The *Journal of Mathematics Education at Teachers College* is a publication of the Program in Mathematics and Education at Teachers College Columbia University in the City of New York.

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Aims and Scope

The *JMETC* is a re-creation of an earlier publication by the Teachers College Columbia University Program in Mathematics. As a peer-reviewed, semi-annual journal, it is intended to provide dissemination opportunities for writers of practice-based or research contributions to the general field of mathematics education. Each issue of the *JMETC* will focus upon an educational theme. The themes planned for the 2012 Fall-Winter and 2013 Spring-Summer issues are *Equity* and *Leadership*, respectively.

JMETC readers are educators from pre-K-12 through college and university levels, and from many different disciplines and job positions—teachers, principals, superintendents, professors of education, and other leaders in education. Articles to appear in the *JMETC* include research reports, commentaries on practice, historical analyses, and responses to issues and recommendations of professional interest.

Manuscript Submission

JMETC seeks conversational manuscripts (2,500-3,500 words in length) that are insightful and helpful to mathematics educators. Articles should contain fresh information, possibly research-based, that gives practical guidance readers can use to improve practice. Examples from classroom experience are encouraged. Articles must not have been accepted for publication elsewhere. To keep the submission and review process as efficient as possible, all manuscripts may be submitted electronically at www.tc.edu/jmetc.

Abstract and keywords. All manuscripts must include an abstract with keywords. Abstracts describing the essence of the manuscript should not exceed 150 words. Authors should select keywords from the menu on the manuscript submission system so that readers can search for the article after it is published. All inquiries and materials should be submitted to Ms. Krystle Hecker at P.O. Box 210, Teachers College Columbia University, 525 W. 120th St., New York, NY 10027 or at JMETC@tc.columbia.edu.

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Call for Papers

The "theme" of the fall issue of the *Journal of Mathematics Education at Teachers College* will be *Equity*. This "call for papers" is an invitation to mathematics education professionals, especially Teachers College students, alumni and friends, to submit articles of approximately 2500-3500 words describing research, experiments, projects, innovations, or practices related to equity in mathematics education. Articles should be submitted to Ms. Krystle Hecker at JMETC@tc.columbia.edu by September 1, 2012. The fall issue's guest editor, Mr. Nathan N. Alexander, will send contributed articles to editorial panels for "blind review." Reviews will be completed by October 1, 2012, and final manuscripts of selected papers are to be submitted by October 15, 2012. Publication is expected by November 15, 2012.

Call for Volunteers

This *Call for Volunteers* is an invitation to mathematics educators with experience in reading/writing professional papers to join the editorial/review panels for the fall 2012 and subsequent issues of *JMETC*. Reviewers are expected to complete assigned reviews no later than 3 weeks from receipt of the manuscripts in order to expedite the publication process. Reviewers are responsible for editorial suggestions, fact and citations review, and identification of similar works that may be helpful to contributors whose submissions seem appropriate for publication. Neither authors' nor reviewers' names and affiliations will be shared; however, editors'/reviewers' comments may be sent to contributors of manuscripts to guide further submissions without identifying the editor/reviewer.

If you wish to be considered for review assignments, please request a *Reviewer Information Form*. Return the completed form to Ms. Krystle Hecker at hecker@tc.edu or Teachers College Columbia University, 525 W 120th St., Box 210, New York, NY 10027.

Looking Ahead

Anticipated themes for future issues are:

Fall 2012	Equity
Spring 2013	Leadership
Fall 2013	Modeling
Spring 2014	Teaching Aids

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Assessment in Finnish Schools

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Fashion Institute of Technology

The Finnish National Board of Education has been publishing guidelines for the evaluation of student learning in the comprehensive school since the 1970s. This evaluation is two-fold: 1) during school it guides and supports students along their academic paths and 2) at the conclusion of the comprehensive school it expresses each student's level of proficiency to the larger community. The Finnish educational authorities conduct sample-based assessments, which are used as a basis for program improvements. They do not, however, endorse high-stakes, total cohort testing. Instead of external measures of accountability, the emphasis is on trust.

Keywords: Finland, Finnish schools, Finnish National Board of Education, mathematics education, assessment, testing.

