent to the coverage of departments obtaining the teachers for external teachers. a_{1i} represents whether the full-time teachers are allocated into the certain department. a_{2i} represents whether the external teachers are allocated into the certain department. If it equals to 1denotes the teachers are assigned to the department. While, If it equals to 0 represents the department has not obtained teachers.

The full-time teachers and external teachers who teach the same public elementary course has different professional impact on the same department. So we modify Z_2:

$$\mathrm{Z}_2^{'} = \min \sqrt{\sum_{i=1}^{6} \frac{\left(\lambda_{1i} b_{1i} + \lambda_{2i} b_{2i} - k_i\right)^2}{\left(n-1\right) k_i^2}} \tag{15}$$

Here, λ_{1i} still represents the extent of full-time teachers to the coverage of departments obtaining the teachers . λ_{2i} also represents the extent of external teachers to the coverage of departments obtaining the teachers . b_{1i} represents the proportion of in the i department full-time teachers' number. b_{2i} denotes the proportion of in the i department external teachers' number. k_i represents the ideal

proportion.

Similarly, the extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on is influenced by the various teachers. So we modify Z_3:

$$Z_3^{'} = \max \sum_{i=1}^{6}\sum_{j=1}^{5}\left(\eta_{1i} f_{2ij} + \eta_{2i} f_{2ij}\right) c_{ij} \tag{16}$$

$$\eta_{1i} + \eta_{2i} = 1 \tag{17}$$

Here, f_{1ij} represents the number that the full-time teachers teaching the j public elementary course are assigned to the i department. f_{2ij} denotes the number that the external teachers teaching the j public elementary course are assigned to the i department. c_{ij} denotes the extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on.

The correlation coefficient matrix that is about elementary courses and employment is still the same which has nothing to do with the full-time teachers and external teachers. Similarly, the distribution of the two kinds teachers stay the same:

$$k_i = k_{1i} = k_{2i} \tag{18}$$

To sum up, we can obtain the model of the allocation of the public elementary teachers that has been modified:

$$\max Z = q_1 \sum_{i=1}^{6}(\lambda_{1i} a_{1i} + \lambda_{2i} a_{2i}) - q_2 \sqrt{\sum_{i=1}^{6} \frac{\left[\lambda_{1i}\left(b_{1i} - k_i\right)\right]^2 + \left[\lambda_{2i}\left(b_{2i} - k_i\right)\right]^2}{\left(n-1\right)k_i^2}} + q_3 \sum_{i=1}^{6}\sum_{j=1}^{5}\left(\eta_{1i} f_{2ij} + \eta_{2i} f_{2ij}\right) c_{ij}$$

$$s.t. \begin{cases} \sum_{i=1}^{6} b_{1i} = 21 \\ \sum_{i=1}^{6} b_{1i} = 46 \\ \sum_{i=1}^{6} f_{1ij} = n_{j=1\sim5} = 4,6,5,2,4 \\ \sum_{i=1}^{6} f_{1ij} = n_{j=1\sim5} = 10,12,15,5,4 \\ a_{1i}, a_{1i} \in \{0,1\} \\ b_{1i}, b_{2i}, f_{1ij}, f_{2ij} \in N \\ c_{ij} > 0 \\ f_{113} = 2,\ f_{133} = 2,\ f_{143} = 1 \\ \lambda_{1i} + \lambda_{2i} = 1 \\ \eta_{1i} + \eta_{2i} = 1 \end{cases} \tag{19}$$

3.5 The solution of the model 1

3.5.1 Data preprocessing

The correlation coefficient matrix is made by virtue of Satty score method. The method use 1 to denote irrelevant, 3 to denote basically irrelevant, 5 to denote

relatively relevant, 7 to denote relevant and 9 represents very relevant. Considering the fact is complex, we add 2,4,6,8 to denote the intermediate values between two score to avoid error and to clearly express the divergence. The following table depicts that :

Table 1

Department Subject	Ideology and politics	English	Math	Language	Physical education
Bridge	5	6	8	1	6
Mechatronics	4	5	4	1	3
Computer	3	8	6	2	1
Management	6	7	7	3	3
Design	5	4	5	4	5
Mathematical modeling (Preparation)	3	7	9	3	4

In addition, the extent of full-time teachers to the coverage of departments obtaining the teachers has more influence, so we take λ_{1i} for 0.9 and λ_{2i} for 0.1 . The extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on is various between full-time and external teachers. So we take η_{1i} for 0.3 and η_{2i} for 0.7 .

3.5.2 Data preprocessing

As there are many sub-objective functions in our model and the weight has great impact on the solution of our problem, we make use of the method of prioritized to solve. First of all, we take coverage factors as the objective functions, then take the result as the constraints to solve the objective of extent coefficient.

We use LINGO software to solve not considering the coverage of departments. The extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on is listed by the below table:

Table 2

Department Subject	Ideology and politics		English		Math		Language		Physical education	
	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers
Bridge	0	0	0	0	2	0	0	0	4	4
Mechatronics	0	0	0	0	0	0	0	0	0	0
Computer	0	0	6	12	2	0	0	0	0	0
Management	4	10	0	0	1	0	0	0	0	0
Design	0	0	0	0	0	0	2	5	0	0
Mathematical modeling (Preparation)	0	0	0	0	0	15	0	0	0	0

Here, we can see that Z_1=4.1, Z_2=0.09845, Z_3=197.8. It is a easy solution. What we need to do is that the teachers teaching different courses are distributed to the highest extent department. But this solution needs to be improved.

