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A LATENT PROFILE ANALYSIS OF CAREER COMPETENCE IN GERMAN VOCATIONAL SCHOOLS

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Abstract

Vocational schools are the backbone of Germany's dual training system and it is expected that students in such schools have successfully mastered their first career-related decision. However, previous research suggests that attending a vocational school is often based more on practical considerations than on an informed career-decision making process. Therefore, questions arise about the state of vocational students' career competences and how to support their development on an individual basis. This study aims to shed light on the developmental patterns of students' career competences at German vocational schools. Latent profile analysis of career competence was therefore conducted with data from vocational school students (N = 453). Data collection took place in 2017 in four vocational schools in North Rhine-Westphalia. The participants were on average 18.20 years old (SD = 1.65), and 48% of them were female. Using a standardized questionnaire, they self-assessed 12 facets of their career competences. The results showed 3 profile groups that followed a similar pattern regarding the 12 career competence facets. They mainly differed in their overall career competence level: low developed, intermediate and advanced. Furthermore, a fourth profile that diverged from the three other profiles in terms of career pattern was identified: highly concerned/little-stress-resistant. A multivariate analysis of variance revealed statistical differences among these profile groups in the 12 career competence facets. Multinomial logistic regressions showed significant effects from gender and concrete career aspirations on profile affiliation. Limitations of the study, practical implications, and issues for future research are discussed.

Keywords

career competence, latent profile analysis, vocational school, career education

Introduction

The world of work continues to change rapidly, partly as a result of globalization and digitization (OECD, 2018). The disappearance of professions, the change of sectors, and the emergence of completely new industries (Freddi, 2018) has created external pressure for employees to anticipate changes and to be flexible. Vocational school students also need to take these developments into account in their career decision-making.

At first glance, it seems that for the moment such students no longer need any support regarding further career choices. After all, they already have successfully mastered their first career-related decision by choosing a vocational educational training program. At the same time, approximately 25% of students drop out of their dual training program (BMBF, 2016) and more than 25% of vocational school students have changed to a different program within their vocational school at least once (Rahn, Brüggemann, & Hartkopf, 2013).

Therefore, it can be questioned how knowledgeably and reflectively students have made their first career decision. They more often base their decision rather on pragmatic thinking than on a well-founded decision-making process (Rahn, Brüggemann, & Hartkopf, 2014). For instance, they choose to enrol in a vocational school due to its geographical proximity to their home or current school. They often do not make their decision based on the program's educational content (Rahn et al., 2014). Additionally, in the short run they will have to manage another transition from vocational school to work or further education, for example university.

Considering individual and societal aspects of career decisions and development, vocational school students certainly have a need for continuous support and guidance regarding career-related issues. In Germany, career education has a legal basis in schools and the employment agency (SGB, 2018; KMK, 2017). In contrast to general schools, career education at vocational schools is not prescribed in detail by law. Therefore, a look at vocational schools is worthwhile.

Vocational schools represent a critical mass in the German education system because they form the backbone of Germany's dual training system and because more students attend a vocational school than a prestigious upper secondary school (*Gymnasium*; Statistisches Bundesamt, 2016). Additionally, in 2009 the school system became more permeable: With three years of work experience, graduates of vocational schools can now also study at a university without having acquired a university-entrance diploma (similar to A levels; KMK, 2009). With these manifold follow-up options, vocational school thus represents a pivotal point for young people's careers. Due to the size and the importance of the vocational school system, securing successful transitions

from vocational school, i.e., a seamless and sustainable transition into a follow-up option, has a high relevance for both the individual and society.

For this reason, it can be argued that career education, which fosters career competence, should not be limited to general-education schools but rather be systematically extended to vocational schools (Watts, 2009) to prepare these students equally for their next transition and the lifelong process of career choices (Savickas, 2005).

Career competence includes, alongside motivational and volitional aspects, knowledge of one's own strengths and an understanding of the world of work (Driesel-Lange, Hany, Kracke, & Schindler, 2010). Furthermore, it enables reflection on and comparison of one's personal preferences with the requirements of a profession. Altogether, career competence leads to the ability to make informed career choices (Driesel-Lange et al., 2010).

Two prerequisites must be met to provide vocational school students with specific support in their acquisition of career competence. First, our knowledge about vocational students' career competence levels needs to be broadened. Since the process of acquiring career competence varies individually (Driesel-Lange et al., 2010), a study of the general level of development would not suffice. Their individual developmental needs have to be analysed in detail. This assessment should also consider factors such as socio-demographic characteristics and the existence of concrete career aspirations. Second, practicable ways must be found to address students' needs on an individual basis in school. In this regard, Ohlemann and Driesel-Lange (2019) proposed grouping students with similar career competence profiles and developmental needs into homogeneous subgroups. These two prerequisites lead to the key questions of this study, namely whether vocational school students can be grouped into profile groups and how these groups would look and differ from one another.

Theoretical model of career competence

The career competence model of Driesel-Lange et al. (2010) provides the theoretical foundation for this study. Our understanding of a career is on the one hand based on the concept of the protean career (Hall, 1996), which assumes an individual's need to adapt to the work environment. Protean careers also imply rather non-linear, not necessarily vertical movement that constitutes a flexible and individual process (Patton & McMahon, 2014). On the other hand, we concur with Savickas' (2013) description of a career as a lifelong individual developmental process in which one creates his or her own understanding of his or her career from the ensemble of occupational stations, projects, and experiences in connection with all other areas of life.

