Messmann, Gerhard; Mulder, Regina H.; Gruber, Hans

Relations between vocational teachers' characteristics of professionalism and their innovative work behaviour

Empirical research in vocational education and training 2 (2010) 1, S. 21-40

in Kooperation mit / in cooperation with:

SKBF | CSRE

http://www.skbf-csre.ch

Relations between vocational teachers' characteristics of professionalism and their innovative work behaviour

Gerhard Messmann[a,*], Regina H. Mulder[a], Hans Gruber[a]

[a] *University of Regensburg, Institute for Educational Science*

Abstract

Innovative work behaviour of teachers is important to develop innovations in vocational colleges. However, it depends on individual characteristics, in particular professional knowledge, professional performance and professional development. To investigate the role of these attributes, a questionnaire study with 60 vocational teachers was conducted. The study showed that characteristics of professionalism are positively related to innovative work behaviour. Aspects of professional development like "occupational learning" and "social expansion" were particularly important. "Metacognitive knowledge" and "reflection" that represent the "metacognitive dimension" of professionalism were considered as crucial. The respondents underlined that when due to changes at work a substantial amount of innovations is required, life-long learning is strongly needed as a part of professionalism.

Keywords: Innovative work behaviour, professionalism, vocational teachers

1. Introduction

Vocational colleges are faced with the results of ongoing economic and technological developments in our globalised society in several ways. First, the cognitive and cultural diversity of youngsters that enter this kind of education is increasing. Second, the workplaces are changing, for which these youngsters have to be prepared in school. Third, our society expects more of teachers in terms of education, it is expected that they have to prepare students not only for work but for life in general. In addition, changes in political behaviour, administration and laws have an effect on the work within vocational colleges (Nieuwenhuis et al., 2004).

As a consequence of all these changes and demands, vocational colleges must be responsive (Nijhof & Streumer, 1994) and innovations are required. Innovations are considered as products or processes that are new, applicable and useful within a specific work context (Kanter, 1988). Innovations in vocational colleges can be new instructional objectives or didactical methods, changes in work processes such

---

*Corresponding author: Gerhard Messmann, University of Regensburg, Institute for Educational Science, 93040 Regensburg, Germany. Tel.: +49 941 943 3824; fax: +49 941 943 4369. E-mail address: Gerhard.Messmann@paedagogik.uni-regensburg.de

as collaboration between teachers, or new work tasks of teachers (Fullan, 2007). Innovations are not restricted to the classroom but include the wider context within and outside the school. In addition, it is crucial that innovations are developed for the requirements of a local school context. It has been argued that it is important to take into account the leading actors within a local school context in order to create a sustainable success of innovation development (Tuomi, 2007).

The development of innovations requires substantial contributions of individuals. Therefore it is important to understand their activities that lead to innovations. In organisational psychology these activities are referred to as innovative work behaviour (Janssen, 2000). With regard to the context of vocational colleges, the work activities teachers carry out in order to find new ideas for coping with challenges and problems at their school play an important role. The interactions of teachers are influential as well as the support they provide each other to realise an idea.

In order to foster such behaviour, the individual requirements for these activities have to be understood. In research on expertise, knowledge is emphasised as a major determinant for performance (Berliner, 2001). In organisational approaches, the focus is on competences as individual capabilities to deal successfully with work tasks (Ellström, 1997). Although both perspectives differ with regard to their research approach, they share the notion that individual characteristics are an important prerequisite for successful work activities. Hence, they might also be an important prerequisite for innovative work behaviour. In vocational colleges transformations do not only lead to new organisational structures, goals and work tasks, but also to a revised picture of a professional teacher. Because teaching is a knowledge-intensive job, knowledge is an important prerequisite for performance. Thus, due to knowledge expansion and changes of performance standards (Simons & Ruijters, 2004), professional development is crucial for teachers, too.

There is little research with attempts to understand which activities teachers carry out that lead to innovations. Our central research question therefore is: *What is the relation between vocational teachers' professional knowledge, professional performance and professional development on the one hand and their innovative work behaviour on the other hand?*

2.   Theoretical framework

2.1   Innovative work behaviour

While in economics there is a long tradition to conceive innovations as macro level phenomena (Schumpeter, 1942), organisational psychology emphasises the individual perspective including the individual and contextual characteristics that determine the success of innovations (Anderson et al., 2004). Based on West and Farr (1990), we define innovations as products or processes that are new, applicable and useful for a certain individual, group or organisation. Innovations can differ with regard to the persons involved, the time required for its development and the range of persons

affected by the innovation.

