

# AHP analysis of teacher's managerial competencies

Helena Brožová<sup>1</sup>

**Abstract.** The students of the Czech University of Life Sciences, Prague had to identify and evaluate their expectance of teacher's competencies. The aim of this research is not to evaluate the teacher's scientific ability which can't be subject of students' evaluation. The key characteristics of the managerial competencies of teachers are set according to the Casselmann typology of teacher's roles. Then the students' pairwise comparisons of various teacher's characteristics and competencies were analysed using the Analytic Hierarchy Process.

**Keywords:** AHP method, teacher's managerial competencies, student's preferences.

**JEL Classification:** C44

**AMS Classification:** 90B50

## 1 Introduction

This article deals with the methodology of identification of the students' preferences of teacher's managerial competencies at the Czech University of Life Sciences, Prague (CULS Prague). The goal is not to evaluate the teacher's scientific ability but the advantage of the teacher's managerial competencies given by students.

Teachers usually think that students are receiving and understanding information in the same way as teachers give it (Skarupská 2007). But do the teachers know what students expect, which pedagogical methods they prefer, what they want not from scientific but from organizational point of view? Therefore the aim of this article is to describe the methodology of how to identify the student's preferences of teacher's managerial competencies.

Preferences could be described as an individual's regard to a set of objects typically in decision-making process (Lichtenstein & Slovic, 2006). Alternatively, preferences mean evaluative judgment as liking or disliking an object (Scherer, 2005). Preferences are generally set as weights. For evaluation of these weights there are many different methods that varied in the proportion of including the subjective and objective judgement. Commonly diffused method is the Analytic Hierarchy or Network Process by T. Saaty (AHP or ANP). The AHP method is a method deriving global weights from partial weights received as result of pairwise comparisons (Saaty, 1980, 1999).

To evaluate teacher's managerial competencies in complexity, we proposed the questionnaires for pairwise comparisons of various teacher's managerial characteristics and competencies. Student's answers are then analysed using the AHP method.

## 2 Method and Data

### 2.1 Model Structure

It is very difficult to evaluate managerial competencies of teachers in complexity; we excluded the technical competencies of teacher from observation. For the rest of managerial competencies of teachers were found the key characteristics from the student's point of view. The base for identification of teacher's managerial competencies had been the Casselmann typology of teacher's roles, which was disintegrated to lower levels (Casselmann, 1967). These levels came from managerial competencies (Koontz et al, 1980) and were described according to Philip Morris competencies model (Hroník, 2006). The competencies observed in the study are in **Table 1** (Brožová et al, 2011, Brožová, 2011).

In **Table 1** the teacher's competencies are organised into three groups and it is possible to create the hierarchy of this competency system. And more, it is possible to suppose, that the students preferences differ according to the intensity of the competency characteristic.

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<sup>1</sup> Dept. of Systems Engineering, Faculty of Agricultural Economics and Management Czech University of Life Sciences, 165 21 Praha 6 – Suchbát, brozova@pef.czu.cz.

