

**Regulation and innovation: stimulating students' creativity
and thinking through innovation education in Ingunnarskóli**

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Abstract

This paper examines the discourse concerning the implementation of innovation education (IE), which was introduced into the Icelandic national curriculum in 1999. Innovation education calls for flexible organization, giving value to student voice, eliciting the tacit knowledge of students and situated learning. The purpose of the research is to understand the regulative and instructional discourse in the implementation of IE and how schools, teachers and students experience the 'innovation' which underlies innovation education.

The research was conducted in Ingunnarskóli, a compulsory school in Iceland in the school year 2006-2007. In the spirit of feminist and participatory research the approach taken was to choose a design where the participants in the research are active partakers and have something to gain from the research. Data was collected through field observations in innovation education classes, in general classes, free periods, lunch breaks, coffee breaks, and at IE teachers meetings. Also through interviews with IE teachers, the head teacher and students. This paper describes the development of innovation education in Ingunnarskóli and how it connected with other developmental work in the school, what was new, as well as emerging issues and surprises.

In this study, concepts from the work of Basil Bernstein such as classification and framing, and recognition and realization rules are used to explore innovation education at Ingunnarskóli. The concepts of regulative and instructional discourse are used to understand the influence of underlying respect, power and responsibility. The paper also draws on the ecological approach described by Bronfenbrenner in order to understand interactions within the pedagogical discourse as described by Bernstein.

Findings show that personal and professional values influence the way in which innovation education is being taught. The regulative discourse in schools seems to include contradicting notions of innovation and tradition which in turn affect the nature of instructional discourse.

Innovation is popular in modern discourse

Innovation is a popular term in official discourse in Iceland. Innovation seems to be highly held by ministers and policy makers. Creativity and innovative capacities are seen to be important traits in the modern society and one would expect a great emphasis on developing innovation in education and offering the kind of education that can be called innovation education. Such an education does exist as a special subject in Icelandic compulsory schools though not common.

What is innovation education?

Innovation education has been in the curriculum for compulsory schools in Iceland since 1999. It is a school subject about inventing new objects, redesigning things that already exist to enhance and improve the conditions of social life. Students search for needs that are important to them and are trained to solve various needs or problems. They find solutions that can become personal solutions, new designs, technological innovations or social innovations and some can be developed into business ideas.

In society today we need innovation on many levels. Sternberg *et al* (2003) point out the relevance of creativity at the individual and societal level: at individual level, when solving problems on the job and in daily life and at a societal level creativity can lead to new scientific findings, new movements in art, new inventions, and new social programs. They also point out the economic importance of creativity as new products or services can become the foundation for new jobs. Furthermore, individuals, organizations, and societies must adapt existing resources to changing task demands to remain competitive (Sternberg, Pretz, & Kaufman, 2003). Creativity and innovation are also important for business and companies as they must develop and implement new ideas to remain competitive in the global marketplace (Clapham, 2003; Kostoff, 2003). It is through the implemented novel productions (economic, social, or technological) that an individual or and organization can survive and prosper when the environment changes, through productions that are appropriate to the new environment (Georgsdottir, Lubart, & Getz, 2003). As we don't know what the society will be like that we are preparing our students

for, we may have to decide what kind of futures are possible and which future we choose to prepare for. Jeffrey and Craft (2006) have argued that there is a contemporary need for people to be self-directed and a need for universal creativity. Craft has pointed out that the constant changes of modern life, in social relations, the economy and technology, requires that individuals are increasingly self-directed (Craft, 2006). Craft suggests one way of describing the quality of self-direction as 'little c creativity' which involves the quality of personal agency that enables individuals to find routes and paths to 'travel' in many aspects of their complex modern lives.

IE requires flexible organization, giving value to student voice, eliciting the tacit knowledge of students. Innovation education in Iceland may be called a close "relative" of what is called Technology Education in other countries as they have many elements in common. Technology education and IE both aim at building an understanding of technologies in the widest sense and problem solving and the design process are also prominent in both (Haché, 2006; Jónsdóttir, 2005).