Transitions form a logical part of careers. In today's understanding, transitions are described as "the period of preparation for the shift, the actual movement between life roles and responsibilities, and the period of initial socialization into the new role" (Blustein, Juntunen, & Worthington, 2000, p. 5). A successful transition could therefore be summarized as a planned, prepared, and proactive career-related change that was based on knowledge about oneself and one's skills and strengths and the aspired (next) occupation and its job description and prerequisites. A successful transition furthermore eventually leads to "induction and adjustment" (Herr, Cramer, & Niles, 2004, p. 122) to the new occupational situation.

For young people who are currently still attending a vocational school, the focus is on the next transition, namely from vocational school to subsequent further training or employment. From our point of view, this transition is successful if students choose a transition goal in an informed, planned manner and by matching their own abilities and interests with professional requirements. During this transitory phase, students also consider their expectations for their next occupational station as well as its nature as a potential starting point for the construction of their career.

The successful completion of work-related transitions requires specific competences. Weinert (2001) defined competence as existing and learnable cognitive abilities and skills to solve a given problem. Competence also includes the motivational, volitional, and social readiness and abilities to successfully and responsibly apply solutions in variable situations (Weinert, 2001). It is also the result of processes of learning and development (Driesel-Lange, Kracke, Hany, & Schindler, 2013). In accordance with the above description, Herr et al. (2004) named self-related and work-related knowledge, exploration, planning and decision-making skills, confidence, and decisiveness combined with motivational and volitional aspects as important facets of the competence to successfully choose a career.

Career competence as such represents a specific setting of competence and builds on the concept of career maturity (Super, 1980). Career competence in accordance with Driesel-Lange et al. (2010) follows Weinert's (2001) definition of competence. Building on Herr et al. (2004), career competence comprises 12 facets of competence and expertise (Dreyfus & Dreyfus, 2005): self-knowledge, occupational knowledge, knowledge of prerequisites, planning and decision knowledge, career concern, career control, career curiosity, career confidence, exploration, self-regulation, problem-solving skills, and stress management. These facets are categorized into three dimensions: knowledge, motivation, and action. Through the motivational dimension, the concept of career competence links up with the concept of career adaptability (Savickas & Porfeli, 2012).

The theoretical model of career competence was developed by Driesel-Lange et al. (2010) in order to theoretically substantiate a) statements on career competence development and b) recommendations for individual advancement at school. This multidimensional model depicts adolescents' individual development of career competence. Young people move through four phases, which can be labelled as the phases of warm-up, exploration, decision-making, and preparation for achievement (Driesel-Lange et al., 2013). The individual pace at which they move from one phase to the next is influenced by various factors, including individual psychological, socio-demographic, and social factors (Kracke & Schmitt-Rodermund, 2001; Neuenschwander, Gerber, Frank, & Rottermann, 2012). As Driesel-Lange et al. (2013) have described, young people develop the aforementioned 12 facets of career competence within these four phases. Due to different phase-related challenges, such as gathering information about the world of work and applying for an internship, the developmental focus shifts between facets over time. It is essential to note that developing career competence takes place in a constant change between the application of competence in dealing with a career-related challenge and the acquisition of competence through its successful mastery (Driesel-Lange et al., 2010). For instance, students need problem-solving and stress management skills to deal with a rejected internship application. By successfully finding a plan B, they also increase these skills.

Achieving career competence enables adolescents and adults to make informed decisions, anticipate and plan changes in their careers, and therefore experience successful transitions.

Current research

Career education at vocational schools

Our knowledge of vocational school students' career planning and developmental state of career competence is poor compared to what we know about career development and career education at general-education secondary schools (Driesel-Lange, 2011; Rahn et al., 2014). The reasons for this partly derive from the assumption that students at vocational school have already made their career choice (Watts, 2009). This may also explain in part the stronger research focus on dropout rates, motivations for enrolment, and subsequent career paths. Thus, we know that for 23.4% of apprentices in Germany the profession they are currently training for was not their initially preferred occupation but rather an unanticipated alternative solution (Krautschat, 2013).

International studies provide insight into the state of career competence among vocational school students. Verhaest, Lavrijsen, Omey, Van Trier, and

Nicaise (2018) compared former vocational students to their generally educated peers in Europe regarding their career- and work-related skills, such as planning and problem-solving. They concluded that vocationally educated individuals had a better match between acquired and required skills early in their careers. Over time, roughly after the first half of their careers, this advantage tilted in favour of the generally educated, who then displayed a better skill match (Verhaest et al., 2018). The findings of Kaur and Kochar (2014) using an Indian adaptation of Crites' Career Maturity Inventory indicated that Indian secondary students in an academic program already had a significantly higher level of self-knowledge and a better knowledge of the world of work while still attending school than those in a vocational stream did. They also had higher mean levels of goal selection, planning, and problem-solving (Kaur & Kochar, 2014). Consistent results were found by Pappas and Kalliope (2011), who investigated the relationships among Greek post-secondary vocational students' career decisions, self-efficacy, and career decision-making. High values for accurate self-appraisal, the ability to gather occupational information, goal selection, planning, and problem-solving correlated significantly with career decision-making (Pappas & Kalliope, 2011). In addition, Valero and Hirschi (2016) compared vocational school students in Switzerland to groups of secondary school students. Through latent profile analysis, they identified in both samples four profile groups that shared similar motivational patterns and differed in their overall level of motivation. An additional fifth profile group displayed low positive affect and low mean levels regarding autonomous goals and self-efficacy (Valero & Hirschi, 2016). High motivation profiles were associated with comparatively high person–job fit, higher work engagement, and higher job satisfaction.