Competencies groups	Competencies	Characteristics/Anti-characteristics
<ul style="list-style-type: none"> <li>● L21 Content and form of teaching</li> </ul>	<ul style="list-style-type: none"> <li>● L311 Amount of information</li> <li>● L312 Complexity of reading</li> <li>● L313 Content of reading</li> <li>● L314 Form of reading</li> <li>● L315 Depth of reading</li> <li>● L316 Way of reading</li> </ul>	<ul style="list-style-type: none"> <li>● L411 High/Low amount of information</li> <li>● L412 High/Low complexity of reading</li> <li>● L413 Oriented on the form of reading/Oriented on the content of reading</li> <li>● L414 Oral/IT based presentation</li> <li>● L415 Narrow specialization/Broad overview</li> <li>● L416 Innovative/Classical education methods</li> </ul>
<ul style="list-style-type: none"> <li>● L22 Organisation of lecture</li> </ul>	<ul style="list-style-type: none"> <li>● L321 Focus on group or individual</li> <li>● L322 Setting the rules</li> <li>● L323 Solving problems</li> <li>● L324 Evaluation process</li> <li>● L325 Evaluation criteria</li> <li>● L326 Plan of teaching</li> <li>● L327 Flexibility</li> <li>● L328 Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>● L421 Individual/Group focus</li> <li>● L422 Consistent/Changeable decision making</li> <li>● L423 First hand/Diplomatic manner</li> <li>● L424 Quantitative/Qualitative evaluation methods</li> <li>● L425 Consistent/Changeable criteria</li> <li>● L426 Fixed/Framework education plan</li> <li>● L427 Impressive/Uninfluenced</li> <li>● L428 Follow/Do not follow control or monitoring</li> </ul>
<ul style="list-style-type: none"> <li>● L23 Personality of teacher</li> </ul>	<ul style="list-style-type: none"> <li>● L331 Teacher's self-presentation</li> <li>● L332 Communication skills</li> <li>● L333 Focus on student</li> <li>● L334 Support of student's independence</li> <li>● L335 Ability to improvise</li> <li>● L336 Teacher's outlook</li> <li>● L337 Way of speaking</li> </ul>	<ul style="list-style-type: none"> <li>● L431 Quiet/Vigorous way of speaking</li> <li>● L432 Good/Poor communication skills</li> <li>● L433 Students/Topic orientation</li> <li>● L434 Directive/Democratic manner</li> <li>● L435 React/Do not react to students</li> <li>● L436 Casual/Informal look</li> <li>● L437 Professional/Conversational language style</li> </ul>

**Table 1** Competencies groups and their elements

The whole competency system is really complicated and comprehensive and preference information can have many different forms; therefore its transformation into numerical expression is necessary for mathematical models calculation. So students' weights of these teacher's competencies are estimated as preferences received using Saaty pairwise comparisons methods and subsequently synthesized using the AHP method. The AHP method using quantitative pairwise comparisons is the suitable tool for this analysis, because it enables above described evaluation by sequential comparisons of all possible pairs of items. The AHP is a method deriving global preferences from partial preferences that represent relative measurements of the hierarchical dependences of decision elements (Saaty, 1980, 1999). Fundamental characteristics of both methods are following.

## 2.2 Analytic Hierarchy Process (AHP)

The AHP (Saaty 1980, 1999) is based on mathematics and psychology. The procedure for using the AHP consists of the following steps:

- i. Creation of the problem hierarchy containing the decision goal, the variants for reaching it, and the criteria for evaluating the variants.

The AHP model for setting of preferences has four levels (**Table 1**): the first one L1 consists of the goal – the preference setting, the second L2x comprise the groups of competences, the third L3xx includes the competencies and the fourth L4xx consists of qualitative characteristics describing the competencies.

- ii. Calculation of the priorities among the elements of the hierarchy by making a series of judgements based on pairwise comparison of the elements.

Pairwise comparison is the process of comparing pairs of items to judge which element of each pair is preferred, or has a greater amount of some quantitative property. One broadly used method is Saaty's pairwise comparison method (Saaty, 1980).

- iii. Checking the consistency of the judgements.
- iv. Synthesis of these judgements to yield a set of overall priorities for the hierarchy.
- v. Selection of the best variant based on the highest overall priority.

### 2.3 Questionnaire and Respondents

#### Questionnaire

To receive the necessary data for this analysis, the student’s survey was made. The students filled the questionnaire in MS Excel (**Figure 1**) and then the answers were synthesized by the AHP for every questionnaire (Brožová 2011). These data then are worked up using MS Excel tools – functions and also macros.

A	Strong preferred A	Equal preferences	Strong preferred B	B						
	9	7	5	3	1	3	5	7	9	
Content and form of teaching				X						Organisation of lecture
Content and form of teaching					X					Personality of teacher
Organisation of lecture						X				Personality of teacher

**Figure 1** The part of questionnaire

#### Respondents

The pilot study was done for really small group of 4 students and this study showed the reasonability of this approach (Brožová 2011). Then the research was done for three groups of students of the last course in Master programs in two faculties of CULS Prague:

- Faculty of Environmental Science
  - 53 regular students of Engineering Ecology, and Landscape Engineering
- Faculty of Economics and Management
  - 48 regular students of Economics and Management, and Administration and Management
  - 127 distance students of Economics and Management, and Administration and Management

Together 228 responses of the student of our university were analysed.