Introduction

Much has been written about the Finnish school system and its excellent performance in recent international assessments (see, e.g., OECD, 2010). Finland is now seen as a leader in education, and the reasons for its success have been explored in the literature (e.g., Sahlberg, 2011; Välijärvi et al., 2007; Kupari & Välijärvi, 2005). This article focuses not on the international comparisons, but rather on issues of national concern in Finland. Since the 1970s, the Finnish National Board of Education (*Kouluhallitus* prior to 1991, *Opetushallitus* since then) has been publishing guidelines for student assessment. The first part of the article sheds light on how Finnish teachers are instructed to evaluate student learning. The second part gives a brief overview of national assessments of mathematics education in Finland. Throughout the article we focus on assessment during the comprehensive school (*peruskoulu* in Finnish) i.e. grades 1 through 9.

Student Assessment

In Finland, assessment at the level of the student is seen as serving two major functions: 1) guiding and supporting learning and 2) expressing the level of proficiency (Opetushallitus, 2004, 1999). The former includes not only semi-annual report cards, but also frequent and varied written and oral feedback during the semester. This type of guidance is crucial throughout the learning process as effective feedback helps students focus on and develop their problem areas. On the other hand, quantitative proficiency level indicators are of particular significance at the conclusion of the comprehensive school. The set of numerical grades in the ninth-year diploma is used to determine which schools students can attend after that year. This dichotomy was not always recognized, however. In what follows, we give a historical glance at how the Finnish educational authorities have viewed the assessment of students.

The foundations of the Finnish comprehensive school were laid in 1970 (Kouluhallitus, 1970a and 1970b). These early documents reflect a deep societal commitment to an egalitarian system of education; all Finnish children were to be given an opportunity to obtain a quality education for free. The system started taking shape in the 1970s and it has been evolving ever since. Updated national guidelines have been issued in 1985, 1994, 1999, and 2004. Strictly speaking, the 1970 documents remain the only national curricula as the subsequent ones contain only curricular frameworks that municipalities and schools flesh out as they best see fit. However, the latest document goes into more detail about the curriculum than the other updates.

The Finnish National Board of Education offers guidelines for student assessment. These guidelines have changed significantly over the years (Opetushallitus, 2011a). When the comprehensive school system was established in the early 1970s, teachers were instructed to grade students using their relative ranking in the class. A certain proportion of students would get the best grades, and so on. The two aforementioned functions of student assessment were not recognized. Nor were they in 1985, but it was decided then that students should be graded solely on their own merits and should not be compared to their classmates. Now the grades would be based on national and regional learning objectives. Each student was to be evaluated against these objectives in accordance with their own talents and progress. This was rather vague and caused problems when students were applying to schools after the comprehensive school as a grade could mean different things depending on the school and the individuals involved. In 1994 the grading guidelines were further blurred by a decentralizing move to less national control over education. Now the learning objectives would

be decided upon locally, which served to create further grading inconsistencies between schools. The national assessment committee was only half-joking when they noted in 1996 that this was an "absolute-relative-subjective mixed model of assessment" (Opetushallitus, 2011a). A new set of guidelines was written only five years later.

The Board of Education made two important changes in 1999. First, the two major functions of student-level assessment—guiding and expressing proficiency—were identified; grading *during* comprehensive school was to be thought of as separate from grading done *at the end* of ninth grade or when a student transfers between schools. The purpose of evaluation during school is to guide and support students on their academic paths. Teachers are asked to provide their students with constant feedback in various ways; the current mixed-method day-to-day assessment includes diagnostic, formative, performance, and summative forms of evaluation (Sahlberg, 2011, p. 126). The numerical grades in the final diploma communicate to the larger community how far the student has come in nine years. The 1999 document calls for numerical evaluation in the eighth grade at the latest, but most schools start giving numerical grades starting in the third or fourth year of the comprehensive school (Mikko Sani, personal communication, January 20, 2012). Before that, report cards contain only qualitative commentary.

The second important change was the start of self-evaluation. Finnish students are now expected to be a part of the assessment process. The goal of self-evaluation is to support the development of self-awareness and to cultivate better studying habits. As their self-evaluation skills improve, the students become more aware of their progress toward set goals. They also become better at setting these goals and controlling their own learning process. In order for students to learn how to evaluate themselves, the teacher needs to set a good model as an evaluator (Opetushallitus, 1999, 2004).

The final diploma at the conclusion of the comprehensive school plays a significant role in the academic career of Finnish students. The numerical grades in that diploma reflect their work over the nine years. In order to standardize the grading process, and thus provide equal opportunities for all students after comprehensive school, a set of criteria for grading was created as part of the 2004 document. A running theme entitled "8 = *hyvä*" ("8 = good") offers a rubric for evaluation for grades 1 through 9 in all subjects. The numerical grading scale in the Finnish schools goes from 4 ("unsatisfactory") to 10 ("excellent"). The lowest passing grade is a 5. All mandatory subjects are graded numerically in the final diploma, but some electives may be evaluated qualitatively throughout (Opetushallitus, 2004, p. 269).