Even though vocational educational systems are difficult to compare on an international level, the results point toward a general necessity to foster career competence throughout vocational education. They also suggest, with a view towards Valero and Hirschi's (2016) results, that vocational students might display similar profiles of career competence as students at general education schools do.

Profiles of career-related attributes and competences

Profile analysis as a means to focus on the individual is increasingly applied to research on vocational behaviour. Building on Valero and Hirschi's research (2016), Paixão and Gamboa (2017) investigated Portuguese secondary school students' motivation as a function of their career exploration and career decision-making. They identified three motivational profiles: self-determined, non-self-determined, and externally regulated students. The groups also differed in terms of career exploration and career indecision levels.

In a study with German university students, Hirschi and Valero (2015) identified four latent adaptability profiles. These profiles differed in terms of their overall adaptability level but showed a similar pattern in terms of their mean levels of career concern, control, curiosity, and confidence. The researchers also observed that the higher students' overall adaptability level was, the higher their levels of adaptivity (e.g., proactivity) and adapting (e.g., career planning, exploration) also were. Perera and McIlveen (2017) studied latent profiles of adaptivity among Australian university students. The three profile groups they found again differed mainly in overall adaptivity. In line with Hirschi and Valero's (2015) findings, a profile of high adaptivity was associated with higher levels of adaptability, adapting, and adaptation. There has been little research on career competence profiles that is based on the theoretical concept of Driesel-Lange et al. (2010) which we used. Analysing a sample of German secondary school students using cluster analysis, Kaak, Heinrichs, Lipowski, Wuttke, and Kracke (2015) extracted four different groups. These four groups differed, above all, in their overall level of career competence and showed similarities in their patterns.

In line with these findings, Ohlemann & Driesel-Lange (2017) also identified three groups of different career competence levels among German secondary school students applying cluster analysis. In a partly overlapping sample, Driesel-Lange and Kracke (2017) further revealed that students within the same grade exhibit different levels of career competence. These students might be in different developmental phases, which are part of the underlying theoretical model.

A more recent analysis by Ohlemann and Driesel-Lange (2019) applying latent profile analysis revealed four profile groups of career competence. The major difference in their findings compared to those of previous studies consisted of the profile patterns. Three profiles mainly differed in terms of their overall career competence levels (*low developed, intermediate, advanced*). They otherwise presented a similar pattern in which the individual facets of career competence showed similar relationships to one another: Self-knowledge, career concern, and career curiosity were comparatively well-developed, while career curiosity and exploration were comparatively underdeveloped for all three groups. Higher mean levels of overall career competence were associated with a higher probability of having specific career aspirations. The fourth profile, *focused*, displayed a diverging competence pattern. This group exhibited high mean levels of self-knowledge, knowledge of prerequisites, career confidence, and stress management. Their knowledge of planning and deciding as well as their career curiosity and exploration were remarkably low. Like the advanced group, a large majority of the focused group already had specific career aspirations, which might in part explain their low exploration and curiosity (Ohlemann & Driesel-Lange, 2019).

Influencing factors

Similarly as the identification of profiles with different vocational behaviour and competences, the constitution of these groups is of great relevance. Factors influencing career decision processes include the support young people receive from their social environment through parents and family (Dietrich, Kracke, & Nurmi, 2011; Luttenberger, Aptarashvili, Ertl, Ederer, & Paechter, 2014), peers (Kiuru, Salmela-Aro, Nurmi, Zettergren, Andersson, & Bergman, 2012), and teachers (Driesel-Lange, Ohlemann, & Morgenstern, 2018). In addition, socio-demographic factors, such as gender, language and migration background (Lörz, Quast, & Woisch, 2012), age, and socio-economic status (Eshelman & Rottinghaus, 2015), impact career decision-making and career choices.

Young women and men in Germany still frequently opt for occupations that are associated with their own gender (Verveckten & Hannover, 2015). Women are more likely to choose vocational training and education in social/health professions or commerce (BMBF, 2016). Men are more likely to pick occupations related to manufacturing or technical/mechanical engineering, which are traditionally considered to have a male connotation (BMBF, 2016). The respective gender-specific predominance can be explained by Gottfredson's (1981) theory of circumscription and compromise. According to Gottfredson, professional preferences are based on the perceived prestige and gender connotation of occupations. Already in childhood and early puberty, girls and boys exclude professions that are related to the other gender (Gottfredson, 2002). Various studies show differences between boys and girls in terms of development of work values (Lechner, Sortheix, Göllner, & Salmela-Aro, 2017), career decision-making (Gati, Gadassi, & Mashiah-Cohen, 2012), and exploration (Driesel-Lange, 2011) as well as consistency within their interests and career aspirations (Luttenberger et al., 2014).

Regarding the impact of age on career-related matters, empirical findings differ. Age seems relevant regarding boundary-less and protean career behaviour. Segers, Inceoglu, Vloeberghs, Bartram, and Henderickx (2008) found that psychological mobility reached higher mean levels among younger people, while increased value orientation was associated with rising age. In addition, Zacher (2014) detected a significant (positive) relationship between age and overall career adaptability, control, and confidence. Novakovic and Fouad (2012) investigated age as a determinant for various career planning aspects among female secondary school students in the USA. Their results were diverse: Some career planning aspects (e.g., gender-traditional careers) were significantly positively impacted by the individual's age. For others (e.g., career commitment), age had no significant effect at all. As previously described, Driesel-Lange and Kracke (2017) found different career competence patterns within one grade. These findings are in line with the theoretical model of age-independent, individual development of career competence.

