Conceptual use of discrepancies in teachers' attitudes towards stated curriculum goals.

Norwegian national results vs. international findings in the IEA SITES 2006 study.

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Abstract

In the IEA SITES 2006, a conceptual framework for the analysis of teachers´ attitudes towards their pedagogical orientations was developed (Law, Pelgrum, & Plomp, 2008). The three pedagogical orientations, *traditional orientation*, *lifelong learning* and *connectedness*, were measured in SITES 2006 using three different sets of indicators; curriculum goal orientation, teacher practice and student practice orientations (Law et al., 2008). The indicators were tested by a combination of reliability analysis and confirmatory factor analysis, and found to be adequate all-over measures of pedagogical orientations for most of the 22 participating educational systems in SITES 2006. National differences from the international combined result still prevail, and this provides an opportunity to cast light upon recent local curriculum and policy changes in Norway. By covering a rich variety of attitudes towards teaching, pedagogy and technology the 13 indicators concerning the stated curriculum goals are of special interest.

Differences in indicator constructions can provide information on if or how the Norwegian teachers in the study were directing their efforts towards the "Knowledge promotion" – the curriculum reform that took place during the SITES 2006 survey period in Norway.

Keywords: *curriculum analysis, policy, pedagogical orientation*

Introduction

This paper stems from the Norwegian part of the IEA SITES 2006 study. The author of this paper acted as National Coordinator within the IEA system, participating in instrument development, organizing the data collection in Norway, analyzing and writing a national report and are currently working on various other outputs based on this data material. The objective of the paper is to analyze some of the differences between the Norwegian subset and the international combined dataset on reliability and factor loading on the 13 indicators comprising the curriculum goal measurement of pedagogical orientation.

Methodology

The paper combines reliability analysis, explorative and confirmatory factor analysis using the above-mentioned datasets and the indicators constructed for the IEA SITES 2006 study, to establish differences on an item level. Item level differences will be analysed conceptually.

Research questions

a) What differences in reliability and factor loadings can be found when analyzing the 13 indicators from the two datasets?
b) Can such differences be of conceptual use to understand the particular working conditions the Norwegian respondents were subjected to when facing a new curriculum reform?

Findings and Discussion

1. About the study

SITES 2006 were conducted under the auspecies of the IEA, and involved 22 educational systems worldwide. Pelgrum and Law (2008) give the following account of the study in the SITES 2006 international report

"SITES 2006, designed as a survey of schools and teachers and building on the findings of SITES-M1 and SITES-M2, examined the kinds of ICT-related pedagogical practices adopted by the participating countries and how these countries were using ICT. The main aims were to find out:

1. The extent to which the characteristics of the innovative ICT-using pedagogical practices identified in SITES-M2 could be found within the general population of teachers as opposed to those teachers identified as being involved in highly innovative practices;

and

2. How the presence of these characteristics related to contextual factors at the school and system levels.

The study administered three questionnaires (for school principals, technology coordinators, and teachers in mathematics and science) to a sample of approximately 400 schools and about four teachers per school in each participating education system. A noteworthy feature of SITES 2006 is that most data were collected via an online data collection (ODC) system specially developed for this study and containing many features that are needed in

international comparative assessments." (Pelgrum and Law 2008;9)

1.2 Curriculum reform in Norway: The Knowledge Promotion

The Knowledge Promotion is the latest reform in the 10-year compulsory school and in upper secondary education and training in Norway. It introduces certain changes in substance, structure and organization from the first grade in the 10-year compulsory school to the last grade in upper secondary education and training. The reform took effect in autumn 2006 for pupils in grades 1-9 in 10-year compulsory school and for pupils in their first year of upper secondary education and training (i.e. the 11th grade). The following paragraphs are a revised version of the official presentation of the Knowledge Promotion as stated by the Ministry of Education and Research in Norway:

> "The Knowledge Promotion, with its special emphasis on learning, is meant to help ensure that all pupils receive a differentiated education. (…) Under the Knowledge Promotion, schools are to prioritize the cultivation of basic skills in all subjects. This is an important foundation for all other learning. These basic skills are as follows:
>
> - the ability to express oneself orally
> - the ability to read
> - the ability to do arithmetic
> - the ability to express oneself in writing
> - the ability to make use of information and communication technology
>
> These basic skills have been incorporated into the subject syllabuses for all subjects. All teachers are therefore responsible for enabling pupils and apprentices/trainee teachers to develop basic skills through their work in various subjects. An emphasis on reading and writing from the first grade in the 10-year compulsory school is an integral part of the Knowledge Promotion.
>
> New subject syllabuses have been worked out for all subjects in the 10-year compulsory school and for the common subjects in upper secondary education and training. (…)
>
> The new subject syllabuses contain clear goals for what pupils should know in each grade. In assigning such skills targets, the subject syllabuses are expressing high academic ambitions for all pupils, who in varying degrees should be able to reach the targets that have been set. Each pupil shall be stimulated to the best realization of his or her goals through differentiated education." (Ministry of Education, 2006)

The Knowledge promotion marks a shift of attention in Norwegian primary and secondary education. Before, weight was put on procedures of teaching; now attention is turned towards learning outcomes and the fostering of competencies. By including the fifth basic skill, "the ability to make use of information and communication technology" as equally important as competencies in reading and writing, the governing bodies in Norway has formalized the pupils' rights to become digital literate through their education.

The SITES 2006 data were collected spring 2006, just months before the Knowledge Promotion was made active for grade 1-10. Hence, the data provides a monitoring of attitudes, behaviors and provided infrastructure concerning the use ICT in pedagogical practice, seen from the point of 8th grade teachers on the brink of a major reform. The main public already knew most of the contents of the reform, both on a policy level and on the level of subject syllabuses, by the time of the data collection, due to various unauthorized leaks and official hearings of the material.

2 Pedagogical practice-orientations

Central to the design of SITES 2006 was organizing data according to three sets of indicators for overall pedagogical orientation: the curriculum goal orientations, teacher-practice orientations, and student-practice orientations.

- Traditional orientation refers to "practices characteristic of classrooms in the industrial society, such as teachers giving instructions and students responding to quizzes and tests" (Law & Chow, 2008),

- Orientation towards life-long learning "includes the use of more collaborative-, inquiry-, and production-oriented activities as well as strategies designed to take greater account of individual differences, such as provision of remedial instructions" (Law & Chow, 2008).

- Orientation towards connectedness "refers to activities in which students collaborate with and/or learn from outside peers and experts to create products and publish results" (Law & Chow, 2008).

Life-long learning and connectedness denotes practices "considered conducive to developing learning outcomes important for the knowledge society, such as undertaking autonomous learning, collaborative inquiry, and communication through use of appropriate digital technology" (Law & Chow, 2008). The two orientations life-long learning and connectedness is also commonly referred to as "21st century pedagogy" within the SITES studies, and marks

a worldwide trend, both practically, in attitudes and at policy-levels, towards reforming education.

The indicators were constructed from sets of questions either referring to the teachers' wants and beliefs (their espoused goals) or their actions (practice). In this paper the analysis will be concentrated to the questions relating to the teachers espoused curriculum goals. These items are mainly measuring the teachers' visions for their pedagogical practice and the vision for their students' learning outcome and competence. The main question is phrased this way:

"In your teaching of the target class in this school year, how important is it for you to achieve the following goals?"

Table 1 presents the distribution of the Norwegian teachers on the thirteen items comprising the body of statements:

[Table 1 here]

Table 1. Espoused curriculum goals. Norwegian Mathematics and Science teachers.

