Critical review

Teaching and learning in Icelandic and Science in the context of national tests in Iceland: A conceptual model of curriculum, teaching and learning

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Context

Iceland has a long standing tradition of national testing in compulsory education. The current system of final high-stakes tests has been in place since 1977, and replaced an older and different one. Tests in Icelandic and Mathematics in years 4 and 7 were added in 1996. Under the current system a large amount of statistical data about the results has been collected, but very limited research into the impact of the tests on teachers' conceptions, classroom practice and learning has taken place. In light of the paucity of such research, the aim of my study is to examine how teachers implement the National Curriculum and organise their teaching, and how students learn in the context of preparation for the tests in two subjects, Icelandic and Science. The main questions addressed in the study relate to the impact of the national tests in Icelandic and Science on the implementation of the National Curriculum, the organization of teaching and on student learning in four Icelandic compulsory schools.

Abstract*: The paper presents a conceptual model used as a theoretical framework to analyse classroom practice in Icelandic and Science in the context of national tests in Iceland. The model represents a synthesis of literature about curriculum, teachers' conceptions, pedagogical content knowledge, teaching and learning and assessment. The conceptual model comprises three main aspects of curriculum: the intended, the implemented and the attained curriculum. Each aspect includes several 'frames' or areas that can be studied separately, together or in interaction with one another. Furthermore theories of teachers' conceptions, pedagogical content knowledge and perceived self- and collective efficacy are used to analyse the possible discrepancy between the curriculum aspects and the effects of national tests on the implemented and attained curricula.*

Introduction: The Icelandic context

The Icelandic educational system is divided into four levels: Pre-school (2–6 years of age), compulsory school (6–16 years of age), upper-secondary level (16–20 years of age) and higher education level (20+ years of age). The compulsory school is a ten year school and comprises two levels: Primary level with years 1–7, and lower secondary level with years 8–10. There is, however, little distinction between the levels and most students finish their compulsory education in the same school (Ministry of Education, Science and Culture, 2002, p 31).

The compulsory school is governed by a legislation (Ministry of Education, Science and Culture, 1995) and a National Curriculum. The current National Curriculum was published in 1999, but is currently under revision and a new edition is due to take effect in 2010. The National Curriculum is highly prescriptive in terms of learning aims and objectives but gives schools a high degree of autonomy over the implementation. It comprises around 900 pages in 12 separate booklets; one providing general guidelines, and the remaining 11 for individual subjects (Ministry of Education Science and Culture, 2004).

The National Curriculum states the intended outcomes of learning in three different ways:

1. As final outcomes of each subject, stated as rather broad aims intended to be met at the end of the compulsory school.
2. As three sets of intermediate objectives to be met by the end of year 4, year 7 and year 10.
3. As learning targets for each year, called 'enabling objectives' in the curriculum guidelines (*op.cit.*).

Assessment is carried out by individual teachers and schools along with the system of national testing. Schools are required to have formal assessment procedures in place, where results are formally fed back to students and parents two or three times during the school year. At the primary level diverse assessment methods are applied, but as students grow older these give way to a more formal quantitative assessment in the form of written exams. When it comes to the lower secondary level (years 8–10 of the compulsory school), assessment is mainly quantitative, based on written examinations in every subject at least twice during the school year. The results of these exams, mainly in the form of numbered grades, are the backbone of what is fed back to students and parents, although other factors such as homework and general performance and conduct are usually taken into account to some extent.

The national tests are held in two subjects, Icelandic and Mathematics in years 4 and 7, and in six subjects at end of year 10, as a part of the final examination for the compulsory school. Since 2003 the final tests are held in Icelandic, Mathematics, English, Danish, Social studies and Science. Since 2003 the examinations are optional, at least in theory, but hold the key to enter the upper secondary schools. In the four schools in my study virtually every student takes the test in Icelandic, Mathematics and English, but participation in the other tests varies, and may go down to around 50%.

The conduct of the tests follows a strict procedure. They are composed, marked and organised by a central government organisation, the Educational Testing Institute, and are held at the same time all over the country under the supervision of officials appointed by the Ministry of Education (Úlfsdóttir, Gunnarsson, Skúlason and Björnsson, n.d.).