Brüggemann (2015) provided an overview of the effects of the existence of specific career aspirations on secondary school students' vocational behaviour. Students who already had specific career aspirations demonstrated more active career planning, e.g., applying for apprenticeships, and faced a lower risk of permanently staying without vocational qualifications (Brüggemann, 2015).

The current study

The goal of our study was to apply an individual-centred approach to career competence and to investigate whether career competence profiles could be detected in a group of vocational school students.

Our research question is therefore: Are there distinct profiles of career competence development and how do these profiles differ from one another?

Based on the previous findings described above, we expected that vocational school students would exhibit different career competence profiles and that at least three groups would demonstrate similar patterns with different overall aptitude levels.

H1. Career competence profiles will be statistically and qualitatively distinguishable.

H2. Some of these profiles of career competence will exhibit similar patterns and differ in terms of their overall career competence.

We also endeavoured to determine whether students' gender or age influenced their career competence profile. Knowledge about possible socio-demographic influences would be very relevant for the application of such profiles in practice. Further potential factors, such as migrant or social status, were not available for this sample and could therefore not be included in the analysis. Based on Gottfredson's theory (1981) and empirical work, which provided various indications that children and adolescents of different genders also differ in their career decision process, we expected differences in terms of gender distribution among the career competence profiles. In line with the theoretical concept of career competence (Driesel-Lange et al., 2010), which emphasizes individual age-independent development, we did not expect varying distributions of age.

H3. We expect differences in gender distribution among profiles.

H4. Profiles will exhibit no difference in terms of age distribution.

Finally, we also investigated the relationship between the existence of concrete career aspirations and the allocation of students to different career competence profiles. Ohlemann and Driesel-Lange (2019) found a linkage between the lack of specific career aspirations and the likelihood of belonging to a profile with low or moderately developed career competence.

H5. A relationship will exist between students' profile memberships and the (non-)existence of concrete career aspirations.

Methods

Participants and procedure

The data we used belong to an ongoing cohort study in vocational schools in North Rhine-Westphalia, Germany. To compile this sample, we contacted 10 local vocational schools with whom the research institute had previous cooperation or standing relationships. After having presented the study to the school management, four vocational schools participated in this first cohort. One of the 453 participants (< 1%) was not included in the analyses due to missing data on relevant variables. The final sample consisted of 216 female (48%) and 233 male (52%) students with a mean age of 18.20 ($SD = 1.65$, median = 18). Three participants choose not to indicate their gender and age. A total of 306 (67%) participants were in the first year of their current vocational training program. Another 128 (28%) were in the second year, and 18 (4%) in their third year. Data collection took place in 2017. The students completed a standardized self-report computer-based questionnaire during regular class hours. Either a member of the research team or a teacher oversaw the survey and instructed the students based on a standardized guideline. Students' participation was voluntary, and they received no compensation for their participation. All students present on the day of the data collection participated in the survey.

Measures

Career competence was measured with a standardized diagnostic questionnaire of career competence (Kaak, Driesel-Lange, Kracke, & Hany, 2013) operationalizing the aforementioned theoretical model (Driesel-Lange et al., 2010). Students self-assessed their developmental state in 12 career competence facets by responding to 90 items on a 4-point Likert-scale rating from 1 (*not at all/not true*) to 4 (*strongly/completely true/very often*). Table 1 offers an overview of the corresponding 12 subscales, each illustrated with an example item. Additionally, we asked students to indicate their gender (0 = male, 1 = female), their age, and whether they already had concrete career aspirations (0 = no, 1 = yes).

Table 1
Means, standard deviations, and Cronbach's alpha of the career competence scales

Facets of career competence (No. of items)	Example item	<i>M</i>	<i>SD</i>	α
Self-knowledge (9)	I can accurately assess my abilities.	3.16	.51	.83
Occupational knowledge (6)	I know how in-service vocational training or academic studies are organized.	2.72	.64	.80
Knowledge of prerequisites (7)	I know exactly how to prepare for my future job.	2.92	.69	.86
Planning and deciding (4)	For the time being, I have set myself clear goals in order to get closer to starting my career.	2.71	.69	.63
Career concern (8)	It is important for me to clarify which professions I am suited for.	3.45	.56	.89
Career control (6)	I am already thinking about what I want to become.	3.19	.60	.85
Career curiosity (7)	It is important for me to collect information about many different professions.	2.69	.58	.75
Career confidence (12)	How much do you trust yourself to describe how your dream job should look like?	3.19	.50	.85
Exploration (9)	Over the past few months, how often have you purposefully asked several people for information about occupations and training opportunities?	2.29	.68	.87
Self-regulation (7)	If something that I wanted to do goes wrong, I want to find out the reasons for it.	3.01	.58	.80
Problem-solving (10)	I trust myself to find a solution if my school performance were to suddenly drop.	3.10	.54	.86
Stress management (5)	Thinking about my future profession is a burden for me.	2.57	.84	.88

Analysis plan

First, we conducted a series of latent profile analyses to identify profiles of vocational students with homogenous developmental career competence states. Latent profile analysis is a type of latent class analysis suitable for continuous variables. In 6 models, each with an ascending number of profiles, the 12 career competence subscales served as latent profile indicators. To include data sets with sporadic and random missing data in the analyses, we chose the full information maximum likelihood method (Graham, 2012). To avoid local likelihood maxima, we increased the set of randomly generated starting values to 500 with 50 iterations in the first round and to 1,000 with 100 iterations in the second round (Geiser, 2010; McLachlan & Peel, 2000).

