

Variations in Teacher Preparation Evaluation Systems: International Perspectives

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Abstract

The purpose of this paper is to review how countries other than the United States assess teacher preparation program quality. The key idea is to clarify how existing systems—accreditation, state program review, federal approaches, ratings or rankings, and program self-study, among others—map against the common purposes of evaluation (1) to provide diagnostic information for program self-improvement, (2) to provide accountability data for external monitoring, and (3) to provide consumer information. We begin by briefly describing the global context for evaluation of teacher preparation programs and provide an overview of institutional mechanisms that are used in other countries to evaluate these programs, including a brief description of how specific evaluation systems are designed or carried out, their strengths and weaknesses, and possible purposes and uses of data resulting from these systems. We then look at specific country cases. The paper attempts to address applicable issues, critiques, and lessons learned from other countries' experiences that are relevant to evaluating teacher preparation in the United States. This paper is part of a larger project seeking to understand the range of institutional mechanisms for evaluating U.S. teacher preparation program quality, including their intended purposes and uses, and the evidence used for and emerging from such evaluations.

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1. Introduction

Our task was threefold, to (a) review how other countries assess teacher preparation program quality; (b) clarify how existing systems design and use program evaluation results (program self-improvement, external monitoring, consumer information); and (c) suggest how what we have learned from other countries can help develop a framework for innovation in teacher preparation program evaluation in the United States.

Sources of Information

The literature search was complex because of definitional problems (e.g., confusion between teacher evaluation and teacher education evaluation). For this reason we decided to use the following terms: “teacher education,” “teacher preparation,” “teacher training,” and “higher education” paired with “quality assurance,” “program evaluation results,” “program effectiveness,” “program monitoring,” “program improvement,” “accountability,” and “evidence-based.” In addition the use of the term “Quality Assurance in Teacher Education” helped find comprehensive reports of efforts across countries. Quality Assurance is an “all-embracing term referring to an ongoing, continuous process of evaluating (assessing, monitoring, guaranteeing, maintaining and improving) the quality of [teacher] education systems, institutions or programmes” (Eurydice, 2006, p. 74).

We used four main sources of information for this paper: (a) research articles reporting results from program evaluation in teacher education programs published in peer-reviewed journals in the last 15 years; (b) research reports from quality assurance and similar agencies found on the Web (e.g., Eurydice’s Quality Assurance in Teacher Education in Europe 2006 report); (c) a survey developed for this purpose sent to selected countries; and (d) results from the 17-country International Association for the Evaluation of Educational Achievement (IEA) empirical study on the outcomes of preservice mathematics teacher education known as the Teacher Education and Development Study in Mathematics (TEDS-M).

- (a) *Research articles reporting results from program evaluation in teacher education programs published in peer-reviewed journals in the last 15 years.* To date we have searched for literature in 12 separate databases including the broad fields of education, management, business, and law: JSTOR, ERIC, ProQuest, Springerlink, Education Full Text, SAGE, OECD iLibrary, Google Scholar, Educational Administration Abstracts, Legaltrac, HeinOnLine, and Business Full Text. We also systematically used multiple combinations of descriptors to capture

- sources using varying terms related to “quality assurance.” This search yielded few empirical journal articles on teacher preparation (TP) evaluation. Nevertheless, we were able to obtain numerous sources that describe and explain the complex ways several countries (at least 18) seek to ensure TP quality and few research studies that evaluate how well these quality assurance (QA) policies are working as expected.
- (b) *Research reports from quality assurance and similar agencies found on the Web (e.g., Eurydice’s Quality Assurance in Teacher Education in Europe 2006 report).* This is a necessary and useful strategy because many of the systems for quality assurance of higher education—which typically also comprehends teacher education—require public sharing of the results. Using the names of the particular countries of interest, plus terms such as those described above, we were able to find websites from the following organizations and collect relevant information often in the form of summaries with comparisons across countries or from individual country systems: International Network for Quality Assurance Agencies in Higher Education (2013), Japan Institute for Higher Education Evaluation (JIHEE, 2013), Ontario Universities Council on Quality Assurance (OUCQU, 2010), Tripartite Liaison Committee of Hong Kong (2009), Norwegian Agency for Quality Assurance in Education (NOKUT, 2011), Organization for Economic Cooperation and Development (Kris, 2005), Council of Europe (2009), Finnish Higher Education Evaluation Council (2013).
- (c) *A survey developed for this purpose sent to selected countries.* The survey designed by the authors had the purpose to obtain up-to-date information from the large network of colleagues we have in countries considered relevant for the purpose of this study. These countries were chosen based on a combination of criteria including the countries’ performance on international education assessments such as Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA) and the authors’ access to professional networks in each country. The questionnaire included in Appendix 5 asked about practices and results of program evaluation in teacher education in the science, technology, engineering, and mathematics (STEM) fields with particular emphasis on mathematics and science. The survey was sent electronically to mathematics and science educators in the following countries: Bulgaria, Brazil, Canada, Chile, China, Cyprus, Czech Republic, Finland, France, Germany, India, Ireland, Israel, Italy, South Korea, Malaysia, Mexico, Norway, Poland, Russia, Slovakia, Singapore, Spain, Switzerland, and Taiwan.
- (d) *Results from the 17-country IEA empirical study on the outcomes of preservice mathematics teacher education known as TEDS-M.* The TEDS-M 2008 is a comparative study of teacher education with a focus on the preparation of teachers

of mathematics at the primary and lower secondary levels. The study was carried out under the aegis of the IEA, a consortium of research institutions in 60 countries. TEDS-M paid particular attention to the links between teacher education policies, practices, and outcomes. The study which among other measures assessed the mathematics teaching knowledge expected of teachers at the moment of finishing their teacher education programs provides a unique source of information about program approaches and characteristics.

2. Literature Review: Quality Assurance in Teacher Education

At the national level, practices of accountability and quality assurance in higher education appear to be increasing and strengthening across the globe. Different authors attribute this change to various global and local forces. For instance, Hou (2011) notes the influence of globalization and marketization that urges countries and their higher education institutions to reach international standards. In this context, competition among institutions and efforts to meet international standards are necessary to maintain key positions in the international community (Chong and Ho, 2009; Kim, 2000). In most countries the public is also interested in holding higher education institutions to high standards in order to maintain the value of their credentials (Hou, 2011). University programs, then, strive to ensure the legitimacy of, or “value added” to, their programs (Chong and Ho, 2009). Perhaps not surprisingly, the World Bank (2007) offers a more muted rationale for increasing accountability and quality assurance for higher education around the world; colleges and universities are merely complying with regulations and professional norms, and they are also genuinely interested in improving their quality.

No matter the cause or reason for an institution’s decision to accept or engage in quality assurance, there seem to be several common assumptions among policy makers regarding assurance practices. One assumption is that, in general, “quality assurance” means the same thing in every national context. It acts as an umbrella term that covers a host of practices including internal and external evaluations, accreditation, site visits, reports, and so on. Two additional assumptions are the notion of a common purpose and that expertise exists within institutions. That is, most quality assurance policies imply that there is broad support for proposed accountability measures and that these measures will succeed in part because of the work of knowledgeable university professionals. Related to these are assumptions in some countries that institutions of higher education are communities open to assessment and willing to engage in a dialogue to ensure quality (Jussila and Saari, 2000). Finally, quality assurance policies often assume that evaluations are conducted reliably and objectively and that competition among institutions (and nations) leads to improved quality (Kim, 2000).

In the located literature we find very similar processes of quality assurance across institutions in nearly every region of the world. Most follow a process that includes an external review which evaluates an institution’s progress in relation to a required internal self-evaluation. The external review is conducted by a panel of experts assembled by a recognized body (e.g., accreditation or government agency) and may include site visits and conversations with key institutional and community stakeholders. Internal evaluations are typically conducted annually and external evaluations every 3–7 years.

How this information is subsequently used by each institution is rarely identified in the literature. Some suggest that external monitoring does not seek to improve quality in

learning; it only meets accountability requirements (Kris, 2005). In 2005 Kris suggested that changes in learning outcomes had not been linked to quality assurance systems; at that time Portugal emerged as one of the few countries in which the evaluation findings were publicized, potentially leading to significant effects on the public perception of the institution (Campos, 2004). As we will see, the last 10 years have had a significant impact on the development of teacher education accountability systems throughout the world.

Asia and the Pacific

Most of the literature in Asia comes from the more affluent East Asian countries: Japan, South Korea, Taiwan, Hong Kong, and Singapore. In general we find quite similar strategies of quality assurance utilized in each of these countries. Perhaps the key difference is in the governance of quality assurance practices. For example, we find more decentralized practices (e.g., accreditation agencies) in Japan and Taiwan and centralized practices (e.g., ministries of education) in South Korea, Hong Kong, and Singapore. Given their size, these differences make sense. For instance, Singapore has one teacher preparation institution, so it seems reasonable that the Ministry of Education would conduct the evaluation.

In 2002 Yonezawa argued that although Japan had adopted the U.S.-style accreditation system, it did not work so well since so many Japanese institutions did not wish to be accredited. Yet according to the Japanese Ministry of Education, Culture, Sports, Science, and Technology (2009) the accreditation system remains in effect for all universities. Each institution must conduct a self-evaluation prior to the accreditation process. This process takes place once every 7 years in Japan and is conducted by certified agencies, namely the Japan Institution for Higher Education Evaluation (JIHEE). JIHEE (2013) promises institutions that evaluations are conducted in a way that grants them the autonomy to show their unique characteristics. According to the Ministry of Education, there are three possible outcomes of this process: satisfactory, unsatisfactory, and pending.

Similarly, South Korean institutions must conduct self-evaluations and submit the report to the Ministry of Education, Science, and Technology (MEST) (Kim, 2000). These efforts were first launched for all teacher training programs by the Presidential Commission on Education Reform of 1996 (Kim, 2000). According to Kim, the reform promotes competition as a means of improving quality. This is accomplished by tying both financial support and administrative decisions to the evaluations. MEST then assembles a team to evaluate the report before conducting a site evaluation. Possible results of the evaluation are very good, good, standard, or poor.

The government of Taiwan adopted the American-styled accreditation system in which the Higher Education Evaluation and Accreditation Council of Taiwan follows a process of first self-evaluation and then peer review. These evaluations examine the following criteria: goals, features, self-enhancement; curriculum design and teaching; learning and student affairs; research and professional performance; and performance of graduates (Hou, 2011). Possible outcomes are accredited, accredited conditionally, or denial. The latter outcomes require additional evaluations in 1 year and if a program fails for 2 years in a row, that program must cease enrollment and operations.

Hong Kong, while conducting similar practices, incorporates some additional measures that are notable. Like the other Asian countries, institutions must first engage in a self-evaluation on a routine basis. Yet this evaluation must include feedback from staff, students, external examiners from years past, and past reports with recommendations for improvement (Tripartite Liaison Committee of Hong Kong, 2009). In addition to these self-assessments, institutions must conduct broader program reviews that include detailed accounts of faculty teaching and quality as well as student assessments and progression. Interestingly, they also gather systematic feedback from employers on the success of their graduates in the labor force.

The National Institute of Education (NIE) of Singapore emphasizes that improvement is the most important purpose of evaluation and the goal is to “support future performance,” not make judgments on the past (Chong and Ho, 2009, p. 306). Their evaluation process appears very straightforward; it considers the *context* in terms of the program’s goals and interests, the *inputs* used to achieve those goals, the *process* by which this was done, and the *product*, matching data to outcomes.

Finally, Chalmers (2008) reports that in Australia five performance models are utilized in quality assurance: accreditation, audit, budgeting and funding, reporting, and surveys. Like universities in other federal systems Australian institutions of higher education are likely accustomed to assessment by external agencies, but institutions are still granted a great deal of autonomy in how they might go about using the information gleaned from these assessments.

Europe

The literature from a few countries in Europe suggests that the quality assurance process in these countries is understood as one that should facilitate dialogue among stakeholders on how to improve educational quality. The range of stakeholders appears quite broad; each of the countries identified here, for example, emphasizes a relatively long list of types of professionals included in the assessment or accreditation process. Beyond policy

makers and institutional leaders, often teachers and students are included, likely improving overall participation.

Finland has no accreditation system; instead the Finnish Higher Education Evaluation Council (FINHEEC)—an independent body that aids higher education institutions and the Ministry of Education and Culture—conducts the evaluations (Niemi and Lavonen, 2011). Like most of the Asian countries, the process begins with a self-evaluation made by institution staff members in which they identify their objectives, strengths, and weaknesses with evidence. Then an external panel of experts familiarizes themselves with these report documents and prepares follow-up questions for the institution. Finally, the panel of experts assembles an evaluation report based on the information from the self-evaluation and the follow-up interviews (Niemi and Lavonen, 2011).

Jussila and Saari (2000) point out that the Finnish evaluation system is engineered to incorporate a wide variety of viewpoints and facilitate dialogue. For instance, they note that the evaluation teams involve heads of universities and faculties, teacher education representatives, student body leaders, administrators, delegates, and government officials. They also mention that many higher education institutions request an international perspective on the evaluation, so the FINHEEC often invites foreign experts to participate.

In Portugal, after 1999, policy makers clearly distinguished a difference between quality assurance evaluations of higher education institutions and teacher preparation programs (Campos, 2004). Institutions that prepare teachers must still be evaluated with the standard higher education process, yet it is a necessary, but not sufficient, assessment. The accreditation committee that evaluates teacher preparation programs is completely independent of the government and includes primary and secondary teachers as well as higher education faculty members. Outcomes of this evaluation include accreditation for 6 years, accreditation for 4 years (with renewal dependent upon meeting certain objectives), and accreditation withdrawal (changes may be made within 1 year). Campos (2004) emphasizes that, like Finland, the “accreditation criteria and methodology is made following consultation and debated widely among participants in the teaching profession including teacher educators and school teachers’ unions and associations” (p. 23).

Finally, Norway requires that higher education institutions maintain routine yearly assessments of their own programs. Essentially, the institution designs and manages its own system, the data it chooses to gather, how those data will be used, and what documents will be produced based on its size, academic profile, and local characteristics (NOKUT, 2011). The Norwegian Agency for Quality Assurance in Education (NOKUT) then proposes a panel of experts that will conduct the external review of the institution based on its proposed goals and evidence of meeting those goals. Each institution has the

right to comment on NOKUT's proposed panel of experts before the panel is ever appointed in order to negotiate for alternative members.

Middle East

The literature we found on quality assurance of higher education institutions in the Middle East is limited, but the evidence suggests that the process is quite similar to that in other regions. That is, there is an internal evaluation effort followed by an external evaluation that generates information with which an institution can develop changes that lead to improvements in institutional and educational quality.

The Council for Higher Education in Israel (2012) outlines the evaluation process as also including a self-evaluation report conducted by the institution itself followed by an external evaluation by committee. This committee is appointed by the Council and its evaluation report is based on data gleaned from an onsite visit as well as meetings with the heads of the institution. The committee comprises representatives from various sectors including academic leaders, faculty, students, administrative staff, and often "leading personalities" from other disciplines and departments (Council for Higher Education, 2012). The committee report is then discussed by the Council and the resolutions published along with a response from the institution.

Though Pakistan is in the early stages of developing a national assessment of higher education institutions, they have formed the Accreditation Council for Teacher Education, an organization that is working on developing standards and requirements for institutions and programs involved with the preparation of teachers (Dilshad and Iqbal, 2010). The authors briefly note that in a survey of educators asking for respondents' chief desired outcomes of the accreditation assessment participants emphasize professional development as the most important goal.

