To what extent do facets of the learning environment influence apprentices’ motivation and learning success?

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Johannesburg, 23 April 2013
Outline

I. Theoretical Background
   • Excursus: 2 venues of training in German VET
   • Why intrinsic motivation and how to improve it?

II. Research project
   • Study design and sample
   • Variables assessed to predict intrinsic motivation

III. Results
   • Working/Learning environment and motivation
   • Prediction of apprentices’ intrinsic motivation
German dual system of Vocational Education and Training

Vocational school and the company providing training fulfill a joint educational remit

1-2 days/week

Vocational School

Teaches vocational and general educational content, specialist competence and general skills

Enables pupils to carry out occupational tasks

4 days/week

Training Company

Provides opportunities for learning via acting and for applying the domain specific contents learned at school in practice

Enables apprentices to acquire the ability to perform professionally on their own
### Why intrinsic motivation?

#### What is intrinsic motivation?

<table>
<thead>
<tr>
<th>„internal“ motivation, governed by individual interests, not external encouragement</th>
</tr>
</thead>
<tbody>
<tr>
<td>„Intrinsically motivated behaviors are performed out of interest and thus require no specific contingencies“ (like threats or promises) (Deci &amp; Ryan 2000)</td>
</tr>
</tbody>
</table>

#### Why do we need intrinsic motivation?

<table>
<thead>
<tr>
<th>Intrinsic motivation indispensable for successful learning and for engaging more thoroughly in learning (Deci &amp; Ryan 2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic motivation as a mediator between the learner’s personality, the learning environment and competence development (Franke 2005)</td>
</tr>
<tr>
<td>-&gt; particularly in informal learning contexts, where learning takes place mainly incidentally and without rewards</td>
</tr>
</tbody>
</table>
Motivation achievable not through selected learning opportunities, but through a continuous beneficial working environment.
How to improve intrinsic motivation?

Frieling et al. (2006): To identify a working environment that stimulates learning, **features of work tasks** as well as **aspects of the social environment** have to be considered.

Hackman/Oldham (1975) – Job-Characteristics-Model: conditions enhancing motivation while attending to one’s tasks:
- Experienced responsibility for work outcomes (autonomy)
- Experienced meaningfulness of work
- Knowledge of results of work activities

Deci & Ryan (2000):
- Autonomy-supportive events enhance intrinsic motivation
- Activities providing an optimal challenge enhance intrinsic motivation
- Under autonomy-supportive conditions, feedback (especially positive feedback) enhances intrinsic motivation
How to improve intrinsic motivation?

Beicht et al. (2009): Tasks designed with these principles in mind can only develop their positive effect on motivation and competence, if they are embedded in a positive working/learning atmosphere (mutual support, respectful interactions with colleagues)

Dreyfus & Dreyfus (1980): Watching experts doing and explaining their work enables novices to recognize patterns in their work

Lave & Wenger (1991): “Acceptance by and interaction with acknowledged adept practitioners make learning legitimate and of value from the point of view of the apprentice.”
Study design

- Project cooperation of BIBB and University of Stuttgart
- *Aim of the project:* **Studying the relationships between input** (e.g. prior knowledge), **variables of the training process** (e.g. motivation and quality of training) **and output** (e.g. domain-specific knowledge)

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<table>
<thead>
<tr>
<th>Prior domain specific knowledge</th>
<th>General mental abilities (CFT 20R)</th>
<th>Domain specific knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic mathematical skills</td>
<td>Training quality in vocational school and company</td>
<td>Training quality in vocational school and company</td>
</tr>
<tr>
<td>Basic reading comprehension</td>
<td>Motivation</td>
<td>Motivation</td>
</tr>
</tbody>
</table>

- **Cohort 1**
  - 1st year of training
  - Jan 2011
  - 2nd year of training
  - Jan 2012
  - Intermediate exam
  - Dez 2012
Study sample and variables

Sample

Prospective mechatronics fitters in their first year of training (N=579) from 4 German federal states, aged 18.5 years, male-dominated profession

<table>
<thead>
<tr>
<th>Type of schooling</th>
<th>% of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic secondary schooling</td>
<td>3.1</td>
</tr>
<tr>
<td>Intermediate secondary schooling</td>
<td>70.5</td>
</tr>
<tr>
<td>Upper secondary schooling</td>
<td>25.9</td>
</tr>
</tbody>
</table>

Assessed dependent variable

- **Apprentices’ intrinsic motivation** for doing work at the training company (following Prenzel et al. 1996)

  3 Items, e.g. „Working at the training company was real fun.“

  Cronbach's Alpha α=.83/.82 (based on partial sample)
### Assessed dimensions of company-based training

(IBAQ – Velten & Schnitzler 2012)