We use LINGO software to solve not considering the extent to which the PEC (Public Elementary Courses) of the teachers assigned to one department is close to the job that the students in this department work on. The proportion of the departments is equal to the proportion of the key majors the departments have which is taken as the ideal proportion. The biggest coverage of departments is listed below:

Table 3

Department Subject	Ideology and politics		English		Math		Language		Physical education	
	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers
Bridge	0	0	3	3	2	5	0	0	0	3
Mechatronics	0	0	3	0	0	6	1	2	0	0
Computer	3	9	0	0	2	0	0	3	0	0
Management	0	0	0	5	1	2	1	0	2	0
Design	1	1	0	0	0	2	0	0	1	1
Mathematical modeling (Preparation)	0	0	0	4	0	0	0	0	1	0

Here, we can see that Z_1=6.0, Z_2=0.021453, Z_3=140.3 . This allocation is based on the ideal proportion.

Based on the two methods of allocation above, we take the coverage of the department as objective function and regard the professional extent as the constraints to let the result approach the objective values. We solve again and the allocation is listed below:

Table 4

Department Subject	Ideology and politics		English		Math		Language		Physical education	
	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers	full-time teachers	external teachers
Bridge	0	0	0	0	2	2	0	0	3	4
Mechatronics	2	0	2	0	0	0	0	0	0	0
Computer	0	0	2	12	2	0	1	0	0	0
Management	1	10	2	0	1	0	0	0	0	0
Design	1	0	0	0	0	0	0	5	1	0
Mathematical modeling (Preparation)	0	0	0	0	0	13	1	0	0	0

Here, we can see that Z_1=5.9， Z_2=0.0251， Z_3=183.5. We can see that though the allocation is not the optimal in the aspect of the coverage of departments and the professional extent, it make a balance between the two factors. And it is near the ideal result. So we can regard it as the optimal allocation.

3.6 Evaluation of the Model

3.6.1 Strengths and Weaknesses of the Model

Here, we list some of the advantages of our approach to the problem.

1.In this model we consider many factors. The model is comprehensive , reliable and easy to carry out which is also convenient to change the parameters and can adapt better.

2.The modify before solving is reasonable.

3.It is easy to modify under different conditions.

We discuss some of the drawbacks of our approach to the problem.

1.It is subjective to definite the the correlation coefficient matrix. However, it is more complicated in real life. So there maybe some errors.

2.The solution we obtained can not contain all the possible results. Therefore, we can only acquire the result that is near the optimal solution.

3.7.2 Extension of the Model

This model can extend to the similar allocation, such as the distribution of employee and post or the objective decision influenced by many factors.

4. Analysis of the problem 2

In order to investigate the current situation of teacher team working on the PECs (teacher structure, vocational ability, specialization level, cultivating and training, job burnout and so on) and consider the requirement of the universities for the vocational ability of teachers, we are required to design a questionnaire which is comprehensive, reliable and convincing. There are principles needing to be satisfied when designing the questionnaire which is objective, logic, common, reasonable length of the questionnaire and easy to handle.

4.1 Analysis of the current situation of teacher team working on the PECs

❶： Teacher structure: the full-time teachers and external teachers;

Title structure: professors, associate professors, lecturers, teaching assistants;

Age structure:

Teacher degree structure: doctors, masters, bachelors, others;

❷: Vocational ability: Vocational ability is the capacity to finish the educational mission smoothly even perfectly including teaching ability, educational ability, management ability, scientific ability, etc.

❸： Specialization level: Specialization level contains professional knowledge, professional skills, professional training and professional development.

❹： Job burnout: Burnout is a state of emotional, mental, and physical exhaustion caused by excessive and prolonged stress.

Job burnout mainly includes three aspects:

1. Job burnout is the depletion or draining of emotional resources

2. Those people have a distant or different attitude of work, and reduce

professional efficacy referring to the lack of satisfaction with past/present expectations.

3.At the same time occupational burnout is a type of stress condition and as such results in concentration problems or decreased problem solving abilities. Thus the desire to achieve these high goals and expectations may collide with physical, emotional and mental exhaustion resulting from an inability to achieve them, which can lead to a type of burnout that may involve even a reflection on the failure to find meaning and growth in life.

4.2 Requirement of the universities for the vocational ability of teachers

Vocational ability: Vocational ability is the capacity to finish the educational mission smoothly even perfectly including teaching ability, educational ability, management ability, scientific ability, etc.

4.3 Evaluation model of public elementary courses in universities

The score of the segment of teacher structure is calculated by the following equations:

$$c = \frac{\sum_{i=1}^{m} a_i b_i}{\sum_{i=1}^{m} a_i} \tag{20}$$

$$x_1 = \sum_{i=1}^{n} c_i (\mathrm{i} = 1....\mathrm{n}) \tag{21}$$

Here, we have assumed that the question has m options. The score of each option is:

$$a_1 a_{2.....} a_m$$

The persons choose the option are separately are:

$$b_1 b_2 .... b_m$$

We have assumed that the segment of teacher structure has n questions.