In the context of vocational colleges innovations are significant changes and improvements of complex learning environments that include a redefinition of basic goals. Some of the relevant aspects of such learning environments are not restricted to the classroom context. There are aspects that are situated in the wider context within and even beyond a school. Examples of innovations in vocational colleges are new learning goals and methods, new work processes, collaboration between teachers, and cooperation with other schools, educational institutions or companies.

A number of studies in work contexts investigated employees' "innovative work behaviour" which is defined as the sum of all work activities carried out by individuals during an innovation process. The "generation" of new and applicable ideas is a core part of this process, but such ideas have to be realised in practice as well (Janssen, 2000; Kanter, 1988). In educational settings innovations and innovative work behaviour are an important issue as well. However, analyses of teachers' work activities that are carried out to develop innovations are still missing. Although there is recognition of the crucial role of teachers in the development of innovations, it has not yet been investigated how teachers are involved in innovation processes and how their active contributions can be encouraged and fostered.

As teachers work both "inside" and "outside" the classroom, work activities related to innovations in both forms of contexts have to be focussed on. Moreover, the participation in an innovation process has to be distinguished from innovative work behaviour. While it is likely that teachers at some stage are involved in an innovation process at their school, innovative work behaviour only refers to those work activities that are actually carried out in order to generate ideas or to support other persons in realising their ideas. Only the latter is referred to as "being innovative".

For instance, a daily challenge in vocational colleges might be that teachers have to cope with a large number of students with motivational problems due to the lack of job perspectives. An "innovative" teacher may therefore have an idea, how (s)he can motivate these students by involving them into realistic work situations. However, in order to realise this idea (s)he needs support: A necessary first step would be to introduce the new plans to colleagues, possibly by showing them some prepared sketches. Furthermore, (s)he may need the help of companies that offer materials and provide appropriate facilities. The teacher may also think of other schools that have the same problems and could be interested in joining the process. In addition, the teacher may need the permission and support of the school management. Taken together, the process may become increasingly complex with many persons involved. At some stage the teacher has to prove the success of the idea by showing results. In the end, this complex interaction of individuals may turn a simple idea into an innovation that significantly changes and improves the status quo.

2.2   Characteristics of professionalism

In order to foster innovative work behaviour it is important to understand the individual requirements of professionals for these activities. Professionalism can be broken down into three constructs:

- Professional knowledge

- Professional performance

- Professional development

2.2.1   Professional knowledge

The role of knowledge for performance was repeatedly emphasised in research on expertise. Qualitative and quantitative characteristics of expert knowledge were described and analysed in various domains (Berliner, 2001). A common distinction divides knowledge into declarative and procedural knowledge, into know-what and know-how (Ryle & Tanney, 2009). With regard to occupational knowledge this distinction refers to codified facts and concepts of the occupation and to rules and conditions of the practical application of this knowledge. Some researchers stressed the role of metacognitive knowledge, i.e. knowledge about oneself and one's knowledge as well as about tasks, cognitive strategies, actions and their regulation (Veenman et al., 2006). Finally, workplace knowledge - knowledge about persons, resources and traditions - is increasingly important to cope with constraints and affordances of the workplace (Billett, 2001).

With regard to teachers, Shulman's (1987) distinction between content knowledge, pedagogical knowledge and curriculum knowledge underlines the importance of different kinds of knowledge in this domain. Through work experience teachers acquire metacognitive knowledge (Kremer-Hayon & Tillema, 1999). Workplace knowledge is crucial for organising classroom work and for coping with the social and organisational context of the school (Sternberg & Horvath, 1995). In sum, professional knowledge can be separated into three core dimensions:

- Occupational knowledge as a basis for standard professional performance in a specific domain

- Metacognitive knowledge as a requirement for self-regulation

- Workplace knowledge as a prerequisite for actions and interactions at work

2.2.2   Professional performance

The domain-specific ability to successfully solve work tasks is described in research on competence (Ellström, 1997). Successful performance depends on self-regulation in order to set goals and to plan and monitor one's actions (Veenman et al., 2006).

Collaboration was emphasised as an important characteristic of professional performance in order to solve work tasks more easily (Brown & Duguid, 1991).

In the domain of teaching, there are some studies that addressed teachers' influence on student success. Characteristics of good teaching are often based on normative performance standards that include high capabilities for problem-solving, improvisation or decision-making, self-regulation and context sensitivity (Leinhardt & Greeno, 1986). Teachers' collaboration at school also was emphasised (Grangeat & Gray, 2008). Taken together, professional performance can be separated into three core dimensions:

- Occupational performance as the sum of one's standard occupational actions

- Self-regulation as all activities to plan and monitor actions

- Collaboration as all interactive activities at work

2.2.3   *Professional development*

As organisational structures and work tasks are changing, professionals cannot rely on their knowledge and performance standards, but have to continue developing as professionals. Professionals have to keep in touch with the knowledge and performance standards of their particular domain. Therefore, adaptation to changes through occupational learning is an important issue (Simons & Ruijters, 2004). Moreover, reflection is a crucial activity to explain success and errors of past experiences and to plan future actions (Van Woerkom et al., 2002). Finally, because the work context holds important social resources to learn with and from others, it is important to expand social relations at work and to improve the quality of existing relations (Van der Heijden, 2002).