### 2.4 Processing of Questionnaires

All questionnaires were firstly checked for completeness and were found missing answers. In these cases the equal preference was added.

Saaty’s matrices were recalculated automatically using sheets functions and consistency index was calculated using Goal seeking. Then the consistency was checked and inconsistent answers were discarded. The individual weights were calculated using sheets functions at the end of this step. **Figure 2** shows sheet organisation for Saaty’s matrix calculation, consistency index checking and weights calculation for competencies and competency groups. Weights of characteristics and anti-characteristics are calculated as shown in **Figure 3**.

										Content and form of teaching	Organisation of lecture	Personality of teacher	Geommean	Weights		
9,00	7,00	5,00	3,00	1,00	0,33	0,20	0,14	0,11		Content and form of teaching	1,000	1,000	0,333	0,6933613	0,2	
0	0	0	0	1	0	0	0	0		Organisation of lecture	1,000	1,000	0,333	0,6933613	0,2	
0	0	0	0	0	1	0	0	0		Personality of teacher	3,000	3,000	1,000	2,0800838	0,6	
														3,46680637		
											-2,000	1,000	0,333	Lambda	3,00005	Consistency Index
											1,000	-2,000	0,333	Determinant	-0,0004	0,00
											3,000	3,000	-2,000			

**Figure 2** Saaty’s matrix calculation and consistency index checking

The processing of data was finalised using special macros made for bringing together of all consistent results. When value of consistency index was very bad, corresponding answers are removed from the final elaboration. Because no student can be preferred more than other one, the average weights of competency groups or characteristics were calculated and analysed at the end.

Excel graphs were used for graphical representation of global student preferences of teachers’ managerial competencies. Various orders of elements were used for easier interpretation of global preferences. The weights of the groups of competencies and the weights of competencies are ordered from the highest value. The weights of characteristics are ordered in two ways. The first way is based on differences between weight of characteristics and weight of anti-characteristics, the second one is based on maximal value of corresponding weights (weights of characteristic and anti-characteristic).

Strong preferred A	Equal preferences									Strong preferred B	A / B										
	9	7	5	3	1	3	5	7	9												
			X							High/Low amount of information	0,75	3	0	0	0	1	0	0	0	0	0,25
								X		High/Low complexity of reading	0,125	0	0	0	0	0	0	0	1	0	0,875
	X									Orientated/Nonorientated on the form of reading	0,875	7	0	1	0	0	0	0	0	0	0,125
						X				Quiet/Vigorous way of speaking	0,16667	0	0	0	0	0	0	1	0	0	0,83333
X										Good/Poor communication skills	0,9	9	1	0	0	0	0	0	0	0	0,1
		X								Oral/IT based presentation	0,83333	5	0	0	1	0	0	0	0	0	0,16667
			X							Students/Topic orientation	0,75	3	0	0	0	1	0	0	0	0	0,25
								X		Narrow specialization/Broad overview	0,125	0	0	0	0	0	0	1	0	0,875	
			X							Individual/Group fokus	0,75	3	0	0	0	1	0	0	0	0,25	
X										Innovative/Classical education methods	0,875	7	0	1	0	0	0	0	0	0,125	
	X									First hand/Diplomatic manner	0,9	9	1	0	0	0	0	0	0	0,1	
		X								Consistent/Changeable criteria	0,875	7	0	1	0	0	0	0	0	0,125	
			X							Consistent/Changeable decision making	0,75	3	0	0	0	1	0	0	0	0,25	
								X		Quantitative/Qualitative evaluation methods	0,125	0	0	0	0	0	0	0	1	0,875	
					X					Fixed/Framework education plan	0,25	0	0	0	0	0	1	0	0	0,75	
	X									Impressible/Uninfluenced	0,875	7	0	1	0	0	0	0	0	0,125	
									X	Directive/Democratic manner	0,1	0	0	0	0	0	0	0	1	0,9	
			X							Follow/Do not follow control or monitoring	0,75	3	0	0	0	1	0	0	0	0,25	
	X									React/Do not react to students	0,875	7	0	1	0	0	0	0	0	0,125	
				X						Casual/Informal look	1	0	0	0	0	0	1	0	0	0,1	
		X								Professional/Conversational language styl	0,83333	5	0	0	1	0	0	0	0	0,16667	

Figure 3 Weights calculation of characteristics and anti-characteristic

### 3 Results and Discussion

#### Preferences of the competency groups

Preferences of competency groups show (Table 2), that for students Organisation of lectures is not very important. It can be explained by student's ability to accept changes.

