How university teachers can support the development of their students' expertise

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Simulation game „Jeans Factory"

Group	*n*	*M*	*SD*
Semi-experts	18	401.000,–	584.200,–
Novices	17	804.000,–	547.700,–

M / SD: Scores in Euros.

Agenda

- Inert knowledge and how to avoid it in teaching
- The double role of expertise in university teaching
- Research on expertise: Individual attributes of excellence and social attributes of professionalism
- Development of expertise: Knowledge encapsulation
- Development of expertise: Growing into networks
- Educational perspectives: Understanding and giving direction to practice
- University teachers as „persons in the shadow"

Inert knowledge and how to avoid it in teaching

- Elements
  - A subject has knowledge available
  - This knowledge has proved to be useful for acting
  - The subject does not act appropriately / good enough
- The Jeans Factory example
  - Semi-experts proved superior declarative knowledge (in business management examinations)
  - Semi-experts were assumed to be superior in business management tasks like running the Jeans Factory
  - Semi-experts were not able to apply their rich knowledge to the situation (with its constraints)

Inert knowledge and how to avoid it in teaching

- Required: A model of action competence
  - Mastering repeated requirements
  - Building functional conceptual mental models of problems
  - Acquiring domain-specific knowledge
  - Acting and participating in professional networks
- Instruction may have divergent effects, affecting these components differently!
- Continued studies using the Jeans Factory
  - Providing multiple learning contexts
  - Explicit guidance for problem-solving
  - Effects: Only the interplay of both instructional methods fostered the acquisition of applicable knowledge

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The double role of expertise in university teaching

- Good teaching improves the quality of learning
  - But: What is „good teaching“?
  - But: What is „high-quality learning“?
- Both questions refer to an high level of expertise – on the teacher‘s side and on the students‘ side
- The double role of expertise university teaching
  - University teachers aim to develop their students‘ expertise domain
  - University teachers have to develop into experts in the domain of teaching

⇒ Relevance of research on expertise

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Research on expertise

- Research approach: Contrastive analysis
  - Comparison of experts and novices
- Identification of attributes of excellence and of individual differences
  - Basic role of knowledge
  - Domain-specific memory performance
  - Dependent of practice and experience („10-years –rule“)
- Identification of social attributes of professionalism
  - Structure of expert networks
  - Communities of learning and practice

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Research on expertise

- A standard paradigm: Free recall of domain-specific material

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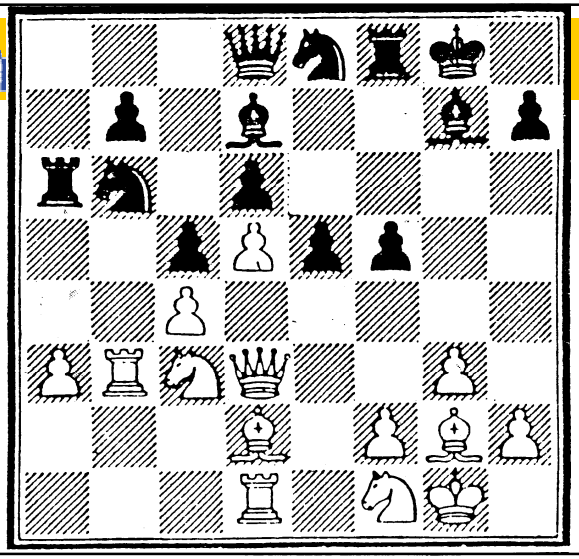

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Research on expertise

Free recall: Performance of chess experts and chess novices

Group	M	SD
Experts	20.75	5.14
Novices	8.17	4.15

Maximum performance of experts: 27

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Research on expertise

- **Semantic components of expert knowledge:**
- Connected with action proposals
  - Ongoing reflection of experiences
  - Subjective relevance of episodes
- Dynamic nature of knowledge
  - Contextualisation
- Qualitative knowledge differences
  - Changes during acquisition and maintenance of expertise
- Historical changes
  - Superior performance in former times often is everyday performance now
  - Relevance of actual network practices

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Research on expertise

- **Individual adaptations during the acquisition of expertise**
- Cognitive adaptations
  - Knowledge, memory, problem-solving
  - Excellent long-term retention for domain-related material
  - Accumulation of increasingly complex patterns in memory
  - Quick retrieval supports flexible problem-solving
- Physiological adaptations
- Perceptual-motor adaptations

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Development of expertise: Knowledge encapsulation

- Experts refer less explicitly to theoretical knowledge
- Theoretical knowledge is not neglected/forgotten
- Instead, knowledge is represented in generalised *and* in case-based schemata
- Encapsulated experiential knowledge develops
- To sum up: Encapsulation as core process of expert professional learning
  - A demanding process (cognitively and in overall effort)
  - Where does the direction come from?

