Slovak Primary Teachers Attitudes on the Inquiry Based Science Education

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The Research Problem Background

The research problem is based on the following two main ideas:

- We theoretically know that changing the teacher's individual conception is difficult.
- Besides we know that the IBSE can help to adapt the educational system to new requirements.

The Research Problem

The core problem:

We would like to know what conditions should be created to help the teachers functionally implement the IBSE into their individual conception of teaching.

The specification of the problem:

We would like to know if it is possible to change teachers´ attitudes:

- by theoretical argumentation full of practice examples (P1),
- by theoretical argumentation replenished with own IBSE teaching practice (P2).

The Respondents

	number of respondents	completed schooling	completed practice
control group	6	none	none
1st experimental group	6	introductory	none
2nd experimental group	5	every year	4 years

The Methodology

The research tool is made of 80 statements which are characterizing variable aspects of primary science education including IBSE principles.

The teacher can assign specific value to the particular statements in an eleven-stage scale 0 – 10. The teacher expresses only the measure of his/ her agreement with the statement; we do not measure his/ her disagreement. The teacher can assign the specific value only to limited number of statements.

value	0	1	2	3	4	5	6	7	8	9	10
Amount of assigned q-types	3	4	6	10	11	12	11	10	6	4	3

Correlation Matrix – concordance rate of teachers attitudes toward different aspects of primary science education

	res1	res2	res3	res4	res5	res6	res7	res8	res9	res10	res11	res12	res13	res 14	res 15	res 16	res 17
res1	x	-0,078	0,297	0,127	0,305	0,318	0,168	0,17	0,133	0,08	0,105	0,16	**0,357**	0,318	0,195	0,344	0,232
res2	-0,078	x	0,061	0,27	0,098	0,119	-0,035	-0,074	0,023	-0,025	0,004	-0,016	0,051	0,045	0,066	0,072	0,047
res3	0,297	0,061	x	0,326	**0,533**	**0,482**	0,113	0,117	0,057	0,002	0,045	0,115	**0,459**	**0,596**	**0,428**	**0,408**	0,25
res4	0,127	0,27	0,326	x	0,189	0,248	0,039	0,023	0,041	0,002	-0,016	0,035	0,051	0,262	0,299	0,164	0,236
res5	0,305	0,098	**0,533**	0,189	x	**0,934**	0,088	0,092	0,078	0,02	0,02	0,088	0,311	**0,367**	**0,379**	0,129	0,094
res6	0,318	0,119	**0,482**	0,248	**0,934**	x	-0,004	0,016	-0,012	-0,037	-0,098	0,002	0,236	0,307	0,297	0,107	0,068
res7	0,168	-0,035	0,113	0,039	0,088	-0,004	x	**0,939**	**0,934**	**0,902**	**0,9**	**0,93**	0,316	0,311	0,275	0,18	0,041
res8	0,17	-0,074	0,117	0,023	0,092	0,016	**0,939**	x	**0,889**	**0,883**	**0,869**	**0,895**	0,318	0,287	0,268	0,16	-0,002
res9	0,133	0,023	0,057	0,041	0,078	-0,012	**0,934**	**0,889**	x	**0,916**	**0,918**	**0,943**	0,207	0,26	0,234	0,133	-0,004
res10	0,08	-0,025	0,002	0,002	0,02	-0,037	**0,902**	**0,883**	**0,916**	x	**0,863**	**0,906**	0,211	0,221	0,252	0,113	-0,059
res11	0,105	0,004	0,045	-0,016	0,02	-0,098	**0,9**	**0,869**	**0,918**	**0,863**	x	**0,91**	0,24	0,197	0,201	0,156	0,004
res12	0,16	-0,016	0,115	0,035	0,088	0,002	**0,93**	**0,895**	**0,943**	**0,906**	**0,91**	x	0,316	0,305	0,318	0,252	0,061
res13	**0,357**	0,051	**0,459**	0,051	0,311	0,236	0,316	0,318	0,207	0,211	0,24	0,316	x	**0,484**	**0,43**	**0,48**	0,273
res14	0,318	0,045	**0,596**	0,262	**0,367**	0,307	0,311	0,287	0,26	0,221	0,197	0,305	**0,484**	x	**0,408**	**0,377**	0,277
res15	0,195	0,066	**0,428**	0,299	**0,379**	0,297	0,275	0,268	0,234	0,252	0,201	0,318	**0,43**	**0,408**	x	**0,371**	0,143
res16	0,344	0,072	**0,408**	0,164	0,129	0,107	0,18	0,16	0,133	0,113	0,156	0,252	**0,48**	**0,377**	**0,371**	x	0,252
res17	0,232	0,047	0,25	0,236	0,094	0,068	0,041	-0,002	-0,004	-0,059	0,004	0,061	0,273	0,277	0,143	0,252	x

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res17	0,232	0,047	0,25	0,236	0,094	0,068	0,041	-0,002	-0,004	-0,059	0,004	0,061	0,273	0,277	0,143	0,252	x

The Correlation Matrix Results

- We can notice higher correlations within the defined respondent groups (1. and 2. experimental group), except for the control group.
- The highest correlation is within the 1.experimental group.
- The higher correlations are between the teachers coming from the same school.
- In a factor analysis, the particular factors are mostly corresponding with the defined respondent groups.

The Interpretation of Correlation Matrix

- The control group of teachers has non-homogeneous attitude to the evaluated aspects of science education environment.
- The theoretical training makes the expressed attitudes more homogeneous as the IBSE practice does .
- The own experience with the IBSE implementation seems to disturb the homogeneity of the attitudes.
- The IBSE conception is specifically naturalised in the concrete school institution.
- The theoretical training and also the IBSE practice are intensively signified in the investigated attitudes.

The Results: Control Group

The teachers:

- perceive the directing of pupils activities as very important;
- have a negative opinion of group activities and outdoor activities as well;
- are beware of pupils own experience signification;
- highlight the importance to use and develop the pupils fantasy.

The Results: 1st Experimental Group

The attitude can be characterized:

- very strongly negative opinion of teaching methods which direct the pupils to create scientific hypotheses and to realize a real scientific experiment;
- negative opinion of project works based on scientific investigation (they perceive that the project elaboration is too difficult for primary pupils);
- the need for knowledge pragmatism; the pupils should obtain or develop more pragmatic knowledge;
- highlighted pupils own experience importance;
- negative opinion of group activities;
- a need for correcting the pupils preconceptions and naive explanations.

The Results: 2nd Experimental Group

The attitude can be characterized:

- The positive opinion on group work and any group activities becomes very significant.
- The teachers feel that appropriate usage of information sources is very important and beneficial.
- It is very important to support pupil's natural curiosity via stimulus situations based on research problem identification.
- Similarly the teachers feel that directing the pupils to argue for their thoughts is very important.
- The need for pupils' knowledge pragmatism persists in their attitudes.

The Basic Conclusion

- The negative attitude to hypothesis making has disappeared and it has been substituted with positive attitude to more significant aspects of the IBSE conception (e.g. work with informational sources, construction of conclusions with appropriate argumentation in active group work). It is significant that the teachers with IBSE practice approach to the conception more analytically.

The Implication

- The teacher's individual conception of teaching can be influenced by theoretical knowledge only after validating the knowledge in own practice. Either the theory succeeds in the practice or not, it will be included into the teacher's attitude. According to positive or negative experience the teacher will change the individual conception of teaching or not.