In the domain of teaching, evidence exists about the importance of these aspects. Attwell (1997) argued that professionals in vocational education and training must adapt new roles and tasks like the creation of conditions for organisational learning, reflection on professional activities and collaboration with colleagues or clients. Sternberg & Horvath (1995) included reflective practice as part of a prototypical model of the expert teacher. Kwakman (2003) emphasised the importance of professional development in contexts of changes at schools and analysed factors that affect teachers' participation in professional learning activities like reflection and collaboration. Moreover, Snow-Gerono (2005) studied teachers' activities in professional development communities and emphasised that attempts to maintain and expand social relations at work are important for professional growth as well as for educational change. In sum, three core dimensions of professional development can be distinguished:

- Occupational learning, including activities to update occupational knowledge and performance standards and the growth of competences

- Reflection on experiences in order to plan future actions

- Social expansion containing the intensification of existing and the establishment of new social relations at work

Changes, challenges and innovations in vocational colleges have only rarely been investigated. Therefore, relations between vocational teachers' professional knowledge, professional performance and professional development with their innovative work behaviour were investigated in a study.

3.   Method

3.1   *Participants and procedure*

In fall 2007, all teachers of one German vocational college ($N = 60$) participated in a cross-sectional questionnaire study. The sample consisted of 38 males and 20 females (background information on two respondents is missing) with an average age of 44.33 years and an average work experience of 14.42 years (Table 1). The questionnaires were filled out by the teachers after a teacher conference at the beginning of the school year.

Table 1: Background characteristics of the vocational teachers

Gender	N	Age (M, SD)		Work experience (M, SD)	
Female	20	40.94	8.95	11.61	13.73
Male	38	46.03	10.35	15.86	11.29
Total	60*	44.33	10.12	14.42	12.21

Note: *Background information on two respondents is missing.

3.2   *Item and scale development*

A questionnaire consisting of 115 self-report items was developed to measure innovative work behaviour, professional knowledge, professional performance and professional development. Based on a literature review, items were constructed in order to capture the different facets of teachers' work situations and corresponding activities. With regard to innovative work behaviour, a 2×2-matrix (tasks "idea generation" and "idea realisation"; contexts "inside the classroom" and "outside the classroom") was used to construct items. A 3×3-matrix (constructs "professional knowledge", "professional performance" and "professional development"; dimensions "occupational", "metacognitive" and "social") was used to develop the measure for characteristics of professionalism.

Self-reports were used for assessment of work-related constructs in order to take advantage of teachers' familiarity with their own work and abilities compared to peer ratings. With regard to innovative work behaviour, supervisor ratings seem to

be inappropriate, because they do not capture early stages of idea generation. For instance, if ideas are not applicable or not promising, they may be discarded or rejected by colleagues and are not communicated to the supervisor. In order to investigate the dimensional structure of the constructs, factor analyses were conducted. The items of each of the four constructs were analysed separately.

Prior to the factor analyses, the following procedures were carried out to select items: The correlation matrix of the items was checked for correlations exceeding a certain minimum or maximum ($0.20 < r < 0.80$). The Kaiser-Meyer-Olkin-Coefficient and the Measure of Sample Adequacy were calculated to check the adequacy of the item matrix ($KMO > 0.60$) and of the single items ($MSA > 0.60$). Bartlett's Test on sphericity was performed to secure that the matrix contains substantial inter-item-correlations. Communalities were calculated to check the reliability of the single items in the matrix ($h^2 > 0.60$).

In the factor analyses, principal axis factoring with a Promax rotation was applied. An oblique rotation technique was chosen in order to take into account the theoretical linkages of the different dimensions of innovative work behaviour and professionalism. For the decision to extract factors the Scree Test and the Eigenvalue criterion (> 1) were used. Items were eliminated if they had loadings of 0.40 or larger on more than one factor.

The 13 extracted factors were then used as measurement scales for the corresponding dimensions of innovative work behaviour and professionalism. With regard to these scales, Cronbach's α ($\alpha > 0.60$) and item-scale-correlations ($r_{it} > 0.30$) were computed as indicators of internal consistency. Next, the measurement scales were transformed into variables by computing the means of the corresponding items of each scale. These variables were used for all further analyses. Finally, the Kolmogorov-Smirnov-Test was carried out with all 13 variables in order to check for normal distribution.

