



PEDAGOGICKÁ FAKULTA
Masarykovy univerzity

PROFILES – WP3:
Stakeholders Involvement and Interaction

PROFILES

Curricular Delphi Study on Science Education

Interim Report on the First Round of the MU Working Group

Dr. Eva Trnova, Assoc. prof. Josef Trna

Department of Chemistry, Department of Physics
Faculty of Education, Masaryk University, Czech Republic

September 2011



PROFILES



1. Framework and procedure of the first round – participation rate

1.1 First attempt

In month April 2011, 350 ‘experts’ were asked via e-mail to fill out the PROFILES Delphi questionnaire (1st attempt). 156 experts gave feedback and sent back filled out answer-sheets (see Table 2).

In month June 2011, next 115 ‘experts’ were asked via e-mail to fill out the PROFILES Delphi questionnaire (2nd attempt). 65 experts gave feedback and sent back filled out answer-sheets (see Table 3).

Table1: Detailed sample structure of the first round of the FUB Curricular Delphi Study on Science Education

Group	Subgroup number	Characteristics / number	number	Percentage
Students	Basic science course 128	Biology	45	138 62 %
		Chemistry	40	
		Physics	43	
	Advanced science course 10	Biology	5	
		Chemistry	4	
		Physics	1	
Science teachers	Science education students at university 9	Biology	1	30 14 %
		Chemistry	4	
		Physics	4	
		Science (elementary level)	0	
	Trainee science teachers 7	Biology	3	
		Chemistry	2	
		Physics	2	
		Science (elementary level)	0	
	Science teachers 7	Biology	1	
		Chemistry	3	
		Physics	3	
		Science (elementary level)	0	
	Trainee science teacher educators 7	Biology	1	
		Chemistry	2	
		Physics	4	
Science (elementary level)		0		
Science educators	Biology	9	28 13 %	
	Chemistry	7		
	Physics	9		
	Science (elementary level)	3		
Scientists	Biologists	7	25 11 %	
	Chemists	7		
	Physicists	9		
	Others (medicine, pharmacy, engineering etc.)	2		
Education administration	Spokespersons for Education		0 0 %	
	Policy			
	Members of the Senate			
Total			221	100 %

Table 2: Structure of the sample, amount of participants for each group and participation rate after the first attempt

Group	Subgroup	Number of questionnaires sent out	Number of response	Response rate
Students		200	138	69%
Science teachers	Science education students at university	25	6	21%
	Trainee science teachers	20	5	
	Science teachers	10	1	
	Trainee science teacher educators	20	2	
Science educators		30	2	7%
Scientists		30	2	7%
Education administration		15	0	0%
Total		350	156	45%

Table 3: Structure of the sample, amount of participants for each group and participation rate after the first and second attempt altogether

Group	Subgroup	Number of questionnaires sent out	Number of response	Response rate
Students		200	138	69%
Science teachers	Science education students at university	30	9	20%
	Trainee science teachers	40	7	
	Science teachers	40	7	
	Trainee science teacher educators	40	7	
Science educators		50	28	56%
Scientists		50	25	50%
Education administration		15	0	0%
Total		465	221	43%

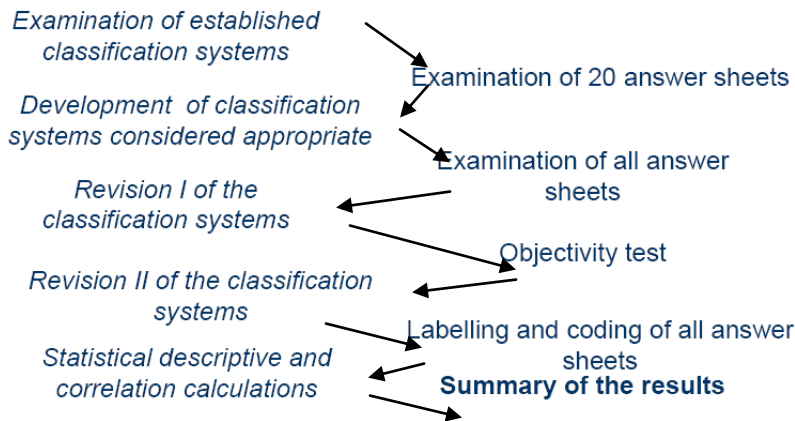
After second round of asking experts all data were collected. The final number of experts is in the table 3.

2. Qualitative analysis

2.1 Method

We used the methodical guidelines:

Mutual coordination of *constructive development* phases and empirical work phases



2.2 Results

Table 4 presents the categories differentiated according to the three questions in the questionnaire.