My (Jónsdóttir's) interest in innovation education comes from my experience as a compulsory school teacher for 28th years. I taught IE for 10 years and found it very rewarding: it gave most of my students a chance to do well and they were generally interested and active more so than in any other subject I taught. In IE lessons I saw some students find their power and use it constructively, students that were not interested or even hated school.

Although innovation education has been in the curriculum for compulsory schools in Iceland since 1999 and has not been widely accepted by schools (Jónsdóttir, 2005). IE requires a flexible setting and situated learning. The students' views and values should be drawn forward and built on in developing the lessons and the learning should make use of the different environments of each group or school.

Purpose of this study

In this paper a case study in Ingunnarskóli, a new school (established in 2001) in

Reykjavík the capital of Iceland, will be reported. The school was taking up innovation education for the first time in the school year 2006-2007. The purpose of the study was to gain an understanding of the regulative and instructional discourse in the implementation of innovation education (IE). We also wanted to find out how schools, teachers and students experience the 'innovation' which underlies innovation education. IE has not been widely accepted and is not well known in Icelandic compulsory schools and is mainly non-existent in teacher education in Iceland (Jónsdóttir, 2005).

Method

The research was conducted in Ingunnarskóli in the school year of 2006-2007. Four teachers in the school had taken a course in innovation education in the summer of 2006 where one of the authors was teaching in-service teachers. These four teachers and the author made an agreement about cooperation and research of their teaching of innovation education that was taught in the school for the first time. The participants (teachers) took active part and had something to gain from the research which was the approach chosen in the spirit of feminist and action research. The author acted as a consultant as well as a researcher of the work in innovation education in the school. Data was collected through field observations in various contexts: in innovation education classes, in general classes free periods, lunch breaks, coffee breaks and at IE teachers meetings. Furthermore interviews were taken from the four innovation education teachers, individually and as a focus group. An interview with the head teacher was also taken and an interview with a group of students. The author jotted down field notes in the observations and took digital photographs and after each visit the notes were developed into detailed written descriptions with the photographs as a part of the field notes. Teachers' journals about the innovation education lessons were consulted and their mind maps of them as teachers.

Theoretical tools

In this study, concepts from the work of Basil Bernstein are used to understand the influence of underlying respect, power and responsibility. The paper also draws on the ecological approach described by Bronfenbrenner in order to understand interactions within the pedagogical discourse as described by Bernstein.

Bernstein's pedagogical code

Bernstein's theories can be used as a kind of sociological "glasses" to uncover influences in pedagogy that would otherwise not be visible. These glasses are sensitive to context and can therefore be used in different settings to uncover how and where respect, power and responsibility are located.

According to Bernstein, educational practice is founded on codes of conduct and traditions that have developed within organizations for a long time and he calls the pedagogic device (Bernstein, 2000). The device regulates the communication it makes possible and regulates the ideal universe of potential pedagogic meanings. The pedagogic device has internal rules that are about social order and rules of what counts as legitimate skills and knowledge.

Bernstein has identified terms that can be used as tools to detect the internal rules of the pedagogic device. The rules of the pedagogic device can be detected in two discourses (that actually are one) the regulative discourse and the instructional discourse.

The regulative discourse (RD) is a discourse of order, relation and identity. The RD distributes rules of the organization on matters regarding cultural practice and values. It holds criteria for the appropriate values in the organization, regarding for example behavior, conduct, ethics, manner and character as well as criteria of knowledge. The regulative discourse is the one who says: *This is who we are, these are our traditions (in a subject or school), this is what we emphasize, these are the kind of students we want, this is the culture of our subject or a school* (Geirsdóttir, 2008).

The instructional discourse (ID) is a discourse of competences relative to a given discipline. It is about choices of tasks, how they are done, sequence, pacing and which knowledge is considered of value in a given context and how it is evaluated. It is the discourse that says: *this is the kind of skills and knowledge our students should acquire, that is the way we arrange teaching to get this knowledge and skills across – in this order/sequence and this is how we evaluate the knowledge and skills* (Geirsdóttir, 2008).