Finally, while Oman is considered "Asian" geographically, here we include it in the Middle East section because of proximity. As in most other countries identified in this review, al Bandary (2005) states that policies in Oman also require institutions to conduct their own evaluation of their key areas of excellence and difficulty. An external team also visits the institution, engaging in formal meetings and informal conversations to get a deeper sense of the institution with the self-evaluation as a guide. The team's feedback is then offered to the institution which ideally begins to make changes that are then further monitored. Al Bandary suggests that for this process to work each institution must have the degree of autonomy necessary to identify and solve its own problems and alter course when data urges the institution in a new direction.

North America

We present findings on just one country in North America (Canada) since, as mentioned above, we are already quite aware of the U.S. context. The Ontario Universities Council on Quality Assurance (OUCQU, 2010) offers a thorough explanation of the process to ensure quality assurance in Canadian higher education institutions, and we find it similar to the process in other regions and countries. Again, institutions are tasked with designing and implementing their own quality assurance process consistent with their own goals, but also with the framework provided by the OUCQA. A panel of auditors then audits that self-evaluation and reports to the Audit Committee of the Quality Council. The panel then evaluates each institution's compliance with its own internal goals and objectives and it has the power to accept or reject the auditor's evaluation.

Challenges

In spite of the universal way quality assurance seems to be conceptualized and implemented in the countries above, the literature suggests numerous challenges to assessing higher education institutions and teacher preparation programs. One challenge is the difficult task of integrating "international standards" in local contexts. For example, in Taiwan some evaluation results suggested that institutions reduce class sizes, strengthen student support services, and increase the use of English as a medium of instruction—all perceived as "international standards" (Hou, 2011). Yet some of these measures fly in the face of culture and traditional methods of instruction. In other setting for instance, in Singapore, teacher education curricula are standard, which means that no variation is expected in coverage even when the courses may be taught by different faculty; although this is an important regulation in a profession, in the United States and in other Western countries higher education faculty will likely resist such a limitation (Kennedy, 2005). Indeed, insisting on these methods may engender institutional resistance. Rennert-Ariev (2008) examines how faculty members at a U.S. higher education institution acknowledged their own lack of intention to integrate new standards in their coursework. They were willing to include the standards on their syllabi, but viewed them as mere labels. Even if an institution (and its members) takes on the challenge of adopting new standards, often administrators, faculty, and students lack clarity on what the standards mean and how they ought to go about meeting them (Kim, 2000). This lack of clarity can lead to failures to implement the standards with fidelity and frustratingly persistent weak evaluations.

3. Assessing Teacher Preparation Program Quality

While the idea of evaluation research applied to programs and policies is not new (see Weiss, 1972), the idea of using these approaches to evaluate teacher education programs is not widespread (for exceptions see Tatto et al., 2012). Our comprehensive search found instead that the idea of quality assurance has been used to introduce a variety of procedures to assess program effectiveness into higher education systems which tend to encompass systems for quality assurance in teacher education. The quality of the work and information that has been done in this area shows wide variability with better developed strategies in those systems where these activities are backed up by legislation. The best compilation we found in this respect is that published by Eurydice (2006), and thus we use it extensively in this section of the paper.

Broadly speaking, dedicated systems to evaluate teacher education programs are relatively rare. Consequently evaluation requirements and guidelines are generic and not teacher education specific. They are, however, beginning to emerge (see TEDS-M study).

As per our review we conclude that internal institutional evaluations are usually driven by external evaluations requirements and guidelines. External evaluations of higher education and by implication of teacher education programs results are typically made public and carry high stakes. In some cases, however, systems only have external evaluations and this is considered sufficient. External program evaluations which require an internal evaluation seem to impose a heavy burden on institutions and their programs including teacher education programs—an exception seems to be in cases where a special office has been created within the institution (as in Singapore) or outside the institution (as in Taiwan) to carry out the evaluation.

The processes and models that are typically used to carry out program evaluations seem to be for the most part atheoretical (e.g., they do not follow the program theory of action) and seem to follow a checklist type of logic. The expert/practitioner evaluations that use the rich knowledge of evaluation research (e.g., Patton, Stake, Stufflebeam, and Weiss) are lacking; Singapore seems to be an exception. Also lacking is research-based evidence of the effectiveness of teacher education, collaborative work between practitioners and researchers, and information systems to help evaluate teacher education program effectiveness.

3.1 Systemic Evaluation of Teacher Preparation Programs

3.1.1. External monitoring

The most important purpose of quality assurance undertakings in the European Union (EU) is for external monitoring; that is, quality assurance seems to be an important tool for governance of higher education institutions including teacher education. In the EU, external monitoring is typically regulated by official documents such as general legislation on higher education, and regulations or guidelines on initial teacher education (e.g., qualification standards for prospective teachers, a list of evaluation criteria or specific national indicators on educator/student ratios, student performance, etc.).

Scope

Our review of the Eurydice document shows that external monitoring mechanisms focus on program processes, content, inputs, outcomes, structure, and resources. For instance these include examination of programs' internal evaluation processes, examination of the content of the teacher education curriculum provided by the institution as well as of the general education curriculum, and a review of teaching methods and assessment practices. There are also reviews of inputs and outcomes including school placements, partnerships with schools, human resources management, trainer-to-student ratios, student performance, student attitudes, and student opinions on the training they receive (these are typically collected via surveys and questionnaires). A review of infrastructure and resources is within scope as well.

Actors Responsible for the Evaluation

While most external evaluations are designed and executed by government evaluation agencies, external evaluations are also done via committees or independent bodies (such as an audit agency) acting on behalf of the public authorities (e.g., an inspectorate for school education, an education agency, the ministry of education).

Procedures and Mechanisms

The procedure to carry out these evaluations is normally based on a site visit and on an internal evaluation report and may include interviews or surveys with the management, the academic and administrative staff, the students, and classroom observation (with a possible direct link to student teachers being taught).

Frequency

The frequency with which external evaluations are done varies greatly between countries and sometimes even within a country. In some cases more than one type of external evaluation exists. This is especially the case when there are no regulations established at central or higher levels (e.g., evaluations can be conducted at fixed intervals, can be conducted at variable intervals according to the institution or program, or can be a single evaluation for the initial accreditation of new institutions).

Figure 1 shows a summary of the major trends between 2005 and 2006 in several countries of the EU where external evaluation of initial teacher education is compulsory, and the profile of external evaluators for ISCED Levels 1–3 (for explanation of ISCED Levels consult European Commission, 2013).

It is important to notice the great variability that exists in the scope, procedures, and frequency across the EU. Variability also exists across countries in the kind of organisms responsible for carrying out the external evaluation. For instance out of the 27 countries included in Figure 1, 13 reported to have an internal evaluation committee within their institution, while 10 reported having some kind of evaluation process in place. In some cases countries report that their external evaluations are done by experts in evaluation (such as Bulgaria, Cyprus, Czech Republic, Spain, Finland, Latvia, Norway, Poland and England, Wales and Northern Ireland), while about the same number report being evaluated by peers (Belgium-Nl., Germany, Estonia, Greece, Lithuania, the Netherlands, Portugal, Romania, Slovenia, and Slovakia). Eight countries rely on both peer and expert evaluators for their external evaluations (Austria, Belgium-Fr., Belgium-De., France, Hungary, Ireland, Iceland, and Scotland).

As shown in Table 1 in some countries the external evaluation is exhaustive, covering a review of all areas (the internal evaluation process, the content of the teacher education curriculum provided by the institution, teaching methods, assessment practices, human resources, infrastructure, and student performance), while in other countries the evaluation is limited to a review of the internal evaluation process (as is the case in Austria, Belgium-Fr., and France). In a few countries the external evaluation includes a review of the curriculum of the teacher education program and of student performance as well (Belgium-De., Belgium-Nl., Bulgaria, Cyprus, Czech Republic, Greece, Spain, Iceland, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, and all the countries of the United Kingdom).

Consequences of External Evaluation According to Regulations

External evaluation results are made available to the institution and/or program management, to the academic staff, to students, and to partner schools. Frequently the results are published as evaluation reports from each institution or program.

The results of external evaluations, especially in cases where this is compulsory, are high stakes and it can impact (re)accreditation and future funding. Negative results can bring about the implementation of a plan for improvement by the institution and a different evaluation to make sure that the program is showing improvement.

3.1.2 Internal Monitoring

Scope

Typically internal monitoring includes a type of self-study with a focus on the program's quality assurance processes. This may include a demonstration of the rigor with which the program selects prospective teachers and how it monitors their progress up to the time of graduation. In addition it may include a review of the program content—including the curriculum provided by the institution, the teaching methods, and assessment practices—and an assessment of the program outcomes including the knowledge that future teachers acquire and their performance, attitudes (motivation), and opinions on the training they received. Internal evaluations may also look at the program structure (e.g., the balance between professional training and general education, school placements, partnerships with schools) and human resources management, trainer-to-student ratios, and infrastructure (libraries, computers, etc.).

Participants

Internal monitoring seems to be within the control of the management, academic staff, or students of the institution concerned. On occasion and depending on the external evaluation requirements and resources within the institution, special evaluation experts may also take part (e.g., experts may act on behalf of the principal or board of the institution, or give methodological or technical support to the staff responsible for conducting the evaluation).

Table 1. Major Trends Regarding the Scope of External Evaluation of Initial Teacher Education for General Education

	Austria	Belgium F	Belgium D	Belgium N	Bulgaria	Cyprus	Czech	Germany	Estonia	Greece	Spain	France	Finland	Hungary	Ireland	Iceland	Latvia	Lithuania	Netherlands	Norway	Poland	Portugal	Romania	Slovenia	Slovakia	UK E-W-N	UK-SCT
Internal evaluation process		○			○			○	○	○	○			○	○	○		○				○	○				○
Content of the teacher education curriculum provided by the institution																											
Teaching methods																											
Assessment practices																											
Human resources																											
Infras-structure																											
Student performance																											

Source: Eurydice (2006).

Key: Profile of external evaluators (ISCED 1–3), 2005–2006 (peers; experts; both); internal evaluation committee within institution. ○

Procedures and Mechanisms

Data for internal evaluation are usually collected via interviews or surveys administered to the management, the academic and administrative staff, and the students. In some cases classroom observations are carried out. While reviews of the curriculum are common these do not include detailed information (such as syllabi analysis).

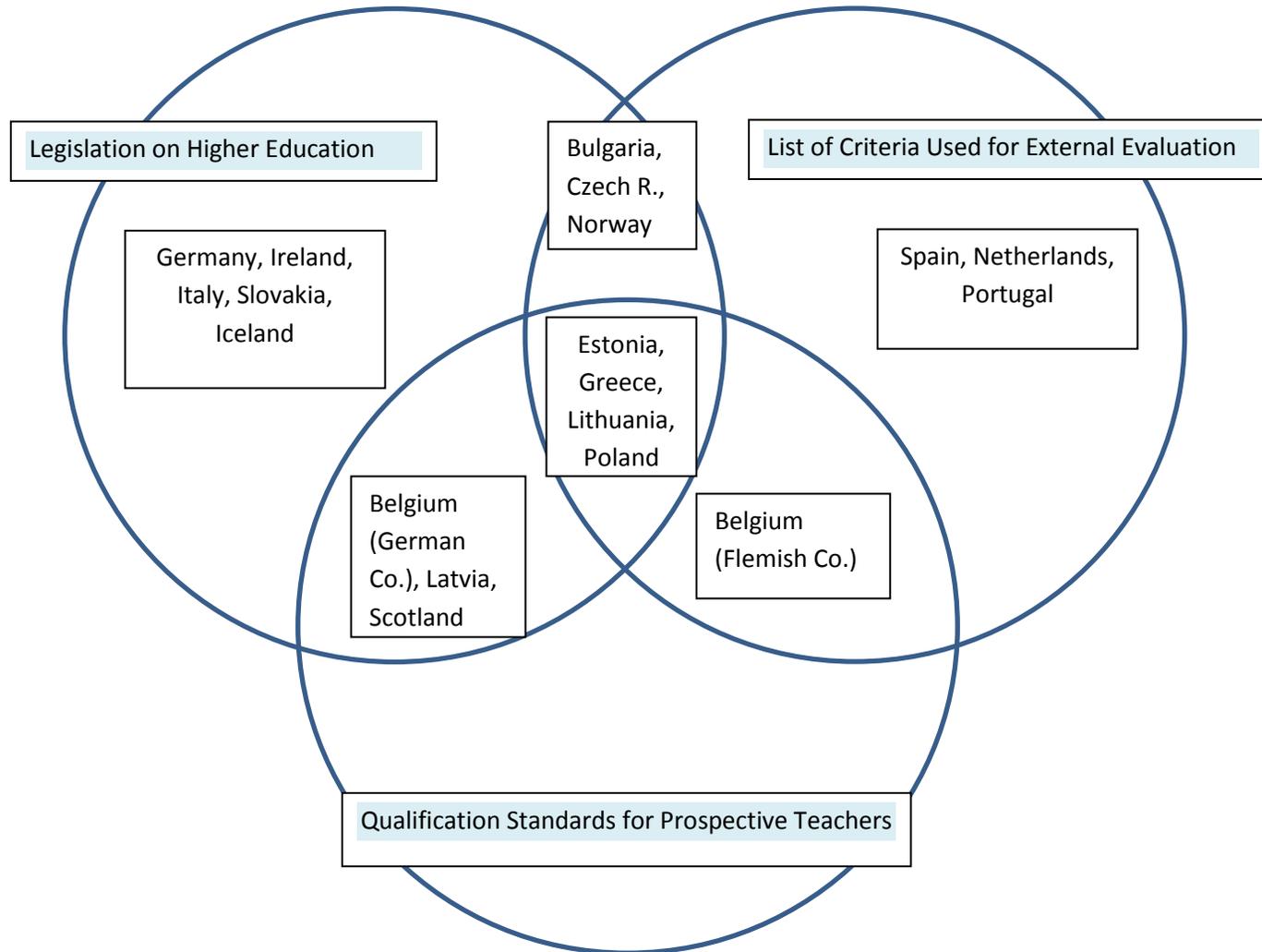
The main criteria used for internal evaluation typically follows the external criteria across the EU countries as expressed in the general legislation on higher education or the criteria used for external evaluation. Only in a few cases the main criteria is given by regulations and content guidelines for initial teacher education or by the qualification standards for prospective teachers. For instance the Legislation on Higher Education dictates the criteria for internal evaluation in Germany, Ireland, Italy, Slovakia, and Iceland. In Spain, the Netherlands, and Portugal the criteria are given by the list for External Evaluation Criteria. In Bulgaria, Czech Republic, and Norway the criteria are dictated by a combination of the Legislation on Higher Education, and the list of Criteria for External Evaluation. In Belgium (German Co.), Latvia, and Scotland the criteria are given by the Legislation on Higher Education, and the qualification standards for prospective teachers. The list of Criteria for External Evaluation and the qualification standards for prospective teachers regulates internal evaluations in Belgium (Flemish Co.).

A combination of the Legislation on Higher Education and the Criteria for External Evaluation, plus the qualification standards for prospective teachers, regulate the internal evaluations in Estonia, Greece, Lithuania, and Poland. In no country did we find that the qualification standards for prospective teachers only guided internal evaluations. See Figure 1.

Frequency

There is great variability. However, as is the case with the standards used for evaluations, the frequency with which these evaluations take place internally is in great part determined by the external requirements.

Figure 1. Criteria used to regulate internal evaluations across countries where external evaluations are compulsory.



Responsible Bodies for the Evaluation

In the case where internal evaluations are carried out to comply with compulsory external evaluation requirements, the responsibility for the evaluation resides with the management or governing board of the institution evaluated, a special evaluation committee set up for this purpose within the institution itself, or a council of academic staff representatives.