For robustness to non-normality, a maximum likelihood estimator with robust standard errors was applied (Muthén & Muthén, 1998–2017). Nesting effects due to school membership were accounted for by adjusting standard errors by means of a sandwich estimator. To evaluate and compare model fits, in order to determine the best-fitting model, we referred to several statistical indicators: log-likelihood value, a parametric bootstrapped likelihood ratio test (BLRT), the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMRT), the Bayesian information criterion (BIC), and the sample-size adjusted Bayesian information criterion (SaBIC). A good model ideally demonstrates a high log-likelihood value and low values for BIC and SaBIC. The BLRT and VLMRT should show significant differences. Entropy values and average latent class probabilities were also included to weight the quality of the model (Rost, 2006). For the final decision, we additionally considered the underlying theory (Nylund, Asparouhov, & Muthén, 2007) and checked for practical applicability by inspecting the average profile group sizes.

Once the model with the best fit was determined, we analysed the mean differences among the profile groups on the 12 career competence facets, calculating a multivariate analysis of variance (MANOVA) with follow-up ANOVAs. The allocated profiles represented the independent variable.

To investigate whether gender, age, and the (non-)existence of specific career aspirations predicted profile group allocation, we performed multinomial logistic regressions.

Results

Table 1 presents the descriptive statistics of the 12 career competence facets. As can be seen, the motivational facet career concern ($M = 3.45$) was on average the most developed facet. Career control ($M = 3.19$) and career confidence ($M = 3.19$), both also motivational facets, were also well above the means of scale. Stress management ($M = 2.57$) and exploration ($M = 2.29$), both facets of career-related action, were on average the least developed facets. Cronbach's alpha ranged between .75 and .89, confirming acceptable to good reliability. Only planning and deciding displayed a lower value of .63 for Cronbach's alpha and should therefore be interpreted with caution.

Latent profile analysis – model selection

We selected the number of profiles by comparing the fit indices of six models with ascending numbers of profile groups, starting with a one-group solution. Table 2 gives an overview of the models' fit indices.

Table 2
Latent profile analysis fit indices

No. of profiles	Log-likelihood	Entropy	BIC	SaBIC	BLRT ¹	VLRMT ¹
1	-5,014.58	1	10,175.89	10,099.72	n/a ¹	n/a ¹
2	-4,327.89	.888	8,881.98	8,764.56	-5,014.58***	-5,014.58***
3	-4,127.04	.840	8,559.77	8,401.09	-4,327.89***	-4,327.89
4	-4,020.73	.844	8,426.62	8,226.68	-4,127.04***	-4,127.04
5	-3,916.28	.875	8,297.20	8,056.01	-4,020.73***	-4,020.73
6	-3,854.28	.883	8,252.67	7,970.22	-3,916.28***	-3,916.28*

Note: BIC = Bayesian information criterion, SaBIC = sample-size adjusted BIC, BLRT¹ = bootstrapped likelihood ratio test, VLRMT = Vuong-Lo-Mendell-Rubin likelihood ratio test. The values for the selected model are in bold. * $p < .05$, ** $p < .01$, *** $p < .001$. ¹The BLRT and VLRMT are not available for the one-class model.

As can be seen, the statistical information did not clearly identify one specific model as the best fitting one. The comparison of log-likelihood values suggests the six-profile solution as this model had the highest value. In addition, the BIC and SaBIC pointed toward a model with a higher number of profile groups. In contrast, the two-profile solution showed the best entropy value and was the only model with a highly significant result from the VLRMT. The BLRT results did not add any more conclusive information due to statistical significance for all available models. Considering all statistical information as well as theoretical matters, group sizes, and profile interpretability, we finally decided on the four-profile solution.

Career competence profiles

Figure 1 illustrates the mean levels of the 12 career competence facets for the 4 profile groups. As can be seen, there are 3 profiles that follow an almost identical pattern regarding the relationships among the 12 career competence facets. They mainly differ on overall career competence. Therefore, we choose to name these profiles *low developed*, *intermediate*, and *advanced*, following Ohlemann and Driesel-Lange's (2019) terminology. The fourth profile depicts a different pattern in comparison to the first three profiles. Due to the very high values for career concern ($M = 3.72$) and the low values for stress management ($M = 1.81$), which are reported in detail in Table 3, we labelled this group *highly concerned/little-stress-resistant*.

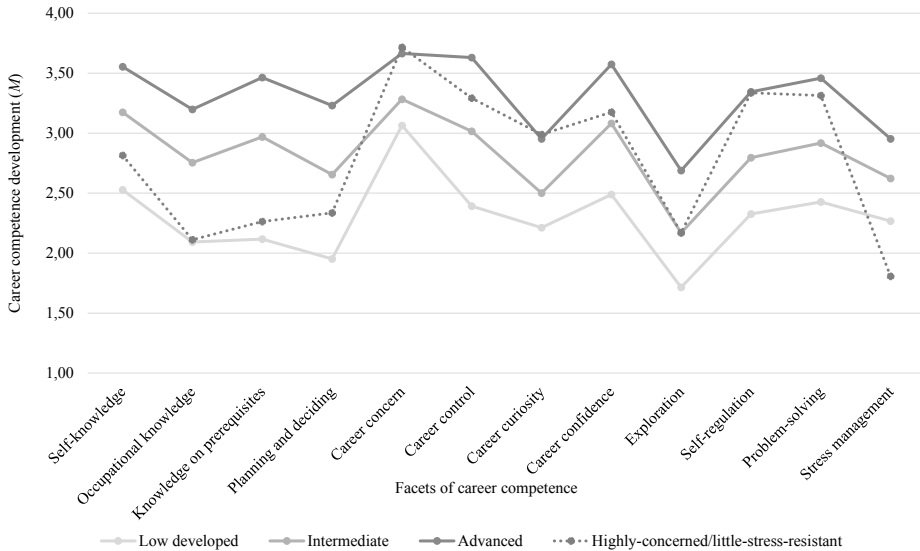


Figure 1. Four-profile-solution – average career competence facets (means).