Finnish teachers spend less time in the classroom than teachers in most other countries, which gives them more time to assess their students' learning (Sahlberg, 2011, p. 66). Much of their time is spent communicating with the students and their parents about evaluations and expectations. This communication is seen as an important part of the assessment combination (Opetushallitus, 2011b).

Finland places great value on special education and the early detection of learning problems. Currently almost a third of the children in comprehensive schools are receiving some type of special education at any given time, and almost a half of the graduates of those schools have received special education at some point in their nine years (Sahlberg, 2011, p. 47). Clearly special education is not really so special anymore. The Finnish system strives to prevent problems from happening while many other systems are stuck trying to repair them. This focus on special education is also reflected in assessment. If a student has studied a subject according to a customized curriculum to fit his or her needs, the final evaluation may be qualitative (Opetushallitus, 2004, p. 270). Also, the evaluation for such a student is to be done according to his or her personal goals and progress, not the criteria set forth in the national guidelines (p. 266).

National Assessments

Unlike in the US and many other countries, total cohort assessments and other external accountability measures are not part of educational practice in Finland. The Finns do not carry out any assessments that include all students, such as the high-stakes examinations held in many US states. According to Sahlberg (2011), the term *accountability* is nowhere to be found in Finnish educational policy discourse (p. 125). The National Board of Education does commission studies that monitor the state of mathematics education in the country, but these studies have no direct consequence to individual students or possible sanctions to schools. Furthermore, these studies are based on samples that generally include about 10% of the cohort[1]. This section highlights some of the national assessments of Finnish mathematics education over the past decade and a half.

Reports are available for eight major assessments of mathematics education commissioned by the Finnish National Board of Education. Ninth-graders were targeted in four consecutive studies held every other year from 1998 to 2004. The focus was on third-graders in 2005 and sixth-graders in 2000, 2007, and 2008. The same schools and, for the most part, the same students were involved in 2005 and 2008, which produced data for a longitudinal survey.

Opetushallitus (2011c) summarizes the findings from the four ninth-grade studies. The studies were all similar in nature. They included 25 to 42 multiple-choice questions

[1] Schools that were not chosen to participate may obtain the tests so they can benchmark their performance.

to be answered in 30 to 57 minutes. Each study also included 6 to 8 longer, open-answer problems with 45 to 90 minutes to solve them. The 2004 study asked the students to solve 12 of the multiple-choice problems without writing anything down. Some of the problems were repeated in each test. The areas covered include arithmetic, geometry, statistics, functions, and algebra. Included in the problems are several calculations with percents. Attitudes toward mathematics were measured with Likert-scale questions.

Based on the four studies, the overall level of mathematics proficiency of the Finnish ninth-graders is good. The results exhibit only slight variations between studies. In each study, the highest average scores were in arithmetic and the lowest in geometry. The problem-solving skills of the students increased significantly over the six-year span, possibly due to the LUMA-project (see below). The between-school differences are rather small; explained variation due to choice of school was at most 10%. There were no significant regional differences; however, schools in rural areas did slightly worse than those in cities and towns. No significant differences were found between Finnish and Swedish speakers.

In each study, boys performed slightly better in all areas of the multiple-choice test except algebra. Girls outdid the boys in the problem-solving section in 2000, but in other years there were no significant differences. The largest difference in favor of boys was in the section on mental calculations. Boys had more favorable attitudes towards mathematics in general. The difference shows especially in self-confidence. Not surprisingly, better attitudes correlate with better test results. It is interesting to note that the girls' scores were more homogeneous than the boys in all of the four studies. According to Mattila (2005), a boy needs on average 4% more mathematical knowhow to get the same grade as a girl. Here are some possible explanations: Girls may work more diligently in school and do more homework, both of which are easily recognized by the teacher. It may also be that girls receive more positive reinforcement through grades in order to keep them interested in mathematics for future studies. In particular, female teachers demand more of boys (p. 111).