The national tests are high-stakes in the sense that the results are published, both for individual schools and regions, various comparisons and inferences are made from the results, not least in the media and in public discourse, about the quality of individual schools. Consequently individual schools are under pressure from parents, local governments and the public in general to perform well on the tests. The test results are seen as an indicator of professional competence, and hence individual teachers see the test results as an important criterion for professional prestige. A cut off score (grade 5 or above in each subject) has been decided as a minimum access requirement for the upper secondary schools. This is generally referred to as 'fail' or 'pass' but secondary schools offer introductory courses for students who did not reach the 'pass' score.

The tests are highly controversial. The educational authorities define them as a tool for external evaluation of schools' performance of implementing the National Curriculum, compared to other schools and the national average results. The tests are also seen as an important source of information for students, parents and secondary schools. The tests in years 4 and 7 are also intended as a means of formative assessment to assist teachers and schools in individualising teaching and learning (Ministry of Education Science and Culture, 2002, 2004). Those respondents in my study who favour the tests see them as a necessary means of control and organisation, value their role as a source of information and comparison, and emphasise the importance of a reliable, external evaluation at the end of

compulsory education. Those who oppose the tests attach a range of unfavourable consequences to them. They regard the tests as an external source of control that deprives them of professional autonomy, narrows the curriculum and limits their possibilities of individualising teaching and learning. They also report stress and anxiety among students and their families and negative impact on students' motivation for learning. Opponents of the tests also criticise their high-stakes nature, the publicity of results and myopic media coverage, focussed almost exclusively on test results rather than the quality of schooling. They also criticise the form of the tests, which is almost entirely multiple-choice, and the fact that dyslexic students have to take a reading comprehension test, as a part of the final test in Icelandic, that affects their possibility to enter secondary education (see also Geirlaugsdóttir, 2007; Sigþórsson, 2005).

Curriculum and high-stakes testing: Towards a conceptual model

There are many definitions of curriculum. Stenhouse (1975) identified it in terms of the relationship – and difference – between intention and reality. He saw curriculum not as a written document of intentions, but as an attempt to study, analyse and understand the reality in schools and classrooms, which may depart from what was intended. Kelly (2004) also warns against seeing the curriculum as a syllabus to be transmitted. He emphasises a vision of the purposes of schooling as a starting point for the curriculum, along with a justification of its content and organisation, and an awareness of the possible outcomes and effects on students. Eisner defines the curriculum as 'a series of planned events that are intended to have educational consequences for one or more students' (Eisner, 1994, p 31). Eisner also acknowledges the possibility that the reality in the classroom – the operational curriculum – may depart from what was intended. Despite some differences, these definitions all have in common the notion of curriculum as intention and reality: intentions of teaching organisation, learning activities and learning outcomes and an implementation that may depart in various ways from the original planning and intentions. It is important to note, however, that the discrepancy between the intended and the implemented curriculum is not necessarily unintentional or unplanned, but may as well result from deliberately planned differences from what was intended.

There is an extensive body of knowledge indicating the various effects of high-stakes testing on the implementation of the intended curriculum. These effects are not necessarily negative. In fact, the very idea of using high-stakes testing to hold schools accountable for results that comply to pre set standards seems to be built on the notion that such measures are effective means to improve education (Department for Education and Skills, 2005a, 2005b; Gandal and Vranek, 2001; Hess, 2003; Scherer, 2001; U. S. Department of Education, n.d.). There are, however, many who heavily criticise the standards and high-stakes testing agenda, and even regard it as counterproductive for the improvement of schooling. This criticism can be summarised as follows:

- Despite a long history of high-stakes testing eg, in the US there is little evidence for their positive effects on teaching and learning or the professional development of teachers (Berry *et al*., 2003; Henry and Opfer, 2003; Linn, 2000; Shepard, 1991; Stiggins, 1999).
- High-stakes tests tend to narrow the curriculum, marginalise not-tested subjects and curriculum areas and direct teaching to the transfer of testable surface knowledge at the expense of deep learning and active knowledge construction (Dysthe, 2004; Linn, 2000; Noble and Smith, 1994; Popham, 2001; Resnick and Resnick, 1992; Shepard, 1991).
- There is concern about the effects of high-stakes tests on low achieving students, students with learning disabilities and students from low social and economical

backgrounds (Abrams, 2004; Abrams and Madaus, 2003; Ainscow, Booth and Dyson, 2006; Darling-Hammond, 1997; Ryan and Cooper, 2004).