Table 4: Overview of the categories for the analysis of the experts' statements

I: Main reasons for teaching science subjects in school	II: Content field		III: Teaching methods that promote pupils' interest.	IV. Skills and attitudes
	Iia: Subject content and themes	Iib: Branches of Science		
Number of categories:11	Number of categories:13	Number of categories:18	Number of categories: 30	Number of categories:23
Categories:	Categories:	Categories:	Categories:	Categories:
To provide students with general knowledge-overview	Human (in general terms)	Botany	By means of demonstration (presentations, videos, films, pictures, products of nature etc.)	To express their opinion and defend it
To teach students the basic knowledge and skills of the subjects	The system overview of animals and plants	Zoology	By presentation of practical examples, interesting facts – teach less theory, more practice	Experimentation
Because these subjects explain practical phenomena of everyday life	The basic subject content of all science subjects	Human biology	To go to the countryside, on excursions, trips	To explain simple phenomena in nature
To show students how to explain phenomena around them	Hazardous substances and first aid	Genetics / molecular biology	To teach in an interesting way so that students don't get bored	Discussions, experts' lectures and other similar events
To familiarize students with the content of subjects	Fundamental laws and relations	Microbiology	Systematisation of knowledge	Reading with comprehension
Because these subjects are interesting and amusing	Topics important for practice	Ecology	To use appropriate teaching aids	Observation

To motivate students to study these subjects further at higher secondary schools	Environment protection	Inorganic chemistry	Fixation of knowledge and skills	To identify the fundamental processes in the ongoing nature
Because these subjects develop technical thinking	Electricity	Organic chemistry	Teach in a playful way – crosswords, concentration games, fill-it-in word games, games with scientific topics	To have a positive relationship to nature
Because the world needs people with science education	Solar System	Analytical chemistry	Project based teaching	Solving of simple tasks
Because of environmental protection	Chemical reactions	Biochemistry	Experts' lectures	Describing of phenomena
Because of the development of gifted pupils	Terminology	Mechanics	Simple experiments	To substantiate their solutions
	Cycle of matter	Electrodynamics	To teach about human body and its properties	Solving of complex problems (project)
	Energy	Thermodynamics	Watching movies, clips of nature	To lead a healthy lifestyle
		Atomic / nuclear physics	Breeding animals and growing plants	To formulate conclusions
		Astronomy / space system	Games with scientific themes	Analysis of phenomena
		Earth sciences	Humor in science	Measurement
		Mathematics	Science in everyday life	Data processing
		History of the sciences	Recording experiments, animals, plants, etc.	Anticipation of development
			Science and art	Evaluation
			Magic and tricks	Creating of hypotheses
			To invent and build of experiments	To work according to instruction
			Solving of problems (tasks)	Verification of hypotheses
			Sci-fi movies	Critical assessing
			Computer-controlled experiments	
			History of discoveries	
			Search for information about nature on the Internet	
			Quotations of important scientists	
			Comics and books	
			Biographies of scientists	
			Computer games	

2.3 Discussion

The categories describe views of all expert groups.

3 Quantitative analysis

3.1 Method

The procedure of processing the data for determining the relative frequency of the categories was based on using EXCEL. We followed all recommendations of WP3 leader.

3.2. Objectivity of the data analysis

The inter-rater agreement of two different coders after coding 20 questionnaires was used (see table 6).

Table 6: Results of the inter-rater agreement of two different coders after coding 20 questionnaires

I: Situations, contexts, motives	IIa: concepts and topics	IIb: fields and perspectives	III: Qualification	IV: methodical aspects
qI = .74	qIIa = .78	qIIb = .80	qIII = .72	qIV = .75
qt = .76				

3.3 Results

Tables and charts with the relative frequencies of the categories (differentiated into the three questions of the formsheets: situation/context/motive, field, and qualification are presented:

Table 7: Number and average number of form sheets per participant

Number and average number of form sheets per participant			
Group	Sub-group	Number of form sheets	Average number of form sheets per participant
Students		184	1,3
Science Teachers	Science education students at University	15	1,7
	Trainee science teachers	11	1,6
	Science teachers	9	1,3
	Science trainee teacher educators	12	1,7
	Total	47	1,6
Science educators		37	1,3
Scientists		33	1,3
Total		301	1,4

Table 7B: Number of form sheets

Number of form sheets	Students		Science teachers		Science educators		Scientists		Total	
	N= 138	%	N=30	%	N=28	%	N=25	%	N=221	%
1	105	76,0%	18	60,0%	22	78,6%	19	76,0%	164	74,2%
2	23	16,7%	8	26,7%	4	14,3%	4	16,0%	39	17,6%
3	7	5,1%	3	10,0%	1	3,5%	2	8,0%	13	5,9%
4	3	2,2 %	1	3,3%	1	3,5%	0	0,0%	5	2,3%
	Σ=184		Σ= 47		Σ= 37		Σ= 33		Σ=301	

Table 8: Number of form sheets filled out by participants – frequencies and percentages

Number of form sheets and percentages			
Number of form sheets	Frequency	Percentage	Cumulated percentages
1	164	74,2	74,2
2	39	17,6	91,8
3	13	5,9	97,7
4	5	2,3	100
Total	221	100	

Table 9: Number of statements made by the participants – taking into account multiple entries

Group	Sum	Average	Median	Minimum	Maximum	% of total number of categories
Students	3767	27,30	24	16	93	56,45
Science teachers	1116	37,20	30	20	102	16,72
Science educators	1062	37,93	30	16	79	15,91
Scientists	729	29,16	26	11	75	10,92
Total	6674	30,20	28	11	102	100

Table 10: Number of different statements per participant – total sample and sample groups

Group	Sum	Average	Median	Minimum	Maximum	% of total number of categories
Students	3228	23,39	22	16	82	56,51
Science teachers	935	31,17	29	18	89	16,37
Science educators	885	31,61	30	16	61	15,50
Scientists	664	26,56	25	10	63	11,62
Total	5712	25,85	27	10	89	100,00

3.4 Discussion and remarks

All needed data were received. Only education administration group is missing according no interest to answer the questionnaire.

4. References

Additional charts we sent separately in Excel format.