In your teaching of the target class in this school year, how important is it for you to achieve the following goals?						
		Not a all	A little	Somewhat	Very much	Somewhat + Very Much
A: To prepare students for the world of work	Mat	5,3 %	39,7 %	34,3 %	20,7 %	55,0 %
	Sci	7,6 %	37,1 %	40,5 %	14,8 %	55,3 %
B: To prepare students for upper secondary education and beyond	Mat	2,5 %	14,8 %	42,4 %	**40,3 %**	82,7 %
	Sci	1,1 %	14,7 %	46,1 %	**38,1 %**	84,2 %
C: To provide opportunities for students to learn from experts and peers from other schools/countries	Mat	**38,3 %**	45,1 %	14,4 %	2,3 %	16,7 %
	Sci	**33,8 %**	48,0 %	15,4 %	2,8 %	18,2 %
D: To provide activities which incorporate real-world examples/settings/applications for student learning	Mat	0,2 %	10,3 %	47,1 %	42,4 %	89,5 %
	Sci	0,4 %	6,5 %	51,6 %	41,5 %	93,1 %
E: To improve students' performance in assessments/examinations	Mat	1,4 %	9,3 %	51,4 %	38,0 %	89,4 %
	Sci	0,7 %	19,5 %	54,1 %	25,7 %	79,8 %

F: To increase learning motivation and make learning more interesting	Mat	0,4 %	0,2 %	16,8 %	**82,6 %**	99,4 %
	Sci	0,0 %	0,9 %	23,3 %	**75,8 %**	99,1 %
G: To individualize student learning experiences in order to address different learning needs	Mat	0,0 %	3,9 %	43,9 %	**52,2 %**	96,1 %
	Sci	0,0 %	10,9 %	51,8 %	**37,3 %**	89,1 %
H: To foster students' ability and readiness to set their own learning goals and to plan, monitor and evaluate their own progress	Mat	0,6 %	15,2 %	48,5 %	35,7 %	84,2 %
	Sci	1,6 %	22,8 %	49,2 %	26,4 %	75,6 %
I: To foster students' collaborative and organizational skills for working in teams	Mat	2,7 %	25,9 %	46,4 %	25,0 %	71,4 %
	Sci	0,8 %	18,2 %	56,5 %	24,5 %	81,0 %
J: To foster students' communication skills in face-to-face and/or online situations	Mat	4,0 %	25,2 %	49,0 %	21,7 %	70,7 %
	Sci	1,5 %	27,4 %	53,6 %	17,4 %	71,0 %
K: To satisfy parents' and the community's expectations	Mat	2,7 %	28,9 %	55,1 %	13,3 %	68,4 %
	Sci	3,3 %	30,4 %	51,5 %	14,8 %	66,3 %
L: To prepare students for competent ICT use	Mat	1,3 %	14,2 %	54,8 %	29,7 %	84,5 %
	Sci	2,6 %	23,3 %	50,2 %	23,9 %	74,1 %
M: To prepare students for responsible Internet behavior (e.g., not to commit mail-bombing, etc.) and/or to cope with cybercrime (e.g., Internet fraud, illegal access to secure information, etc.)	Mat	7,3 %	22,4 %	35,0 %	**35,3 %**	70,3 %
	Sci	7,3 %	22,2 %	40,1 %	**30,4 %**	70,5 %

The top ranked curriculum goals among all teachers in all participating nations in the study were "To increase learning motivation and make learning more interesting", "To prepare students for upper secondary education and beyond" and "To improve students' performance in assessments/examinations". These curriculum goals are in the SITES 2006 study perceived as expressing aspects of a traditional orientation.

The Norwegian teachers is slightly differing from this pattern, ranging "To increase learning motivation and make learning more interesting" first, then "To individualize student learning experiences in order

to address different learning needs" and "To prepare students for upper secondary education and beyond" as second and third.

Orientation towards *life-long learning* is traceable in the table, curriculum goals that express student-centred goals, i.e. "To foster students' ability and readiness to set their own learning goals and to plan, monitor and evaluate their own progress", are valued among the Norwegian respondents.