We have the five sections scored. The score of the segment of teacher structure is x_1

and the full score is y_1. The score of the segment of vocational ability is x_2 and the full score is y_2. The score of the segment of specialization level is x_3 and the full score is y_3. The score of the segment of cultivating and training is x_4 and the full score is y_4. The score of the segment of job burnout is x_5. The highest score is $y_5^{'}$ and the lowest score is y_5. The score of job burnout is negative, so the score lower, the better. The others higher, the better.

The score of the public elementary courses in universities is calculated by:

$$f = \frac{y_1 x_1 + y_2 x_2 + y_3 x_3 + y_4 x_4 - y_5 x_5}{y_1 + y_2 + y_3 + y_4 - y_5} \tag{22}$$

The full score is:

$$f_1 = \frac{y_1^2 + y_2^2 + y_3^2 + y_4^2 - y_5^2}{y_1 + y_2 + y_3 + y_4 - y_5} \tag{23}$$

We define λ as below:

$$\lambda = \frac{f}{f_1} = \frac{y_1 x_1 + y_2 x_2 + y_3 x_3 + y_4 x_4 - y_5 x_5}{y_1^2 + y_2^2 + y_3^2 + y_4^2 - y_5^2} \tag{24}$$

According to various universities to develop a standard rating, we judge the different public elementary courses in universities. We obtain the standard rating by researching all kinds of data from universities.

Table 5 Classification

λ	Rating
0．8—1	Class university
0.6—0．8	Key university
0．4—0．6	General
0．2—0．4	Insufficient
0—0．2	Poor

We acquire the evaluation model of public elementary courses in universities as below:

$$\begin{cases} \lambda = \dfrac{f}{f_1} = \dfrac{y_1 x_1 + y_2 x_2 + y_3 x_3 + y_4 x_4 - y_5 x_5}{y_1^2 + y_2^2 + y_3^2 + y_4^2 - y_5^2} \\ x_j = \sum_{i=1}^{n_j} c_i (\mathrm{i} = 1....\mathrm{n})(\mathrm{j} = 1...5) \\ c = \dfrac{\sum_{i=1}^{m} a_i b_i}{\sum_{i=1}^{m} a_i} \end{cases} \tag{25}$$

Here, n_j represents the total question number of the j section.

4.4 Content of the questionnaire

4.4.1 School situation

1.School name:

2.Schools competent authorities:

A.Ministry of Education

B.Other ministries

C. Provincial Department of Education

D. Other department (bureau), city (prefecture)

3.*School Type:* A. Integrated B. Tech C. Agriculture D. Forestry E. Medicine F. Teachers G. Language H. Finance I. Politics and Science J. Sports K. Art L. Nation M. Vocational and Technical(including short-term

vocational universities)

4.*School level:* A. Key University B. Normal Undergraduate University C. Vocational Universities

4.4.2 Structure of public elementary teachers

Project		Number of people	Proportion
Total number of public elementary teachers			
Teacher structure	Full-time teachers		
	External teachers		
Title structure	Professors		
	Associate professors		
	Lecturers and Teaching assistants		
Teacher degree structure	Doctors		
	Masters		
	Bachelors		
	Others		
Age structure	Less than 35 years old		
	36-45 years old		
	46-55 years old		
	More than 55 years old		
Academic structure	Academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering		
	Doctoral supervisors		
	Master tutors		
	National experts with outstanding contribution		
	Provincial experts with outstanding contribution		
	Changjiang Scholars and other scholars		
Work Experience	Less than 5 years		
	5-10 years		
	10-20 years		
	More than 20 years		

We design a questionnaire based on the form to investigate public elementary teachers and then make a form using the questionnaire to analyze.

The content of the questionnaire is as below:

1. *Gender:* (1)Male (2)Female

2. *Age:* (1)Less than 35 years old (2)36-45years old
(3)46-55years old (4)More than 55 years old

3. *Which kind of teacher are you?* (1)Full-time teacher (2)External teacher

4. *Degree:* (1)Doctor (2)Master (3)Undergraduate (4) Others

5. *Title:* (1)Professor (2)Associate professor (3)Lecturers (4)Teaching assistants

6. *Academic status:* (1)Academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering (2)Doctoral supervisor (3)Master tutor (4)National expert with outstanding contribution (5)Provincial expert with outstanding contribution (6)Changjiang Scholar and other scholar

7. *Work Experience:* (1)Less than 5 years old (2)5-10 years old
(3)10-20 years old (4)More than 20 years old

4.4.3 Vocational ability of public elementary teachers (Students can fill)

*1. Can the public elementary teachers operate the multimedia devices and computer ,etc adeptly? (only fill number)*_____.

(1)Very adeptly (2)operate independently but can not solve malfunction (3)can not operate independently and need help (4)never use

*2. When preparing teaching, how often do you (teacher) observe learner feature, learning content and learning objectives? (only fill number)*_____.

(1)often (2)sometimes (3)never (4)not know these concepts

*3. How often do you (teacher) design teaching and choose proper teaching resource according to teaching analysis and teaching conditions? (only fill number)*_____.

(1)often (2)sometimes (3)never (4)not know these concepts

*4. How often do you (teacher) make use of the information technology to create the environment where it is suitable for students self-learning? (only fill number)*_____.

(1)often (2)sometimes (3)never

*5. How often do you (teacher)search teaching resources on the internet or making use of the data library? (only fill number)*_____.