Content and form of teaching	Personality of teacher	Organisation of lecture
0,44884	0,33304	0,21811

Table 2 Preferences of groups of competencies

#### Preferences within the competency groups

The weights of elements in the level Content and form of teaching are in Table 3. Surprisingly these results show that for students the Way of reading is much more important than the Complexity of reading and Amount of information.

Way of reading	Form of reading	Content of reading	Depth of reading	Complexity of reading	Amount of information
0,31816	0,22186	0,199	0,12601	0,07065	0,06456

Table 3 Preferences of competencies in Content and form of teaching

In the group of competencies Personality of the teacher the competencies have small differences among the weights, only the Teachers outlook has very low preference (Table 4). It seems that students are really excited and disturbed if the teacher has some inappropriate communication, speech habits and self-presentation or if he is not able to dialogue with students and to improvise.

Communication skills	Way of speaking	Ability to improvise	Focus on student	Support of student's independence	Teacher's self-presentation	Teacher's outlook
0,19276	0,17019	0,17018	0,15675	0,14512	0,12837	0,03663

Table 4 Preferences of competencies in Personality of teacher

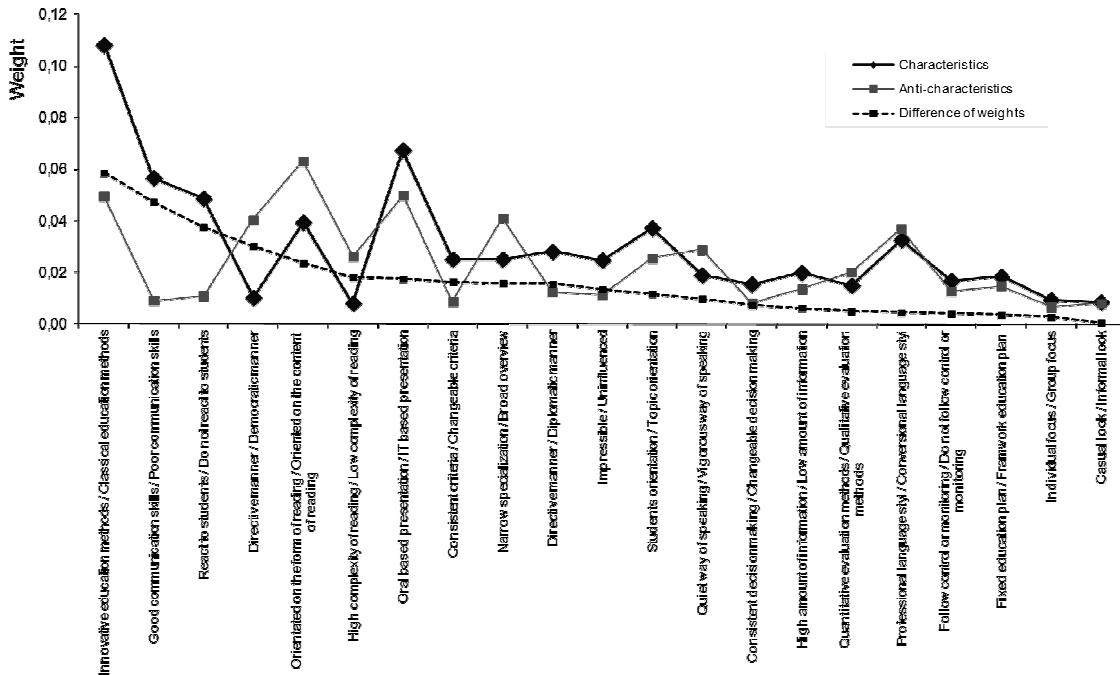
Organisation of lectures is not really important for student (Table 5) because weights of competencies are not high. In this group of competencies only the Way of solving problems can be mentioned. It seems that students are very interesting and influenced by teacher attitude to problems.