In the following paragraphs the item and scale development are described in detail for the four constructs innovative work behaviour, professional development, professional performance and professional development.

Innovative work behaviour. Thirty-four items were formulated that represented the two tasks "idea generation" and "idea realisation" in the two contexts "inside the classroom" and "outside the classroom". In the factor analysis, two separate factors for the contexts inside and outside the classroom were found. However, a separation of idea generation and idea realisation was not possible, in both contexts items of the two tasks loaded on the same factor. Due to the similarity of these items it was decided to exclude all items that represented idea generation. Therefore, the remaining nine items associated with the two factors "IWB inside the classroom" and "IWB outside the classroom" only contained items related to idea realisation (Table 2).

Table 2: Factor structure and scale characteristics of the *innovative work behaviour* measure

Variable	Items	IC	OC	Scale characteristics			α if item deleted
				M	SD	α	
Inside the classroom (IC)	Last school year I used new approaches of supporting students.	**0.80**		3.50	1.21	0.90	0.88
	Last school year I used new instruments to guide students.	**0.83**					0.87
	Last school year I used new methods for student assessment.	**0.67**					0.90
	Last school year I used methods that take into account characteristics of students.	**0.90**					0.87
	Last school year I used methods that take into account characteristics of students' future jobs.	**0.84**					0.87
Outside the classroom (OC)	Last school year I established cooperations with companies and other institutions outside school.		**0.64**	4.23	1.17	0.85	0.81
	Last school year I established new collaborations at my school.		**0.81**				0.80
	Last school year I used insights from lectures and professional development courses for changes at school.		**0.82**				0.76
	Last school year I used insights from journals for teachers for changes at school.		**0.69**				0.82

Note: 6-point Likert scales were used (1 = applies not at all, 6 = fully applies). $N = 60$. Boldface indicates loadings of items associated with a factor. Factor loadings below 0.40 are suppressed.

Professional knowledge. The measure for this construct consisted of thirty-one items that represented the dimensions "declarative" and "procedural occupational knowledge", "metacognitive knowledge", and "workplace knowledge". In the factor analysis, five factors were extracted. Twenty items were associated with these factors. Contrary to the assumed factor structure, workplace knowledge was represented by two factors: The first factor was related to knowledge about needs of other persons. The second factor represented knowledge about constraints and affordances of the workplace (Table 3).

Professional performance. Thirty items were formulated to measure this construct. These items represented the dimensions "occupational action", "self-regulation" and "collaboration". In the factor analysis, three factors were extracted that represented the three assumed dimensions. Fifteen items were associated with these factors (Table 4).

Professional development. This construct was measured by twenty items that represented the dimensions "occupational learning", "reflection" and "social expansion". In the factor analysis, three factors were extracted that represented the three assumed dimensions. Fourteen items were associated with these factors (Table 5).

Relations between the three professionalism constructs. A second order factor analysis was carried out in order to analyse whether the 11 primary factors of professionalism could be associated with general factors. Factor values of the 11 primary factors were computed and entered into the second order analysis (Table 6). Two factors were identified. The first factor represented the "occupational dimension of professionalism". Declarative and procedural occupational knowledge, occupational action and occupational learning were associated with this factor. However, workplace knowledge about constraints and affordances was associated with this factor as well. The second factor represented the "metacognitive" as well as the "social dimension of professionalism". Metacognitive knowledge, self-regulation and reflection as well as workplace knowledge about needs of other persons and social expansion were associated with this factor. Collaboration was not associated with any of the secondary factors.

As the aim of the study was to identify relations of innovative work behaviour with different characteristics of professionalism, it was decided to use the primary factors for further analysis. The implications of two secondary factors will be discussed in the concluding section.

Table 3: Factor structure and scale characteristics of the *professional knowledge* measure

Variable	Sample item	DOK	POK	MK	WK1	WK2	Scale characteristics			α if item deleted
							M	SD	α	
Declarative occupational knowledge (DOK)	I am able to find concrete examples for abstract topics.	**0.64**					4.89	0.66	0.88	0.84
		0.85								0.81
		0.81								0.86
		0.88								0.81
Procedural occupational knowledge (POK)	I know how to use my educational knowledge for lessons.		**0.45**				4.83	0.58	0.87	0.83
			0.63							0.82
			0.61							0.86
			0.63							0.85
			0.66							0.83
Metacognitive knowledge (MK)	I know how I can acquire subject-specific contents for lessons.			**0.69**			4.96	0.60	0.85	0.78
				0.61						0.79
				0.64						0.77
Workplace knowledge 1 (WK1)	I know how I have to respond to my colleagues' needs.				**0.77**		4.80	0.59	0.82	0.74
					0.62					0.79
					0.79					0.74
					0.69					0.81
Workplace knowledge 2 (WK2)	At my school, I know how I can exploit useful information for work.					**0.67**	4.28	0.80	0.78	0.72
						0.77				0.77
						0.66				0.68
						0.48				0.71

Note: 6-point Likert scales were used (1 = applies not at all, 6 = fully applies). $N = 60$. Boldface indicates loadings of items associated with a factor. Factor loadings below 0.40 are suppressed.