Consequences and Uses of Internal Evaluation

Typically the results of internal evaluation are often used by the program and may result in the implementation of a plan for improvement by the institution. Sometimes these are used to monitor the institution in comparison with national indicators and national reports on higher education and on initial teacher education. In some cases the results of the evaluations may be available to those who are in the role of making decisions about the future of the institution (e.g., for the academic staff and students). In some cases the results are made available to the general public.

In sum the results of external and internal evaluations help control the system, provide reports on its quality, enable adjustments to enhance performance, and give an overall picture of the state of initial teacher education to provide input for policy making.

Table 2 shows the consequences of external and internal evaluations for institutions or programs providing initial teacher education for general education (ISCED 1–3) for the period 2005–2006, in those systems where the evaluations are compulsory or high stakes.

Table 2. Consequences of External and Internal Evaluation for Institutions or Programs Providing Initial Teacher Education for General Education

	Belgium F	Belgium D	Belgium N	Bulgaria	Cyprus	Czech R.	Germany	Estonia	Greece	Spain	France	Finland	Hungary	Ireland	Iceland	Latvia	Lithuania	Netherlands	Norway	Poland	Portugal	Romania	Slovenia	Slovakia	Sweden	UK E-W-N	UK-SCT
Implementa-tion of a plan for improvement by the institution in the event of poor results																											
Impact on (re)accredita-tion																											
Different evaluation in the event of poor results																											
Impact on funding																											
Availability of external evaluation results: Publication of evaluation reports from each institution /program																											

Source: Eurydice (2006). Concerns (ISCED 1–3), 2005–2006.

3.2 National Evaluation of Teacher Preparation Programs

3.2.1 Overview

To complement the data obtained in our literature review and via websites we sent surveys to university faculty members and policy makers in 25 countries. Answers to the survey helped gain additional and current insights into the processes by which these governments seek to ensure the quality of teacher preparation programs and their graduates. Respondents from nine of those countries (Bulgaria, Brazil, China, Finland, Germany, Israel, Italy, South Korea, and Taiwan) supplied the detailed information that we outline below.

All of the responding countries point to efforts to attend to quality teacher preparation (see Table 3), although some are clearly more systematic than others. For example, in Brazil the government appears to rely on results of assessments of teacher graduates to determine the quality of the content, skills, and competencies taught in teacher preparation programs. In contrast, the South Korean government has established a clear national system of standards and mandates that are used to evaluate teacher preparation programs through both internal and external evaluations linked to specific consequences.

All respondents except Germany and Italy report a focus on national-level quality assurance mandates and slightly more than half report linkages to laws or regulations. Fewer than half of the respondents identify quality assurance efforts that address teacher preparation programs specifically. Most point to measures that focus on quality assurance of universities in general; teacher preparation programs, housed within universities in most countries, are therefore included in these measures. Of the four countries reporting specific evaluation systems for teacher preparation programs, three are East Asian.

Whether there are specific evaluations for teacher preparation programs, responding countries report differences in the kinds of evaluations utilized to ensure quality of teacher education graduates. In most countries either internal or external evaluations are conducted and four countries report conducting both internal and external assessments. Few systems mandate universities or teacher preparation programs to conduct internal evaluations while mandated external evaluations are quite common among countries with identified teacher program quality assurance systems. Interestingly, none of the respondents report a focus on STEM teacher preparation.

3.2.3 Types of Evidence Used

Our survey asked respondents to identify evidence collected (i.e., outcomes and inputs) to evaluate teacher preparation programs and the measures by which this evidence is collected. In terms of outcomes, participants report looking at tests of graduates, evaluations of classroom performance, teacher placement, and retention rates. Commonly reported inputs evaluated include numbers and qualifications of faculty members, facilities, resources, number and quality of scientific or educational projects, and characteristics and quality of student candidates. Finally, the process measures identified by our respondents suggest that evaluations consider student subject area course credits, descriptions of curricula and syllabi, use of information technology, observations of instruction, and quality of field experiences.

3.2.4 Role of Different Actors in the Quality Assurance Process

We asked respondents to identify the various roles of actors in the quality assurance system at the federal, state, agency, and program levels. Since most of the responding countries have national quality assurance systems, survey results indicate that the key roles in the evaluation process are most often performed by a ministry of education and an evaluation or accreditation agency. In these countries, the ministry of education sets the standards and mandates the evaluations conducted by the appropriate agency. Teacher preparation program faculty and administrations are expected to align their programs with the standards and conduct internal evaluations with the intent to support continued improvement.

3.3 Specific Country Cases

In this section we provide detailed cases of the quality assurance processes in two countries: Finland and Singapore.

3.3.1 Finland in 2010–2013

According to the [Finish National Board of Education](#) website, the teaching profession in Finland is regulated according to Teaching Qualifications Decree 986/1998.¹ The University of Helsinki, the largest institution preparing teachers in Finland, states the specific qualifications as follows:

¹ Decree No. 986/1998 on the qualification requirements for teaching personnel and the amendment to the aforementioned decree, Decree No. 865/2005.

The qualifications for subject teachers in Finland depend on the school level. To be a qualified subject teacher in the comprehensive school (Grades 1 to 9) in Finland, a person must have completed a higher University degree (a Master's degree); at least basic and intermediate or equivalent studies of 60 ECTS² credits (35 study weeks) in a subject that is taught in comprehensive schools; 60 ECTS of teachers' pedagogical studies. To be a qualified subject teacher in the upper secondary school in Finland, a person must have completed a higher University degree (a Master's degree); at least 120 ECTS credits in one teaching subject that is taught in the upper secondary school and at least 60 credits in other possible teaching subjects; at least 60 ECTS of teachers' pedagogical studies. In order to be qualified to teach in a Finnish basic school, teachers must also possess excellent competence of the teaching language of the school (usually Finnish or Swedish). In upper secondary schools the competency requirement for teachers is to possess good competence of the teaching language. (University of Helsinki, 2006)

While In Finland a teacher's work is not subject to "standards" as is done in the United States, there is an explicit agreement that teachers are expected to follow the national core curriculum yet guided by their own professional judgment to tailor teaching to the individual needs of their students and their families and with the goal to help children develop critical thinking skills. The knowledge and skills required among certified teachers are specified by universities' requirements (see, for example, the University of Helsinki degree requirements) and include a complex and demanding course of study with a differentiated pathway for teachers for primary grades (or class teachers mainly working in grades 1–6) and for secondary teachers (or subject teachers for those teaching in grades 7–9 of comprehensive school—lower secondary level and upper secondary school). While the materials such as the study program and syllabi for Finnish future teachers are not all in English we looked into the study program for English education teachers in general education. The information for English speakers is abundant and provided via videos and text.

According to the Finnish National Board of Education website, the structure of the schools from grades 1–9 dates back to the 1970s. Teacher education was reformed accordingly:

Teacher education was divided into education for class teachers and subject teachers. Class teachers mainly work in grades 1–6 of comprehensive school (primary level), whereas subject teacher education is mainly for those teaching in grades 7–9 of comprehensive school (lower secondary level) and at upper secondary school, but teachers with subject teacher's education may also work in

² European Credit Transfer and Accumulation System (ECTS) is a standard for comparing the study attainment of students of higher education across the European Union. One credit generally corresponds to 25-30 hours of work while one academic year corresponds to 60 ECTS credits that are equivalent to 1500-1800 hours of study.

vocational education and training and liberal adult education. Teacher education for both is provided by university departments of teacher education. The training of kindergarten teachers was transferred completely to universities in 1995.

Teacher education is provided by seven Finnish-language universities and by one Swedish-language university and they work in partnership with the so-called “teacher training schools”:

Each teacher education unit has teacher training school(s) for teaching practice, experiments, research and continuing education. Teacher training schools may have either grades 1–6 of basic education or grades 7–9 of basic education and general upper secondary school, or all of these. They may also include pre-primary level.

Concerning the organization of the curriculum:

Subject teacher education is provided by university faculties of the different subjects [...] students usually first apply to study a particular subject at the relevant university faculty and, after one or two years of studying, they may apply for subject teacher education. At some universities and faculties, students may also apply directly for subject teacher education; in such cases, education is provided in co-operation between the department of teacher education, the relevant subject departments and teacher training schools. The department of teacher education is responsible for providing pedagogical studies, whereas subject departments of different faculties provide education in the teaching subjects. These studies are taken in parallel and in interaction with each other. The length of subject teacher education is 5–6 years.

Pedagogical studies are provided by teacher education units within faculties of education. The periods of teaching practice included in pedagogical studies are organized at university teacher training schools and at so-called affiliated schools. Teacher education in art subjects is offered by art academies. Class teacher and kindergarten teacher education is organized concurrently. The length of kindergarten teacher education is 3 years and class teacher education 5 years [...] teacher's pedagogical studies are a minimum 60 ECTS while the whole degree is 300 ECTS for class and subject teachers and 180 for kindergarten teachers. In the teacher's pedagogical studies practical training amounts to 20 ECTS for class teachers and subject teachers and 25 ECTS for kindergarten teachers. The pedagogical studies combine theory and practice.

Teacher competencies are clear in the Finnish curriculum. Future teachers are expected to develop competence in planning curriculum and language and communication skills, including foreign and second national languages. Courses aimed at developing these competencies also attend the ways media and information technology are increasingly used in communications. Finnish teachers also must have a deep understanding of the

cultural, psychological, and pedagogical bases of education as well as knowledge about the role of research in education and key methods of conducting educational research culminating in a thesis required for graduation. Finally, teachers in Finland are expected to be competent practitioners, receiving considerable experience teaching students. See Appendix 1 for the list of course requirements and competencies for future teachers in Finland.

Teacher Education Program Evaluation

While the evaluation of teacher education programs is left to the individual program and its faculty, the external evaluation is in the form of an audit by the Finnish Higher Education Evaluation Council. Box 1 shows the process typically followed in an audit for higher education institutions which comprehend teacher education programs.

3.3.2. Singapore in 2010–2013

In Singapore there is only one teacher education institution, the National Institute of Education (NIE), which is an autonomous institute of Nanyang Technological University. There is a high degree of control over teacher training and certification in the nation. Teachers are recruited by the Ministry of Education and sent to NIE for training. Primary education in Singapore includes grades 1–6, and secondary education includes grades 7–10, Postsecondary education includes grades 11 and 12. Most future teachers go into teacher training after grade 12 (A-level), but some have a polytechnic diploma, which is taken after grade 10.

Singapore has eight different program types: four concurrent and four consecutive. The consecutive program types are called Postgraduate Diplomas in Education for either primary or secondary teaching: it includes future teachers who have already gained a degree (4 years of degree study), plus a 1-year second phase at the NIE. The concurrent program types include a general diploma program type (2 years), and a Bachelor of Arts (BA) (Education) or Bachelor of Science (Education) degree (4 years), the primary diploma option A (trained to teach two subjects), and the primary diploma option C (trained to teach three subjects).

All teacher education candidates are required to complete core courses in education studies, subject knowledge (primary only), curriculum studies, academic studies (degree only), practicum, and Language Enhancement and Academic Discourse Skills (LEADS). LEADS courses are unique to Singapore and include courses to develop the skills required to use English for communication, academic, and professional purposes. Emphasis on the practicum varies by program type: diploma, 23 percent of training; bachelor's degree, 16 percent of training; and postgraduate diploma, 25 percent of training. The diploma program type is not officially recognized as being university level, even though it takes place within a university.

Box 1. Finland—Audits: Evaluating the Quality System of HEIs

The Finnish Higher Education Evaluation Council (FINHEEC) has conducted audits of the quality systems of higher education institutions (HEIs) since 2005. FINHEEC is an independent expert body that organizes evaluations of the operations and quality systems of HEIs called audits. It may also take assignments from international parties. The goal of the audits is to support Finnish HEIs in developing their quality systems to correspond to the European quality assurance principles for higher education. The audits are valid for 6 years. HEIs are responsible for the quality and continuous development of their education and other operations and for regularly performing and publishing the results of external evaluations of their operations and quality systems (Finnish Universities Act and Polytechnics Act). Finnish HEIs decide on their own quality systems, and the comprehensiveness, functioning, and effectiveness of the systems are evaluated in the audits. The audit approach corresponds to the principle of enhancement-led evaluation, and comprehends the following steps:

Step 1. The HEI registers for an audit with FINHEEC

The institution and FINHEEC agree on a preliminary audit time frame based on the registration.

Step 2. Agreement negotiation between the HEI and FINHEEC

FINHEEC and the HEI sign an agreement on the audit. The agreement specifies the audit targets, procedure and time frame, national or international composition of the audit team and language to be used to carry out the audit, duration of the audit visit, price of the audit, and commitment to a potential reaudit.

Step 3. Appointment of the audit team

FINHEEC usually appoints an audit team with five to seven members.

Step 4. Compilation of audit material and preparation of the self-evaluation report

The HEI compiles audit material, the goal being to provide the audit team with a sufficient knowledge base and evidence for the evaluation of the quality system. The material consists of basic material and a self-evaluation report drawn up by the institution. The material is submitted to FINHEEC at the latest 12 weeks prior to the audit visit.

Step 5. Briefing and discussion event

Around 4 weeks prior to the audit visit, the chair of the audit team and the FINHEEC project manager visit the HEI subject to the audit. The purpose of the visit is to arrange an open event for the institution's staff and students at which the objectives and implementation of the audit can be discussed.

Step 6. Audit visit

The audit team's visit to the HEI lasts from 3 to 5 days, depending on the size of the institution and on the audit task.

Step 7. Audit report

The audit team draws up a report based on the material accumulated during the evaluation and on the analysis of that material. In accordance with the principle of continuous enhancement, the report points out the strengths and good practices in the HEI's quality system, in addition to giving the institution recommendations for further development.

Step 8. Consequences of audit

In its report, the audit team presents its appraisal of whether the HEI should pass the audit or whether a reaudit needs to be conducted. The Evaluation Council decides on the audit result on the basis of the appraisal.

Source: Finnish Higher Education Evaluation Council (2013).

In particular, these future teachers do not complete university-level mathematics. But with the nondegree diploma, future teachers are considered officially qualified to teach, even though other future teachers who obtain a university degree have a higher academic level.³

Teacher Education Program Evaluation

Singapore has a tailored approach and uses the methods of evaluation research: The Evaluation Cycle is a multistage evaluation procedure involving data collection, observations, and analysis of the quality of the programs evaluated either as a whole or through one of its components. The evaluation of the learning processes and outcomes is part of a quality management system. The data collected and the evaluation process are linked to the program goals and objectives to ascertain program effectiveness (see Box 2).

Box 2. Singapore: Teacher Education Evaluation Model Mechanisms and Rationale**Inputs: Quality Admissions**

A consistent procedure to extract enrollment trends and profiles of student teachers allows the National Institute of Education (NIE)—the national teacher training institute in Singapore—to study student performance across intakes and programs and to benchmark cohort performance over time.

Process: Quality Teaching, Learning and Assessment

A culture of professional self-accountability and continual self-improvement through a process of self-evaluation within the Academic Groups and Program Offices helps the NIE identify best practices and areas for improvement.

A validation of the self-evaluation process is performed by a panel of external advisors invited to perform a critical examination of NIE's Academic Quality Management (AQM) strategies and processes. Combining both internal and external evaluations helps to offer a balanced assessment and minimize bias.

³ Source: Tatto et al. (2012). TEDS-M ... Chapter 3. Based on the national report by K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng.

Product: Quality of the Graduates

Data and trends of graduate performance are based on direct and indirect indicators of student learning.

Graduate feedback is obtained on course units, programs of study, and Academic Groups.

The Stakeholders' Survey via surveys and forums helps NIE establish an understanding of the requirements of recent and future graduates as well as identify gaps between professional needs of graduates and how NIE can help to address these gaps.