The RD is the dominant discourse and produces *the order* in the instructional discourse (Bernstein, 2002).

The pedagogical discourse or the ideology in teaching and up-bringing is always conditioned by the rules of classification and framing in each context (Jóhannsdóttir, 2007). *Classification* and *framing* are key concepts in Bernstein's theories. **Classification:** is used to define the construction of a social space such as school subjects or by roles such as teachers vs. students, home and school. Power is embedded within a classified category which can be strongly or weakly classified. The power of school subjects is for example reflected in the amount of time it is allocated and the space it gets in the curriculum and the timetable of schools. **Framing:** refers to where the control in pedagogy is located (up-bringing and teaching). Framing is about who controls what. It refers to the nature of the control over: the selection of communication, sequencing (what comes first), pacing (the rate of expected acquisition), the criteria and control over the social space (Morais, Neves, & Fontinhas, 1999). Strong framing indicates that control is located in a category which keeps the power e.g. a teacher or a school subject and weak framing indicates control shared by categories e.g. by a teacher and a learner or between several subjects (Macdonald & Jóhannsdóttir, 2006). Framing refers to the relationship between controls on *instructional discourse* in which specific skills are transmitted and their relation to each other and to *regulative discourse* in which the rules of social order are transmitted (ibid). Instructional discourse is a part of and is embedded within the regulative discourse and Bernstein presented framing as ID/RD (Bernstein, 2000).

Other concepts from Bernstein that are helpful here are *recognition rules* and *realization rules*. To function effectively within a particular cultural group an individual needs to possess both the recognition and realization rules of that society (Chien & Wallace, 2004). They include the necessary understanding of "the rules of the game", to understand what is expected of you. Changes in classification strength alter the recognition rules by means of which individuals are able to recognize the specialty of the context that they are in. **Realization rules:** The ability to realize the necessary skills to produce the legitimate communication within a given context, to produce the expected

text – that is how to behave, how to write or speak. The realization rules determine how we put meanings together and how we make them public. In other words in schools the recognition rules determine which knowledge is relevant and the realization rules regulate what kind of student behavior, text and production of knowledge is judged valid.

To see how all of these concepts work together it may be useful to look at a picture built on a model from Chien and Wallace (2004) explaining their relationship.