Solving problems	Flexibility	Evaluation criteria	Plan of teaching	Evaluation methods	Monitoring	Setting the rules	Focus on group or individual
0,17154	0,14665	0,13738	0,13697	0,13328	0,11095	0,09999	0,06323

Table 5 Preferences of competencies in Organisation of lecture

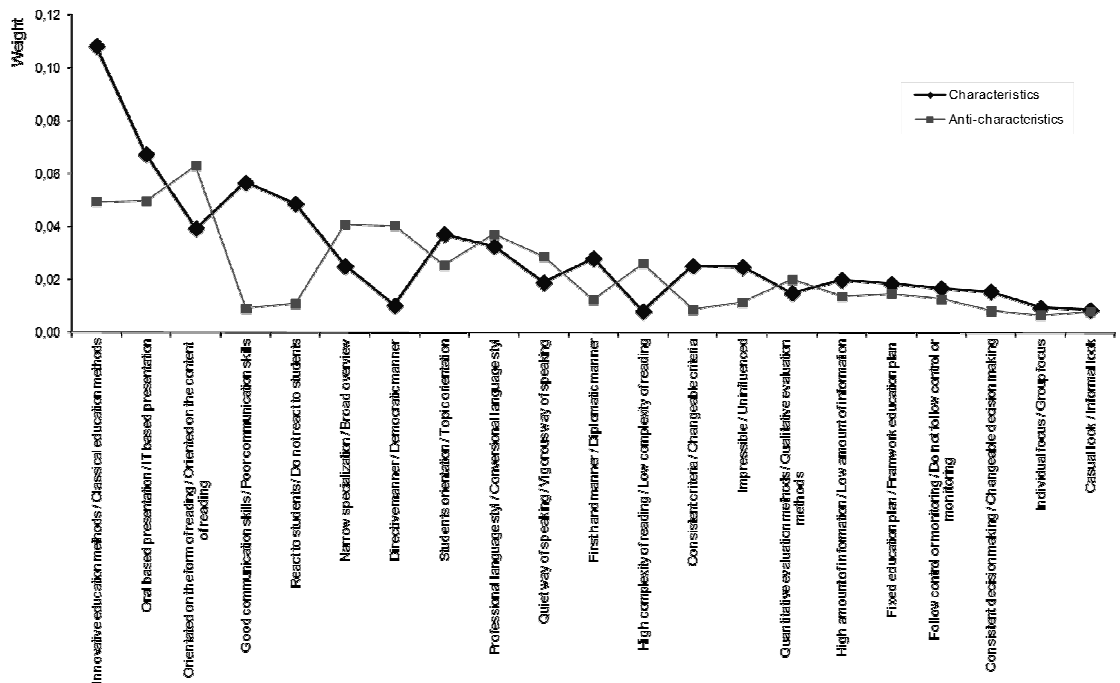
**The analysis of the synthesised information on the fourth level of hierarchy**

Synthesised weights on the fourth level show the preferences of teacher’s managerial characteristic (and anti-characteristic) from the quantitative point of view.



**Figure 4** Preferences of managerial characteristic and anti-characteristic (according to the weights differences)

The **Innovative educational methods** (not classical), **Good communication skills**, and immediate **Reaction on students** and to their problems are most preferred by students in contrast with its anti-characteristics. The students want to enjoy their study (**Figure 4**).



**Figure 5** Preferences of managerial characteristic and anti-characteristic (according to the maximal weights)

The **Innovative educational methods** (not classical), **Oral based presentation** (not IT based), and **Orientation to the content of reading** are most preferred by students (**Figure 5**).

## 4 Conclusion

This article describes the methodology and results of evaluation of students' preferences of teacher's managerial competencies. The questionnaire for evaluation of preferences of competencies and the AHP model was prepared. Questionnaire for students takes not more than 10 minutes of their time, so students are willing to fill them. Totally 228 students were interviewed and results show that for students are much more important:

- Way of reading, Form and Content of reading in the group Content and form of teaching.
- Communication skills, Way of speaking, and Ability to improvise in the group Personality of the teacher
- Way of solving problems in the group Organisation of lecture.
- Innovative educational methods which are more preferred to classical methods.

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