The Project Observe

Pre-service Teachers’ Professional Vision within university-based Teacher Education

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Background

- first faculty in Germany to be dedicated entirely to initial and further training of teachers (founded 2009)
- evidence-based teacher education for pre-service teachers (I Phase)
- students study two subjects (mathematics, science) + education/psychology (BA/ Master degree) for middle/high school
- after pre-service education at universities, students follow a 2-year internship program (II Phase)
Background

Classes in teacher education:

• The Psychology of the teacher as learner (pre-service teacher)
• Introduction to Teaching and Learning (pre-service teacher)
• TUMpaedagogicum (pre-service teacher)
• Basic scientific writing (Master Teaching and Learning research)
• Literature administration (Master Teaching and Learning research)

Research in teacher education:

Investigation of indicators for professional development

• within university-based teacher education (I Phase)
• within internship program (II Phase)
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Research in teacher education:
Investigation of indicators for professional development
• within university-based teacher education (I Phase)
• within internship program (II Phase)
Background

University-based teacher education ...

• faces the challenge to conceptualize, assess and support the acquisition of pre-service teachers’ competencies proximal to teaching practice

• to advance the field: modeling the structure of teacher competencies and testing models empirically, especially with regard to initial processes of knowledge acquisition

Project Observe: Investigation of Pre-service teachers professional vision

• funded since 2008 by the German Research Foundation (DFG, equivalent to NSF)

• part of Priority Programme "Competence Models for Assessing Individual Learning Outcomes and Evaluating Educational Processes" (SE 1397/2-1/2/3)

• Prof. Tina Seidel (PI)

• Stefanie Schäfer (PhD student), Gloria Jahn (PhD student)
Professional Vision ...

Describes how individuals observe and interpret events and situations specific to their profession (Goodwin, 1994)

Two processes (van Es & Sherin, 2012)

- **Noticing**
  - ...ability to direct attention to situations that are relevant for teaching and learning

- **Reasoning**
  - ...ability to use knowledge about teaching and learning in order to reason about noticed situations
Professional Vision: Noticing

• in the complexity of classroom settings it is necessary to select relevant teaching and learning situations

• What is relevant for teaching and learning?

• Basis: Teaching effectiveness research referring to generic pedagogical knowledge

• Teaching components shown as relevant for student learning:
  (Process-oriented model of teaching Seidel & Shavelson, 2007)
  
  » Goal setting and orientation
  » Execution of learning activities
  » Evaluation of learning progress
  » Teacher guidance and support
  » Learning climate

Effects on student learning
- Cognitive
- Motivational-affective
Professional Vision: Reasoning

- the ability of teachers to process and interpret classroom situations based on their professional knowledge (Borko, 2004; Sherin, 2007; van Es & Sherin, 2007)
- provides insights into the quality of teachers’ mental representations and transfer to the classroom context
- distinguishes three qualitatively different dimensions (Berliner, 1991; Borko & Livingston, 1989; Evertson & Green, 1986; Sherin & van Es, 2009)

- Describing
- Explaining
- Predicting
Professional Vision: Reasoning

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- distinguishes three qualitatively different dimensions (Berliner, 1991; Borko & Livingston, 1989; Evertson & Green, 1986; Sherin & van Es, 2009)

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<thead>
<tr>
<th>Professional Vision: Reasoning</th>
<th>Describing</th>
<th>Explaining</th>
<th>Predicting</th>
</tr>
</thead>
<tbody>
<tr>
<td>identify and differentiate between observed events without making any further judgments</td>
<td>link observed events to conceptual knowledge about teaching</td>
<td>predict consequences of observed events based on knowledge about effects of teaching on student learning</td>
<td></td>
</tr>
</tbody>
</table>
Project Objectives

Investigation of:

(1) the structure of pre-service teachers professional vision

(2) the development of pre-service teachers professional vision within university-based teacher education

(3) the relation between pre-service teachers professional vision and their first teaching experiences
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What do we know about the Structure?