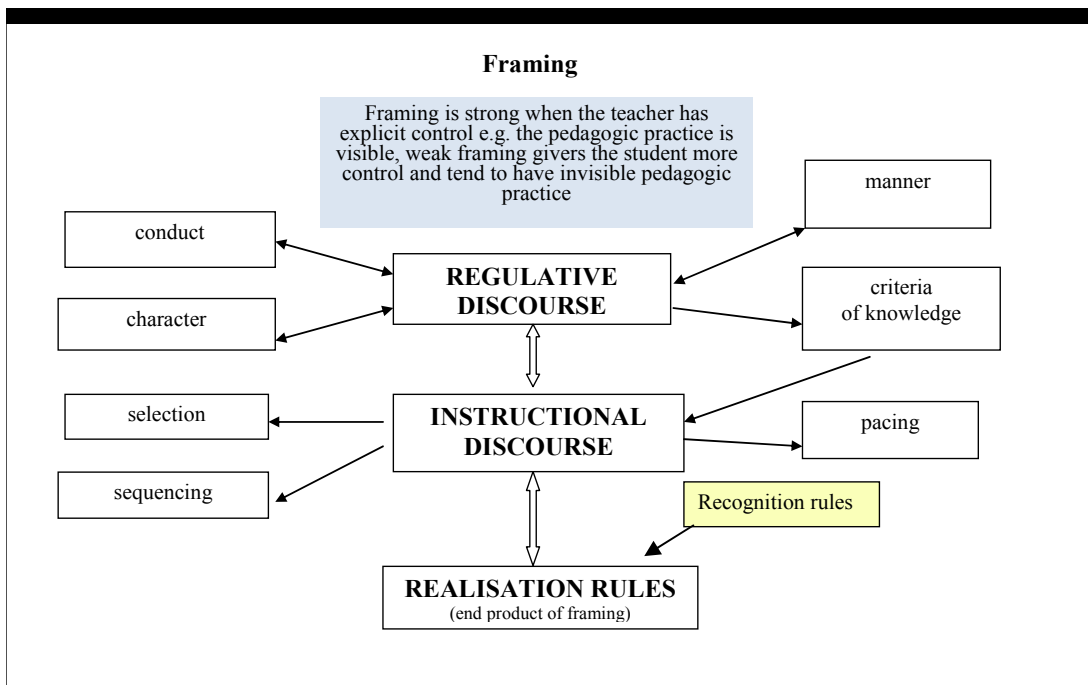


Figure 1 Framing

This picture shows how all of the concepts introduced hang together – the RD is underlying and the ID comes from the RD. The **regulative discourse** transmits rules of social order which relates to conduct, character and manner and the instructional discourse, transmits specific skills, referring to selection, sequencing, pacing and criteria of knowledge (evaluation). **The instructional discourse** is always embedded in the regulative discourse which is the dominant discourse. Regulative discourse communicates the institution’s public moral practice, values, beliefs and attitudes, principles of conduct, character and manner. It also transmits features of the institution’s

local history, local traditions and community relations. Framing is strong when the teacher has explicit control e.g. the pedagogic practice is visible, weak framing gives the student more control and tend to have invisible pedagogic practice (Chien & Wallace, 2004).

Bronfenbrenner's model

The foundation of Urie Bronfenbrenner's bio-ecological theory (Bronfenbrenner, 1979) is the view that human abilities and their realization depend in significant degree on the larger social and institutional context of the individual activity. Bronfenbrenner realized the power of phenomenology and social context in influencing human development. His research showed that different environments were producing discernible differences, not only across but also within societies, in talent, temperament, human relations, and in the ways in which the culture, or subculture, brought up its next generation. The ecological environment in Bronfenbrenner's theory is conceived as a set of nested structures, each inside the next, like a set of Russian dolls. Different kinds of settings are analyzed in terms of their structure. Environments are not distinguished by reference to linear variables but are analyzed in system terms. These systems are not seen as isolated spheres, but, rather, as organic, interacting systems.