Table 4: Factor structure and scale characteristics of the *professional performance* measure

Variable	Sample item	OA	SR	CO	Scale characteristics			α if item deleted
					M	S D	α	
Occupational action (OA)	So far, I was able to recognise problems and critical situations in class quickly.	**0.69**			4.81	0.60	0.90	0.88
		0.84						0.88
		0.78						0.87
		0.54						0.89
		0.90						0.87
		0.56						0.89
		0.73						0.88
Self-regulation (SR)	So far, I always pursued a concrete goal in my lessons.		**0.71**		4.90	0.63	0.87	0.85
			0.69					0.87
			0.89					0.82
			0.84					0.82
			0.54					0.85
Collaboration (CO)	When I work together with colleagues, I am usually good at the coordination of tasks.			**0.71**	4.33	0.80	0.80	0.81
				0.70				0.73
				0.92				0.59

Note: 6-point Likert scales were used (1 = applies not at all, 6 = fully applies). N = 60. Boldface indicates loadings of items associated with a factor. Factor loadings below 0.40 are suppressed.

Table 5: Factor structure and scale characteristics of the *professional development* measure

Variable	Sample item	OL	RE	SE	Scale characteristics			α if item deleted
					M	SD	α	
Occupational learning (OL)	I invest much time to inform myself about teaching methods in professional journals.	**0.60** **0.56** **0.85** **0.92**			3.79	1.10	0.89	0.85 0.86 0.85 0.87
Reflection (RE)	I use discussions with colleagues to get a picture of the quality of my teaching.		**0.73** **0.63** **0.74** **0.67** **0.73**		4.37	0.84	0.84	0.78 0.81 0.81 0.82 0.80
Social expansion (SE)	I invest much time to establish contacts with other schools.			**0.63** **0.75** **0.66** **0.53** **0.58**	3.88	1.00	0.82	0.80 0.79 0.75 0.77 0.78

Note: 6-point Likert scales were used (1 = applies not at all, 6 = fully applies). N = 60. Boldface indicates loadings of items associated with a factor. Factor loadings below 0.40 are suppressed.

Table 6: Secondary factors of professionalism

Primary factors	Secondary factor 1	Secondary factor 2
Declarative occupational knowledge	0.91	
Procedural occupational knowledge	0.61	
Metacognitive knowledge		0.52
Workplace knowledge 1		0.73
Workplace knowledge 2	0.83	
Occupational action	0.90	
Self-regulation		0.53
Collaboration		
Occupational learning	0.58	
Reflection		0.86
Social expansion		0.42

Note: Factor values of the primary factors were used. $N = 60$. Boldface indicates loadings of items associated with a factor. Factor loadings below 0.40 are suppressed.

3.3 Analysis

First, a descriptive analysis was made. In addition to values of the background characteristics "gender", "age" and "work experiences" (Table 1), mean values of the two dependent variables "IWB inside the classroom" and "IWB outside the classroom" as well as of the 11 independent variables related to professional knowledge, performance and development were calculated.

Next, a correlation analysis was carried out. Here, the two dependent variables, the 11 independent variables and the three background variables were taken into account.

Based on these results a hierarchical multiple regression analysis was conducted. Two separate regression models for the dependent variables "IWB inside the classroom" and "IWB outside the classroom" were specified. Variables were included in the regression analyses if they had shown significant correlations with the dependent variables. A hierarchical procedure was chosen to take into account the amount of variance explained by background variables, knowledge-related variables, performance-related variables and development-related variables. First, all variables of a particular block were entered into the regression model. Next, the variable with the lowest beta-weight was excluded. This procedure was repeated until only predictors with beta-weights of at least 0.20 remained in the model. Then, the next block of variables was added and the whole procedure was repeated for these variables. In order to take into account strong correlations between predictors in the model ($r > 0.60$), a decision for one predictor was made based on theoretical considerations and on the strength of the relation with the dependent variable.

