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# Perspectives for defining student teacher performance-based teaching skill indicators to providing formative feedback through learning analytics

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# Introduction

Aim: to prepare the ground for optimizing student teachers' professional learning in school practice by applying learning analytics (LA).

The practice of defining and using teaching skills' performance indicators for LA procedures calls for being informed :

- of the current state-of-art in practice of using LA for educational purposes and
- of possibilities for performance-based definition of teaching competences.

Project Watch Me: Workplace-based e-assessment technology for competency-based higher multi-professional education (<http://www.project-watchme.eu/project-description/>)

# What is Learning analytics?

LA is a computer-based instructional system for documenting assessments of learning results, providing specified feedback on achievement of expected objectives and dispensing suggestions for corrective and further learning activities (e.g. Clow, 2013; Ferguson, 2012). Also called *data mining* or *big data approach*.

*Limitation:* even if a teaching competence can be reliably and integrally described in operational terms, the models created on the basis of teaching performance indicators by LA procedures can only be approximations of this competence (Greller and Drachsler, 2012).

So, there are at least two central problems :

- 1) How to ensure **the quality of measuring specific teaching performances** that are representative or content valid regarding the teaching competences to be acquired?
- 2) How to ensure that **statistical procedures of LA are meaningfully summarizing** progress in acquiring relevant teaching competences?

... as Yves Rosseel (2015) pointedly warns „...there is a very common misunderstanding that it is enough to put into operation computer program with big data, and this program or underlying algorithm will be thinking for us. It does not work like that. The algorithm needs to be told what to look for, and the main problem is that we do not know what to look for“.

## Issues in defining (inter-)national standards for effective teaching in details:

What is considered as good teaching in one country is not necessarily good teaching in another. Furthermore, expectations of teachers' roles might differ within a country.

Considering that educators' models and representations of good teaching and its component skills are never ideal or unchangeable, an adequate assessment of teaching always involves **an interpretative component** (Tigelaar & Van Tartwijk, 2010; Van der Schaaf, Stokking, & Verloop, 2008b), which certainly complicates applying LA procedures.

## Cont.

- Big variations in characterizing effective teaching (Cochran-Smith, 2014; Good, 1996; Medley, 1985; a.o.)
- Dependence of the teaching quality on the subject being taught and the situation in which it takes place.
- Different stakeholders in educational systems might have differing expectations for the professional competences of teachers (Doyle, 1990).
- Teacher standards or competence requirements tend to be context dependent, and mostly not provided with any research-based evidence of their quality, and not suitable for defining performance-based requirements.

# Approaches to defining teaching competences that are provided (at least some) estimations of validity

- Theory-driven characterization of effective teachers (Looney, 2011)
- Dutch teacher competence requirements (Bourgonje & Tromp, 2011)
- NBPTS standards
- INTASC Model Core Teaching Standards and Learning Progressions for Teachers 1.0 (CCSSO, 2013)

## The main categories of CCSSO (2013) draft standards :

- learner development;
- learning differences;
- learning environments;
- content knowledge;
- application of content;
- assessment;
- planning for instruction;
- instructional strategies;
- professional learning and ethical practice;
- leadership and collaboration

# Standard #6: Assessment (CCSSO, 2013)

The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

## Performances (9)

6(a) The teacher balances the use of formative and summative assessment as appropriate to support, verify, and document learning.

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6(i) The teacher continually seeks appropriate ways to employ technology to support assessment practice both to engage learners more fully and to assess and address learner needs.

## Essential Knowledge (7)

6(j) The teacher understands the differences between formative and summative applications of assessment and knows how and when to use each.

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6(p) The teacher understands how to prepare learners for assessments and how to make accommodations in assessments and testing conditions, especially for learners with disabilities and language learning needs.

## Critical Dispositions (6)

6(q) The teacher is committed to engaging learners actively in assessment processes and to developing each learner's capacity to review and communicate about their own progress and learning.

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6(v) The teacher is committed to the ethical use of various assessments and assessment data to identify learner strengths and needs to promote learner growth.

# Progression for Standard #6: Assessment

The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

1. The teacher uses, designs or adapts multiple methods of assessment to document, monitor, and support learner progress appropriate for learning goals and objectives.

1	2	3
The teacher engages each learner in examining samples of quality work on the type of assignment being given ...	And... The teacher engages learners in generating criteria for quality work on a particular assignment...	And... The teacher engages learners in giving peers feedback on performance using criteria generated collaboratively...

2. The teacher uses assessment to engage learners in their own growth.

1	2	3
The teacher matches ...	And ... The teacher prepares learners for ...	And ... The teacher uses ...