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Development of expertise: Knowledge encapsulation

- Episodes as base of learning
  - Generalisation across episodes
  - Indexing specific episodes
- Learning processes
  - Generalisation
  - Learning from errors
- Necessity of experiencing episodes
  - Reflection and permanent evaluation of one's own experience
  - Subjective relevance
  - Willingness to perform deliberate practice

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Development of expertise: Growing into networks

- Expertise is situated within social and cultural contexts
- Social partners attribute expertise to experts
  - Only participation in networks of practice leads to recognised expertise
- Professional networks provide "valid" measures of expertise
- Professional networks offer affordances for the development of expertise (or set constraints)
- Teachers (trainers, coaches, etc.) set the direction of practice and guide individuals into networks

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Development of expertise: Growing into networks

- Reanalysing theories of situated learning as theories how to support growing into networks
  - Complex problems
  - Participation and responsibility through learning as active process
  - Authenticity of learning situations
  - (Realistic) Multiple perspectives
  - Articulation, reflection, exchange with others

Educational perspectives: Understanding and giving direction to practice

- Practice makes perfect = educational optimism!
- Analysis of the individual
  - Criteria of strength
  - Reproducible superior performance for representative tasks
- Social context
  - Deliberate practice
  - Guidance by teachers
- Analysis of the interplay
  - Designing domain-specific learning opportunities
  - Behaviour and communication of groups and networks of experts

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Educational perspectives: Understanding and giving direction to practice

- Deliberate practice
  - A set of structured, often strenuous activities that experts in the domain consider important for improving performance
- Research strategy
  - Investigation of "life-time accumulated practice" (e.g., time and effort)
  - Retrospective interviews, diaries, document analyses
  - Investigation of the role of "persons in the shadow" (teachers, trainers, coaches, etc.) who set the direction of deliberate practice

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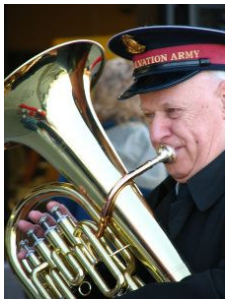
Educational perspectives: Understanding and giving direction to practice

- Amount of practice highly correlated with performance
- Predictive validity of practice
- Number of hours of practice differs across domains and even sub-domains
  - Example: Pianists and violinists are practice fanatics, singers are (relative!) lazybones
- Duration of practice does not necessarily indicate short-run performance



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University teachers as „persons in the shadow"

- **Back to the double role of expertise in university teaching**
- University teaching is aiming at students' expertise
  - Facilitate the acquisition of individual attributes of excellence
  - Facilitate the growing into professional networks
- University teaching is an expertise domain itself
  - Knowledge about the subject matter
  - Expert about expertise and about fostering expertise
  - Designing learning environments that support the growth of expertise – both individual attributes and participation
  - Most important: Set the direction for (adequate, deliberate) practice

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University teachers as „persons in the shadow“

- Related work about school teaching expertise
  - Ropo (Finland), Berliner (USA), Leinhardt (USA), Bromme (Germany)
- Focus on subject matter knowledge and didactical and instructional components
  - Systematic presentation of knowledge
  - Instructional techniques
  - Classroom management
  - Time management
  - Perception and memory of classroom activities
- Little focus (so far!) on the direction-giving part
  - Setting deliberate practice
  - Introducing into networks of expertise

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University teachers as „persons in the shadow“

If you want to read more, why “persons in the shadow are important”:

Gruber, H., Lehtinen, E., Palonen, T., & Degner, S. (2008). Persons in the shadow: Assessing the social context of high abilities. *Psychology Science Quarterly, 50*, 237-258.

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