The lowest ranked curriculum goal is "To provide opportunities for students to learn from experts and peers from other schools/countries". Over 80 % of the Norwegian teachers in both subjects' answers "Not at all" or "A little", while just about 50% of all teachers internationally provides the same answers. In the International PISA 2006, Norwegian school leaders scores significantly lower than the OECD mean on an indicator measuring the school's ability to provide courses about environmental issues in Science. This indicator sums activities where students and teachers contacts peers and experts outside the school, to enhance their pedagogical practice. (Kjærnsli, 2007). This same tendency is found in the Norwegian SITES 2006 when a majority of the teachers are answering "Not at all" or "A little" on the item "To provide opportunities for students to learn from experts and peers from other schools/countries". The teachers seem to be more inclined towards practice and examples from within the schools' environments than the international mean.

The Norwegian answers on the two curriculum goals concerning ICT, "To prepare students for competent ICT use" and "To prepare students for responsible Internet behaviour" are interesting. A clear majority of the teachers are positive to these statements. While most Norwegian teachers are quite on line with the international mean (Table XX), the mathematics teachers are differing on the first item, scoring almost 13 points higher than the international mean.

[Table 2, here]

Table 2, Norwegian and International scores. Categories "Somewhat" and "Very much" combined.

		Norway	International
To prepare students for competent ICT use	Mat	84,5 %	71,2 %
	Sci	74,1 %	76,5 %
To prepare students for responsible Internet behavior	Mat	70,3 %	68,4 %
	Sci	70,5 %	71,3 %

This opens for an interesting question: are math teachers in Norway responding to the particular demands presented in the curriculum reform? The reform is, as before mentioned, oriented against

fostering basic skills, and has also introduced the fifth basic skill to be taken into consideration in all pedagogical practice. The clear overrepresentation of maths teachers that are positive to the first items, raises the question if whether these teachers are responding to phrasings in the Knowledge Promotion.

3. International and Norwegian indicators for curriculum goal-orientations

The three curriculum goal-orientations presented above are products of factor analysis of the international dataset (Law 2008). The items comprising each orientation are presented in Table 3. If we use the same factor structure on the Norwegian data set, a reliability analysis (Cronbach's alpha) on the constructs gives us the following results:

[Table 3 here]

Table 3, International factor structure, comprising the three pedagogical orientation. Reliability analysis, international and Norwegian datasets.

Pedagogical orientation	Curriculum goal	CA All Math	CA All Sci	CA NOR Math	CA NOR Sci
Traditionally important	B: To prepare students for upper secondary education and beyond E: To improve students' performance in assessment/examinations K: To satisfy parental and community expectations	.571	.545	.532	.435
Lifelong learning	D: To provide activities that incorporate real-world examples/settings/applications for student learning G: To individualize student learning experiences in order to address different learning needs H: To foster students' ability and readiness to set their own learning goals and to plan, monitor, and evaluate their own	.739	.726	.687	.679

	progress I: To foster students' collaborative and organizational skills for working in teams				
Connectedness	C: To provide opportunities for students to learn from experts and peers from other schools/countries J: To foster students' communication skills in face-to-face and/or online situations M: To prepare students for responsible internet behavior	.666	.660	.651	.595

The international factor structure does seem to replicate quite satisfactory in Norway, when checked for internal reliability. With the exception of the scale for the traditional curriculum goal for the norwegian science teachers, all scales are quite strong. On the other side, the international factor structure omits three items, which probably not loads on a specific factor when all data are included. Both the table analysis above, and an exploratory factor analysis on the Norwegian data, indicates that two[1] of these items holds explanatory power in the Norwegian context, and should be included again:

- "To prepare students for the world of work"
- "To prepare students for competent ICT use"

The last item is of particular interest. When Norwegian math and science teachers are ranging the statements, the intention of fostering ICT competence seems to be clustered together with a specific set of other statements, and this is not the case when all teachers in all educational systems are included in the analysis. The rotated factor matrices for math and science teachers in Norway on the said 12 items are presented in table 4 and 5. The three-factor solution explained 41 % of the variation among the math

[1] The item "To increase learning motivation and make learning more interesting" holds no explanatory power neither in the international nor the Norwegian datasets, and is ignored in the further analysis.

teachers, and 37 % among the science teachers. When executed with the common eigenvalue criteria of 1, the science teachers' answers loaded on four different factors, whereas the last contained only one item (H). A confirmatory approach with three factors forced on the science teachers' data provided the results in table 5.