- **Work tasks** (task variety & matching of job demands to apprentice‘s skills) (6 Items) ($\alpha=.81$)
  - I’m given tasks that match my skills
- **Meaningfulness of tasks** (3 Items) ($\alpha=.78$)
  - My team relies on the results of my work
- **Autonomy** (3 Items) ($\alpha=.77$)
- **Feedback** (5 Items) ($\alpha=.79$)
- **Excessive demands** in form of time pressure (4 Items) ($\alpha=.72$)
- **Trainer’s professional competence** (8 Items) ($\alpha=.87$)
- **Trainer’s personal involvement** (4 Items) ($\alpha=.82$)
- **Colleagues’ behavior** (6 Items) ($\alpha=.87$)
  - My trainer cares for my well-being
  - My colleagues explain their thoughts while working on a problem

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1 (Cronbach’s Alpha based on partial sample)
Results: Working environment and motivation
Mechatronics fitters ½ year into training

<table>
<thead>
<tr>
<th>Motivation-relevant facets of working/ learning environment</th>
<th>Intrinsic Motivation (N=579)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work task diversity and complexity</td>
<td>.465**</td>
</tr>
<tr>
<td>Autonomy</td>
<td>.336**</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td>.311**</td>
</tr>
<tr>
<td>Feedback</td>
<td>.367**</td>
</tr>
<tr>
<td>Excessive demands</td>
<td>-.379**</td>
</tr>
<tr>
<td>Trainer’s competence</td>
<td>.484**</td>
</tr>
<tr>
<td>Trainer’s involvement</td>
<td>.457**</td>
</tr>
<tr>
<td>Colleagues’ behavior</td>
<td>.406**</td>
</tr>
</tbody>
</table>

Note: ** The beta-coefficient is significant at the .01 level.
Prediction of apprentices‘ motivation (Multiple Regression)
Mechatronics fitters ½ year into training (N=579)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>SE</th>
<th>B</th>
<th>R²</th>
<th>R² adj.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Work task diversity and complexity</td>
<td>.214</td>
<td>.053</td>
<td>.170**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive demands</td>
<td>-.200</td>
<td>.043</td>
<td>-.171**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomy</td>
<td>.084</td>
<td>.031</td>
<td>.101**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>.015</td>
<td>.042</td>
<td>.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meaningfulness</td>
<td>.052</td>
<td>.033</td>
<td>.062</td>
<td>.338 .332</td>
<td></td>
</tr>
<tr>
<td>2. Colleagues‘ behavior</td>
<td>.187</td>
<td>.039</td>
<td>.178**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainers’s competence</td>
<td>.123</td>
<td>.049</td>
<td>.125*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainer’s involvement</td>
<td>.095</td>
<td>.043</td>
<td>.112*</td>
<td>.387 .378</td>
<td></td>
</tr>
</tbody>
</table>

Note: ** The beta-coefficient is significant at the .01 level. * The beta-coefficient is significant at the .05 level.

Work task diversity and complexity and excessive demands on the one hand and colleagues‘ and trainer‘s support on the other hand predict a substantial amount of apprentices‘ intrinsic motivation.
Prediction of apprentices' motivation after 1 year (Mult. Reg.)
Mechatronics fitters midtraining – N=479

<table>
<thead>
<tr>
<th>Predictors</th>
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<th>β</th>
<th>R²</th>
<th>R² adj.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Work task diversity and complexity</td>
<td>.226</td>
<td>.063</td>
<td>.172**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive demands</td>
<td>-.157</td>
<td>.057</td>
<td>-.131**</td>
<td>.083</td>
<td>.079</td>
</tr>
<tr>
<td>2. Trainer’s involvement</td>
<td>.085</td>
<td>.043</td>
<td>.098*</td>
<td>.090</td>
<td>.085</td>
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</tbody>
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Note: ** The beta-coefficient is significant at the .01 level. * The beta-coefficient is significant at the .05 level.

Work task diversity and complexity, excessive demands and to a lesser extent the trainer’s involvement contribute to apprentices’ motivation even a whole year later.
Summary

Influence of working/learning environment on motivation

Working/learning environment has a strong impact on apprentices’ intrinsic motivation to do their tasks in the training company.

Especially task design, in the form of varied tasks that match the respective apprentice’s skills, substantially affects intrinsic motivation.

Not only trainer’s competence and involvement influence intrinsic motivation, but also other colleagues’ support and willingness to give the apprentice access to their expert performance.

Not surprisingly, motivation is influenced most strongly by immediate training quality; however, some facets of the working environment affect motivation even over a period of one year.
Outlook

**Working environment, motivation and learning success**

The working environment facets of excessive demands and meaningfulness have a small but significant effect on domain specific knowledge at mid-training ($R^2=.05$).

Adding the apprentices’ intrinsic motivation to the impact of the environment facets, $R^2$ increases to 7.4%.

To be continued…
Thank you for your attention!

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References


Backup: Instruments – Basic competences and skills

Initial (cognitive) resources

Mathematical skills
Reading comprehension
General mental abilities (reasoning)
Aufgabe 2
Lösen Sie folgende Aufgabe und geben Sie Ihre Rechenwege an:

Gegeben: \( I = 2 \, \text{A}; \, R_1 = 50 \, \Omega; \, R_2 = 100 \, \Omega \)

Berechnen Sie:
- Gesamtwiderstand \( R_G \)
- Spannungen \( U_1; \, U_2 \)
- Strom \( I_1 \)