The MANOVA revealed a highly significant overall effect of profile membership on career competence, $V = 1.26$, $F(36, 1314) = 26.57$, $p = .000$, $\eta^2 = .421$. The results of the follow-up ANOVAs are presented in detail in Table 3.

The ANOVAs tested the difference among the profile groups for each career competence facet individually. The partial η^2 values in Table 3 reveal a strong effect of profile affiliation on average competence for all 12 facets. Post-hoc tests showed that the low developed, intermediate, and advanced profiles differed significantly on all facets. For the last group, highly concerned/little-stress-resistant, this statement is also applicable, except for two facets: Regarding their knowledge of prerequisites, we could not detect a significant difference between this fourth group ($M = 2.27$) and the low-developed group ($M = 2.12$). In terms of their mean levels of career confidence, the fourth group ($M = 3.17$) did not vary from the intermediate group ($M = 3.09$) in a statistically significant way.

Even with these two exceptions, our first hypothesis of statistically and qualitatively distinguishable profiles is validated.

Low-developed, intermediate, and advanced career competence

A total of 73 students (16%) self-evaluated their career competence over all facets as low and were allocated to the low-developed profile. Two thirds of them (66%) were male, and less than one third of all students in this group

(28%) had concrete career aspirations. The intermediate group consisted of 143 students (32%). Again, there were more men ($n = 85$, 60%) than women in this group, but only 40% of the group did not yet have concrete career aspirations. In the group displaying advanced career competence, the gender proportions among the 171 students (38%) were almost equal (male: $n = 82$; 48%). The vast majority (78%) of the advanced group already had concrete career aspirations.

All three groups rated their career concern as their highest career competence facet ($M_{Low} = 3.07$, $M_{Int} = 3.28$, $M_{Adv} = 3.66$). Self-knowledge and career confidence were also relatively high in relation to the remaining facets, as can be seen in Table 3. The intermediate and advanced groups displayed relatively high overall competence. Their mean levels for all facets lay above the means of scale (2.50). The exploration facet constituted the only exception for the intermediate group ($M = 2.17$). Exploration was also the least developed facet for the low developed ($M = 1.71$) and advanced ($M = 2.69$) groups.

Highly concerned/little-stress-resistant

A total of 65 students (14%) fell within the highly concerned/little-stress-resistant group. Over two thirds of them were female (71%) and only a quarter of the group (25%) had concrete career aspirations.

Regarding the knowledge dimension, the highly concerned/little-stress-resistant group were closer to the low developed group than to the intermediate group. They had an average level of self-knowledge ($M = 2.82$). However, the other three knowledge facets were less developed ($M_{Occupational} = 2.12$, $M_{Prerequisites} = 2.27$, $M_{Planning} = 2.35$). Regarding the other two dimensions (motivation and action), highly concerned/little-stress-resistant students responded overall more in agreement with either the advanced or intermediate group. Their career concern ($M = 3.72$) and career curiosity ($M = 2.98$) were on average slightly higher than those of the advanced group. They also resemble the advanced students in terms of their self-regulation ($M = 3.34$) and problem-solving skills ($M = 3.31$). The highly concerned/little-stress-resistant group felt relatively confident with regards to their career ($M = 3.17$), resembling the intermediate group. The same observation can be made regarding their exploration ($M = 2.17$). Unlike the other three groups, exploration was *not* the least developed facet – stress management was ($M = 1.81$). Regarding stress management, highly concerned/little-stress-resistant students ranged even below the low developed group. An overall observation for this profile group is the higher amplitudes for individual facets and their relationships to one another.

Our second hypothesis regarding similar career competence patterns and different overall competence levels was partly confirmed. The fourth group, highly concerned/little-stress-resistant, forms an exception to this finding.

Table 3
ANOVA results for the four profile groups

Facets of career competence						
Profile group		Self-knowledge	Occupational knowledge	Knowledge of prerequisites	Knowledge of planning/deciding	Career concern
Low developed (<i>n</i> = 73)	M	2.52	2.09	2.12	1.95	3.07
	SD	.44	.43	.52	.47	.66
Intermediate (<i>n</i> = 143)	M	3.18	2.76	2.97	2.65	3.28
	SD	.35	.43	.42	.51	.56
Advanced (<i>n</i> = 171)	M	3.55	3.20	3.46	3.23	3.66
	SD	.28	.49	.42	.51	.45
Highly concerned/ little-stress-resistant (<i>n</i> = 65)	M	2.82	2.12	2.27	2.35	3.72
	SD	.39	.46	.44	.52	.33
<i>F</i> -values		176.59	146.47	214.93	125.78	35.27
Df		3	3	3	3	3
df error		448	448	448	448	448
<i>p</i>		.000	.000	.000	.000	.000
η^2		.54	.50	.59	.46	.19

Effects of gender, age, and career aspirations

To investigate whether gender, age, and the (non-)existence of specific career aspirations predicted students' profile membership, we conducted a series of logistic regressions. First, we included only gender as an independent variable. In the second model, we added the participants' age as an additional predictor. We recoded age as a dichotomous variable, dividing the sample into minor students (*n* = 171) and students of age (*n* = 279). In the third model, we added the (non-)existence of concrete career aspirations as a third predictor variable. Each time, the highly concerned/little-stress-resistant group served as the reference group.