The NIE's AQM framework is based on the Stufflebeam (1971:2007) CIPP Evaluation Model. According to the NIE this framework provides a "comprehensive" structure that covers context, inputs, process, and product with channels for iterative improvements.

Source: Chong and Ho (2009).

Singapore's Ministry of Education (MoE) clearly describes the "desired outcomes of education" as confident, self-directed learners who are also innovative, active contributors to society, and concerned citizens (MoE, 2013). Preparing teachers to accomplish this goal is a monumental task largely undertaken by the NIE, the country's premier teacher education institution. In 2009 the NIE published *TE21: A Teacher Education Model for the 21st Century*, a report outlining the future of NIE's programs for a rapidly changing global context. The report includes six key recommendations aimed at holistically enhancing teacher education. These recommendations emphasize the guiding philosophy of NIE, establish a competencies framework for graduates, attempt to minimize the theory-practice gap, strengthen programs and pedagogy, build teachers' assessment skills, and enhance professional development.

However, perhaps most salient to this paper are the core competencies for graduates of teacher education programs at NIE. The Graduated Teacher Competencies Framework offers specific standards for competencies in three main categories: professional practice, leadership and management, and personal effectiveness. Steiner (2010) explains that these competencies were adapted from MoE's Enhanced Performance Management System (EPMS), a comprehensive teacher evaluation system which describes competencies as "referring specifically to underlying traits and habits—patterns of thinking, feeling, acting, or speaking—that cause a person to be successful in a specific job or role" (p. 8).

Singapore's NIE categorizes the achievement of these competencies as either "capacity building" (which a graduate should be able to demonstrate) or "awareness" (which a graduate may not be able to demonstrate, but will develop further during induction, mentoring, and professional development) (NIE, 2009). Under the category of professional practice, the NIE identifies the following competencies as "capacity

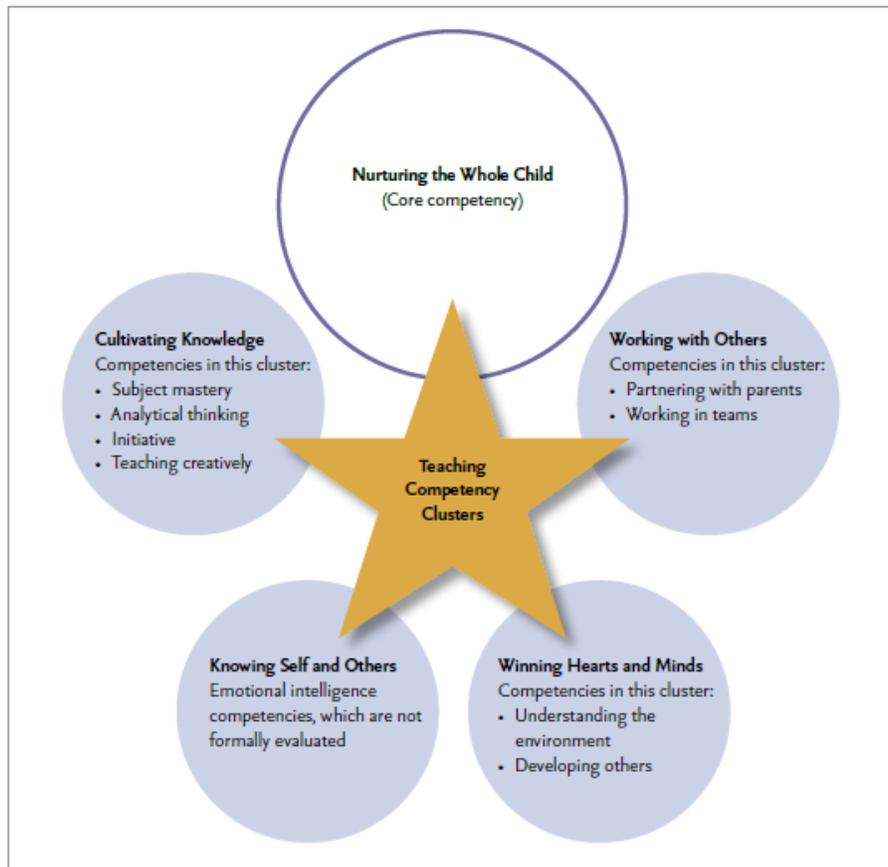
building’’: *nurturing the whole child* (e.g., the teacher uses a variety of methods to determine pupil needs and expectations), *providing quality learning of the child* (e.g., the teacher has a repertoire of approaches that engage pupils in problem solving, and critical and creative thinking), and *cultivating knowledge with subject mastery, reflective thinking, and analytic thinking* (e.g., the teacher is aware of major areas of research on teaching and of resources for professional learning).⁴ Capacity-building competencies under leadership and management include only *working in teams* (e.g., the teacher cooperates with and supports colleagues and shares information and good ideas). Finally, competencies under personal effectiveness assigned the “capacity-building” label include *knowing self and others by tuning into self* (e.g., the teacher monitors own self to identify support of developmental needs), *understanding and respecting others* (e.g., the teacher demonstrates sensitivity to cultural and religious differences), and *resilience and adaptability* (e.g., the teacher is able to think on his or her feet and make appropriate decisions for context). In addition to the detailed list of standards in Appendix 3, Steiner (2010) offers a helpful graphic representation of Singapore’s competency clusters (see Figure 2). The corresponding curriculum structure (see Appendix 4) supports these competencies.

The coherence and quality of this system—one in which teachers are trained in and evaluated by the same core competencies—is maintained by a robust quality assurance framework adapted from the CIPP Evaluation Model (Chong and Ho, 2009). This model includes four key components: context, inputs, process, and product. It also emphasizes that developing quality teachers is the key objective and that evaluations are for improvement, not punishment.

Similarly, evaluations of teacher preparation programs aim to help these programs develop their quality and to ensure that systems and structures are aligned in order to meet institutional objectives (Seng, 2009). Quality assurance in Singapore occurs at three levels: formative, external, and summative (Chong and Ho, 2009). In the formative reviews, or institutional self-assessments, all processes and procedures are measured against “best practices” in order to note program strengths and areas in need of improvement. External reviews are conducted periodically by a panel of experts (comprising six or seven corporate leaders, industry professionals, and academics, including one local chairperson) and often include a 5-day site visit to validate an institution’s self-assessment (Seng, 2009). Finally, summative reviews aid long-term strategies for continuous improvement. Institutions submit a report in which they identify proposals to meet the recommendations of the external review panel. The MoE offers funding to incentivize institutions and programs to pursue quality improvement and these institutions promise to provide annual progress updates (Seng, 2009).

⁴ See Appendix 3 for a complete list of competencies and standards from the National Institute for Education.

Figure 2. Singapore teacher competencies.



Source: Steiner (2010)

4. Quality Assurance in Mathematics Teacher Education in High Achievement Countries: Lessons from the TEDS-M Study

In 2008 the IEA carried out the first study of teacher education for primary and secondary future teachers (Tatto et al., 2012). The 17-country study focusing on mathematics was the first to assess the knowledge and skills acquired by future teachers enrolled in these programs. The study not only assessed mathematics knowledge, skills, and dispositions expected from future primary and secondary teachers but also asked questions about the kind of quality assurance policies and mechanisms that were in place at the time of the study in 2008.

In contrast with the information we have presented above, TEDS-M quality assurance data are at the intersection of national and program policy and provided by teacher educators (or program implementers). In other words the data answer the question, “what are the strategies that are in use by the programs to make sure that they are able to

produce the kind of teacher they expect and at the moment “they are ready to teach” and how does national or local policy support such strategies?” This question produced answers revealing a wide range of quality assurance and other strategies guaranteeing entrants’ competency to engage in the kind of program offered to them. In addition to asking these questions, the TEDS-M team analyzed syllabi in a representative sample of programs in order to understand at a more detailed level the kinds of competencies programs required from prospective teachers. Table 4 shows the mechanisms in place to secure competent graduates. Table 5 shows examples of the competencies required for a selected number of countries including the United States, and other higher achieving countries in the TEDS-M assessments. Table 6 shows a comparison of competences as indicated by topics covered by the syllabi in several countries in comparison with the United States.

4.1 Quality Assurance Mechanisms in the TEDS-M Programs

In the TEDS-M study (2008) we found that quality assurance mechanisms had to do with control over inputs, process, and product.

Control over Inputs

Control over inputs was defined by the TEDS-M study as the “policies and agencies a country has to monitor and assure the quality of *entrants* to teacher education.” These include the recruitment and selection of highly qualified students, and the promotion of teaching as an attractive career.

The *recruitment and selection of highly qualified students for teacher education* is the most common strategy used by those systems with high QA. High qualifications such as a strong background or learned knowledge of the subject teachers will teach (in this case mathematics) allow programs to control the total number of university places available for teacher education students. This strategy ensures that the number of graduates is matched by the number of teachers needed in the school system and allows programs to spend more time reinforcing knowledge already acquired and expanding knowledge needed for teaching. This is indeed the case in Singapore and Chinese Taipei. Countries with weak controls such as the United States do not have fixed quotas attached to teachers needed or rigorous selection policies. The *promotion of teaching as an attractive career* is an expression of policy as highly qualified candidates would not apply to teacher education if the career was not seen as important and rewarding work (key policies are providing job security, pensions and other benefits, plus mechanisms for teachers to become effective). While in most countries teaching is not a highly remunerated profession, in those countries where teaching is competitive the salaries are as well. Social norms reinforce teaching as a highly attractive profession in Chinese Taipei and in Singapore and less so in Germany, the Russian Federation, and the United

States. The existence of *selection standards for entry to teacher education* either internal or external to the programs serves to reinforce quality criteria. Such standards may include graduation from secondary school with a specific subject matter requirement, in this case mathematics (as for primary and secondary teachers in the Russian Federation, for secondary teachers in the United States, and for primary teachers in Singapore) or without specific subject matter requirement (as for primary teachers in Germany and the United States); see Table 4.

Table 4. Level of Math Required to Enter TEDS-M Teacher Education Programs

Entry Requirements to Teacher Education: Primary Level⁵	
Graduation from secondary school—no specific mathematics requirement	Canada, Chile, Georgia, Germany, Malaysia, Philippines, Spain, Switzerland, Thailand, United States
Graduation from secondary school with specific mathematics requirement	Botswana, Norway, Poland, ⁶ Russian Federation, Singapore
Graduation from secondary school and requirement for 1-year tertiary-level studies; national examination to enter university with mathematics as a required subject	Chinese Taipei
Entry Requirements to Teacher Education: Secondary Level	
Graduation from secondary school—no specific mathematics requirement	Chile, Philippines, Thailand, Switzerland
Graduation from secondary school with specific mathematics requirement	Botswana, Georgia, Malaysia, Norway (ALU & ALU+), Oman, Poland ^[2] , Russian Federation, United States
Graduation from university with a first degree in mathematics or successful completion of designated mathematics courses at university level or national examination to enter university with mathematics as a required subject	Canada, Chinese Taipei, Germany, Norway (PPU & Masters programs), Singapore, Spain

Source: Tatto et al. (2012).

⁵ Oman is not currently training primary school teachers due to oversupply.

⁶ Only for teachers who will teach grades 4 and above, not teachers who will teach grades 1–3.

^[2] Note: This applies only to programs included in the TEDS-M sampling frame. Successful completion of mathematics courses is a requirement for “second degree studies” in mathematics for secondary school teaching.

The standards for entry are higher for primary teachers in Chinese Taipei where in addition to graduation from secondary school and a requirement for 1 year of tertiary level studies, there is a national examination to enter university with mathematics as a required subject. For secondary teacher entrants in a number of countries including Canada, Chinese Taipei, Germany, and Singapore, the standards require graduation from university with a first degree in mathematics or a similar level of knowledge (Tatto et al., 2012, pp. 44–45). In addition to subject matter competence, other cultural attributes are considered important for becoming a teacher. In Singapore for instance in addition to “core competencies in professional practice,” internal standards such as a disposition toward leadership and management, and personal effectiveness are important precursors to the competencies that are required from future teachers (see Appendix 3).

Control over Process

Control over process was defined in TEDS-M as the existence of policies and agencies to monitor and ensure the quality of teacher education institutions and their *programs*. These policies can be of two kinds: one internal or institutional or self-regulatory and another more external to the programs.

Institutional or Internal Requirements in the TEDS-M Study

In the TEDS-M study we found eight key requirements programs use to regulate the quality of their graduates; these include receiving a passing grade on all their courses required by the program, comprehensive oral and written examinations, examinations set by national or state/provincial authorities, examinations set by their institution or program, demonstration of a required level of teaching competence in a classroom, receiving a passing grade in field experience, and writing and defending a thesis.

Table 5 shows that Chinese Taipei, which was the highest achieving country in TEDS-M, shows a high percent of institutions complying with all requirements with the exception of the completion of a thesis. Singapore, the next best performing country, however, only complies with three requirements: receiving a passing grade on all the courses/subjects/units required by the program, successfully demonstrating a required level of teaching competence in a classroom, and receiving a passing grade in field experience. Germany complies with all requirements while the United States shows a pattern very similar to Singapore yet more than 80 percent of institutions comply with the requirement that future teachers must pass an examination set by national or state/provincial authorities. While Finland did not participate in the TEDS-M study, available documentation shows that it follows program-based requirements including importantly the completion of a thesis which emphasizes Finland’s strong orientation to using inquiry as a way to develop a reflective stance on teaching.

Table 5. Institutional Requirements to Successfully Complete Teacher Education in Selected TEDS-M Countries

Institutional Requirements Future Teachers Have to Meet to Successfully Complete Their Teacher Education Program (Percentage of Institutions Answering “Yes”)					
	Chinese Taipei	Germany	Russian Federation	Singapore	United States
Receive a passing grade on all the courses/subjects/units required by the program	100 (n=19)	100 (n=51)	99 (n=88)	100 (n=10)	100 (n=115)
Pass a comprehensive written examination/assessment	87 (n=18)	100 (n=51)	13 (n=87)	0 (n=10)	38 (n=115)
Pass a comprehensive oral examination/assessment	82 (n=18)	100 (n=51)	83 (n=88)	0 (n=10)	11 (n=115)
Pass an examination set by national or state/provincial authorities	70 (n=18)	100 (n=51)	60 (n=87)	0 (n=10)	83 (n=115)
Pass an examination set by this institution or program	76 (n=19)	100 (n=51)	92 (n=86)	0 (n=10)	32 (n=115)
Successfully demonstrate a required level of teaching competence in a classroom	71 (n=19)	100 (n=51)	82 (n=88)	100 (n=10)	100 (n=115)
Receive passing grade in field experience	100 (n=19)	75 (n=51)	99 (n=88)	100 (n=10)	99 (n=115)
Write and defend a thesis	3 (n=19)	100 (n=51)	99 (n=88)	0 (n=10)	7 (n=115)

Accreditation and External Requirements in the TEDS-M Study

We found high variability across countries in the mechanisms and policies used for regulating the process of teacher education; nevertheless, in most cases accreditation is dependent on teacher education programs complying with such regulations. The TEDS-M study classified the countries in the study according to the typology used in the Eurydice study (Eurydice, 2006): those with weak regulations or voluntary systems for the evaluation and accreditation of teacher education programs; those with general regulations for evaluation of all higher education institutions, but no regulations specific to teacher education institutions or programs; those with specific and general regulations, but only for internal evaluations by institutions (e.g., no requirement for external evaluations); and those with requirements for evaluation of teacher education institutions or programs by an independent, external accreditation authority or agency, with power to disaccredit. Since 2008, in part as a result of the Bologna process, we see an increased tendency for external evaluations with the power to disaccredit failing institutions as explained in the previous sections of this paper.