(1)often (2)sometimes (3)never (4)not know how to use

6. Can you (teacher) manage your own teaching resource library to classify based on your specialized knowledge? (only fill number) _____.

(1)adeptly manage (2)sometimes manage (3)not use but hear of (4)not hear

of

7. *How often do you (teacher) classify and sort out your own knowledge resource? (only fill number)* _____.

(1)In two weeks (2)In one month (3)In two months (4)In one semester (5)never

8. Where are the teaching materials used in teaching from? (only fill number) _____.

(1)made by own entirely (2)made by own partly

(3)designed by own and made by others (4)always load from the internet

*9. Have you (teacher) taken part in researches related professional major? (only fill number)*_____.

(1)Yes and have papers published (2)Yes and no papers

(3)No and want to join but no opportunity (4) No and not interested

*10. When teaching, what is the proportion of the verbal language and the writing language? (only fill number)*_____.

(1)more verbal language(2)more writing language(3)same proportion (4)as one wish

11. Can you (teacher) design some teaching courseware based on your teaching resource? (only fill number)

(1)Yes and often design (2)Yes and sometimes design(3)Yes and never (4)No

12. How long do you (teacher) spend improving professional level or preparing teaching content? (only fill number) .

(1)Less than 1 hour (2)1-3 hours (3)3-5 hours (4)more than 5 hours

4.4.4 Professional level of public elementary teachers (Students can fill)

*1. What aspects do you need to improve in professional knowledge and skills? (only fill number)*_____.

(1)New technology and methods (2)Practical skills and experience

(3)relative professional knowledge and theory (4)Basic theory and knowledge (5)others

*2. How often do you read professional books or care for the development of the major you are learning? (only fill number)*_____.

(1)sometimes (2)never (3)often

3. *What is your (teacher) professional development goals? (only fill number)*_____.

(1)Be able to teach (2)Be the leader of the school (3)Be the key teacher

(4)Be famous provincial teacher (5)Be famous national teacher

4.4.5 Cultivation and training of the public elementary teachers (Students can fill)

*1. What is the proportion of the teachers participating in the training in your university during summer holiday and winter holiday? (only fill number)*_____.

(1) Less than 5% (2)6%-10% (3)11%-15% (4)16-20% (5)more than 20%

*2. How much money do your university spend training teachers during summer holiday and winter holiday? (only fill number)*_____.

(1)Less than 10 thousand ￥ (2)10-50 thousand ￥ (3)50-100 thousand

￥(4)100-150 thousand￥ (5)More than 15 thousand￥

3. *What is the order of the difficulties your universities have choosing teachers to go out and train? (only fill number)*_____.

(1)The staff are tight and need to work (2)Shortage of money

(3)No relative major (4)Lake of enthusiasm (5)others

*4. What is your universities' arrangement when teachers go out and train? (only fill number)*_____.

(1)Turn over (2)Holding a post

5. *What is the order of the way of the training arrangement in your universities? (only fill number)*_____.

(1)Learn in the graduate school/class (2)Training before working (3)Social practice (4)Participating seminar (5)Carry out teaching and education research

(6)Professional (courses) Seminar (7)Communicating with scholars at home and abroad (8)Postdoctoral research (9)others

4.4.6 Teacher burnout (Students can fill based on the performance of the public elementary teachers)

The different capital letters represent various meaning: A denotes this never happens. The score is 1 point. B denotes this seldom happens. The score is 2 points. C represents this sometimes happens. The score is 3 points. D represents this to large extent happens. The score is 4 points. E represents this entirely correspond . The score is 5 points.

1. Even though you had a good sleep night, you are still exhausted next day when working.

2. You always work while looking watch hoping to get off work.

3. You often feel headache, body aches, or have a flu.

4. You avoid working pressure by daydreaming, watching TV and reading something which has nothing to do with work.

5. You often reduce working time by virtue of asking for leave or arriving late.

6. You often forget assigned task and appointment and sometimes even more forget private valuables.

7. You do not like your colleague. You prefer to be alone rather than communicate with colleagues.

8. When confronting difficulties, you have nobody reliable to talk with.

9. You think you are ignored while working and your strive is not valued. You are more diligent than before but make less achievement.

10. You feel no challenge and satisfactory and there is no meaning to work.

The relationship between score and job burnout: 10-15 denotes job burnout is very low. 16-25 represents job burnout is relatively low. 26-35 denotes Mild burnout.36-45 denotes high burnout. More than 45 denotes burnout is too high.

4.4.7 Requirement of the universities for the vocational ability of teachers

1. Before working, do you think what ability attracts the university?

2. Do you think what vocational ability the university requires?

(1)Teaching ability (2)Moral and physical ability (3)Management ability (4)Scientific ability (5)Information ability (6)Language ability (7)Interpersonal skills (8)The ability to self-improvement (9)others

4.5 Verify the reliability of the questionnaire

To investigate the public elementary teachers, we can research according to students and teachers. So in order to guarantee that the questionnaire is comprehensive and scientific and the research is authentic and reliable, we design two questionnaire and choose the same number of students and teachers. Lastly, fill the questionnaire and collect the statistical results.