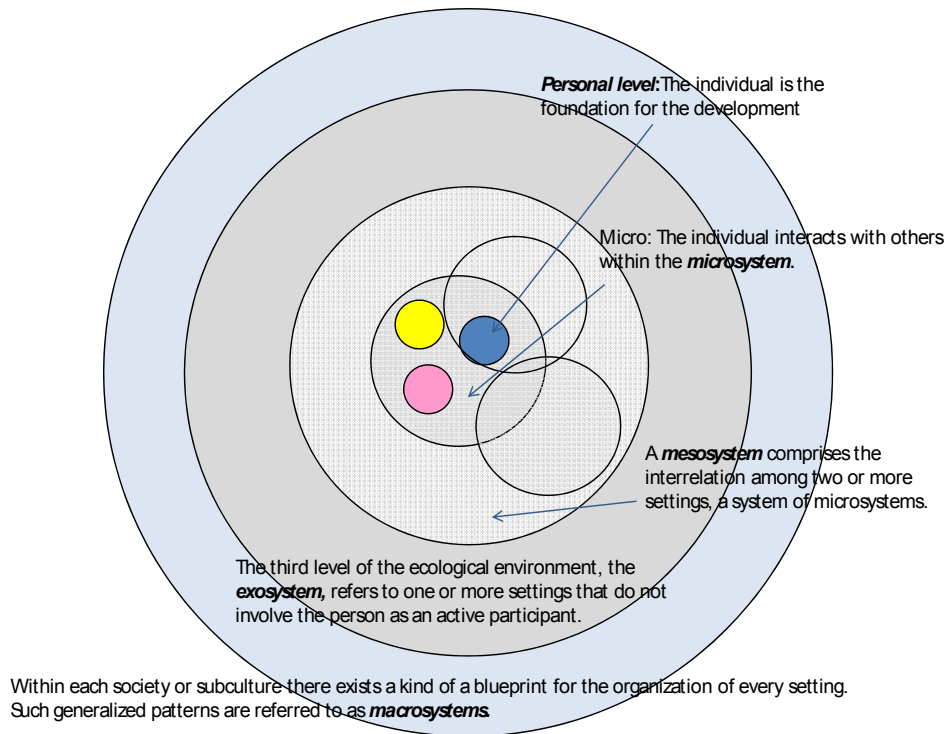


Figure 2 Bronfenbrenner’s model

The most common use of social ecology is looking at macro and micro context, but as Bronfenbrenner found in his research there are other systems in-between that are detectable and can be defined to some extent that each receive influences and exert influences often both ways.

Personal attributes

The foundation for development of a person or professional is the individual herself. That is, characteristics of the individual will influence one’s development. Personal attributes of individuals have been identified as determinants in the development of educational professionals (Lewthwaite, 2006). In the research to be described in this study a variety of individual or personal attribute factors will likely affect the development of an innovation education teacher.

Microsystem

In Bronfenbrenner's bio-ecological theory the innermost level influencing the development of an individual is the microsystem. Within an educational context, the microsystem of a teacher is likely to be the family members, students within classrooms, and close colleagues within school.

Mesosystem

The interconnections can be as decisive for developments as the events taken place within a given setting. A *mesosystem* comprises the interrelation among two or more settings, a system of Microsystems. Mesosystem factors in this research could be: priority placed on IE as a curriculum area by school; school emphasis on arts and manual subjects; physical arrangement of IE lessons; connections with other school work; school receptiveness to learning and change; school timetabling decisions; evaluation procedures at school level.

Exosystem

The third level of the ecological environment the *exosystem* refers to one or more settings that do not involve the person as an active participant, but in which events occur that affect what happens in the setting containing the person. These are settings such as parent and community aspirations towards innovation education. Demands of the modern society, working outside the home, attending to own children affect these aspirations and the efficacy of the teacher to fulfill her professional role.

Macrosystem

The complex of nested, interconnected systems is viewed as a manifestation of underlying patterns of ideology and organization of the social institutions common to a particular culture or subculture. Within each society or subculture there exists a kind of a blueprint for the organization of every type of setting. Such generalized patterns are referred to as *macrosystems*. Here the macrosystem factors are seen as the government curriculum policy decisions; national curriculum development priorities; professional development agendas at national level; national external evaluation procedures; pay scale

structures. Teacher education and the official discourses used about innovation in society and the connection (or lack of it) between the two are also a part of the underlying macrosystem.

Within a given society or social group, the structure and substance of micro-, meso-, and exosystems tend to be similar, as if they were constructed from the same master model, and the systems function in similar ways. Conversely, between different social groups, the constituent systems may vary markedly. By analyzing and comparing the micro-, meso- and exosystems it becomes possible to describe systematically and to distinguish the ecological properties of these larger social contexts as environments for professional development.

About Ingunnarskóli - its structure and ideology



Figure 3 Ingunnarskóli in Reykjavík

Ingunnarskóli, a school house designed by architect Bruce Jilk is a school that is from its beginning, prearranged around individualized curriculum with an emphasis on flexible

instruction, integration of year groups and subjects and teachers' teamwork. The school emphasizes theme work and practical subjects (arts, crafts, woodwork, textiles). Innovation education is a subject that has a weak classification, that is it incorporates many other subjects, it utilizes many kinds of knowledge (i.e. Icelandic, crafts, woodwork, mathematics, business, arts, technology, ICT) in a practical way. The framing is also weak in IE as the student is expected to have a lot to say and control about content and pacing and is considered the specialist in his/her own idea rather than the teacher and therefore the classification between student and teacher is weakened. Innovation education also requires a continuum in work time that is necessary for the flow of ideation in the creative process and therefore does not well suit a clear cut 40 minute lesson structure (Jónsdóttir, 2005).