Table 6 shows the countries participating in the TEDS-M study classified according to this typology, based on information provided in the country reports and the Eurydice study.

Table 6. Accreditation Systems for Teacher Education in the TEDS-M Countries (2008)

Accreditation Systems of Teacher Education	Country
Category 1: Unregulated teacher education systems or voluntary accreditation only	Chile, Philippines, Georgia, Oman
Category 2: Countries with agencies responsible for the accreditation of higher education institutions, but limited requirements for the evaluation of specific teacher education programs	Germany, Spain, Switzerland
Category 3: Countries with agencies responsible for the accreditation of teacher education institutions, but based mainly on internal evaluations conducted by institutions; no independent, external evaluation	Malaysia, Norway, Poland
Category 4: External evaluation and accreditation of teacher education providers by a government, statutory or professional agency; power to disaccredit programs	Botswana, Canada, Chinese Taipei, Russian Federation, Thailand, United States
Special case Singapore is a special case because there is only one teacher education provider. It does not have an independent external accreditation body. However, there are close links between the National Institute of Education and the Ministry of	Singapore

Education and strong feedback systems are in place regarding program quality; international experts are employed regularly to provide independent evaluations in specialist fields such as mathematics teacher education. Thus, regulation is high.	
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Source: Tatto et al. (2012, p. 47).

Control over Product

In TEDS-M control over product was defined as the existence of policies and agencies to ensure that graduates are competent and qualified before gaining certification and full entry to the profession.

As with the other aspects, quality assurance policies and practices in relation to entry to the profession vary widely across participating countries. In 2008, requirements for entry to the profession in participating countries fell into three main categories: countries where graduation leads automatically to certification and/or official entry to the teaching profession; countries where entry to the profession depends on passing further tests set by external agencies (e.g., licensure tests of professional knowledge); and countries where entry to the profession depends on passing further tests of professional knowledge *and* assessments of teaching performance during a probationary period. Table 7 shows the distribution of TEDS-M countries across these categories.

Table 7. Levels of Regulation to Enter the Teaching Profession in the TEDS-M Countries (2008)

Entry to the Teaching Profession/Certification	Country
Level 1 Countries where graduation leads automatically to official entry to the teaching profession	Botswana, Chile, Georgia, Malaysia, Norway, Poland, Russian Federation, Singapore, Spain ⁷ , Switzerland, Thailand
Level 2 Countries where entry to the profession depends on passing further tests set by external agencies (e.g., licensure tests of professional knowledge)	Canada (Ont.), Oman, Philippines, Spain ⁸
Level 3 Countries where entry to the profession or gaining employment depends on passing further tests of professional knowledge and assessments of teaching performance	Chinese Taipei, Germany, United States

Source: Tatto et al. (2012, p. 49).

⁷ Private school teachers.

⁸ Public school teachers.

Table 8 summarizes the quality assurance mechanisms in the TEDS-M program sample and shows that only Chinese Taipei and Singapore had strong QA systems, followed by Canada and Germany (with medium/high strength). The United States was classified as moderate/low along with Spain and Norway.

While there are mechanisms in place to secure different levels of program quality, the TEDS-M assessments provided the most important indicator of how well the design of preservice teacher education and quality assurance mechanisms were achieving their objective. In the TEDS-M tests of mathematics content and pedagogy knowledge, for instance, the highest-scoring countries among the nonspecialist future primary teachers were Chinese Taipei and Singapore followed by the Russian Federation. Poland and Singapore were the best performers among the mathematics specialists. While U.S. primary future teachers scored 25 points above the international mean (which was set at 500), Singapore and Chinese Taipei future teachers scored from one half to a full standard deviation above U.S. future teachers (Tatto et al., 2012, pp. 139–143). The pattern was similar for future secondary teachers with the exception that U.S. future lower secondary teachers scored below the international mean while upper secondary teachers did better (see Tatto et al., 2012, pp. 147–150).

The description of quality assurance mechanisms and future teachers' results in tests of knowledge for teaching (defined in TEDS-M as a combination of mathematics and mathematics pedagogy knowledge) provided both a possible explanation and a good indicator of program quality. In TEDS-M, however, we explored the breadth and depth of opportunities to learn offered to future teachers. This exploration required a detailed analysis of program syllabi including mathematics, mathematics pedagogy, school mathematics, and pedagogy syllabi. This analysis also provided with a "list of competencies" as expected by the programs. In the next section we show results of the syllabi analysis for selected countries in the TEDS-M study.

Table 8. Quality Assurance Mechanisms in the TEDS-M Program Sample

	<i>Control over Inputs</i>			<i>Control over Process</i>	<i>Control over Product</i>	<i>Relative strength of QA system</i>
	Recruitment of highly qualified students for teacher education	Promotion of teaching as attractive career	Selection standards for entry to teacher education	Accreditation of teacher education programs	Regulated entry to the teaching profession	
Botswana						Moderate
Canada						Moderate/High
Chile						Low
Chinese Taipei						High
Georgia						Low
Germany						Moderate/High
Malaysia						Moderate
Norway						Moderate/Low
Oman (Secondary)						Low
Philippines						Low
Poland						Moderate
Russian Fed.						Moderate
Singapore						High
Spain (Primary)						Moderate/Low
Switzerland						Moderate
Thailand						Low
United States						Moderate/Low

Key:

Strong QA procedures

Moderately strong QA procedures

Limited QA procedures

Source: Tatto et al. (2012).

5. TEDS-M Syllabi Analysis as a Program Evaluation Strategy

The syllabi analysis strategy used in TEDS-M proved to be an important approach to better grasp program requirements and design. It clearly illustrates international variation in the opportunities to learn provided to future teachers and its consequences at the point in which future teachers are declared ready to teach by their programs. Because the syllabi analysis was done by the teacher educators this experience was a very helpful bottom-up program/review activity that enabled program implementers and designers to critically analyze program design and opportunities to learn in comparison with programs from other countries.

The results should be interpreted with caution and in light of the entry requirements to teacher education stipulated by the programs in the countries listed and explained above and in Table 8. In addition these results are only for the actual teacher education programs per se and do not include coding of subject matter experiences that future teachers may have acquired outside of the formal teacher education program; we used a questionnaire to ask for the latter and such information was used for triangulation. As expected the program's selection strategy plays a key role in the opportunities to learn offered to future teachers. Tables 9–12 show the percentage of institutions that reported covering the topics listed as part of opportunities to learn school mathematics, mathematics, mathematics pedagogy, and pedagogy provided to future teachers in Chinese Taipei, Germany, Singapore, and the United States. Because Finland did not participate in TEDS-M, we used the syllabi published in the University of Helsinki website as a reference and did the coding ourselves.

Opportunities to Learn School Mathematics

Table 9 shows that in all countries a proportion of programs designed for future primary teachers (program types 1 to 3 for nonspecialists and type 4 for mathematics specialists) cover some or all of the topics listed under “school mathematics.” In contrast, when looking at programs designed for lower and upper secondary teachers, no program covers these topics in Chinese Taipei (program type 5) or in Finland and Germany (program type 6) as knowledge of these areas is part of the entry requirements in these countries. Topics that received uniformly no coverage in Chinese Taipei and Singapore were measurement units, computations, and properties of length, perimeter, area, and volume. In Singapore alone areas such as whole numbers, fractions and decimals, integers, rational and real numbers, and estimation and error in measurement were not covered. In the United States, in contrast, a proportion of programs provides some opportunity to learn most or all of these topics.

Opportunities to Learn Mathematics

Table 10 shows almost the reverse pattern as the one observed for the opportunities to learn school mathematics, with a larger proportion of programs designed for lower and upper secondary teachers covering some or all of the topics designated as “mathematics.” A small proportion of programs designed for primary future teachers in Chinese Taipei, Germany, Singapore, and the United States cover some of the listed mathematics topics. We found no indication of this kind of coverage in Finland.

Opportunities to Learn Mathematics Pedagogy

Table 11 shows that most of the topics listed are covered at least by some of the programs in the countries. Across all the countries most of the programs across levels cover topics having to do with learning how to approach *mathematical problems and solutions*, *mathematics instruction*, *developing of mathematics teaching plans*, *analyzing/observing/reflecting on mathematics teaching*, and *developing knowledge of mathematics standards and curriculum*. Chinese Taipei, Finland, and Singapore are distinct in that they place almost universal emphasis in areas such as *theories/models/aspects of mathematics ability and thinking*. Importantly and given the high levels of performance in Chinese Taipei and Singapore, there is a strong emphasis on *methods of presenting main mathematics concepts*, and in Chinese Taipei a strong emphasis on *studying and selecting textbooks and instructional materials*.

Opportunities to Learn Pedagogy

Table 12 shows that there is almost uniform coverage of the topics listed under general pedagogy across the countries and levels examined including history of education and educational systems, educational psychology, philosophy of education, sociology of education, introduction to education or theories of schools, principles of instruction, classroom management, and practical knowledge of teaching. Three areas received less emphasis across the board (but not in Chinese Taipei, Finland, and Singapore); these include assessment and measurement theory methods of educational research, and instructional media and operation. Counseling, advising students, and pastoral care received the most emphasis in Chinese Taipei and Finland.

In sum, while there is widespread uniformity on the topics covered in general pedagogy there is more variability on how programs design opportunities to learn in the areas of school mathematics, mathematics, and mathematics pedagogy. Such differences no doubt obey the set of competencies that future teachers bring with them when they enter their program and those they are expected to master when they graduate such as the level and depth of mathematics and school mathematics knowledge. In Finland, for instance, future primary school teachers seem to be expected to master the mathematics of the school curriculum only and in close correspondence with the level at which they will teach; advanced mathematics are left for those future teachers who will teach upper-level courses. The same seems to be true in Chinese Taipei, Germany, and the United States.

The area of mathematics pedagogy shows the most important similarities and differences in areas that may leverage important practices. Similarities across the countries examined are opportunities to learn *how to approach mathematical problems and solutions, mathematics instruction, developing of mathematics teaching plans, analyzing/observing/reflecting on mathematics teaching, and developing knowledge of mathematics standards and curriculum*. Important differences found among the higher achieving countries is in their emphasis to provide opportunities to *develop deep understandings of models and aspects of mathematics ability and thinking, learning methods to present main mathematics concepts, and studying and selecting textbooks and instructional materials*. Similarly the *ability to know how to do development assessment, how to do educational research, and how to use instructional media* seem to be important in the higher achieving countries.

Table 9. Analysis of School Mathematics Syllabi Using the TEDS-M Method

School Mathematics	Chinese Taipei		Finland				Germany				Singapore		USA			
	Program type		Program Type				Program Type				Program type		Program type			
	TWN2	TWN5	FIN1	FIN2	FIN3	FIN6	DEU1	DEU4	DEU5	DEU6	SGP2	SGP4	USA2	USA4	USA5	USA6
Whole numbers	B	E	A	A	A	E	C	C	C	E	E	E	C	C	C	D
Fractions & decimals	A	E	A	A	A	F	C	C	C	E	E	E	C	C	B	D
Integer, rational & real numbers	A	E	E	E	A	E	C	C	C	E	E	E	C	C	C	D
Other numbers & number concepts & number theory	A	E	E	E	A	E	C	C	C	E	C	E	C	C	C	D
Estimation & number sense concepts	D	E	A	A	A	E	C	C	C	E	E	E	C	C	C	D
Ratio and proportionality	B	E	A	A	A	E	C	C	C	E	C	B	C	C	C	D
Measurement units	E	E	A	A	E	E	C	C	C	E	E	E	D	D	D	D
Computations & properties of length, perimeter, area & volume	E	E	A	A	E	E	C	C	C	E	E	E	E	E	E	E
Estimation & error in measurement	D	E	E	E	E	E	C	C	C	E	E	E	D	D	D	D
1-D & 2-D coordinate geometry	C	E	A	A	A	E	C	C	C	E	E	E	D	D	D	D
Euclidean geometry	D	E	E	A	A	E	C	C	C	E	B	B	D	C	C	D
Transformational geometry	E	E	E	E	A	E	C	C	C	E	C	B	C	C	C	D
Congruence and similarity	C	E	E	E	A	E	C	C	C	E	B	B	C	C	C	D
Constructions with straightedge and compass	E	E	E	E	A	E	C	C	C	E	B	B	D	C	C	D
3-D geometry	C	E	A	A	A	E	C	C	C	E	E	B	D	D	C	D
Vector geometry	D	E	E	E	E	E	C	C	C	E	E	E	D	E	D	D
Simple topology	E	E	E	E	E	E	C	C	C	E	E	E	D	E	E	E
Patterns, relations & functions	E	E	A	A	A	E	C	C	C	E	E	E	D	E	E	E
Equations & formulas	C	E	E	A	A	E	C	C	C	E	C	E	C	B	B	C
Trigonometry & analytic geometry	B	E	E	E	A	E	C	C	C	E	E	B	C	C	C	D
Data representation & analysis	D	E	A	A	A	E	C	C	C	E	C	E	C	C	C	D
Uncertainty & probability	C	E	E	A	A	E	C	C	C	E	E	E	D	C	B	C
Elementary Analysis	C	E	E	E	E	E	C	C	C	E	E	E	D	D	D	D
Validation & Structure	A	E	E	E	E	E	C	C	C	E	E	E	D	D	D	D
Other School Mathematics Topics	B	E	E	E	E	E	C	C	C	E	B	B	D	C	D	D

Remarks: A **topic** is considered "taught in the institution/TPU" if at least one of the subtopics is taught in the institution/TPU. E, no one institution/TPU covers the topic; D, less than 25% of the institutions/TPUs cover the topic; C, between 25% and 50% of the institutions/TPUs cover the topic; B, between 50% and 75% of the institutions/TPUs cover the topic; A, more than 75% of the institutions/TPUs cover the topic. **Program Types:** Program Type 1, Lower Primary Generalist (Grade 4 Maximum); Program Type 2, Primary Generalist (Grade 6 Maximum); Program Type 3, Primary/Lower Secondary Generalist (Grade 10 Maximum); Program Type 4, Primary Mathematics Specialist; Program Type 5, Lower Secondary Mathematics (to Grade 10 Maximum); Program Type 6, Lower Secondary Mathematics (to Grade

11 and above). **Germany:** School Mathematics was reported as a part of Mathematics because the institutions are from the second phase of the consecutive route. **Finland:** Did not participate in TEDS-M; the analysis was done using information available in the University of Helsinki website.