To prove the reliability of our questionnaire, we choose our universities as research objective and let some students and teachers fill the questionnaire. Here, we acquire some data as below:

Table 6 Scores of public elementary course in Huazhong University of Science and Technology

Content	Teacher structure	Vocational ability	specialization level	cultivating and training	Job burnout
Score	*22*	53	12	17	20
Total score	25	60	15	25	50(Lowest point is 10)
λ			0．831		

We can conclude that λ is very high in our school--Huazhong University of Science and Technology and rated as the China class university which corresponds to the fact. At the same time, we can also find that the scores of teacher structure and vocational ability are high, it is mainly because Huazhong University of Science and Technology has many academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering and Changjiang Scholars which is also corresponds to the fact. And that demonstrates fully the questionnaire

Designed is authentic and reliable.

5. Design of the problem 3

We need to draw a research plan and the corresponding appropriation budget (the total time: one year, the total funds: 4500 RMB). The plan consists of three stages: earlier stage, middle stage and later stage. The main tasks are preparations, actual inspection, and result analysis which are allocated to the three stages. We have assumed that one year is equal to 365 days.

Earlier stage:

The main plan in earlier stage is to prepare, analyze the problem, certify programs and simulate the result to be prepared for the actual inspection in middle stage. The specific arrangement is as below:

Table 7: Pre-program of the plan

Time/day	Arrangement	Remark
7	Analyze the problem, certify the quality	All members take part in the preparation and express own opinion. After that, we allocate the task and deal with the problem qualitatively and then quantitatively. We can link to the practice but there are no subjective factors.
15	Read relevant literature and certify the research plan	
15	Data preprocess and certify relevant parameter	
15	Build the model and make preliminary forecast	
7	Compare different methods	
15	Discuss reasons for different allocations and plan important content that should be investigated	

The total time is 74 days.

Middle stage:

The main plan in middle stage is to inspect, record and research. And then analysis the data. Combining the results to update the investigating content and methods. The specific arrangement is as below:

Table 8: Medium-term program of the plan

Time/day	Arrangement	Remark
15	Plan the investigate program and certify survey population, questionnaire content and statistical range.	The plan is supposed to be reasonable and comprehensive.
30	Make small-scale preliminary experiments , conduct polls and record the questions people care about.	It should be made according to a standard. The investigating objective should be typical and the sample is large enough.
15	Count and analyze data. Estimate what to do next and modify investigating program.	It is supposed to be handled using professional data processing software.
30	Allot questionnaire, survey and count on the internet.	—
7	Make field research.	We should consider the investigating objectives should be different levels and can reflect what the problem needs.
45	Research and record to the destinations separately.	During these days, we ought to be in touch with experts and gain guidance.

The total time is 142 days.

Later stage:

The main plan in later stage is to analyze and paper writing and at the time consult with experts to modify papers. Then we can contact with editors. The specific arrangement is as below:

Table 9: End-program of the plan

Time/day	Arrangement	Remark
7	Count the investigating results and analyze the results.	Refer to experience.
7	Compare with the predict results and analyze reasons based on facts.	
7	Make the conclusions back to the modified model and acquire new results.	
15	Improve the original theory.	Examine the conclusions.
30	Evaluate and expand the model and finish the paper.	Modify paper and format.
30	Post to experts and gain advice and evaluation from specialists.	This part ought to be remained processing.
53	Contact relative editors and contribute the paper.	The total remaining time.

The total time is 149 days.

Here, the three programs above give order and time roughly, but in fact there may be some errors and the time is not independent and maybe there are some activities processing at the same time. There may be some items unfinished, so we need to adjust the plans in practice.

The corresponding appropriation budget plan:

The budget is tight and we allot the 4500 RMB to three stages. We need to reduce cost. The cost is based on the practical investigate and the specific arrangement is as below:

Table 10: Appropriation budget

Cost item	Specific item	Budget	Remark
Scientific item	Questionnaires made fee	3000x0.1=300 RMB	A questionnaire cost is 0.1 RMB
	Post fee	200 RMB	Rough fee
	Books and investigating tools	500 RMB	Borrow some books to library to save money
Travel and research fee	Accommodation and transport fee	3x(100x3+500)=2400 RMB	There are three investigating to research separately.
Evaluate and appraise fee		500 RMB	Evaluation
Printing fee	Material copying	100 RMB	It is mainly materials , data and papers according to the present price.
	Printing	100 RMB	
	Binding	100 RMB	
Other fee	Experts consulting	—	It is mainly online.
	Paper publishing	100 RMB	Contribution fee
Sum		4300 RMB	Saving 200 RMB just in case

Here, except that there are 200 RMB just in case, the cost of each item except travel and research fee is almost the same. So it is impossible to have financial deficit if we not spend too much and save money.

6. To education management ministry ——Research of professional training of the teachers specialized in PECs

6.1 Connotation and necessity of the professional training of the teachers specialized in PECs [2]

Professional training of the teachers specialized in PECs is to learn teaching skills, achieve professional autonomy and reflect the professional ethics by professional training to improve teaching quality and become professional educational workers in their teaching life. The connotation includes professional spirit, professional ethics, professional intelligence, professional autonomy and professional organization. The ability contains general ability, specialized academic ability, professional capacity to act, educational research capacity and self development capacity. Teacher professionalization is autonomy, staged, constant, special, mutual aid and diverse. Although educational career develops fast in our country, there are still many serious problems in our public elementary teaching. So it is necessary to make teachers professional. Besides, teacher professionalization is a common tendency in the education reform and development all over the word. In our country, public elementary teachers have less pressure in teaching and scientific research and have a loose schedule who have no incentives and have almost the same treatment. Therefore, it is easy to have job burnout. Nowadays, every universities are developing fast and need to improve in teaching quality, so it is urgent to accelerate professional training of the teachers which is also an approach to improve teacher quality. Hence, it is necessary to develop professional training of the teachers.