As Table 4 shows, the first model was statistically significant with an R-squared based on Nagelkerke of .06. Within this first model, a student's gender had a significant effect on his or her profile membership. Males were more likely than females to belong to the low developed group rather than the highly concerned/little-stress-resistant group. This also applied to the probable allocation of men into the intermediate and advanced groups in comparison to the highly concerned/little-stress-resistant group. The probability for male students to belong to the highly concerned/little-stress-resistant group increased with the overall career competence of the profiles. In other words, the likelihood that a male student, compared to a female classmate, belonged to the low developed group rather than the highly concerned/little-stress-resistant group was higher than his chances of

Career control	Career curiosity	Career confidence	Exploration	Self-regulation	Problem-solving	Stress management
2.40 .55	2.22 .54	2.49 .45	1.71 .49	2.33 .53	2.43 .45	2.27 .73
3.01 .42	2.50 .53	3.09 .30	2.17 .60	2.79 .40	2.92 .40	2.63 .68
3.63 .32	2.95 .49	3.57 .27	2.69 .61	3.34 .45	3.46 .35	2.95 .85
3.29 .45	2.98 .41	3.17 .37	2.17 .60	3.34 .36	3.31 .40	1.81 .61
163.07	50.96	192.57	51.72	118.14	135.84	41.12
3 448	3 448	3 447	3 447	3 447	3 447	3 447
.000	.000	.000	.000	.000	.000	.000
.52	.25	.56	.26	.44	.48	.22

belonging to the advanced group compared to the highly concerned/little-stress-resistant group. On a descriptive level, the gender ratio of the reference group confirmed this observation: 71% of the highly concerned/little-stress-resistant students were female. The predicting effect of student gender remained unchanged when we added more predictors in the following two models. There was one exception in that in the third model gender no longer had a significant effect regarding the prediction of whether a person had a profile of advanced career competence or was highly concerned and little-stress-resistant. Still, our third hypothesis on differences in gender distribution between profiles can be considered confirmed.

The second model, which included gender and age as predictors, was again statistically significant with an R-squared based on Nagelkerke of .06. However, age did not predict students' profile group membership. Table 4 indicates that even in the third model there were no significant age effects, confirming our fourth hypothesis that profile affiliation is independent of age.

The third model included career aspirations as predictor and reached an R-squared based on Nagelkerke of .25, indicating a better model fit compared to the previous two models.

Based on the existence of career aspirations, no significant effects were found regarding the prediction of belonging to the low-developed group in comparison to the highly concerned/little-stress-resistant group. In both groups, more than 70% of members did not yet have specific career aspirations.

Table 4
Multinomial logistic regressions predicting profile allocation from gender, age, and career aspirations

Profile group	Model 1						Model 2						Model 3					
	B	(SE)	OR	95% CI	B	(SE)	OR	95% CI	B	(SE)	OR	95% CI	B	(SE)	OR	95% CI		
Low developed	Constant	-.65	(.25)*		-.77	(.29)**			-.98	(.47)								
	Gender (0)	1.56	(.37)***	4.74	[2.29, 9.80]	1.60	(.37)***	4.96	[2.39, 10.30]	1.56	(.40)***	4.93	[2.27, 10.69]					
	Age (0)				.21	(.36)	1.24	[.61, 2.52]	.35	(.39)	1.42	[.66, 3.07]						
	Career Aspirations (0)								.20	(.43)	1.23	[.52, 2.87]						
Intermediate	Constant	.21	(.20)		1.21	(.29)**			1.17	(.35)***								
	Gender (0)	1.28	(.32)***	3.61	[1.92, 6.79]	1.28	(.32)***	3.61	[1.92, 6.79]	1.01	(.34)**	2.75	[1.41, 5.37]					
	Age (0)				.01	(.32)	1.01	[.54, 1.89]	.08	(.35)	1.08	[.54, 2.17]						
	Career Aspirations (0)								-1.39	(.36)***	.25	[.12, .50]						
Advanced	Constant	.66	(.18)***		.57	(.22)**			1.76	(.34)***								
	Gender (0)	.80	(.31)*	2.23	[1.21, 4.12]	.81	(.31)*	2.24	[1.21, 4.13]	.45	(.35)	1.57	[.79, 3.12]					
	Age (0)				.24	(.31)	1.26	[.70, 2.32]	.34	(.36)	1.40	[.70, 2.83]						
	Career Aspirations (0)								-2.31	(.37)***	.10	[.05, .21]						
Nagelkerke's R ²		.057			.062				.247									
χ^2 (df)		24.35***	(3)		26.49***	(6)			104.80***	(9)								

Notes: The reference category is highly concerned/little-stress-resistant. Gender: 0 = male, 1 = female; age: 0 = < 18 yrs, 1 = ≥ 18 yrs.; existing career aspirations: 0 = no, 1 = yes. * $p < .05$, ** $p < .01$, *** $p < .001$.

However, the existence of specific career aspirations predicted allocation to the intermediate and advanced groups with significant effect (see Table 4). Students who had concrete career aspirations were more likely than those without concrete career aspirations to belong to the intermediate group than the reference group. The probability of a student with specific career aspirations belonging to the advanced group, in comparison to those without such aspirations, was even higher than for the intermediate group. In other words, students without specific career aspirations were more likely than those with concrete career aspirations to be highly concerned/little-stress-resistant than to have an advanced career competence profile.

Our last hypothesis that there would be a relationship between a vocational student's profile and the existence of concrete career aspirations was partly confirmed.