Ingunnarskóli seemed an ideal candidate for innovation education as its structure is relatively open and its emphasis on arts and crafts and integrating subjects in themes and the idea of teacher teamwork all seemed to be supportive for IE. Students in Ingunnarskóli should also be used to working independently - and autonomous work is one of the characteristics of IE, where the teacher is often more a supporter than a teacher in the traditional sense (the one who knows and controls the "right" answers) (Gunnarsdóttir, 2001; Jónsdóttir, 2005; Thorsteinsson & Denton, 2003).

Findings – the regulative discourse of Ingunnarskóli

The regulative discourse of Ingunnarskóli as it could be seen as in the data was somewhat surprising though logical when examined.

The deliberately open school structure requires a strong structure (order – towards a stronger classification) and this kind of structure was seen in Ingunnarskóli in the organization of the timetable, i.e. the arrangements of groups eating at the canteen and arrangements of group work. Even though the timeslots for lessons were longer than traditional 40 minute slots, they had a definite structure (that still allowed the students some choices and influence).

The open structure and team-teaching allows small student groups which is a RD that is supportive to IE (towards a weaker classification). Ingunnarskóli is developing assessment that includes evaluation of process and hands-on projects - (criteria of knowledge that is beneficial for weakly classified subjects). The strong emphasis on practical subjects (arts, crafts, woodwork and textiles) and integration of subjects indicates weakening of RD thus the criteria of knowledge is different from a strongly classified academic emphasis, a weaker classification than for example is reflected in the standardized tests for Icelandic compulsory schools. The clear vision on behalf of the school that could be seen in the integration of subjects seems to fit well for innovation education (deliberately works against a strong classification of subjects).

Some contradictions were seen in the instructional discourse by the use of *positive behavior support* (a behaviorist training system - PBS), that was an indicator of stricter RD than the general openness of Ingunnarskóli suggests, and implies a strong classification between students and teachers where teachers have explicit control. So at Ingunnarskóli the deliberate regulative discourse was indicated in the open vision (weak classification and framing) that pulls against a strong classification of subjects but there were also indicators of a different regulative discourse (strong classification and framing).

To me it was somewhat of a surprise that the school had such a clear structure, but soon I saw the necessity of it. The RD of Ingunnarskóli is both open and structured at the same time. On one hand the RD in Ingunnarskóli is open and supportive of IE, the structure of the school is deliberately open – they want students to be independent and creative in their learning and they emphasize the role of manual subjects. On the other hand there is a clear structure in the organization of time slots and what can be worked at during certain hours – but the time slots are relatively long (80-100 minutes) which gives students possibility of organizing their work within that time. The innovation education lessons were somewhat isolated in a special room within the school which is an indicator of an RD that is more strict and classified. The use of the Positive Behaviour Support system gave the students clear messages about what kind of behaviour was acceptable.

So a struggle between a contradicting pull of the RD of innovation education and Ingunnarskóli (weak classification and framing) on one hand and the RD coming from other sources (strong classification and framing) on the other hand could be detected, and to analyze those other influences we used Bronfenbrenner's ecological model.

Other findings – the instructional discourse of innovation education lessons

Analysing the innovation education lessons of the four teachers using Bernstein's concepts of framing (who controls: selection of knowledge, the communication, sequencing, pacing and criteria and control over the social space) a mixed framing of the instructional discourse appeared. The teachers had to balance the necessary freedom for creative work in IE lessons with the structure that inevitably comes with arranging and planning the work of group of students within a given time and space. What was exemplifying for the lessons was that the teachers were very busy, assisting and guiding, giving individual support to students. They were usually very patient, warm yet steadfast and disciplinary matters dealt with in a defined process (PBS). What was characteristic for their approach was generally a good balance of freedom and structure and is what I suggest we call the *artistic approach* in teaching that Eisner (2001) has described and analyzed. One of the four teachers tended to lean towards more control in the lessons and leaving less room for freedom for the students' creativity.

The factors seen in the lessons were given values for framing (F) from - - weak, - rather weak, - + mixed, + rather strong and + + strong framing.