6.2 Models and approaches to sustainable development

Education needs reform to proceed professional training of the teachers specialized in PECs. What we need to do is reform subject teaching concept and dilute the disciplinary system. There is no need to classify elementary subjects and professional subjects because some elementary subjects include professional content and also reach the same level of difficulty. We need to intensify for students learning professional concept to guarantee students have a strength and reform teaching methods. Public elementary teachers can improve student learning students and service for employment and entrepreneurship. It is only to combine public elementary teaching system and practical system that can both achieve the goal of cultivating high-quality and high-skilled persons and service for professional training which also guarantees sustainability of teacher professional development.

Firstly, we can consider some aspects to improve vocational ability of public elementary teachers:

1. Universities

① Take incentive measures

Universities should provide good platform and environment because teachers are easy to be job burnout and lose confidence feeling no meaning and satisfy. Therefore, the teaching quality is low which has a bad impact on students and their own life. Hence, it is necessary for universities take incentive measures. According to their performance and requirement, we can certify the goal of professional training and combine self evaluation and student evaluation and link quantitative analysis to qualitative analysis. We can also combine the job training and job employment with income, appraised, and job promotion through encourage and punishment by improving treatment and teacher quality to give teachers professional platform. So we must encourage teachers' enthusiasm and improve their achievement and pride to make teachers develop willing and autonomy.

② Providing good platform

Schools should not only be concerned about the brand specialty building with core competitiveness, but also pay attention to public basic course and improve teacher training. We need to improve the recognition of basic course teachers and the sense of accomplishment, and establish an important position in the minds of students of teachers. Many students believe that the public basic courses are irrelevant and have utilitarian values, learning courses which is good for professional development for their own to look for work more easily. The school is required to give the public basic course teachers good public opinion environment and attach great importance professional training of the teachers providing them with good development platform to enhance teachers 'sense of belonging and optimizing teacher interpersonal environment and improving public infrastructure teachers' sense of identity and inspire their pride,

2. Teachers

①Improving self

To improve their professional competence and professional development, teachers must start from their own. Investigation proves there are many basic course teachers doing a bad use of the school database library and related resources online. And they spend very little reading professional books to make progress. Teachers must cultivate the habit of reading in their lives and have some confidence specializing in issues. They can read professional books having their own independent thinking and original insights. It is only improving their literacy and

professionalism that can improve student quality. Basic course teachers need to read widely for lifelong time. Reading can help them get new ideas and new methods of knowledge and accumulate wisdom of their teaching and their own teaching level.

②Reflecting self [3]

Times are changing. Education is reforming. Curriculum is changing. Teacher-student relationship is changing. Facing so much change, public basic course teachers have difficulty supporting the whole process of their own teaching by own original expertise and teaching experience. Professional expertise is external relying of teacher professional development while professionalism is the memory power of teachers' professional development. A teacher who can reflect on themselves is wisdom. The teacher must gain experience in the teaching and learning process in life and then reflect themselves so as to improve themselves. Deep reflection not only can help teachers expand their thinking and analysis skills and improve teaching efficiency and quality of teachers, but also improve the theoretical knowledge of teachers, which rises to the theoretical level and effectively help guide future instruction.

③Research more [3]

"Teacher as researcher" is an important concept of professional development of teachers and professional growth of teachers in colleges and universities can not do without public basic research.Scientific research is an important feature of modern teacher and an important means of education reform and professional development of teachers. Teaching and research are complementary relationship which are indispensable. Teaching is a prerequisite for scientific research and also the ultimate goal of research. Researchers find the problem in teaching, propose topics to study and solve problems, then ultimately serve the teaching. No scientific teaching will have no vitality. No scientific research is not true scientific research. The research results can only be a castle in the air form.Some students in vocational colleges have poor cultural foundation and basic course teachers should be good at finding problems. According to the actual teaching, it is necessary to research materials, classroom studies, student and methods. Pay attention to the accumulation of research material, be good at writing teaching experiences and make good case study forming of independent thinking and original perspectives on the teaching process. Teachers should conduct issues research and develop in the direction toward the study teachers. Through teaching and research, and then the process is repeated, teachers can improve research capacity and enhance professionalism, self-training, self-improvement and personal growth promoting career development. Doing more research not only will allow a higher level of professional development of teachers in teaching and research .

3. Students

Students should have the courage to express their views and learn to speak their minds participating in the teaching process and forming interaction with teachers. Students should also note teacher job burnout. When there are obvious teacher burnout, students should know the right way to remind teachers and incentive teachers learning to communicating with teachers. So that teachers can feel his teaching meaningful and accomplished. At the same time students should make a fair and impartial evaluation of teachers. Therefore, teaching evaluation can help teachers in their teaching and make professional development progress.