4.   Results

The mean scores of the 13 analysed variables ranged from 3.50 to 4.96. The corresponding variables of professional knowledge and performance had the highest means (4.28 - 4.96) followed by those of professional development (3.79 - 4.37). Compared to knowledge and performance, the means of innovative work behaviour inside the classroom ($M = 3.50$) and innovative work behaviour outside the classroom ($M = 4.23$) were also lower.

Correlation analyses provided information about the relations of background variables and independent variables with innovative work behaviour both inside and outside the classroom. Age was positively related with innovative work behaviour inside the classroom ($r = 0.43$, $p < 0.01$). Work experience was positively related with innovative work behaviour inside ($r = 0.34$, $p < 0.05$) and outside the classroom ($r = 0.30$, $p < 0.05$). With the exception of collaboration, all variables of professional knowledge, professional performance and professional development were substantially related to innovative work behaviour in at least one of the two contexts. If the strength of these relations is taken into account, the most important variables were "procedural occupational knowledge", "metacognitive knowledge", "occupational action", "occupational learning" and "social expansion".

The correlation analysis also showed how the three constructs concerning professionalism were related to each other and to other constructs (Table 7). The five knowledge variables were significantly related with only one exception. The performance variables and the development variables were, with only few exceptions, substantially related to each other. However, positive relations with the corresponding variables of the other constructs were also found. In some cases these relations were even larger than the correlations within constructs. Professional knowledge, professional performance and professional development seem to be interdependent constructs.

Table 7: Scale inter-correlations of professional knowledge, performance and development and innovative work behaviour

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Declarative occupational knowledge	-											
2. Procedural occupational knowledge	0.62**											
3. Metacognitive knowledge	0.45**	0.63**										
4. Workplace knowledge 1	0.25	0.41**	0.49**									
5. Workplace knowledge 2	0.43**	0.44**	0.47**	0.30*								
6. Occupational action	0.69**	0.82**	0.60**	0.35**	0.46**							
7. Self-regulation	0.31*	0.68**	0.49**	0.46**	0.19	0.60**						
8. Collaboration	-0.11	0.03	0.22	0.45**	0.04	0.07	0.26*					
9. Occupational learning	0.44**	0.57**	0.52**	0.19	0.27*	0.60**	0.53**	0.16				
10. Reflection	0.05	0.21	0.34**	0.42**	0.09	0.23	0.31*	0.49**	0.19			
11. Social expansion	0.08	0.33*	0.50**	0.26*	0.27*	0.30*	0.32*	0.46**	0.64**	0.34**		
12. IWB Inside the classroom	0.27*	0.37**	0.44**	0.12	0.24	0.44**	0.35**	0.20	0.48**	0.42**	0.48**	
13. IWB Outside the classroom	0.31*	0.50**	0.55**	0.28*	0.27*	0.48**	0.32*	0.13	0.64**	-0.00	0.49**	0.44**

Note: $*p < 0.05$, $**p < 0.01$, $N = 60$

The regression analyses provided insight into the weighted importance of the relations of background and independent variables with innovative work behaviour (Table 8).

With regard to innovative work behaviour inside the classroom ($R^2 = 0.41$, $p < 0.001$), age was the strongest predictor ($\beta = 0.33$, $p < 0.01$), but reflection explained a significant amount of variance as well ($\beta = 0.27$, $p < 0.05$). In addition, metacognitive knowledge and social expansion proved to be important predictors ($\beta > 0.20$). Due to their own close relation ($r = 0.50$, $p < 0.01$) and to their relation with reflection ($r = 0.34$, $p < 0.05$), their predictive effect was not significant, however.

In the regression model for innovative work behaviour outside the classroom ($R^2 = 0.43$, $p < 0.001$), occupational learning explained the most variance ($\beta = 0.38$, $p < 0.01$). In addition, metacognitive knowledge was a significant predictor ($\beta = 0.35$, $p < 0.01$). Work experience contributed significantly only if analysed independently of other variables. The variables measuring professional performance did not explain a significant amount of variance in the two regression models.

Table 8: Hierarchical multiple linear regression models for innovative work behaviour

Innovative work behaviour inside the classroom				
Age		0.43**	0.35**	0.33**
Metacognitive knowledge			0.41**	0.21
Reflection				0.27*
Social expansion				0.22
	R^2	0.17**	0.32***	0.41***
	ΔR^2		0.15	0.09

Innovative work behaviour outside the classroom				
Work experience		0.30*	0.21	0.10
Metacognitive knowledge			0.54***	0.35**
Occupational learning				0.38**
	R^2	0.07*	0.34***	0.43***
	ΔR^2		0.27	0.09

Note: All betas are standardised. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. $N = 60$.