Table 10. Analysis of School Mathematics Syllabi Using the TEDS-M Method

Mathematics	Chinese Taipei		Finland				Germany				Singapore		USA			
	Program type		Program Type				Program Type				Program type		Program type			
	TWN2	TWN5	FIN1	FIN2	FIN3	FIN6	DEU1	DEU4	DEU5	DEU6	SGP2	SGP4	USA2	USA4	USA5	USA6
Axiomatic Geometry (including Euclidean axioms)	D	E	F	F	F	F	B	A	A	C	E	E	D	C	C	B
Analytic/Coordinate Geometry	C	A	E	E	E	A	D	B	C	B	E	E	D	C	C	B
Non-Euclidean Geometry (e.g. geometry on a sphere)	E	E	E	E	E	E	E	E	E	D	E	E	D	C	C	C
Differential Geometry	F	A	F	F	F	E	F	F	F	D	E	E	D	D	D	D
Topology	F	A	F	F	F	E	F	F	F	D	E	E	D	E	E	D
Linear Algebra	D	A	E	E	E	A	D	B	B	A	C	E	D	C	C	A
Set Theory	A	A	E	E	E	E	D	C	D	D	C	E	D	D	D	D
Abstract Algebra (e.g., group theory, field theory, ring theory, ideals)	D	A	E	E	E	E	E	D	D	B	E	E	D	D	D	B
Number Theory	B	C	F	F	F	E	B	B	B	C	B	B	C	D	C	B
Beginning Calculus topics (e.g., limits, series, sequences)	B	A	E	E	E	E	D	C	C	B	C	E	D	C	C	A
Calculus (e.g., derivatives and integrals)	C	A	F	F	F	A	D	C	B	A	C	F	D	B	B	A
Multivariate Calculus (e.g., partial derivatives, multiple integrals)	D	A	E	E	E	E	E	E	E	C	C	E	D	D	D	B
Advanced calculus or real analysis or measure theory	E	A	E	E	E	A	E	E	E	C	E	E	E	E	E	C
Differential Equations	E	A	E	E	E	A	E	E	D	B	C	E	D	D	D	C
Functional Analysis, Theory of Complex Functions	E	B	E	E	E	A	E	E	E	D	E	E	D	D	D	C
Discrete Mathematics, Graph theory, Game theory, Combinatorics	E	A	E	E	E	E	D	C	D	D	C	E	D	C	C	B
Probability	B	A	E	E	E	E	D	C	C	C	C	E	D	C	B	B
Theoretical or Applied Statistics	C	A	E	E	E	E	D	C	C	C	C	E	D	C	B	B
Mathematical Logic	B	A	E	E	E	A	E	C	D	D	E	E	D	D	D	C
Other Mathematics Topics	E	A	E	E	E	E	D	C	D	D	C	E	D	C	C	B

Remarks: A **topic** is considered "taught in the institution/TPU" if at least one of the subtopics is taught in the institution/TPU. E, no one institution/TPU covers the topic; D, less than 25% of the institutions/TPUs cover the topic; C, between 25% and 50% of the institutions/TPUs cover the topic; B, between 50% and 75% of the institutions/TPUs cover the topic; A, more than 75% of the institutions/TPUs cover the topic. **Program Types:** Program Type 1, Lower Primary Generalist (Grade 4 Maximum); Program Type 2, Primary Generalist (Grade 6 Maximum); Program Type 3, Primary/Lower Secondary Generalist (Grade 10 Maximum); Program Type 4, Primary Mathematics Specialist; Program Type 5, Lower Secondary Mathematics (to Grade 10 Maximum); Program Type 6, Lower Secondary Mathematics (to Grade 11 and above). **Finland:** Did not participate in TEDS-M; the analysis was done using information available in the University of Helsinki website.

Table 11. Analysis of Mathematics Pedagogy Syllabi Using the TEDS-M Method

Mathematics Pedagogy	Chinese Taipei		Finland				Germany				Singapore		USA			
	Program type		Program Type				Program Type				Program type		Program type			
	TWN2	TWN5	FIN1	FIN2	FIN3	FIN6	DEU1	DEU4	DEU5	DEU6	SGP2	SGP4	USA2	USA4	USA5	USA6
Theories/Models of Mathematics Ability and Thinking	B	B	A	A	A	E	D	C	D	C	B	A	C	D	D	D
Nature and Development of Mathematics Ability and Thinking	C	B	A	A	A	E	E	C	D	C	E	E	C	B	C	C
Aspects of Mathematical Ability and Thinking	C	C	A	A	A	E	D	B	C	C	B	A	C	B	B	B
Mathematical Problems and Solutions	B	C	A	A	A	E	C	C	C	C	B	A	B	B	A	C
Mathematics Instruction	B	A	A	A	A	E	B	A	A	A	B	A	B	B	B	B
Developing of Mathematics Teaching Plans	A	A	A	A	A	A	B	A	A	A	B	A	B	B	B	B
Analyzing/Observing/Reflecting on Mathematics Teaching	A	A	A	A	A	A	B	A	A	A	B	A	B	B	B	B
Knowledge of Mathematics Standards and Curriculum	A	A	A	A	A	A	E	C	C	C	B	A	A	B	B	B
Studying and Selecting Textbooks and Instructional Materials	A	B	E	E	E	E	D	C	D	C	E	E	C	C	C	D
Methods of Presenting Main Mathematics Concepts	B	A	E	E	E	E	C	B	C	B	B	A	C	C	C	C
Foundations of Mathematics	C	C	E	E	E	E	D	C	D	D	E	E	D	D	D	B
Context of Mathematics Education	D	B	E	E	E	E	D	C	D	D	E	E	D	D	D	D
Affective Issues (Beliefs, Attitudes, Anxiety, etc.)	A	C	A	A	A	A	D	E	E	D	E	E	D	D	D	D

Remarks: A **topic** is considered "taught in the institution/TPU" if at least one of the subtopics is taught in the institution/TPU. E, no one institution/TPU covers the topic; D, less than 25% of the institutions/TPUs cover the topic; C, between 25% and 50% of the institutions/TPUs cover the topic; B, between 50% and 75% of the institutions/TPUs cover the topic; A, more than 75% of the institutions/TPUs cover the topic. **Program Types:** Program Type 1, Lower Primary Generalist (Grade 4 Maximum); Program Type 2, Primary Generalist (Grade 6 Maximum); Program Type 3, Primary/Lower Secondary Generalist (Grade 10 Maximum); Program Type 4, Primary Mathematics Specialist; Program Type 5, Lower Secondary Mathematics (to Grade 10 Maximum); Program Type 6, Lower Secondary Mathematics (to Grade 11 and above). **Finland:** Did not participate in TEDS-M; the analysis was done using information available in the University of Helsinki website.

Table 12. Analysis of General Pedagogy Syllabi Using the TEDS-M Method

General Pedagogy	Chinese Taipei		Finland				Germany				Singapore		USA			
	Program type		Program Type				Program Type				Program type		Program type			
	TWN2	TWN5	FIN1	FIN2	FIN3	FIN6	DEU1	DEU4	DEU5	DEU6	SGP2	SGP4	USA2	USA4	USA5	USA6
History of Education and Educational Systems	A	C	A	A	A	E	B	B	C	B	A	A	B	B	B	B
Educational Psychology	A	A	A	A	A	E	A	B	B	A	A	A	A	A	A	A
Philosophy of Education	A	B	A	A	A	F	D	C	D	C	A	A	B	B	B	B
Sociology of Education	A	B	A	A	A	F	B	B	B	B	A	A	A	A	A	A
Introduction to Education or Theories of Schools	A	B	A	A	A	E	A	B	B	A	A	A	A	A	A	A
Principles of Instruction	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A	B
Methods of Educational Research	A	C	A	A	A	A	D	C	D	E	F	B	B	C	C	C
Classroom management	A	B	A	A	A	A	A	C	B	C	A	A	A	A	A	A
Assessment and Measurement Theory	A	B	A	A	A	A	B	B	B	B	A	A	C	C	B	B
Counseling, Advising Students, and Pastoral Care	A	C	A	A	A	E	B	B	B	B	C	E	D	D	D	D
Instructional Media and Operation	A	A	A	A	A	F	A	A	A	A	A	A	B	B	B	B
Practical Knowledge of Teaching	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A

Remarks: A **topic** is considered "taught in the institution/TPU" if at least one of the subtopics is taught in the institution/TPU. E, no one institution/TPU covers the topic; D, less than 25% of the institutions/TPUs cover the topic; C, between 25% and 50% of the institutions/TPUs cover the topic; B, between 50% and 75% of the institutions/TPUs cover the topic; A, more than 75% of the institutions/TPUs cover the topic. **Program Types:** Program Type 1, Lower Primary Generalist (Grade 4 Maximum); Program Type 2, Primary Generalist (Grade 6 Maximum); Program Type 3, Primary/Lower Secondary Generalist (Grade 10 Maximum); Program Type 4, Primary Mathematics Specialist; Program Type 5, Lower Secondary Mathematics (to Grade 10 Maximum); Program Type 6, Lower Secondary Mathematics (to Grade 11 and above). **Germany:** School Mathematics was reported as a part of Mathematics because the institutions are from the second phase of the consecutive route. **Finland:** Did not participate in TEDS-M; the analysis was done using information available in the University of Helsinki website.

6. A Framework for Innovation in Teacher Preparation Program Evaluation in the United States: Lessons from Abroad

6.1 How the Current Accountability Movement May Be Undermining Quality

According to the Oxford English Dictionary, quality assurance (QA) is understood as “the maintenance of a desired level of quality in a service or product, especially by means of attention to every stage of the process of delivery or production” while quality is defined as “the standard of something as measured against other things of a similar kind; the degree of excellence of something,” and as “a distinctive attribute or characteristic possessed by someone or something.” Evaluation is defined by the same dictionaries as “the action of appraising or valuing (goods, etc.); a calculation or statement of value,” and “program evaluation (PEv) as a systematic method for collecting, analyzing, and using information to answer questions about the effectiveness of programs and whether they are having the intended effect.” While program evaluation is a comprehensive undertaking, quality assurance is by definition more focused and tailored to the particular attribute under consideration; moreover, while some things can be measured according to universal standards, others cannot. In this case teacher education, just as teaching and learning, has both predictable and unpredictable features and require both structure and improvisation. Teacher education, just like learning to teach, requires a combination of collegial learning, shared vision, and creativity; yet while teaching—and teacher education—could be delivered through standard methods (e.g., the same video on a particular topic delivered by the same teacher), learning still retains an unpredictable and unexpected quality. Quality assurance seems a model better suited for assessing and improving teacher preparation program quality and illuminating what features are conducive to better learning.

First, let us examine the important distinctions between QA and PEv that seem confounded in the activity carried out on behalf of accountability in teacher education.

Table 13. Comparing Program Evaluation and Quality Assurance

<i>Program Evaluation</i>	<i>Quality Assurance</i>
Focus on program processes and outcomes	Focus on individual processes and outcomes
Aggregate data	Individual clinical cases
Goals-based judgment	Professional based judgment
Intended for decision makers	Intended for clinical staff

Source: Patton (2002, p. 149).

Quality assurance is a dynamic process which if carried out authentically must focus on the study of individual processes and outcomes, highlighting individual cases of either

success or failure, using practice-based judgment and considering as its intended users practitioners such as the program's staff. In contrast program evaluation focuses on program processes and outcomes as aggregated data, goals-based expert judgment, and considering as its intended users decision makers such as managers (see Patton, 2002, p. 149). Throughout this paper we have presented evidence of systems that have engaged in the development of mechanisms for assessing teacher preparation program quality but have for the most part focused on the delivery of program evaluation results such as "aggregated outcomes" rather than "individualized outcomes," following a strong tendency to use goal-based judgments that tend to override professional-based judgments.

Second, it is important to examine the consequences of such activities. Program evaluation-based results on teacher education quality are intended for decision makers and are thus tailored to fulfill decision makers' expectations and will tend to ignore or distort programs' achievements and outcomes (e.g., if aggregated program outcomes are expected to fall along a normal curve, evaluators will try and deliver such a distribution which may mask features that allow "deviant" programs to be innovative to fit important clients' demands). Assuming for instance that teacher education programs across a country have similar goals may not only be misleading but could also affect how programs that are different are classified as failing while in fact the goals may be different according to the kind of teacher they expect to produce. In education as in other branches of the social sciences, "one size fits all" is a myth that needs to be debunked. We are not arguing against standards; we are instead arguing for a tailored approach to standards in accordance with practice. (For example, see the careful work that has gone into the development of the New Generation of Science Standards (NGSS) in the United States; its full implementation will require careful nuances in enactment and evaluation, both in teaching and teacher education, to translate them faithfully into practice.)

Third, we argue that teacher education quality may be undermined by generic attempts at accountability because a generic model of program evaluation tends to assume a standard for all program outcomes which then can be equally measured. But while in fact teacher education programs may have similar goals in some areas (e.g., knowledge proficiency to teach primary-level mathematics), they may not in others (e.g., an expanded knowledge of cultural differences), and some teacher education programs may be in fact attempting to maximize individualized outcomes among future teachers, including maximizing variability and flexibility to adapt to challenging students' needs and contexts. If this is the main goal of teacher education programs, especially those that attempt to equip teachers to work with disadvantaged students and settings, then it is likely that the more successful the program is at adapting to specific contexts and needs the more it runs the risk of not "fitting the standards" according to current evaluation practices.

In this paper we propose that the kind of approach that is more appropriate to assess and improve teacher education quality is "utilization focused participatory quality assurance."

There are very few examples of this approach but some can be found in Finland and to some degree in Singapore, and among the countries that recently participated in the TEDS-M study. In contrast, a variety of outcome-focused approaches and hybrids can be found, notably in the EU in compliance with the Bologna agreement, which has resulted in legislation to regulate higher education institutions and the formation of external evaluation agencies. The result has been in some cases the evaluation of teacher education under the same “generic” models used to evaluate higher education. In some cases this has meant the creation of internal evaluation procedures to respond to increasing demands for information required by accountability mandates these institutions are ill prepared to collect (e.g., such as the effects of teacher performance on student performance). Other aspects having to do with program implementation such as the examination of the content of the teacher education curriculum provided by the institution, the teaching methods, the assessment practices, and the program’s human resources and infrastructure may be easier to procure and represent a more appropriate model for implementation and evaluation. In a number of EU countries and in the United Kingdom with the exception of Scotland, these evaluations are done by so-called experts, while in others they are performed by “peers” or by both. In cases when the evaluation is done by peers or by experts and peers there is a tendency to have an internal evaluation committee within the teacher education institution but not always. In other words and by definition “expert and goal-driven quality assessment” systems are nonparticipatory and non-program-utilization-focused.

While a program-utilization-focused quality assurance model would argue for a collaborative approach enacted with knowledgeable program implementers and evaluation researchers, a whole “industry” has evolved to “take care” of teacher education program evaluation, eliminating participation from those who implement the programs.

In the research done for this paper we found a wide variety of organizations that carry out the needed reviews for accreditation. For instance, there are nongovernment agencies in charge of evaluation mostly following set standards mandated in the legislation, or by professional bodies or in some cases by program standards. Under this model programs are evaluated by an external group such as the National Council for Accreditation of Teacher Education (NCATE) in the United States, now the Council for the Accreditation of Educator Preparation (CAEP). This model seems to also exist in Norway and Taiwan. More centralized models are common in Asian and Latin American countries, usually enacted by the national government through the appropriate branch of the Department of Education or MoE. Singapore follows this centralized model, and to validate the process experts and foreign authorities are invited to participate or review the evaluation documents and data. In other countries, notably in England, the government is also the evaluation authority via an inspectorate system. In this system careful monitoring

activities are carried out periodically and reports once written are shared with the public. In other countries the programs design and implement the evaluation (self-study) according to professional standards and/or national core curricula but are accountable to an external agency that corroborates the information collected by the program (much as old Teacher Education Accreditation Council (TEAC)) in the United States, now joined with NCATE into CAEP). In some cases the external agency has the power of placing the program on probation if the evaluation results are nonfavorable as in many of the EU countries and in the United States. However, no consequences were reported in French Belgium, France, and Latvia in terms of an externally driven improvement plan, accreditation, funding, or publication of the results.

Given our analysis some points are worth considering in the future development of a new framework to innovate the quality assurance assessment of teacher preparation programs:

1. Preevaluation, a tried procedure to determine whether a program can and should be subjected to a formal evaluation, is not mentioned in the literature and documents we examined. Instead programs are placed on probation if they fail to fit quality criteria. Preevaluation strategies may help evaluators better understand what are particular programs' goals and expectations and may support program improvement before more serious steps are followed. The idea here is one of a quality assurance *learning community* rather than an *enforcing community*.
2. Although the rhetoric differs, the so-called quality assurance mechanisms do not seem to be constructed to help programs learn from the evaluation process and improve their practice. For instance, evaluations of outcomes by experts obviate the need for an internal committee in the institution. External evaluators may not be able to document program implementation and processes accurately, how these programs continuously learn to adapt to their clients, and how impositions of standards may impede the flexibility needed to adjust to clients' needs.
3. While quality assurance is expected to monitor a program's process and implementation it is difficult to see how this is currently done, especially as it concerns external evaluations with the problematic conclusion that it is likely that evaluations may be driven by the "one-standard-fits-all" model.
4. The one-standard-fits-all model may have the undesirable consequences that a program's ability to prepare future teachers to attend to an individual student's needs may be lost; it may be that programs that are successful at adjusting to clientele fail to look like the standard ideal expected by decision makers end up "on probation."