3. The teacher implements assessments in an ethical manner and minimizes bias to enable learners to display the full extent of their learning.

1	2	3
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## Dutch-Estonian project (WATCHME, 2014)

The matrix was developed on the basis of Dutch and Estonian teacher competence requirements. The original list of seven Dutch competences was shortened to four professional roles and then extended to five based on Estonian competences. Each of the five professional roles were specified through descriptions of tasks or activities that a student teacher is expected to be able to perform. The obtained final versions differed to some extent: the Dutch model contained **5 roles, 11 professional activities, 34 indicator performances, and 4 performance levels indicators**; the Estonian model had **5 roles, 12 professional activities, 40 performance indicators and 5 performance levels indicators for each activity**.

# Defining performance indicators by 4 performance levels for task 1 (Formulates a vision of the subject content and the subject didactics)

Role/task	Performance indicators	Level 1	Level 2	Level 3	Level 4
Role: supervisor and evaluator of learning activities (subject didactician and supervisor of the learning process)  Task 1: Sets learning goals for the whole curriculum and specific lessons.	1. The teacher does/does not formulate (self-formulated) ...	The teacher takes over the learning goals of others ....	The teacher takes over the learning goals of others and ...	The teacher formulates his/her own learning goals ...	The teacher formulates his/her own learning goals ....
	2. The teacher does/does not make use of ....	The teacher does not check ...	The teacher regularly checks ...	The teacher formulates his/her own ...	The teacher formulates his/her own learning goals ...
	3. The teacher does/does not take into consideration ...	The teacher incidentally stops to think about ...	The teacher regularly checks if ...	The teacher formulates his/her learning goals which ...	The teacher formulates his/her learning goals which ...

## A core practices approach as a way of adjusting teacher learning tasks to promote essential teaching competences

A solution to this atomization of teaching competences - application of the recently adopted concept of **core practice** (Grossman, Hammerness, McDonald, 2009).

Unlike former practice-based teacher education where researchers tried to decompose teaching into specific performances “... core or high-leverage practices ... have used carefully developed criteria to identify a smaller number of items, recognizing that the short duration of teacher education must be used strategically” (ibid., p. 363).

# **Data collection tools for performance-based assessments of student teachers' teaching skills**

For providing student teachers with feedback for the formative evaluation of their competences by applying LA procedures, the evidences of their teaching skills should be collected in reasonable time limits.

Using EPASS (2014), offered by Maastricht University, allows collecting lesson plans, student teacher self-evaluation placement forms, lesson observation forms from supervisors, lesson observation forms from other student teachers and reflection.

However, the definition of performance indicators (in the form of assessment matrices) and data collection procedures—when based on teaching portfolios—tend to be tightly interconnected and take on **an interpretive character** though the application of LA calls for quantitative data input. Therefore, the formulation of performance indicators that are relevant for the evaluation of learning (to teach) play a critical role for translating learning into numbers for applying LA (Greller & Drachsler 2012).

Another problem is **how to preserve the semantics of initial data** in the models of progress in teaching skills,<sup>15</sup>

## Discussion and conclusive remarks

To sum up, central issues in using statistical modelling to analyze progress in learning of a very complex professional activity like teaching is related to (1) creating models of quality teaching, (2) identifying main performance indicators of it, and to (3) technical capabilities of LA to collect and process data for creating quantitative progress models.

Yet, there are no generally valid rules or guidelines for characterising quality teaching or standards and competence requirements. The same applies to specifying indicator performances that are needed for assessing teachers' or student teachers' teaching competence.

Performance-based teacher evaluation matrices, such as those offered by the CCSSO *Model Core Teaching Standards and Learning Progressions for Teachers* or the WATCHME project, cannot therefore be automatically assumed to be valid in any context.

The necessary validation study would start from an investigation if teaching of student teachers that is meeting all performance-based indicators and analytically described (using LA procedures) proves to be competent on the basis of expert ratings as well.

The other problems are that composing portfolios for assessing teaching competences and procedures are time consuming, and student teachers' self-reflection of teaching activities often unsatisfactory.

Many of the issues related to validating models of good teaching and their component skills to identify progress in mastering teaching skills and providing timely feedback can be solved if the practice of decomposing of teaching into atomistic performances could be replaced with a more careful selection of teaching tasks by decomposing practice into learnable parts for student teachers, as foreseen with the concept of core practice.

To summarize: application of LA procedures might be a powerful tool for providing student teachers with relatively quick feedback on their progress in acquiring teaching competences, however the realities of meaningful describing teaching competences in quantitative terms and meaningful modelling of these competences should be taken into account.

Thank You for your attention!

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