Pre-service teachers describe classroom situations in limited and “naïve” terms (overgeneralize situations) (i.e. Berliner, 1991)

Experts: identify critical classroom situations, explain the effects of critical classroom situations based on their knowledge, predict consequences of relevant classroom situations for student learning (i.e. Seidel & Prenzel, 2007)
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- Learning about the structure required for modeling pre-service teachers learning processes
- Structure of professional vision based on qualitative descriptions
- Requirement of standardized, contextualized measures for formative assessment purpose
Assessing the Structure of Professional Vision in the Observer Tool


Video clips (2 components)
2-4 minutes
Content: goal clarity, teacher support, learning climate

Format: Rating items
Referring to knowledge-based reasoning
4-point likert scale
Expert judgment: 1 = hit, 0 = miss (kappa = .79)

Integration of video and rating items in online-tool
Duration: ca. 90 min
**Structure of Professional Vision (Study 1)**

**Sample:** $N = 152$ pre-service teacher, same university middle/high school

<table>
<thead>
<tr>
<th>Description</th>
<th>Explanation</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha = .99$</td>
<td>$\alpha = .91$</td>
<td>$\alpha = .97$</td>
</tr>
<tr>
<td>$\sigma = 1.24$</td>
<td>$\sigma = 1.33$</td>
<td>$\sigma = 2.14$</td>
</tr>
</tbody>
</table>

Seidel & Stürmer (accepted)
Structure of Professional Vision (Study 2)

Sample: $N = 1029$ pre-service teacher, different universities
- Elementary $n = 166$
- Middle/High $n = 671$
- Vocational training $n = 171$

Jahn, Stürmer, Seidel & Prenzel (accepted)
**Structure of Professional Vision (Study 2)**

**Sample:** $N = 1029$ pre-service teacher, different universities
Elementary $n = 166$, middle/high $n = 671$ and vocational training $n = 171$

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<tr>
<td>$\alpha = .95; \sigma = 1.19$</td>
<td>$\alpha = .85; \sigma = 0.89$</td>
<td>$\alpha = .84; \sigma = 1.09$</td>
</tr>
<tr>
<td>$\alpha = .93; \sigma = 0.94$</td>
<td>$\alpha = .80; \sigma = 0.61$</td>
<td>$\alpha = .84; \sigma = 1.00$</td>
</tr>
<tr>
<td>$\alpha = .93; \sigma = 0.78$</td>
<td>$\alpha = .80; \sigma = 0.62$</td>
<td>$\alpha = .78; \sigma = 0.68$</td>
</tr>
</tbody>
</table>

Jahn, Stürmer, Seidel & Prenzel (accepted)
Conclusions - Structure

• Combining a pool of standardized items with video as items prompt is a stable, valid way to assess professional vision.

• Comparing different models shows that the Observer assesses knowledge-based reasoning as one ability differentiating between the three aspects description, explanation and prediction in reliable way.

• The structure is comparable for pre-service teachers with regard to different universities and school tracks (elementary, middle/high school, vocational training).
Project Objectives

Investigation of:

1. the structure of pre-service teachers professional vision

2. the development of pre-service teachers professional vision within university-based teacher education

3. the relation between pre-service teachers professional vision and their first teaching experiences
What do we know about the development?

- Professional vision is a knowledge-based process. (i.e. Palmeri et al., 2004; van Es & Sherin, 2002).

- Professional vision requires the integration of theory and practice (i.e. Darling-Hammond & Bransford, 2005; Putnam & Borko, 2000).

- With guided training pre-service teachers learn to direct attention, to notice relevant situations (Star & Strickland, 2008) and are better able to use precise descriptions of observed events (Santagata & Guarino, 2011).

Learning more about the development within university-based teacher education program helps to support pre-service teachers initial professional vision.
**Development of Professional Vision (Study 1)**

**Sample:** theoretical teaching and learning courses at university $N = 53$
- (1) video-based course: $n = 16$
- (2) Nature of learning processes: $n = 16$
- (3) Hot topics of instruction: $n = 21$

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Pre-Post-Main Effect: Description: $F(1, 52) = 27.08^{**}$; $p = < .01$; $n^2 = .34$;
Pre-Post-Main Effect: Explanation: $F(1, 52) = 26.44^{**}$; $p = < .01$; $n^2 = .34$;
Pre-Post-Main Effect: Prediction: $F(1, 52) = 36.19^{**}$; $p = < .01$; $n^2 = .41$

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**Stürmer, Könings & Seidel (2013)**
**Development of Professional Vision (Study 2)**

**Sample:** theory practice term at university $N = 109$
- 3 month internship at school
- 3 video-based courses (per 4h): goal clarity, teacher support, learning climate

Stürmer, Seidel & Schäfer (2013)

Low entry level: $F(1, 28) = 19.19^{**} ; p = < .01 ; n^2 = .41$

High entry level: $F(1, 26) = 3.62; p = .07 ; n^2 = .12$
Conclusion - Development

- Knowledge acquisition about teaching and learning supports the development of pre-service teachers' professional vision.

- Specific effects of university-based courses on different aspects of professional vision depending on content specify and theory/practice integration.

- Despite complexity of demands in internship positive changes in professional vision with a theory/practice integrating approach.