5. Logic models and theories of action-based studies, and process studies, both key to proving and improving quality, do not seem to be part of the large accountability movement in teacher education.

Table 14 shows 24 model variations for quality assurance studies. We advocate those models that are internally driven by practitioner research, that are collaborative across programs and contexts, and where the object of study is either one or more of the following: preevaluation studies, individualized outcomes studies, and process and implementation studies, *all* according to programs' logic models and theories of action-based studies.

In contrast most of the studies we encountered are externally driven and focused on aggregated outcomes with a few studies also asking about implementation aspects (marked with a ☉ symbol in the table).

An example of a participatory-collaborative quality assurance study is the recently released IEA-TEDS-M study. TEDS-M represented an effort by the national governments but was executed by a team of teacher educators lead by Michigan State University in collaboration with the IEA research outfit; the study was designed in close collaboration between evaluation researchers and program implementers. The program implementers researched their own program in detail, including syllabi analysis, and knowledge for teaching assessments. The idea was for the program theory of action to drive the evaluation, in a model that was collaborative and bottom-up, was formative, incorporated program implementers' accumulated knowledge of and research on own practice, and created multidisciplinary working groups and the basis for longitudinal study. Although the study was not mandated by law it did create the capacity and the infrastructure for rigorous program self-study and high user rate.

Table 14. Recommended Purposes of Quality Assurance⁹

Program Utilization Focused Evaluation Continuum	Pre-evaluation Studies	Outcomes Studies	Individualized Outcomes Studies	Process Studies	Implementation Studies	Logic Models and Theories of Action-based Studies
Externally driven by accountability mandates		○			○	
Internally driven by accountability mandates		○			○	
Internally driven by practitioner research (collaborative)						
Internally driven by practitioner research (collaborative across programs and contexts)						

Adapted from: Patton (2002)

Less participation					More participation
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⁹ **Preevaluation studies:** to determine whether a program is well conceptualized and consistently implemented to undertake a formal and rigorous evaluation of overall effectiveness; **Outcomes:** Central focus of accountability-driven evaluation to demonstrate—not quality (what it means to achieve something rather than whether something has been achieved) but rather the responsible use of public funds to achieve politically desired results; **Individualized outcomes:** Whether program services are matched to the needs of individual clients; **Process studies:** looking at how something happens rather than or in addition to examining outputs and outcomes; **Implementation evaluation:** Whether or not the program is operating according to design and the “treatment” is believed to be in operation [note: “where outcomes are evaluated without knowledge of implementation the results seldom provide a direction for action because the decision maker lacks information about what produced the observed outcomes or lack of outcomes”]; **Logic models and theories of action based evaluations:** depicts the connections between program inputs, activities and processes (implementation), outputs, immediate outcomes, and long-term impacts to achieve an “ideal” – “actual” comparison or espoused theory and theory in use (based on Patton, 2002, pp. 143–187).

6.2 How to Increase Teacher Education Quality and Accountability Through Evaluation Research

The development of a framework for innovation in teacher preparation program evaluation in the United States should begin with a simple question: Why evaluate teacher education programs? To engage in a good evaluation (or a quality assurance effort) is a major undertaking and should not be taken lightly. Indeed a study of such dimensions should be considered as a carefully planned intervention as in the TEDS-M example (see Tatro, 2011). Results of top-down accountability mandates have come close to destroying whole systems of teacher education as in England, and closed institutions in others as in a number of states in the United States, and yet we do not have evidence that these efforts have improved programs or teacher performance in significant ways. We argue that one reason for this is that most efforts have focused on measuring outcomes, providing information for managers and decision makers rather than practitioners, and the efforts have been for the most part characterized by nonparticipatory approaches and conducted by “experts” under a model expected to provide “scientifically based” answers to policy makers to independently ensure accountability. This “enforcer” dynamic is illustrated in Table 15 in the lower left quadrant.

If we were to agree that the purpose of teacher education program evaluation is to create an *Informed Dialogue*, then the recommendation would be an emphasis on interest-acknowledged interpretation within contexts, and a participatory approach toward accountability, what we call here quality assurance. This dynamic is illustrated in Table 15 in the upper right quadrant.

Thus, the imperative is to clarify the purposes, means, and ends for teacher education quality assurance.

Table 15. Role of Evaluation in Teacher Education Programs: Current Tendencies

Informed Dialogue (Emphasis on interest-acknowledged interpretation within contexts)	
Non-participatory ¹⁰	<p style="text-align: right;">TEDS-M Countries</p> <p>Finland</p> <p>Singapore (?)</p> <p>USA (TEAC)</p>
USA (NCTQ)	<p style="text-align: right;">Participatory¹¹</p> <p>Some EU Countries</p> <p>USA (NCATE) Norway Taiwan Most EU Countries</p> <p>UK (inspectores)</p>

Expert Judgment

(“Scientifically based” answers to policy makers to independently ensure accountability)

¹⁰ Methods and measurement decisions are purely technical. Evaluation users and program implementers are marginally or not involved in the evaluation design, methods, scope, and data collection or in the analysis and findings reports.

¹¹ Based on notions of organizational learning to develop more informed practitioners through use of findings that they themselves helped produce, and more thoughtful and deliberative practitioners by helping them weigh evidence and think and engage with each other evaluatively.

We suggest the following questions and answers:

What is the purpose?

- Program improvement.

What to evaluate?

- Individualized outcomes, program implementation, and process according to the program's theories of action.

How?

- Collaborative, bottom-up accountability.

When?

- Formative and longitudinal, accumulated knowledge of practice.

By whom and for whom?

- Internally driven by practitioner research (collaborative across programs and contexts) with multidisciplinary groups of evaluation researchers and program implementers and users.

Why?

- Research on own practice, learning what works.

6.3 Final Thoughts

First, university administrators and the faculty of teacher preparation programs should charge a specialized group with expertise on participatory research and evaluation to value and facilitate collaboration to carry the task of conducting yearly internal evaluations that gather information on individualized program outcomes, process studies, and implementation studies all based on logic models and theories of action. The effort should be directed at developing a longitudinal database in close collaboration with and useable by program people.

Second, to ensure the development of the habit or culture of self-evaluation (weighing evidence and think evaluatively), program implementers should participate fully in learning from their own practice. Students should be exposed to methods for conducting research on their own practice early and often in their preparation. This is not a practice best reserved for induction, mentoring, or professional development; it is a life-long skill. An example is teacher candidates learning how to develop assessment and how to effectively use them to evaluate and improve their own performance and that of their pupils. This is a practice firmly embedded in the Finnish curriculum.

Third, in terms of competencies we found that, in high-achieving countries like Finland and Singapore, the curriculum for teacher preparation programs appears quite lean. Both have three key elements: the performance of key practices, curriculum and class planning, and assessment and reflection.

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Appendix 1. Finland's Teacher Education Curriculum

Main Components of the Teacher Education Program for Class School Teachers

300 ECTS credits

BEd= studies included in the Bachelor of Education degree

MEd= studies included in the Master of Education degree

		BEd	MEd
Communication studies and orientation studies	25 CR		
Basics of curriculum planning	5 cr	3 cr	2 cr
Language and communication skills	14 cr		
Mother tongue			
Speech communication and interaction skills		4 cr	
Scientific writing		4 cr	
Foreign language		3 cr	
Second national language		3 cr	
Information and communication technology in studies	3 cr 3 cr	3 cr	
Introduction to media education			3 cr
Main subject studies in education	140 cr	BEd	MEd
Cultural bases of education	15 cr		
Introduction to educational sciences		3 cr	
Change and continuity in education		7 cr	
Individual confronting change		5 cr	
Psychological bases of education	15 cr		
Growth, development, and learning		5 cr	
Knowing your pupil		5 cr	
Special needs education and pupil welfare services		5 cr	
Pedagogical bases of education	20 cr		
Didactics		7 cr	
Theory and didactics of early childhood education		3 cr	
Curriculum theory and evaluation			3 cr 7 cr
Pedagogical knowledge and construction of personal practical theory			cr
Research studies in education	70 cr		
Introduction to educational research		3 cr	
Educational research methods		7 cr	
Bachelor's thesis (incl. seminars 4 cr)		10 cr	
Research in teaching Advanced quantitative research methods			5 cr 5 cr
<i>or</i>			cr
Advanced qualitative research methods			5 cr
Master's thesis			40 cr
Teaching practice Minor subject teaching practice	20 cr		12 cr
Main subject teaching practice			8 cr

Appendix 1 (continued)

Minor Subject Studies

	BEd	MEd
Multidisciplinary studies in subjects and cross-curricular issues taught in comprehensive school	60 cr	
1. Mother tongue and literature education	8 cr 7 cr	8 cr 7 cr
2. Mathematics education		
3. Arts and skills education	13 cr	
3.1 Arts education		3 cr
3.2 Crafts education		4 cr
3.3 Physical education		3 cr
3.4 Music education		3 cr
4. Didactics in humanistic subjects	6 cr	
4.1 History education	<i>or</i>	3 cr 3 cr
4.2 a) Evangelical-Lutheran religious education		
4.2 b) Secular ethics education		3 cr 3 cr
5. Didactics in environmental and science subjects	12 cr	
5.1 Geographical education		
5.2 Biology education		3 cr
5.3 Physics education		3 cr
5.4 Chemistry education		3 cr 4 cr
6. Optional courses	14 cr	
6.1 Arts education		4 cr
6.2 Crafts education		4 cr 4 cr
6.3 Physical education		
6.4 Music education		3 cr
6.5 History education		3 cr
6.6 Evangelical-Lutheran religious education		3 cr
6.7 Secular ethics education		3 cr
6.8 Geographical education		3 cr
6.9. Biology education		3 cr
6.10 Physics education		3 cr
6.11. Chemistry education		
Optional minor subject and optional studies: 75 cr		
		40 cr 35 cr
Study points in the whole degree: 300 CR		

1 ECTS credit = 27 hours of work

Appendix 1 (continued)**Structure of Pedagogical Studies for Teachers (60 ECTS credits)**

Bachelor's Level	Master's Level
25 ECTS credits	35 ECTS credits
1st period 18 ECTS credits Psychology of development and learning (4 cr) Special education (4 cr) Introduction to subject teaching (10 cr)	3rd period 17 ECTS credits Social, historical, and philosophical foundations of education (5 cr) Evaluation and development of teaching (7 cr) Applied practice (5 cr)
2nd period 7 + 6 ECTS credits Basic practice in Teacher Training School (7 cr) Master's level studies in 2nd period Teacher as a researcher seminar Part 1: Research and methods (6 cr)	4th period 12 ECTS credits Teacher as a researcher seminar Part 2: Pedagogical thesis (4 cr) Master's level practice in Teacher Training School (8 cr)

1 ECTS credit = 27 hours of work

Source: University of Helsinki (2008). Department of Applied Sciences of Education Faculty of Behavioural Sciences.

Appendix 1 (continued)

Main Components of the Teacher Education Programs for Secondary School Teachers

Secondary school teacher education programme	Bachelor's Degree 180 ECTS	Master's Degree 120 ETCS	TOTAL 300 ETCS
Subject teachers' pedagogical studies (minor) <ul style="list-style-type: none"> • basics of teaching methods and evaluation • support of different kind of learners • latest research results and research methods of teaching and learning • cooperation with different partners and stakeholders 	25-30 (Including supervised teaching practice)	30-35 (Including a minimum of 15 ETCS supervised teaching practice)	60
Academic studies in different disciplines - a major	60 (including BA thesis, 6-10)	60-90 (including MA thesis, 20-40)	120-150
Academic studies in different disciplines - 1-2 minors	25-60	0-30	25-90
Language and communication studies, including ICT Practice in working life Preparation and updating a personal study plan ¹ Optional studies	35-40	0-30	35-70

Source: Niemi and Jakku-Sihvonen (2009, p. 6).

¹ According to the authors, "The preparation of a personal study plan is a new element in university studies since 2005 in Finland. Its main function is to guide students to develop their own effective programs and career plans and to tutor them in achieving their goals" (p. 6).

Teaching Practice in Finnish Teacher Education Curricula

Study Years

5

4

3

2

1

Advanced Practicum (MA level, 8 ECTS):
 Different options for developing expertise,
 can be connected with the Master's Thesis
 Mainly in Municipal field schools

Intermediate Practicum (BA level, 12
 ECTS):
 Starting with specific subject areas, moving
 towards more holistic and pupil-centred
 approaches
 University teacher training schools

Practicum integrated with theoretical studies

Source: Niemi and Jakku-Sihvonen (2009, p. 8).

Appendix 2: List of Contacts for Countries Surveyed

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Appendix 3: Singapore NIE Teacher Competencies and Standards

PROFESSIONAL PRACTICE

Core Competencies	Definitions	Focus level of ITP Learning
1. Nurturing the Whole Child	<p>The teacher believes that all pupils can learn.</p> <p>The teacher shows care and concern for all pupils.</p> <p>The teacher:</p> <ul style="list-style-type: none"> - develops a culture of care, trust and friendliness that enhances the well being and character development of pupils; - uses a variety of methods to determine current and future pupil needs and expectations, and provides necessary guidance and support; - encourages practices that support the physical, emotional and social well-being of pupils; - has high expectations of all pupils, respects their varied backgrounds, and is committed to their development as learners; - uses communication skills, listening and attending skills in his/her interactions with pupils; and, has skills in identifying and assisting pupils with basic learning problems. 	Capacity Building
2. Providing Quality Learning of Child	<p>Teaching for Learning – the teacher:</p> <ul style="list-style-type: none"> - has a well integrated understanding of how pupils learn and develop and provides learning opportunities that support their development; - is organised and self-managing in relation to time, planning, resources, attention and relationships; - creates instructional opportunities adapted to diverse learners; - uses a variety of instructional strategies to teach concepts in ways that encourage pupils to see learning as meaningful; - has a repertoire of approaches that engage pupils in problem-solving, and critical and creative thinking; and, - plans, develops and delivers IT-integrated and multi-media supported learning experiences to engage pupils and to help them understand issues pertaining to cyber wellness. <p>Management of Learners and Learning – the teacher:</p> <ul style="list-style-type: none"> - creates and maintains an effective classroom environment that encourages positive social interaction, self-motivation and active engagement in purposeful learning; - manages the resources of time, space, activities, and attention to engage pupils individually and in groups in productive tasks; - proactively plans to maintain discipline and order in class; - facilitates pupils' acquisition of self and relationship management skills; and, - uses basic helping skills to assist pupils in coping with learning. 	Capacity Building