6.3 Reform and faculty of public basic course is based on practice [4]

Public basic course is an important part of college curriculum system involving

large. Teaching content and strong foundation for the promotion of all-round development of students is very important. Therefore, the quality of public basic teaching is demanding and to very large extent, it will affect students interest while public basic course content is abstract and boring requiring teachers to spend more energy.

❶Single teaching methods and the number of student increase make teacher-student interaction decreased. Teachers teach simple textbook knowledge and training for students to explore the ability of the method of knowledge is not enough. The practice of teaching is weak making students in public basic course have less interest in learning.

❷Because of faculty shortage and uneven level, public elementary teachers in the introduction and training seems to be rather weak and a lot of the number of public elementary teachers in colleges and universities is declining. Compared to students, basic course teachers of teachers is obviously insufficient and teachers have arduous task of teaching. So there is no other effort to carry out teaching and research and teaching reform, while most of their time is spent on teaching. Researching less and less financial resources and low income and lack of training have a direct result of the quality of teaching decline. Based on the importance of public basic course and the current problems, we need to seriously consider and resolve it, so the reform of public basic course teaching is necessary. At the same time strengthening the public basic

course faculty is also needed.

6.4 Some new ideas

①The new education system

System that has been formed has great difficulty in reforming involving many aspects. Therefore, to create a new education system is the most difficult part of the reform. There are many the system not helpful for teachers to put more effort hindering the promotion of education reform measures. Assistants of the university by the current system is far from perfect. With more and more people in the classroom and classroom increasingly large, single teacher is unable to meet teaching and does not have a good and effective classroom management. When talking about discipline or classroom interaction, it often seems beyond their grasp. So we must seriously ponder the existing education system, reform and innovate discussing how to improve the teaching assistant system so that teaching assistants would better help teachers manage classroom. We can also learn some good experience from excellent teachers referring to its education system to observe and to decide whether it is worth promoting.

② The new philosophy of education [4]

Faced with the requirements of personnel training in the knowledge economy era, colleges and universities recognize that it is very important to broaden students' knowledge base and improve the quality of student ability. They should do both general education and professional education so that students learn to do things and how to be a qualified person at the same time. In order to improve adaptation ability, public basic course which is an important part of general education needs to provide students with generous knowledge base and to equip students with knowledge and methods to understand the ideas and concepts of knowledge behind so that students learn how to correctly analyze social phenomena, develop independent thinking and have the ability to communicate with others. The public teachers need to focus on the concept of quality education adding to their curriculum teaching designing teaching

content and methods to improve the overall quality of students.

③ The new teaching methods and content

Public basic course should have targeted selection and design of teaching content combining with professional features and personnel training program to give courses of different disciplines of content modules in order to improve disciplines targeted to strengthen the basic concepts, theories and methods of application, so that students could feel the basic course of practical value and importance. We can divide the basic courses into required courses and professional training to improve the nature of elective modules allowing students to choose courses they are interested and truly willing to learn basic course. We are supposed to change the single teaching mode at the same time, improve the interaction of teachers and students, encourage class discussion, create active classroom atmosphere for students to be able to speak freely and encourage students to express their personal opinions. You can also set up a network of classroom and online teaching, so that students can learn at other times. On the one hand, they can learn something to make up their own place, on the one hand they can consolidate what they have learned.

④To strengthen the construction of teachers

We can strengthen public basic teacher training courses to update knowledge and send teachers to study abroad or participate in training and exchange in our country. When they come back, teachers can report the situation and their own learning and learning experience exchanging with others. We can also invite experts to give lectures and introduce of discipline leaders to build team and encourage their participation in research by giving them special treatment, so basic course teachers would know what to do for their own development and also promote the teachers' enthusiasm.

Teaching reform of public infrastructure is an ongoing exploration process, which requires our collective wisdom and efforts. We need to make public basic courses and specialized courses more closely linked. So we not only need to improve teachers' professional capacity and strengthen the construction of teachers, but also start to improve the teaching of public basic course from all aspects. We also should full play the role of public basic course in personnel training.

7. References

[1]Keliang Zhou、Xiaoyan Jiang, *Research of Professional Development of Public Elementary Teachers in College,* New Courses(Mid), 10th: 175, 2012

[2]Xueyong Huang, *Strategies of Professional Development of Public Elementary Teachers in College,* Heilongjiang Higher Studies, 236th: 109-111, 2013

[3]Xiaofeng Li, *Current Situation and Reform of the Public Elementary Course,* Higher Science Education，107th: 108-111, 2013

[4]Xinzhu Peng, *Construction of Public Elementary Course Teachers in Vocational Colleges,* Volume 12, 3th: 262-263, 2011

[5]Jinxing Xie、Yi Xue, *Optimization Modeling and LINDO / LINGO software,* Beijing：Tsinghua University Press, 2005.