- High-stakes tests have unfavourable effects on student motivation and self-efficacy, especially on low achieving students (Assessment reform group, 2002; Gardner and Cowan, 2005; Harlen, 2006; Harlen and Crick, 2003).

In light of the controversy about high-stakes national testing it is important to acknowledge the complexity of the relationship between the tests and classroom practice. We have to recognise the possibility that the tests are not necessarily, in themselves, to blame for all the negative consequences attached to them. The tests are undoubtedly one of many forces that shape classroom practice, but we need to be cautious not to overlook other potential variables that have an impact on teaching and learning, even though the tests are not easily isolated from them.

To capture the complexity described above, a conceptual model that takes these issues into account would be a useful tool. A basic model of that kind is presented in the TIMMS (Trends in International Mathematics and Science Study) assessment framework, organised by the International Association for the Evaluation of Educational Achievement (IEA) and expanded in an OECD document from 2005 (Figure 1) (Mullis *et al*., 2007; OECD, 2005). The TIMMS model has three main aspects: The intended or the official curriculum, the implemented curriculum, which refers to how the intended curriculum is carried out in the classroom, and the attained curriculum, which represents what students actually learn and how they think about learning. It should be noted from the outset that the last aspect, how students think about learning, is also a condition of learning and has to be developed within the implemented curriculum. This is to some extend elaborated in the following section about the implemented curriculum. The OECD model further suggests that each of the three curriculum aspects is dependent, first of all on a particular context or conditions, and secondly on certain antecedents that play a part in determining the context within which each aspect of the curriculum takes place.
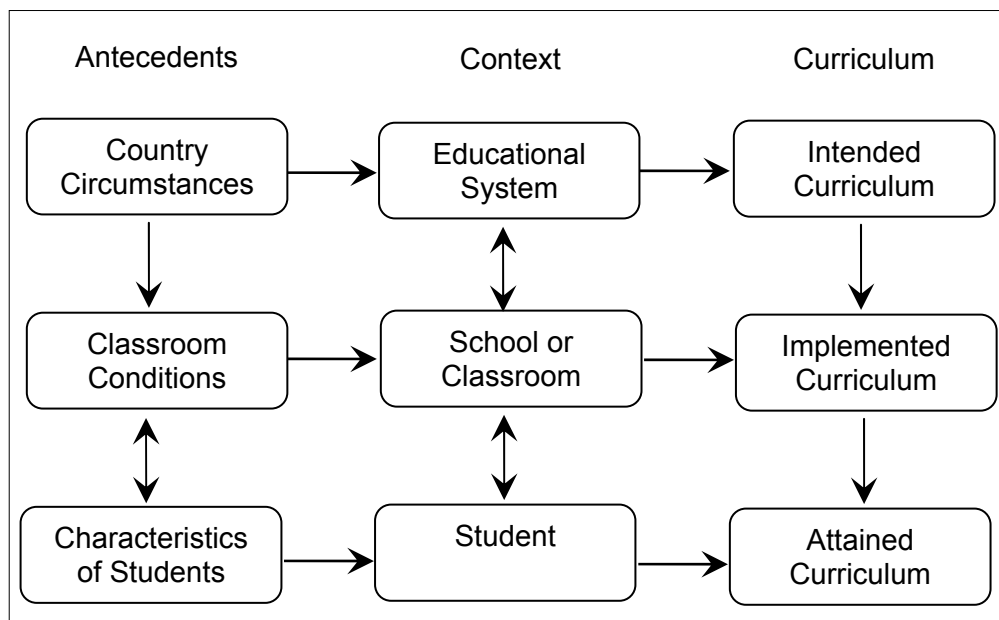

Figure 1. The curriculum process (OECD, 2005)

A conceptual model to analyse teaching and learning

The model of the curriculum process in Figure 1 is helpful, as far as it goes, but to understand more fully the complexity of what actually goes on within each of the main curriculum aspects a further elaboration is needed. An elaborated version of the model is offered in figure 2. It has the same basic aspects of curriculum: the intended, the implemented and the attained. Additionally it takes into account the aspect of teachers: their conceptions, pedagogical content knowledge, and perceived self and collective efficacy. The elaborated model is further explained in the following sections.