5. Discussion

Innovations play an increasingly important role in work contexts such as vocational colleges. As the development of innovations always includes contributions of individuals, it is important to know what activities individuals carry out during their work in order to generate, promote and realise ideas. In order to foster these activities, it

is important to identify characteristics of teachers which are substantial prerequisites for these activities. Therefore, different aspects of vocational teachers' innovative work behaviour as well as their professional knowledge, professional performance and professional development were investigated.

Large mean scores of most variables indicated a positive bias of the teachers' self-reports. The use of self-reports on work-related constructs may have provoked attempts to present oneself in a favourable light. Moreover, self-reports on performance may not have captured performance but only reflections about performance. Therefore, performance measures in which participants have to solve context-specific tasks based on realistic cases can be an alternative for future research. However, due to the exploratory character of the study and the greater insight this approach permits, self-reports were justifiable. The particularly large mean scores of professional knowledge and professional performance can be explained by teachers' professional self-concept. While knowledge and performance seem to be a natural part of teachers' self-conceptualisations, professional development and innovative work behaviour obviously are less pronounced, as their comparably lower means indicated. Hence, these aspects should be emphasised more in teacher education and further learning.

With regard to the development of the instrument, the factor analyses showed that the scales adequately represented the theoretically assumed structure of the constructs. However, some deviations from the theoretical conceptualisations occurred. With regard to workplace knowledge, the two empirically identified dimensions "needs of other persons" and "workplace constraints and affordances" have to be taken into account in future investigations. Taken together, the factor analyses provided some support for our operationalisation of professionalism as a basis for further studies.

The second order factor analysis showed that the professionalism variables can be associated with general factors. These represented the occupational and the meta-cognitive and social dimension of professionalism. This finding emphasises the complexity of the operationalisation of professionalism. If the aim in an operationalisation process is to include many variables, many different aspects like relations to other constructs or the theoretical structure of professionalism can be investigated. A number of different kinds of relations between variables can be identified. The correlation analyses confirmed that positive relations exist within the three constructs of professionalism, as well as across the constructs. Professional knowledge, professional performance and professional development obviously are interdependent constructs - within the common construct "professionalism".

In the operationalisation of innovative work behaviour, a context-specific approach was chosen that focussed on innovative products and processes in the work context of vocational teachers. The advantage of this approach is that the relation to a specific work context is already included in the items. The downside is that items related to different tasks of innovative work behaviour tend to be very similar, which can cause methodological problems. Therefore, an alternative for future studies on

innovative work behaviour can be a more general measure that focuses on concrete work activities. In order to relate work activities to innovation development and to a specific domain, context-specific cases and the activation of personal experiences with innovation processes might prove useful. With regard to the two scales that represented innovative work behaviour in this study, only the realisation of ideas was included. However, since the realisation of ideas is the last step of innovation development, this might be acceptable.

The correlation analysis showed which variables significantly relate to innovative work behaviour. Positive relations of background variables and of professionalism variables with innovative work behaviour were found. Based on these results, the regression analysis revealed which variables are most important in predicting innovative work behaviour. Regarding innovative work behaviour inside the classroom, age, metacognitive knowledge, reflection, and social expansion were the most important predictors. Age possibly is related with work experience and thus may help to develop innovations inside the classroom. With increasing age, teachers have more insight into student interests, characteristics of their future jobs, and routes to adapt one's teaching behaviour to changing circumstances. Reflection possibly is important for examining one's own experiences in order to use them for the development of innovations. Younger teachers may not be as capable as older teachers to reflect on their work. Consequently, they are less able to develop innovations. Social expansion can support the emergence of innovations inside the classroom. In particular in vocational education with its complex links to the labour market it has been claimed that learning environments have to take into account characteristics of future jobs (Messmann & Mulder, 2009).

Concerning innovative work behaviour outside the classroom, work experience, metacognitive knowledge and occupational learning were most important. Vocational teachers with more work experience tend to be more devoted to the development of innovations outside the classroom. Possibly, a more elaborated perspective on their job as well as useful contacts inside and outside school were helpful here. These teachers possibly have routines available that help to use resources required for the development of innovations. Even more important were metacognitive knowledge and occupational learning. Metacognitive knowledge provides insight into one's work-related strengths and weaknesses and into strategies to cope with shortcomings that may be particularly useful to identify needs and opportunities for changes. Engaging in occupational learning on-the-job and off-the-job can be an important resource for generating new ideas.