The mixed framing unfolded as follows :

- Freedom and structure (F + -)
- PBS – strong teacher control (F + +)
- Selection: choice of work limited (F - +)
- Creative solutions personal (F- -)
- Pacing (F + -)
- Location of work restricted (F+ +)
- Evaluation criteria (F -+)

The framing in IE lessons was somewhat mixed where the freedom of the students was limited to some extent. Students had some choices of work and they had freedom to create and choice of materials, they could work at their own speed (with some limits of finishing) and the space to work in was clearly defined (the crafts room). Evaluation criteria were known to students as they had been developed within the school in other areas for measuring the work in integrated subjects and manual work – although not prominent.

In spite of the weak framing inherent in IE there was tendency towards strong framing in the IE lessons in Ingunnarskóli. The instructional discourse of innovation education in Ingunnarskóli indicates that the school and the teachers want independent and creative students. Three out of the four IE teachers tackled well the balance between students' autonomous work and structure and control. The use of the PBS system was a part of the teacher's control of the students and indicated clearly their different classification and thus status and power.

The clearest indication of strong framing of selection was the repeatedly expressed wish of the students to do more hands-on work and less of the paper-written assignments. The students loved the hands-on part and were less enthusiastic about the discussions and written assignments. It seems that a balance between the written and hands-on work is necessary to achieve on one hand the thinking and deliberations and on the other hand to experience the joy of seeing their ideas realized in substantial form. So a weaker framing of selection might be beneficial.

Students' recognition and realization rules seemed to be developing towards recognizing what was expected in innovation education. They were getting to know and understand the "rules of the game" of innovation education and gradually learning to behave accordingly. The teachers said they occasionally had difficulties in getting the students to "fly" in their creative process, the students' didn't always know how to handle the freedom offered for creative work. Sometimes the students misinterpreted the freedom as permission to "act out". Even though the students should have recognition rules from

other schoolwork (work independently) that would fit well the weak framing of IE they sometimes either did not make use of the freedom offered (to “fly”) or they were not able to accept the responsibility of the freedom (did not have the realization rules for IE)

A proposal of an understanding – the social ecology of Ingunnarskóli

By using Bronfenbrenners’ model we can locate the larger contexts that interact and affect schoolwork and by using Bernsteins’ theories we can make visible the different forces of power that reside in our language and influence our conduct. By making these forces visible we can consciously choose some of the responses in education that would otherwise keep their power and pull in opposite directions from where we want to go.

Personal level	Supports taking risks, experiments and folly. Balance control and freedom skillfully. Artistic approach 3 of Ingunnarskóli’s teachers F - 1 teacher F - +	One teacher more controlling in her teaching, the other three are able to allow students more freedom
Microsystem School leaders and colleges	Actively familiar with IE Leaders mediate external support. Secure support of school community towards IE Colleges support IE. The ethos of the school supports weaker framing. F -	School leaders intentionally weaken classification of subjects and framing towards students’ control and choice
Mesosystem IE as a curriculum area by school	School receptiveness to learning and change Emphasis on arts and manual subjects as tools for learning and on integrating subjects in creative projects C - - Physical arrangement of IE C+ - Use of PBS system F++ Lesson length supportive of project work C - - Evaluation procedures supportive of IE F - + Builds on a system of strong classification and is a deviation from it	Classification is weakened by integrating subjects and length of lessons give space for students’ control of sequencing and pacing. Evaluation criteria for project work, - may need to be more explicit.
Exosystem Parent and community aspirations towards IE	Reliance on traditional measures of school quality. Traditional school subjects given priority. C++ Parents minimally involved in school activities. Indifference towards IE C++ (strong classification between home/society and school)	Parents (and society) do not oppose IE but seem to pay most attention to the national tests that build on a strong classification of selected (respected) subjects
Macrosystem	Law and policy expects innovation education. National curriculum includes innovation education. Official evaluation procedures focus on selected subjects. C- +	The official discourses call for creative and cooperative individuals but offer an evaluation system on an individual and strongly classified subjects basis



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Figure 4 A proposal of a way to understand the interacting systems of the SYSTEM

The RD and the ID of Ingunnarskóli are by and large supportive of innovation education

Findings show that personal and professional values influence the way in which innovation education is being taught and can be seen in differences in framing.