- Specific effects depending on pre-service teachers' entry level.
Investigation of:

(1) the structure of pre-service teachers professional vision

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What do we know about the relation to teaching performance?

• The ability to notice and interpret classroom situation affect and initiate teaching action (i.e. van Es & Sherin, 2002;).

• First indications of a direct relationship between professional vision and teaching performance are found in the area of in-service teaching (Hamre et al., 2012; Kersting 2010).

• only few opportunities for pre-service teachers for real-life teaching within university-based teacher education

• first teaching experiences in classroom characterized as high complex and challenge task

• Requirement of: in complexity reduced and low stakes teaching opportunities for pre-service teachers
- Microteaching as learning opportunity has a long tradition within university-based teacher education (i.e., Allan & Ryan, 1972; Olivero & Brunner, 1973)
- No research how to use the approach of Microteaching as performance assessment task
Micro-Teach Events as Performance Assessment Task

Objectives:

• Investigation of relation between pre-service teachers professional vision measured with the Observer and their teaching performance
• built up on the Observe-framework

Requirement (i.e. Shavelson, 2012):

• high standardization
• high fidelity (validity)
Reduced complexity

- Tutoring (1:1) and small group (1:4)
- 20 minutes

Low stakes environment

- Focus on selected teaching and learning components
  (goal clarity; teacher support, learning climate)
- Pre-service teachers acting as simulated learners, representing student diversity (acting scripts based on student profiles as identified in video studies)
- Teaching of a generic topic
  (tactical game/public train system of Munich)
Standardization Instruction (1:4 M-Teach, tactic game):

Setting
2013 is the year of tactic games. Therefore the Technical University of Munich (TU) arranges a tactic game party during semester break where the individual faculties compete against each other. Winner is the one faculty, whose students win the most games within the appointed five hours. Each faculty randomly selects ten students in the first semester to compete in the classic tactic game “Monopoly” against each other. For the winner-faculty the TU will host a summer party. To be perfectly prepared, the student council of the TUM School of Education launches an initiative, where students explain “Monopoly” to the previously selected freshmen. The goal is to win as many games as possible for the faculty within the given timeframe.

Task
Plan a maximum 20-minute teaching unit after which the students should be able to play the tactic game “Monopoly” independently. Please take care not to overrun the time limit. After 20 minutes you will be interrupted. The aim is that the students master the rules, are able to act quickly and acquire knowledge about successful winning strategies. Furthermore, you should motivate the randomly selected students for participation in the game party. Please make sure to act goal-oriented, to support the students in their learning processes and to create a positive learning atmosphere. For preparation you have 40 minutes available.

Target group
Plan your 20-minute teaching unit for a small group of four students with different prior knowledge as well as different motivation, but who represent all the TUM School at the game party.

You have the following materials available:
- a tactic game “Monopoly” (including game instructions) as well as additional material
- paper and pencils
- flipchart and noticeboard
Standardization - Simulated learners (Student profiles)

uninterested
struggling
underestimating
strong

(Seidel, 2006)
Micro-Teaching Events (M-Teach): Example

Teaching (20 Min.)
Sample \((N = 20)\)

1. Pre-service teachers acting as teachers \((n = 8)\)
2. Pre-service teachers acting as simulated learners \((n = 6)\)
3. Experts in classroom research \((n = 6)\)

Procedure

- Questionnaire for pre-service teacher after acting in the teaching situation
- Videotaping of the teaching situation
- Questionnaire for experts after watching the video-taped classroom situation
Fidelity – Design (II)

Instruments

Authenticity (instruction, acting script, teaching situation) all:
• scale for all participants $\alpha = .84$ “the teaching was authentic”
• open questions to experts: “Do you have any remarks with regard to ...?“

Identification of teaching competencies by experts:
• Scale identification with role as teacher $\alpha = .85$ “The pre-service teacher act as teacher.”
• open questions to experts: “Do you have any remarks with regard to the teaching situation?“

Cognitive Processes by acting pre-service teachers:
• self-confidence $\alpha = .96$
• Immersion $\alpha = .83$
• Cognitive load $\alpha = .81$
# Fidelity – Authenticity: Participants

Table 1

*Perceived Authenticity of Micro-Teach Event Components*

<table>
<thead>
<tr>
<th></th>
<th>Instruction</th>
<th>Acting Script</th>
<th>Teaching Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-service teachers</td>
<td>3.29 (.49)</td>
<td>-</td>
<td>3.19 (.53)</td>
</tr>
<tr>
<td>acting as teacher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-service teachers</td>
<td>-</td>
<td>3.50 (.53)</td>
<td>3.65 (.41)</td>
</tr>
<tr>
<td>acting as simulated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>learner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom research experts</td>
<td>3.33 (.58)</td>
<td>3.31 (.59)</td>
<td>2.98 (.60)</td>
</tr>
</tbody>
</table>