The intended curriculum and teachers

The backbone of the intended curriculum is the National Curriculum, along with various other regulations, issued by educational authorities. The national tests also belong here, as the primary means of the authorities to evaluate the implementation of the National Curriculum and the performance of the compulsory school sector generally. The intention is, of course, that the prescriptions of the National Curriculum are followed through in the classroom, but as established in the previous section of this paper, there is little guarantee for that.

We have to bear in mind that the implementation of the intended curriculum is filtered through the teaching force of schools and shaped by the conceptions, decisions and arrangements of teachers. In the model three elements are suggested to analyse that:

- *Teachers' conceptions*: Teachers' own beliefs and ideas about themselves as teachers, the nature of teaching and learning, the purposes of learning and what should be the outcomes of learning (Brown, 2002, 2004).
- *Pedagogical content knowledge*: The blending of content knowledge and pedagogy into an understanding of how teaching of subjects is organised and carried out in a way that is adapted to the diverse interests and abilities of learners (Grossman, Schoenfeld and Lee, 2005; Shulman, 1987).
- *Self-efficacy beliefs*: Teachers' conviction or belief in their own ability to influence how well students learn or perform (Bandura, 1994). Another important aspect of efficacy is perceived collective efficacy, which refers to the collective judgement of teachers as to what extent a school, or a department as a whole can organise its practice to have positive effects on students (Goddard, Hoy and Hoy, 2004).

It is suggested here that these elements are indispensable to understand the transfer from the intended to the implemented curriculum and the discrepancy that often exists between those two curriculum aspects.
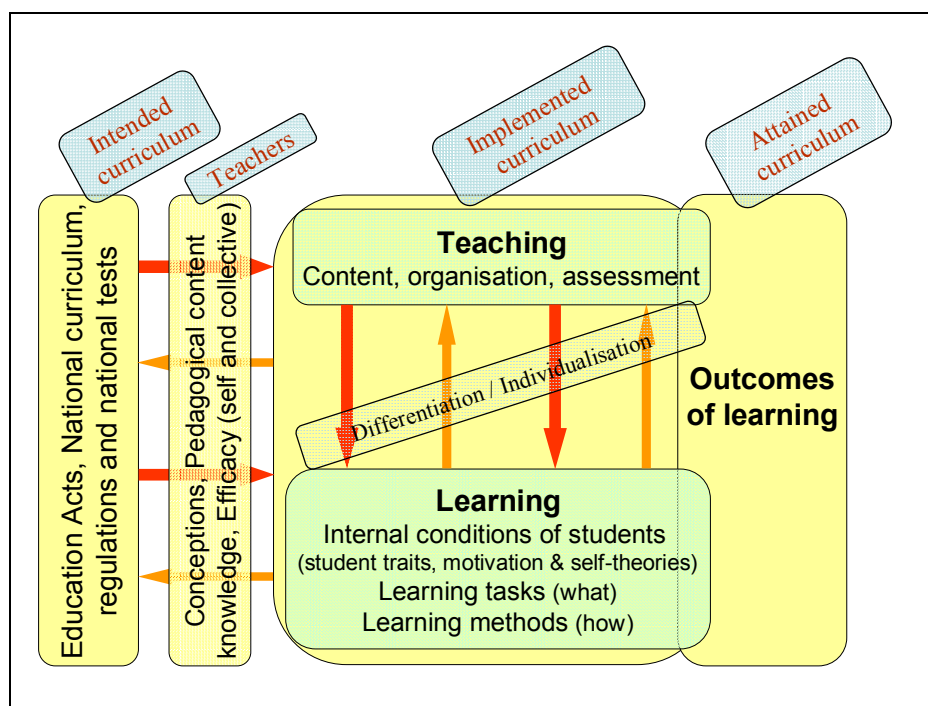
Figure 2. A conceptual model of teaching and learning