Taken together, the results support the idea that characteristics of professionalism are crucial to foster innovative work behaviour and the development of innovations in work contexts. Possibly, work experience and age of teachers strongly influence innovative work behaviour. However, the ascribed role of professional development shows that the picture is much more complex: Vocational teachers have to learn and have to be engaged in professional development activities on-the-job and off-the-job. To establish, expand, and improve social work contacts is part of this process, too. So

far, research paid too little attention to the ability and willingness of subjects to continue learning during one's whole professional life. As the metacognitive dimension of professionalism and the ascribed roles of metacognitive knowledge and reflection showed, teachers, teacher educators, and school leaders have to be simultaneously aware of many components, in particular in complex contexts and eras of change.

References

Anderson, N. R., De Dreu, C. K. W. & Nijstad, B. A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of Organizational Behavior*, 25, 147-173.

Attwell, G. (1997). New roles for vocational education and training teachers and trainers in Europe: A new framework. *Journal of European Industrial Training*, 21, 256-265.

Berliner, D. C. (2001). Learning about and learning from teacher experts. *International Journal of Educational Research*, 35, 463-482.

Billett, S. (2001). Knowing in practice: Re-conceptualising vocational expertise. *Learning and Instruction*, 11, 431-452.

Brown, J. S. & Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science*, 2, 40-57.

Ellström, P.-E. (1997). The many meanings of occupational competence and qualification. *Journal of European Industrial Training*, 21, 266-273.

Fullan, M. G. (2007). *The new meaning of educational change (4th ed.)*. London: Cassell.

Grangeat, M. & Gray, P. (2008). Teaching as a collective work: Analysis, current research and implications for teacher education. *Journal of Education for Teaching*, 34, 177-189.

Janssen, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, 73, 287-302.

Kanter, R. M. (1988). When a thousand flowers bloom: Structural, collective and social conditions for innovation in organizations. *Research in Organizational Behavior*, 10, 169-211.

Kremer-Hayon, L. & Tillema, H. H. (1999). Self-regulated learning in the context of teacher education. *Teaching and Teacher Education*, 15, 507-522.

Kwakman, K. (2003). Factors affecting teachers' participation in professional learning activities. *Teaching and Teacher Education*, 19, 149-170.

Leinhardt, G. & Greeno, J. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, 78, 75-95.

Messmann, G. & Mulder, R. H. (2009). Zusammenhänge zwischen Lernmotivation und Lernumgebungsmerkmalen an beruflichen Schulen. Jugendliche ohne Ausbildungsplatz und Auszubildende im Vergleich. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, 105, 343-360.

Nieuwenhuis, L. F. M., Mulder, R. H. & Van Berkel, H. (2004). Improving the quality of teaching-learning arrangements in VET. In W. J. Nijhof & W. van Esch (Eds.) *Unravelling policy, power, process and performance. The formative evaluation of the Dutch adult and vocational education act*. 's-Hertogenbosch: CINOP.

Nijhof, W. J. & Streumer J. N. (1994). Flexibility in vocational education and training: An introduction. In W. J. Nijhof & J. N. Streumer (Eds.) *Flexibility in training and vocational education*. Utrecht: Lemma.

Ryle, G. & Tanney, J. (2009). *The concept of mind (60th anniversary ed.)*. London: Routledge.

Schumpeter, J. A. (1942). *Capitalism, socialism and democracy*. New York: Harper & Row.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the New Reform. *Harvard Educational Review*, 57, 1-22.

Simons, P. R.-J. & Ruijters, M. C. P. (2004). Learning professionals: Towards an integrated model. In H. P. A. Boshuizen, R. Bromme & H. Gruber (Eds.) *Professional learning: Gaps and transitions on the way from novice to expert*. Dordrecht: Kluwer.

Snow-Gerono, J. L. (2005). Professional development in a culture of inquiry: PDS teachers identify the benefits of professional learning communities. *Teaching and Teacher Education*, 21, 241-256.

Sternberg, R. J. & Horvath, J. A. (1995). A prototype view of expert teaching. *Educational Researcher*, 24, 9-17.

Tuomi, I. (2007). Learning in the age of networked intelligence. *European Journal of Education*, 42, 235-254.

Van der Heijden, B. I. J. M. (2002). Individual career initiatives and their influence upon professional expertise development throughout the career. *International Journal of Training and Development*, 6, 54-79.

Van Woerkom, M., Nijhof, W. J. & Nieuwenhuis, L. F. M. (2002). Critical reflective working behaviour: A survey research. *Journal of European Industrial Training*, 26, 375-383.

Veenman, M. V. J., Van Hout-Wolters, B. H. A. M. & Afflerbach, P. (2006). Metacognition and learning: Conceptual and methodological considerations. *Metacognition and Learning*, 1, 3-14.

West, M. A. & Farr, J. L. (1990). Innovation at work. In M. A. West & J. L. Farr (Eds.) *Innovation and creativity at work: Psychological and organizational strategies*. Chichester: Wiley.