*Note: scale ‘1’ totally disagree to ‘4’ totally agree; standard deviation in parentheses*
### Fidelity – Authenticity: Format and Topic

Table 2

*Perceived Authenticity depending on Topic and Format of Micro-Teach Event*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Instruction</th>
<th>Acting Script</th>
<th>Teaching Situation</th>
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</thead>
<tbody>
<tr>
<td>Traffic system</td>
<td>3.27 (.71)</td>
<td>3.40 (.66)</td>
<td>3.26 (.70)</td>
</tr>
<tr>
<td>Tactic game</td>
<td>3.22 (.44)</td>
<td>3.38 (.50)</td>
<td>3.27 (.51)</td>
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</tbody>
</table>

**Format**

<table>
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<th>Instruction</th>
<th>Acting Script</th>
<th>Teaching Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutor (1:1)</td>
<td>3.28 (.75)</td>
<td>3.38 (.88)</td>
<td>3.36 (.53)</td>
</tr>
<tr>
<td>Small group (1:4)</td>
<td>3.39 (.42)</td>
<td>3.38 (.56)</td>
<td>3.30 (.59)</td>
</tr>
</tbody>
</table>
The pre-service teachers acting as simulated learner play their role pretty authentic.

It is very interesting to see the differences in teaching competencies vary by videotaped situation.

### Table 2

Perceived Authenticity depending on Topic and Format of Micro-Teach Event

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<th>Instruction</th>
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<tr>
<td>Math</td>
<td>3.27 (.71)</td>
<td>3.40 (.66)</td>
<td>3.26 (.70)</td>
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<td></td>
<td>3.22 (.44)</td>
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## Fidelity – Identification of teaching competencies

### Table 3

*Experts Estimation about the Identification with Role as Teacher*

<table>
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<tr>
<th></th>
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<th>Small Group (1:4)</th>
<th>Traffic system</th>
<th>Tactic game</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>3.53</td>
<td>3.11</td>
<td>3.23</td>
<td>3.42</td>
</tr>
<tr>
<td>SD</td>
<td>.31</td>
<td>.32</td>
<td>.25</td>
<td>.33</td>
</tr>
</tbody>
</table>

*Note*: scale ‘1’ totally disagree to ‘4’ totally agree
Fidelity – Identification of teaching competencies

23 from 46 comments to teaching situation refer to teaching competencies:
- advices of improvement: “The acting student should explain the game strategies rather with a presentation and than follow to simulate the strategies on the game board”
- judgment of the quality of performance: “The cycle for motivation was not good prepared. The motivational stimulus for students was extrinsic and the time management was bad.”
## Fidelity – Cognitive Processes

Table 3

*Pre-service Teachers’ Cognitive Processes while Acting*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Self-confidence*</th>
<th>Immersion*</th>
<th>Cognitive load**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>extrinsic</td>
</tr>
<tr>
<td>Traffic system</td>
<td>3.25 (.50)</td>
<td>3.33 (.47)</td>
<td>3.83 (.43)</td>
</tr>
<tr>
<td>Tactic game</td>
<td>2.63 (1.11)</td>
<td>2.75 (.99)</td>
<td>3.58 (.17)</td>
</tr>
<tr>
<td><strong>Format</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutor (1:1)</td>
<td>3.38 (.48)</td>
<td>3.50 (.43)</td>
<td>3.67 (.47)</td>
</tr>
<tr>
<td>Small group (1:4)</td>
<td>2.50 (1.00)</td>
<td>2.58 (.83)</td>
<td>3.75 (.17)</td>
</tr>
</tbody>
</table>

*Note*: scale *‘1’ totally disagree to ‘4’ totally agree, **‘1’ pretty difficult to ‘5’ pretty easy; standard deviation in parentheses*
Conclusion

- All participants perceive the instruction, acting script and teaching situation as authentic (content validity).
- The experts estimate that pre-service teachers acting as teachers take over the role and identify teaching competencies related to real-life performance (content validity).
- The cognitive processes of pre-service teachers while acting as teachers support the assumption of shown competencies (cognitive validity).
Further Steps of Validation

- development of observation protocols based on the Observe framework
- investigation of the relation between shown teaching behaviors in different M-Teach events as well as classroom

?? Relation between pre-service teachers professional vision and their teaching performance ??
Thank you for your Attention !!!
References