The implemented curriculum

The implemented curriculum is realised along two dimensions: Teaching and learning. The model also suggests that decisions and arrangements within those two dimensions are made within several 'frames' or elements that can be studied separately, together or in interaction with one another (Macdonald, 2002; Trigwell and Prosser, 2005). It is proposed here that the teaching dimension is analysed in terms of three main elements:

- The curriculum content – WHAT teachers choose to deal with.
- The teaching organisation – HOW the actual teaching is carried out.
- Assessment.

Assessment is a vital element here because of what some authors have termed as the 'wash- back' effect of assessment (Dysthe, 2004; Rea-Dickins, 2007). This means that assessment tends to have direct influence on both the curriculum content and the teaching organisation that leads up to it. Two further sources underline the notion of 'backwash'. The first is Lorrie Shepard (2000), who advocates that there must be a harmony between our conceptions and actions regarding three aspects of teaching: curriculum content, teaching organisation and assessment. If not, conflicting ideas and actions are likely to stifle the development of curriculum and teaching. The second source is a widely cited chapter by Laureen and Daniel Resnick (Resnick and Resnick, 1992). They conclude that: You get what you assess. You do not get what you do not assess, and therefore assessment has to be built towards what we want teachers to teach. In other words, we have to assess what we value instead of valuing what we assess.

A prominent feature of the Icelandic National Curriculum is a requirement that teaching and learning is adapted or differentiated to the diverse needs of students. To analyse this element of the implemented curriculum the model draws on the work of Carol Ann Tomlinson and Caroline Cunningham Eidson (Tomlinson, 1999; Tomlinson and Eidson, 2003). Tomlinson and Eidson define differentiated teaching as "a systematic approach to planning curriculum and instruction for academically diverse learners … [and as] a way of thinking about the classroom

with the dual goals of honouring each student's learning needs and maximising each student's learning capacity" (Tomlinson and Eidson, 2003, p 3).

According to Tomlinson and Eidson teachers have to differentiate five teaching elements according to three sets of student traits, in order for differentiation to take place. These elements are:

- *Content*: What is taught and how students are given access to relevant information and ideas.
- *Process*: How students come to attain knowledge, understanding and skills.
- *Products*: How students demonstrate their knowledge, understanding and skills.
- *Affect*: How students are made feel safe and secure and given a sense of belonging to the classroom community.
- *Learning environment*: The way the classroom feels and functions.

The three traits or characteristics of students to which the teaching elements need to be adapted are:

- *Readiness*: How ready and well prepared each student is to engage in the learning process.
- *Interest*: What each student enjoys learning, thinking about and doing.
- *Learning profile*: In what way each student likes to engage in the learning process.

In addition to student traits, two further and closely related sets of internal conditions of students are highlighted in the model: motivation for learning and self-efficacy. To explain the role of assessment in motivation for learning the model draws mainly on the work of the British Assessment Reform Group (Assessment reform group, 2002) and professor Wynne Harlen (Harlen, 2006). Harlen (op.cit. pp 64–67) maintains that internal motivation is influenced by a number of interconnected factors that are to a great extent contingent on classroom conditions, not least assessment. These factors are:

- *Interest*: The result of a pleasant interaction between an individual and certain aspects of the environment.
- *Goal orientation*: How learners see the goals of engaging in a learning task and whether they see them as learning (mastery) goals or performance (ego) goals.
- *Locus of control*: To what extent learners see the cause of their success or failure to be under their own control or controlled by others.
- *Self-esteem*: How confident students feel as persons and as learners.
- *Self-efficacy*: Student's beliefs about their own capabilities to succeed and control events that affect their lives.
- *Self-regulation*: Students' will and ability to consciously control their attention and actions in ways that brings about learning, and the ability to select and use successful strategies for learning and evaluation of success. In that sense self-regulation is closely related to metacognition, the knowledge and understanding of ones own cognition and learning (Anderson *et al*.2001; McGregor, 2007) and the notion of deep learning (Entwitsle, 2000).