Discussion and conclusions

Career competence profiles among vocational students

Our goal for this study was to shed light on the developmental state of the career competence of vocational students and to identify their career competence profiles.

We identified four profiles. Three of them had similar career competence patterns and mainly differed in terms of their overall career competence. These results of different competence levels are in line with previous empirical work on career competence (Kaak et al., 2015; Ohlemann & Driesel-Lange, 2017). Although not provable using cross-sectional data, these three profiles could also represent three consecutive phases within the career decision-making process as described in different theoretical models (e.g., Herzog, Neuenschwander, & Wannack, 2006). With three of the four profiles/phases, our results largely map to the theoretical model of career competence by Driesel-Lange et al. (2010).

The differing progress made by the students in those three profile groups also speaks in favour of the existence of such phases. The higher the overall career competence was, the higher the percentage of students who already had defined career aspirations also was. Less than one third of the low developed group had a specific idea about which occupation they would like to pursue. They appear to have been standing at the beginning of their vocational orientation. Applying the theoretical model of career competence, they might have experienced at the time a) the first phase of warming-up, in which they familiarize themselves with the task of choosing a career; or b) the second phase of exploring, in which they start to actively explore their interests, skills, and possibilities in the world of work.

In comparison, our second group, intermediate, seems to have already advanced in their career decision-making process: 60% of the students in this group stated that they had specific career aspirations. Again, applying the theoretical model of career competence, this group might have been undergoing the third phase, called decision-making. Their higher level of career competence might have been a result of successfully overcoming career-related challenges in the past. Overcoming setbacks, for example during an application for an apprenticeship, might have developed their confidence in being able to manage their careers. Through these experiences, their problem-solving skills and ability to manage stress might have increased. Consistent with the model, the third profile, advanced, would represent the fourth phase: Almost 80% of these students had made up their mind regarding their occupational future and might then have been preparing to achieve their goal.

As anticipated and similar to Valero and Hirschi's (2016) findings on latent profiles among vocational school students, we found an additional profile that diverged in terms of competence pattern. This fourth profile, however, differed from the other three profiles in this sample not only in terms of pattern, but also in relation to the fourth profile that Ohlemann and Driesel-Lange (2019) found among general education school students. Within their fourth group, called *focussed*, a large majority of students already had specific career aspirations. They also demonstrated high mean levels of self-knowledge, career confidence, and stress management (Ohlemann & Driesel-Lange, 2019).

In contrast, we identified a group whose members seem to be extremely stressed by thinking about their occupational future. Moreover, most of these students did not yet have concrete career aspirations. Like the focussed group (Ohlemann & Driesel-Lange, 2019), highly concerned/little-stress-resistant students displayed a high degree of self-knowledge, revealing a profound awareness of their strengths and maybe an even profounder consciousness of their weaknesses. These students may have been more self-critical in reflecting on their own career-related abilities and competences than students belonging to the other three profiles. Still, they were rather confident in their ability to manage upcoming challenges. The large proportion of female students in this group also speaks in favour of a rather self-critical, perhaps overly negative or downgrading self-assessment. On average, female students rate their interests and abilities in mathematics as being poorer than their male classmates at the same performance level do (Lazarides & Ittel, 2011).

The self-assessed lack of knowledge in this group about the world of work and its prerequisites may also indicate that, compared to all other students, this group had developed a more comprehensive understanding of the diversity of occupations and access opportunities. Therefore, they might have been more unsettled by this multitude of choices and decisions to make.

Students in this fourth group were more aware than the others of the need to care about their professional future. They also wanted to apply themselves to this task and were strongly convinced that they could positively influence their career. Perhaps the realization that the success of their professional future is in their hands resulted in a high(er) level of stress.

This group illustrates that competence acquisition takes place both within an individual (Savickas, 2005) and in a non-linear process (Rahn et al., 2014).

Limitations and future research

The primary weakness of this study is the limited sample with only four vocational schools. These highly context-specific data might not be generalizable for the German vocational school system. Furthermore, the question about students' grade might have been unclear. Participants might have indicated either their total time of enrolment at the vocational school or the number of years they had been enrolled in the program they were participating in at the time. Rahn et al. (2013) observed that over time one quarter of the student body switches at least once between programs at their school. For these two reasons, as well as due to the sample size, we chose not to include grade and the nature of the program in our analyses. Future analyses should differentiate among vocational educational programs. Additional data on socio-economic and educational backgrounds were not collected in this study. Therefore, we know little about how these factors might influence and predict students' profile allocation. Additionally, longitudinal studies are needed to further investigate our hypothesis on developmental phases and to explain the process of career competence development in vocational schools.

Practice implications and conclusions

Regarding the first three groups, the practical application of career competence profiles should be primarily oriented towards challenges typical of the phase in question.

Low-developed students need support to start their process of career choice. Concrete practical assistance might therefore focus on clarifying fundamental questions, e.g., regarding their interests, skills, and future aspirations. The intermediate group require guidance on how to explore further career options and how to implement their career aspirations. Advanced students can be helped in coping with their future role and anticipating personal, social, and organizational changes that emerge because of their occupation. The fourth group needs assistance in transferring their advanced self-knowledge into tangible career prospects. From there, these students can plan and explore further options and develop specific career aspirations.

Especially the low-developed and highly concerned/little stress-resistant profiles revealed how urgent the need for career competence development appears to be in vocational schools. In this sense, the results presented support for Watts' (2009) request to extend career education to vocational schools to "provide young people with the generic, transferable skills to support occupational mobility and life-long learning" as Field, Hoeckel, Kis, and Kuczera (2009, p. 43) have stated.

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