8. Appendix

8.1 LINGO program 1 and program 3 in problem 1

```
model:
sets:
  e/1..6/:a1,a2,k;
  f/1..5/:n1,n2;
  assign(e,f):c,b1,b2;
endsets
data:
  n1=4 6 5 2 4;
  n2=10 12 15 5 4;
  k=3 2 3 2 1 1;
  c=5 6 8 1 6
    4 5 4 1 3
    3 8 6 2 1
    6 7 7 3 3
    5 4 5 4 5
    3 7 9 3 4;
  rmp1=0.9;                                          !Parameter
 assignment
  ita1=0.7;
enddata
b1(1,3)=2;b1(3,3)=2;b1(4,3)=1;
rmp2=1-rmp1;
ita2=1-ita1;
kz=@sum(e(i):k(i));
nz1=@sum(f(j):n1(j));
nz2=@sum(f(j):n2(j));
@for(e(i):a1(i)=@SMIN(1,@sum(f(j):b1(i,j))));
@for(e(i):a2(i)=@SMIN(1,@sum(f(j):b2(i,j))));
max=@sum(e(i):rmp1*a1(i)+rmp2*a2(i))-@sqrt(@sum(e(i):(rmp1*(@sum(f(j):
b1(i,j))/nz1-k(i)/kz))^2+(rmp2*(@sum(f(j):b2(i,j))/nz2-k(i)/kz))^2)/5);
!min=@sqrt(@sum(e(i):(rmp1*(@sum(f(j):b1(i,j))/nz1-k(i)/kz))^2+(rmp2*(@su
m(f(j):b2(i,j))/nz2-k(i)/kz))^2)/5);                 !Directly solve Sub-objective
function
!@sum(assign:ita1*c*b1+ita2*c*b2)>185;               !Constraints in
program 3
@sum(e(i):b1(i,1))-4<1e-3;
@sum(e(i):b1(i,1))-4>-1e-3;
@sum(e(i):b1(i,2))-6<1e-3;
@sum(e(i):b1(i,2))-6>-1e-3;
@sum(e(i):b1(i,3))-5<1e-3;
@sum(e(i):b1(i,4))-2<1e-3;
@sum(e(i):b1(i,4))-2>-1e-3;
@sum(e(i):b1(i,5))-4<1e-3;
@sum(e(i):b1(i,5))-4>-1e-3;
@sum(e(i):b2(i,1))-10<1e-3;
@sum(e(i):b2(i,1))-10>-1e-3;
@sum(e(i):b2(i,2))-12<1e-3;
```

```
@sum(e(i):b2(i,2))-12>-1e-3;
@sum(e(i):b2(i,3))-15<1e-3;
@sum(e(i):b2(i,3))-15>-1e-3;
@sum(e(i):b2(i,4))-5<1e-3;
@sum(e(i):b2(i,4))-5>-1e-3;
@sum(e(i):b2(i,5))-4<1e-3;
@sum(e(i):b2(i,5))-4>-1e-3;
@for(e(i):a1(i)-1<1e-3);
@for(e(i):a2(i)-1<1e-3);
@for(e(i):@BIN(a1(i)));
@for(e(i):@BIN(a2(i)));
@for(assign(i,j):@GIN(b1(i,j)));
@for(assign(i,j):@GIN(b2(i,j)));
end
```

8.2 LINGO program 2 in problem 1

```
model:
sets:
  e/1..6/:a1,a2,k;
  f/1..5/:n1,n2;
  assign(e,f):c,b1,b2;
endsets
data:
  n1=4 6 5 2 4;
  n2=10 12 15 5 4;
  k=3 2 3 2 1 1;
  c=5 6 8 1 6
    4 5 4 1 3
    3 8 6 2 1
    6 7 7 3 3
    5 4 5 4 5
    3 7 9 3 4;
  rmp1=0.9;                                          !Parameter assignment
  ita1=0.7;
enddata
b1(1,3)=2;b1(3,3)=2;b1(4,3)=1;
rmp2=1-rmp1;
ita2=1-ita1;
kz=@sum(e(i):k(i));
nz1=@sum(f(j):n1(j));
nz2=@sum(f(j):n2(j));
@for(e(i):a1(i)=@SMIN(1,@sum(f(j):b1(i,j))));
@for(e(i):a2(i)=@SMIN(1,@sum(f(j):b2(i,j))));
max=@sum(assign:ita1*c*b1+ita2*c*b2);
@sum(e(i):b1(i,1))-4<1e-3;
@sum(e(i):b1(i,1))-4>-1e-3;
@sum(e(i):b1(i,2))-6<1e-3;
@sum(e(i):b1(i,2))-6>-1e-3;
@sum(e(i):b1(i,3))-5<1e-3;
```

```
@sum(e(i):b1(i,4))-2<1e-3;
@sum(e(i):b1(i,4))-2>-1e-3;
@sum(e(i):b1(i,5))-4<1e-3;
@sum(e(i):b1(i,5))-4>-1e-3;
@sum(e(i):b2(i,1))-10<1e-3;
@sum(e(i):b2(i,1))-10>-1e-3;
@sum(e(i):b2(i,2))-12<1e-3;
@sum(e(i):b2(i,2))-12>-1e-3;
@sum(e(i):b2(i,3))-15<1e-3;
@sum(e(i):b2(i,3))-15>-1e-3;
@sum(e(i):b2(i,4))-5<1e-3;
@sum(e(i):b2(i,4))-5>-1e-3;
@sum(e(i):b2(i,5))-4<1e-3;
@sum(e(i):b2(i,5))-4>-1e-3;
@for(e(i):a1(i)=1);
@for(e(i):a2(i)=1);
@for(e(i):@BIN(a1(i)));
@for(e(i):@BIN(a2(i)));
@for(assign(i,j):@GIN(b1(i,j)));
@for(assign(i,j):@GIN(b2(i,j)));
end
```