Core Competencies	Definitions	Focus level of ITP Learning
	<p>Monitoring and Assessing Learning – the teacher:</p> <ul style="list-style-type: none"> – understands the link between the purpose of assessment and the intended learning outcomes; – comprehends that assessment is closely tied to the teaching learning activities; – comprehend that assessment is closely tied to pupil motivation and their academic performance; – understand the interdependence of 'assessment of learning' on 'assessment for learning'; – can use a range of appropriate monitoring and assessment strategies and instruments to identify learning needs, to evaluate progress, to provide evaluative feedback to help pupils in their progress, and to take follow-up action – understands statistical concepts in representing pupils' patterns of responses to assessment tasks; and, – recognises objective and ethical assessment procedures. 	Capacity Building
3. Providing quality of learning of child in Co-Curricular Activities	<p>The teacher is aware of the opportunity to use CCA to inculcate desirable values and attitudes, and to support the holistic development of pupils.</p> <p>The teacher is aware of:</p> <ul style="list-style-type: none"> – the use of CCA to provide opportunities for pupils to maximise their potential and is committed to supporting CCA activities; – the need to manage pupil behaviour in CCA activities; and, – basic safety procedures / considerations during activities, including basic first aid. 	Awareness
4. Cultivating Knowledge with : i. Subject Mastery	<p>The teacher shows strong working knowledge of subject matter and related educational issues, and seeks to deepen his/her understanding of the subject area and teaching practices.</p> <p>The teacher:</p> <ul style="list-style-type: none"> – draws on deep and well integrated disciplinary knowledge; – draws on well developed Pedagogical Content Knowledge; – has knowledge of recent developments in the field; – helps pupils associate concepts and principles to their everyday experiences; and, – is able to apply his/her subject knowledge to help learners of different levels understand core concepts and their applications. 	Capacity Building
ii. Reflective Thinking	<p>The teacher adopts a critically reflective stance towards his/her own professional practice as a basis for ongoing monitoring and refinement of those practices, including the identification of strengths and areas for improvement.</p> <p>The teacher:</p> <ul style="list-style-type: none"> – seeks opportunities to grow professionally; and, – is aware of major areas of research on teaching and of resources for professional learning. 	Capacity Building

Core Competencies	Definitions	Focus level of ITP Learning
iii. Analytic Thinking	<p>The teacher demonstrates a capacity to engage with problems.</p> <p>The teacher:</p> <ul style="list-style-type: none"> - Identifies possible cause-and-effect relationships, develops plans to respond, prioritises tasks in order of importance, and carefully monitors responses; - makes and defends complex choices and decisions; and, - frames, analyses and synthesises information in order to solve problems and provide solutions. 	Capacity Building
iv. Initiative	<p>The teacher seeks opportunities to take initiative to improve his/her professional practices.</p> <p>The teacher is aware of the value of, and need for skills in innovation and entrepreneurship.</p>	Awareness
v. Creative Teaching	<p>The teacher explores the use of creative teaching techniques / strategies to cater for pupils with different abilities.</p>	Awareness
vi. with a Future Focus	<p>The teacher is committed to environmental sustainability, social justice and equity.</p> <p>The teacher is aware of the need to develop 21st century skills and values in his/her pupils.</p> <p>The teacher recognises that, in a rapidly changing world, the ability to experiment with and advocate for new practices will be a core professional capacity.</p>	Awareness

LEADERSHIP & MANAGEMENT

Core Competencies	Definitions	Focus level of ITP Learning
<p>5. Winning hearts and minds:</p> <p>i. Understanding the Environment</p>	<p>The teacher is aware of the rationale for national education policies and practices and their infusion.</p> <p>The teacher:</p> <ul style="list-style-type: none"> - has critical awareness of the norms and values inherent in the Singapore system of education; - understands the Desired Outcomes of Education; and, - is aware of the role of school rules, and is committed to understanding and abiding by the operating procedures and organisation structure of the school to which he/she is appointed. 	Awareness
ii. Developing Others	<p>The teacher takes initiative to support peers and colleagues.</p>	Awareness

Core Competencies	Definitions	Focus level of ITP Learning
6. Working with Others: i. Partnering Parents	The teacher: – is aware of the need to build collaboration and partnership with parents to maximise the learning of pupils; – uses strategies to keep parents informed on the progress of pupils and school activities; and, – values perspectives of parents.	Awareness
ii. Working in Teams	The teacher actively seeks out opportunities for professional collaboration within and beyond the school. The teacher: – cooperates with and supports colleagues; – shares information and good ideas; – expresses positive expectations of others; and, – speaks positively of team members.	Capacity Building

PERSONAL EFFECTIVENESS

Competencies	Definitions	Focus level of ITP Learning
7. Knowing Self and Others i. Tuning into Self	The teacher takes care to: – monitor his/her emotional and professional self in order to identify immediate support and/or developmental needs; and, – to achieve work-life balance, and seeks guidance where necessary.	Capacity Building
ii. Exercising Personal Integrity and Legal responsibilities	The teacher is aware of the need for professionalism in all aspects of his/her demeanour. The teacher is aware of his/her legal responsibilities and the need to maintain high standards of professional integrity when discharging his/her duties and responsibilities.	Awareness
iii. Understanding and Respecting Others	The teacher is committed to National Education, and to valuing diversity in all its forms. The teacher demonstrates sensitivity to cultural and religious differences.	Capacity Building
iv. Resilience and Adaptability	The teacher: – is tough in spirit, able to persevere in times of challenge, keeping a positive disposition; – stays the course though there may be obstacles to surmount (he/she is optimistic); – is able to think on his/her feet and make decisions appropriate to the situation at hand; and, – encourages and teaches her/his pupils to be resilient and adaptable.	Capacity Building

Appendix 4: General Education Curriculum for Secondary Teacher in Singapore¹²

CURRICULUM STRUCTURE FOR BA (ED) (GENERAL) (SECONDARY) PROGRAMME

Student teachers enrolled in the BA (Ed) (General) (Secondary) programme will follow the curriculum structure shown in Table 7 below:

Table 7: Curriculum Structure for BA (Ed) (General) (Secondary) Programme

Year 1

Category/ Subject	Course Code	Title	No. of AUs
EDUCATION STUDIES			
	AED105	Critical Perspectives on Education	2
	AED106	Educational Psychology: Theories and Applications for Learning and Teaching	3
	AED107	ICT for Meaningful Learning	2
ACADEMIC SUBJECTS			
AS1		Arts Subject *	12
AS2		Arts or Science Subject #	12
LANGUAGE ENHANCEMENT AND ACADEMIC DISCOURSE SKILLS			
	ALS101	Academic Discourse Skills	3
PRACTICUM			
	APR102	School Experience	0

* AS1: Select 1 from the following list of Arts Subjects:
Art, Drama, English Language, English Literature, Geography, History, Malay Language, Music.

AS2: Select 1 from the following list:
Art, Biology, Chemistry, Drama, English Language, English Literature, Geography, History, Mathematics, Music, Physics.

Note: In addition to the core courses and the required number of prescribed electives, student teachers are required to undertake a compulsory Group Endeavours in Service Learning (GESL) project – AGS101. Description on GESL projects is available in page 25.

¹² Source: Singapore National Institute of Education (NIE). (2012). *Bachelor of Arts and Bachelor of Science 2012-2013 Program Handbook*. Available at <http://www.nie.edu.sg/studynie/admissions/teacher-education-undergraduate-studies>.

Year 2

Category/ Subject	Course Code	Title	No. of AUs
EDUCATION STUDIES			
	AED201	The Social Context of Teaching & Learning	2
ACADEMIC SUBJECTS			
AS1		Arts Subject *	12
AS2		Arts or Science Subject #	12
LANGUAGE ENHANCEMENT AND ACADEMIC DISCOURSE SKILLS			
	ALK201	Communication Skills for Teachers	2
GENERAL ELECTIVES[ⓐ]			
			3
PRACTICUM			
	APR202	Teaching Assistantship	3

- * AS1: Select 1 from the following list of Arts Subjects:
Art, Drama, English Language, English Literature, Geography, History,
Malay Language, Music.
- # AS2: Select 1 from the following list:
Art, Biology, Chemistry, Drama, English Language, English Literature,
Geography, History, Mathematics, Music, Physics.
- ⓐ Student teachers are required to select 1 General Elective worth 3 AUs.

Year 3

Category/ Subject	Course Code	Title	No. of AUs
EDUCATION STUDIES			
	AED323	Teaching and Managing Learners at the Secondary Level	3
ACADEMIC SUBJECT *			
AS1		Arts Subject *	12
CURRICULUM STUDIES (CS1 align with AS1, CS2 align with AS2) #			
Art	ACA321	The Development of Adolescent Art & Its Implications for Teaching	3
	ACA322	Concepts and Practices in Art Education	3
Biology	ACB321	Teaching of Biology I	3
	ACB322	Teaching of Biology II	3
Chemistry	ACY321	The Teaching of Chemistry I	3
	ACY322	The Teaching of Chemistry II	3
Drama	ACU321	Elements of Drama	3
	ACU322	Drama and Theatre in Education	3
English Language	ACE321	Teaching of English at the Secondary Level: Oral Communication	3
	ACE322	Teaching of English at the Secondary Level: Reading	3
English Literature	ACR321	Teaching Prose	3
	ACR322	Teaching Poetry	3
Geography	ACG321	Planning for Geography Teaching	3
	ACG322	Classroom-based Teaching Methods	3
History	ACH321	Teaching and Learning of Secondary History and Social Studies I	3
	ACH322	Teaching for Historical Understanding	3
Mathematics	ACM321	Teaching and Learning Mathematics I	3
	ACM322	Teaching and Learning Mathematics II	3
Music	ACI321	General Musicianship I	3
	ACI322	General Musicianship II	3
Physics	ACP321	Teaching of Physics I	3
	ACP322	Teaching of Physics II	3
ESSENTIAL COURSE			
	AMX301	Multicultural Studies: Appreciating & Valuing Differences	3
PRACTICUM			
	APR302	Teaching Practice 1	6

* AS1: Select 1 from the following list of Arts Subjects:
Art, Drama, English Language, English Literature, Geography, History,
Malay Language, Music.

For CS: Malay, see section under Malay Specialisation (Secondary track).

Year 4

Category/ Subject	Course Code	Title	No. of AUs
ACADEMIC SUBJECT *			
AS1		Arts Subject *	3
CURRICULUM STUDIES (CS1 align with AS1, CS2 align with AS2) #			
Art	ACA421	Creativity, Thinking Skills and the Visual Arts	3
	ACA422	Visual Arts Education In Museums and Galleries	3
Biology	ACB421	Teaching of Biology III	3
	ACB422	Teaching of Biology IV	3
Chemistry	ACY421	The Teaching of Chemistry III	3
	ACY422	The Teaching of Chemistry IV	3
Drama	ACU421	Theatre for Young People	3
	ACU422	Process Drama	3
English Language	ACE421	Teaching Grammar at the Secondary Level	3
	ACE422	Teaching of English at the Secondary Level: Writing	3
English Literature	ACR421	Teaching Drama	3
	ACR422	Literature Assessment	3
Geography	ACG421	Field-based Teaching Strategies and Assessment In Teaching Geography	3
	ACG422	Teaching Social Studies to Secondary School Students	3
History	ACH421	Teaching and Learning of Secondary History and Social Studies II	3
	ACH422	Assessment and Evaluation In Secondary History and Social Studies	3
Mathematics	ACM421	Teaching and Learning Mathematics III	3
	ACM422	Teaching and Learning Mathematics IV	3
Music	ACI421	General Musicianship III	3
	ACI422	The Secondary School Music Syllabus	3
Physics	ACP421	Teaching of Physics III	3
	ACP422	Teaching of Physics IV	3
PRACTICUM			
	APR402	Teaching Practice 2	12

* AS1: Select 1 from the following list of Arts Subjects: Art, Drama, English Language, English Literature, Geography, History, Malay Language, Music.

For CS: Malay, see section under Malay Specialisation (Secondary track).

Appendix 5. Survey to Countries



January 28, 2013

Dear colleague:

I am working with Prof. Joe Krajcik on an initiative from the National Academy of Education and George Washington University on the evaluation of teacher education programs funded by the US National Science Foundation. We have been commissioned to write a paper that collects existing evidence from teacher preparation evaluation systems in other countries. Particularly, the paper should include a description of the system, the mechanisms that are in place to carry out the evaluation of teacher education programs, and whether there is research on the effects of such evaluation systems on teacher preparation programs. In examining the literature, we found that systematic teacher preparation evaluation is in some countries associated within a Quality Assurance System in an effort to increase system accountability and that such systems of quality assurance in teacher education are usually mandated by law.

The enclosed international survey that contains a series of open-ended items seeks to find out about different countries' Quality Assurance Systems or Evaluation systems in Teacher Education. More specifically, we are interested in knowing whether or not there are systemic efforts to undertake "Evaluation of Teacher Preparation Programs" in your country or locality. We know that often teacher educators do informal or occasional evaluation activities and while important we are not interested in those at the moment.

I. Are there system-wide efforts (for instance at the national or local level) to evaluate teacher preparation in your country?

1. Is there a Quality Assurance System in Teacher Preparation?
 - a. National level mandates and requirements or guidelines/standards?
 - b. Local level mandates and requirements or guidelines/standards?
 - c. Program level mandates and requirements or guidelines/standards (only if linked to a larger quality assurance system)?
 - d. Is this linked to a law or regulation?
2. Are there Teacher Preparation Program Evaluation Systems?
 - a. Internal (who does this and based on what standards or guidelines if any?)
 - b. External (who does this and based on what standards or guidelines if any?)
 - c. Is program evaluation mandated or optional? What are the consequences of the evaluation results (for instance is there is an agency that does the program evaluation with the authority to close a program or is only advisory)?
3. We are particularly interested in STEM (Science Technology, Engineering and Mathematics) education in the areas of quality assurance in teacher preparation

and in program evaluation of teacher preparation. Do evaluation programs exist for teacher preparation as related to STEM?

- a. If those systems exist we are interested in obtaining evidence as to the consequences of introducing these systems. For instance we would like to know if these are effective and the intended and unintended results.
- b. If those systems do not exist we are interested in obtaining evidence as to whether they may be introduced and if not, why not.

II. If in fact there are quality assurance systems for teacher education and / or systemic efforts to implement evaluation of teacher education programs we would like you to provide us with the description of these. For instance we would like to know about:

1. The purposes and intended uses of such systems (for instance: diagnostic information for self-improvement, accountability data for external monitoring, and/or to provide information to the “consumer”).
2. What are the types of evidence that is used in quality assurance and program evaluation? For instance in terms of outcomes, inputs and processes?
 - a. Outcomes (e.g., measured by teacher test scores, classroom environment/performance, placement, retention rates, high need areas prep, etc.)
 - b. Inputs (e.g., program’s intended purpose, resources used in programs, characteristics of entering students, quality of candidates, facilities, faculty, etc.)
 - c. Process measures (e.g., descriptions of curricula, observations of instruction, syllabi, length/quality of field experience, etc.)
3. What is the role of different actors in the system in the development and implementation of quality assurance systems and the evaluation of teacher preparation programs?
 - a. Federal government (what are the purposes, standards, laws, mandates)
 - b. State government (what are the purposes, standards, laws, mandates)
 - c. Other (private) agencies (what are the purposes, standards, laws, mandates)
 - d. Program people (what are the purposes, standards, laws, mandates)

III. Finally we would like you to provide us with documents and a website link (if it exists) that could tell us more about the mechanisms used to do quality assurance and evaluation of teacher preparation programs, guidelines or standards and regulations or laws governing such systems.

Please let us know if you are willing respond to our questions. If so we will need to have them before or by February 15. Also, please let us know if you have any questions. You can email Teresa Tatto at mttatto@msu.edu and Joe at Krajcik@msu.edu. We look forward to receiving your responses at the same email addresses. Thank you very much for your collaboration!!!

Sincerely,

A handwritten signature in black ink, appearing to read "Maria Teresa Tatto". The signature is fluid and cursive, with a long horizontal stroke at the end.

Maria Teresa Tatto
Professor and Director of TEDS-M and
FIRSTMATH

A handwritten signature in black ink, appearing to read "Joe Krajcik". The signature is cursive and somewhat stylized.

Joe Krajcik
Professor and Director of CREATE for
STEM