The notion of students' self-efficacy and self-theories draws mainly on the work of Albert Bandura (Bandura, 1994, 1997) and Carol Dweck (2000, 2006). Bandura defines perceived self-efficacy as people's beliefs about their own capabilities to succeed and control events that affect their lives. Dweck advocates the idea of two different mindsets or self-theories: a fixed mindset (a theory of fixed intelligence) and a growth mindset (an incremental theory of intelligence). People with the fixed mindset believe that their abilities are a constant that can neither be changed nor cultivated. As a result if they feel they cannot do something, they

assume it is not worth trying. Likewise, they are reluctant to jeopardise a self-image of good abilities by engaging in something challenging that might fail. People with the growth mindset, on the other hand, believe that their abilities can – and in fact have to – be cultivated and matured through their own efforts. It is important to recognise here that both efficacy and mindsets have a direct bearing on motivation and can be directly affected by the teaching and learning organisation of schools and classrooms (Dweck, 2006).

It needs to be emphasised here that teachers have no direct control over those internal conditions and can not experience them themselves. They can, however, have an impact on the conditions and in fact have an obligation to try to understand and assess them in order to be able to differentiate their curriculum content and teaching arrangements accordingly.

The second and the third areas of the learning dimension of the implemented curriculum (teaching organisation and assessment) relate to the nature and organisation of the learning tasks the pupils are given, how the pupils are supposed to engage in them and how the outcomes of their learning are assessed. Here it is obvious that teachers have a choice and a direct control over the tasks they give their pupils, although they do not have any direct control over how the students respond to the tasks and engage in their work.

The attained curriculum

The last aspect of the conceptual model – the attained curriculum – can be realised in a number of ways. First, it needs to be reiterated that there is not always a clear-cut distinction between the implemented and attained curricula. For example it can be argued that students' motivation and self-theories are outcomes of the teaching and learning process, although it is located in the implementation part of the model, as an integral part of the learning process and an important condition for successful learning (Dweck, 2006; Harlen, 2006).

Secondly the attained curriculum reflects what areas of the intended curriculum are actually presented to students or whether some of them are marginalised in classroom work. A useful concept here is what Elliot Eisner (1994) terms as the null-curriculum, the curriculum that "does not exist" (Eisner, 1994, p 97). The null-curriculum represents what is NOT taught in schools, either as a result of an explicit choice of those who construct the curriculum, or as a consequence of an implicit (or hidden) curriculum or the 'wash-back' effects of testing.

Thirdly we could ask how much of the implemented curriculum and what kind of knowledge and skills pupils attain. Again there are various ways to realise this, but five conceptions of learning seem to be useful for analysis:

- Constructive learning, metacognition and thinking skills (Anderson *et al.*2001; McGregor, 2007; Resnick and Resnick, 1992).
- Deep and purposeful learning (Entwistle, 2000).
- Higher order thinking skills and cognitive processes (Anderson *et al.*2001; Bloom, Engelhart, Furst, Hill and Krathwohl, 1956).
- Inclusive education (UNESCO, 2005).
- Social and life skills and moral responsibility.

Taken together these components form a picture of what most authors of the day advocate as the imperative outcomes of schooling and the future challenges of education: Deep, constructive learning where students engage in tasks that require higher order thinking and nurture metacognition, thinking skills and social responsibility, and are adapted to the diverse learning needs of students.

Conclusion

There are several ways to define curriculum and consequently there are different ways to analyse it. In this paper the curriculum is conceptualised as a dynamic process of 1) curriculum intentions, 2) implementation, shaped by teachers' conceptions, pedagogical content knowledge and efficacy, and external forces such as high-stakes national testing and accountability, and 3) students' attainment as a direct consequence of the implementation.
Whilst this conceptual model is presented here as a useful tool to analyse and understand the impact of high-stakes national tests on teaching and learning, the difficulty in isolating the tests from other forces that shape the implemented curriculum is also recognised. However, where high-stakes tests are a prominent part of assessment of individual students and data gathering about the general performance of the school system it is vital to accept that challenge, and make an effort to understand the tests' role and impact in the lifeworld of the classroom – and in fact irresponsible not to do so.

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