The regulative discourse in schools seems to include contradicting notions of innovation and traditions which in turn affect the nature of the instructional discourse. In Ingunnarskóli there is an RD, a policy that is deviating from the RD that pulls towards strong classification and strong framing. The official RD is indicated through the official evaluation system that values a few strongly classified subjects. The part of framing in Ingunnarskóli regarding evaluation of IE may need to be stronger, more visible, to give students and society clear messages about what is expected of students and how it is to be assessed and so enhance their recognition and realization rules.

References

- Bronfenbrenner, U. (1979). *The ecology of human development*. Cambridge, MA: Harvard University Press.
- Chien, R., & Wallace, J. (2004). *The Use of Bernstein's Framework in Mapping School Culture and the Resultant Development of the Curriculum*. Paper presented at the AARE Conference 2004. Retrieved 10.01.2008, from <http://www.aare.edu.au/04pap/chi04732.pdf>
- Clapham, M. M. (2003). The Development of Innovative Ideas Through Creativity Training. In L. V. Shavinina (Ed.), *The International Handbook on Innovation* (pp. 366-376). Amsterdam: Elsevier Science.
- Craft, A. (2006). 'Little c Creativity'. In A. Craft, B. Jeffrey & M. Leibling (Eds.), *Creativity in education* (pp. 45-61). London: Continuum.
- Georgsdóttir, A. S., Lubart, T. I., & Getz, I. (2003). The Role of Flexibility in Innovation. In L. V. Shavinina (Ed.), *The International Handbook on Innovation* (pp. 80-190). Amsterdam: Elsevier Science.
- Haché, G. J. (2006). Developments in technology education in Canada. In M. de Vries & I. Mottier (Eds.), *International Handbook of Tehcnology Education. Reviewing the Past Twenty Years* (pp. 171-177). Rotterdam: Sense Publishers.
- Jeffrey, B., & Craft, A. (2006). Introduction: The Universalization of Creativity. In A. Craft, B. Jeffrey & M. Leibling (Eds.), *Creativity in education* (pp. 1-13). London: Continuum.
- Jóhannsdóttir, u. (2007). Spjallfrelsi. Kenningum Bernsteins beitt á rannsókn á fjarnámi. *Rannsóknir í félagsvísindum VIII*, 771-781.

- Jónsdóttir, S. R. (2005). *Ný námsgrein verður til. Nýsköpunarmennt í grunnskóla [The Emergence of a new School Subject. Innovation Education in Compulsory Schools]*. Unpublished M.A., University of Iceland, Reykjavík.
- Kostoff, R. N. (2003). Stimulating Innovation. In L. V. Shavinina (Ed.), *The International Handbook on Innovation*. Amsterdam: Elsevier Science Ltd.
- Lewthwaite, B. (2006). Constraints and Contributors to Becoming a Science Teacher-Leader. *Science Education*, 90, 331 -347.
- Macdonald, A., & Jóhannsdóttir, u. (2006). *Fractured pedagogic discourse: teachers' responses to educational interventions*. Paper presented at the European Conference on Educational Research. Retrieved 15.05.2008, from <http://www.leeds.ac.uk/educol/documents/159994.htm>
- Morais, A. M., Neves, I. P., & Fontinhas, F. (1999). Is There Any Change in Science Educational Reforms? A sociological study of theories of instruction. *British Journal of Sociology of Education*, 20(1), 37-53.
- Sternberg, R. J., Pretz, J. E., & Kaufman, J. C. (2003). Types of Innovaitons. In L. V. Shavinina (Ed.), *The International Handbook on Innovation* (pp. 158-169). Amsterdam: Elsevier Science.
- Porsteinsson, G., & Denton, H. G. (2003). The Development of Innovation Education in Iceland: a Pathway to Modern Pedagogy and Potential Value in the UK. *The Journal of Design and Technology Education*, 8(3), 172-179