The LUMA (*LUonnontieteet ja MAtematiikka* [natural sciences and mathematics])-project in 1996 to 2002 was a nationwide endeavor to improve the teaching and learning of science and mathematics through innovation. Professional development opportunities, collaborations between schools, and new learning materials were incorporated within a network 270 schools nationwide (Opetushallitus, 2010). Mattila (2005) reports that in the 2004 national assessment the schools that were involved in the LUMA-project performed significantly better than those that did not take part in it. She projects that the effects of LUMA may increase further in the years after 2004 as the students have been going to LUMA-schools for longer (p. 146).

Niemi (2007) reports on a study of sixth-graders. The findings are similar to the studies of ninth-graders, although in sixth grade, girls were slightly better than boys in geometry. As before, if a student likes being in school and is not bullied, he or she is likely to do better in the exam. In this study, Finnish-speakers performed significantly better than Swedish-speakers, but once again the regional differences were small. The choice of textbook had a significant impact on test scores; the 6.4% of the students that were using a book called *Matikkamatka* had significantly higher test scores and better attitudes toward mathematics than the students who used any of the other books. Users of *Laskutaito*—who made up 76.6% of the sample—had the second highest scores.

The longitudinal study by Niemi & Metsämuuronen (2010) has yielded valuable information. As before, the findings were good overall, and less than 5% of the participants had low scores. Geometry was again the area that needed the most improvement. This time statistics and probability had the highest average scores. Scores on mental calculations were significantly higher than those on open-answer items. Students gained about 30% more mathematical knowhow from third to sixth grade. The attitudinal findings were similar as in the aforementioned studies. Again the Finnish-speakers did better than those students who speak Swedish as their home language. Alarmingly, the variations in Swedish-speaking schools are rather large. By sixth grade, the worst Swedish-speaking schools can be 2–3 years behind the best ones in geometry, for example. Immigrant students have a significant gender gap, and 33% of immigrant girls had low scores. It was also found that special education is not always targeted to the right students. Textbooks were again found to have a correlation with test scores. However, in this case, it was *Laskutaito* whose users performed the best. *Matikkamatka*-users were second.

Conclusion

The main function of assessment at any level is to gauge how well goals are being met. In Finland, educational goals are set by the National Board of Education, regional authorities, municipalities, teachers, and the students themselves[2]. Assessments are conducted by all of the above. This article touches on three of the five levels: national, teacher, and student.

Since the inception of the comprehensive school in the 1970s, the Finnish National Board of Education has set guidelines for student assessment. The current format calls for mixed-method assessment that includes diagnostic, formative, performance, and summative forms of evaluation (Sahlberg, 2011, p. 126). The day-to-day

[2] The European Union also sets educational guidelines. See more at http://ec.europa.eu/education/index_en.htm.

classroom assessment is distinguished from the numerical assessment at the conclusion of the nine-year comprehensive school. Students are taught how to set goals for themselves and to evaluate their achievements.

It is no longer a secret that Finnish teachers are well-respected and highly trained. The teaching profession is appealing to young Finns allowing the teacher training programs to select the future educators carefully; only approximately 10% of applicants are admitted to teacher training programs (Sahlberg, 2011, p. 73). The best consequence of this is the *trust* that is earned by and bestowed upon the Finnish teachers. The parents, the administration, and the larger community trust that the teachers do what is best for the students. This in turn means that there do not have to be any external accountability measures, such as high-stakes testing, to make sure the teachers are really teaching. And this means no "teaching to the test." Sahlberg cites this as one of the main reasons for Finland's success. There are no anxiety-producing standardized tests that take all the joy from learning. In Finland, students are allowed to learn through curiosity and creativity. They become adept at critical thinking, analysis, and problem-solving rather than working through sets of problems geared for standardized tests. Furthermore, it is the spirit of collaboration—not competition—that drives the Finnish educational system.

The Finnish comprehensive schools are not ranked. Putting schools for children in order does not sit well with the Finnish way of thinking. Furthermore, because the regional and between-school differences are so slight, any such ranking would give a misleading picture of the Finnish system, where all the schools are relatively strong. In contrast, the gymnasiums (*lukio* in Finnish), the upper secondary institutions that about half of the students attend after ninth grade, are ranked. Students in all the gymnasiums take the same final exams at the end of the three-year school, and the average exam results from each school are published. This naturally makes some gymnasiums more desirable than others, which serves as encouragement for many students to do the best they can in comprehensive school. The national grading rubric (Opetushallitus, 2004) was conceived to make the resulting competition more just. It should be mentioned that the differences in the gymnasiums are rather small, and only the top schools have very high admission requirements. However, admission to any of the eight teacher training programs is highly competitive and, paradoxically, it is these programs that produce the teachers for the non-competitive Finnish schools.

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