Table 4. Rotated Factor Matrix, Norwegian math teachers.

Curriculum goal	Factor		
	1	2	3
J: To foster students' communication skills in face-to-face and/or online situations	.825	.065	.079
I: To foster students' collaborative and organizational skills for working in teams	.603	.047	.300
M: To prepare students for responsible Internet behavior	.567	.073	.238
L: To prepare students for competent ICT use	.499	.205	.179
C: To provide opportunities for students to learn from experts and peers from other schools/countries	.418	.117	.095
D: To provide activities which incorporate real-world examples/settings/applications for student learning	.369	.134	.321
K: To satisfy parents' and the community's expectations	.362	.183	.271
B: To prepare students for upper secondary education and beyond	.162	.986	-.009
A: To prepare students for the world of work	.256	.421	.132
E: To improve students' performance in assessments/examinations	-.005	.402	.258
G: To individualize student learning experiences in order to address different learning needs	.192	.164	.633
H: To foster students' ability and readiness to set their own learning goals and to plan, monitor and evaluate their own progress	.385	.085	.582

Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization. Rotation

converged in 5 iterations.

Table 5. Rotated Factor Matrix, Norwegian Science teachers.

Curriculum goal	Factor		
	1	2	3
H: To foster students' ability and readiness to set their own learning goals and to plan, monitor and evaluate their own progress	.702	.140	.116
G: To individualize student learning experiences in order to address different learning needs	.605	.203	.071
I: To foster students' collaborative and organizational skills for working in teams	.599	.332	.058
K: To satisfy parents' and the community's expectations	.204	.195	.185
M: To prepare students for responsible Internet behavior	.192	.679	.049
L: To prepare students for competent ICT use	.104	.608	.150
J: To foster students' communication skills in face-to-face and/or online situations	.401	.545	.093
B: To prepare students for upper secondary education and beyond	-.016	.057	.699
A: To prepare students for the world of work	-.007	.251	.610
C: To provide opportunities for students to learn from experts and peers from other schools/countries	.234	.316	.425
E: To improve students' performance in assessments/examinations	.215	-.064	.321
D: To provide activities which incorporate real-world examples/settings/applications for student learning	.293	.062	.316

Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations.

The similarities between the two Norwegian teacher groups are greater than the differences, especially when it comes to the assosciation of item "L: To prepare for students competent ICT use" with other items. For both teacher groups the item loads on a factor together with

"M: To prepare students for responsible Internet behavior" and

"J: To foster students' communication skills in face-to-face and/or online situations".

Both these items are internationally placed into the pedagogical orientation "Connectedness", which in

turn are bearer of central traits of 21st century pedagogy, according to central analysis in the SITES 2006 international report. This then suggest that the Norwegian teachers could be adding a contextual dimension to the pedagogical orientation "Connectedness". This dimension then has to do with the students ICT competence.

4 Conclusions

The wording in the three items L, M and J also suggests that the following central aspects, among others, are associated with the questions:

- competent ICT use
- responsible internet behaviour
- communication skills online

These aspects are all central in the framework of the Knowledge Promotion, linking directly to the fostering of the basic skills, especially perhaps the fifth basic skill, and "the ability to express oneself in writing". Analyzing the traits of the factor structure with weight on the three items then gives an impression of teachers responding quite directly to demands stated in policy, even when the said curriculum reform still was in its infancy.

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