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Why Engineering Students Choose a Career in Teacher Education – Qualitative Analysis of Bachelor Students' Motives

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Abstract

Context: The shortage of teachers can be identified as a European, if not global, problem. To ensure teacher supply in the future, various possibilities have been established recently in Germany to enter vocational teacher education. One of these ways are special cooperation projects between universities of applied sciences for engineering and universities with teacher education programs. A project like this lies in the focus of the research at hand. The aim of the research is to identify the motivational factors of engineering students choosing to participate in the project in order to later enter teacher education. Through this, recruitment potential for possible future students may be identified.

Approach: A qualitative interview study is conducted to gather data on the motives of bachelor engineering students to take part in the project mentioned above. We therefore draw from research results regarding the widely used FIT-Choice scales and the in Germany more prominently used FEMOLA-scales. The FEMOLA-scales are used to conduct guideline-based interviews with $n=7$ engineering students currently participating in the project. Additionally, narrative inquiry is used in the interviews to get insights on the biographical and academic pathways of the engineering students into the project. For analysis, a combination of narrative inquiry and qualitative content analysis is used.

Findings: The results show three discernible types of students characterised by their respective motivations, namely intrinsic, altruistic and extrinsic. The analysis reveals that the idea of pursuing vocational teacher education is initially formulated during the students' own academic journeys within the education system, particularly within the context of vocational education.

Conclusions: Although the identified types of students differ in their characteristics of motives of entering the project, across all types the interest in a career in vocational teaching stems from own experiences in vocational education. Here, recruitment potential for future teacher students can be identified. Additionally, pedagogical interest and altruistic motives can be identified as the most important influences.

Keywords

VET, career choice, teacher education, study choice, Germany



1 Introduction

Germany is currently experiencing a shortage of teachers, which is particularly pronounced in the field of technical vocational education. This shortage is not a problem singular to Germany. The European Commission states, that across Europe shortages of teachers affect 35 educational systems (European Commission, 2021). Beyond Europe, teacher shortages are a pervasive global issue, as evidenced by reports from the OECD (Organisation for Economic Cooperation and Development) referencing to challenges with teacher supplies in countries such as Korea and the US (OECD, 2021). In Germany, the current low number of new teachers is set to be counterbalanced by a significant projected recruitment need in vocational education over the next few years. First, due to the current high average age of teachers at vocational schools, it is expected that around half of the teaching staff employed will retire by 2032 (Klemm & Bertelsmann Stiftung, 2018). Second, new recruitment requirements in the vocational teaching profession are estimated at 4,800 positions per year between 2025 and 2030 and as many as 6,100 positions per year over the following five-year period (Klemm & Bertelsmann Stiftung, 2018). With around 2.700 new applicants predicted (KMK, 2022), this means that the number of vacancies for vocational teachers will not be sufficiently covered, which could become even more acute in the coming years. It therefore seems sensible to open up new routes into the vocational teaching profession in order to attract more potential teachers. In Germany, special co-operation projects are one of these possibilities, in which engineering students in the bachelor's programme are given the opportunity to take additional pedagogical courses that allow them to enter the teacher training programme in the master's programme. A project like this is at the centre of the research at hand.

1.1 Project EduTechNet OWL

The aim of the project EduTechNet OWL is to attract engineering students in their Bachelor to enrol in a Master of Education, therefore qualifying for a teaching career at vocational schools. This goal is realised through a cooperation between the University of Paderborn and four surrounding universities of applied sciences (UoAS). The participating universities are the University of Applied Sciences and Arts Bielefeld, the University of Applied Sciences Südwestfalen (especially with the locations Soest and Meschede), the Technical University of Applied Sciences OWL and the University of Applied Sciences Hamm-Lippstadt. At all four UoAS locations, engineering students in the fields of mechanical and electrical engineering have the opportunity to attend a total of five additional (subject-specific) didactic courses during their Bachelor of Engineering degree. These allow them to switch to the Master of Education and thus to the professional vocational teacher training at Paderborn University without any additional requirements after completing their Bachelor's degree (at many other universities, students have to complete these additional requirements in their Master's degree). These students then complete the Master's program in the same way as students who may have already completed a teacher-oriented Bachelor's program. A peculiarity of the project EduTech is that it is permanently established and therefore especially sustainable. Although many teachers have been recruited through said project over the years, the number of students is currently declining. Therefore, the present study answers the question of why engineering students choose to participate in additional pedagogical courses, what their motives are, and thus how new potential students can be addressed in the future. These possible recruitment opportunities are potentially transferable to other European VET systems.

2 Theoretical Background

To analyse and identify recruitment potentials for possible future teacher students, career and study choice motives have proven to be an important predictor and are therefore often focused on in literature on teacher shortages around the world (Fray & Gore, 2018; Mičiulienė & Kovalčikienė, 2023; Stellmacher & Paetsch, 2023). Looking at existing literature on the motives for choosing a career in teaching, pre-service vocational teachers are underrepresented (Berger & D'Ascoli, 2012; Kristmansson & Fjellström, 2022). In addition, with regard to the present sample, the engineering students who choose to participate in an additional pedagogical course have not yet made the decision to enter teacher education but only show an affinity for this career path. Therefore, additional motives that differ from the existing literature may influence this decision. In the following sections, we will first characterise (vocational) teacher education in Germany, followed by an analysis of the factors that influence the career and study choices of those entering teacher education.

2.1 Teacher Education in Germany

In order to place the project in the context of the present study, the following section describes teacher education in Germany with its various entry points. Traditionally, teacher education in Germany consists of a Bachelor's degree followed by a Master's degree. Together, these form the first phase of teacher training. After this, students from general education can enter their pre-service training. For vocational education, however, an additional 52 weeks of experience in the field in which the students will teach is required before they can enter pre-service training in a vocational school. This pre-service training lasts 18 months and forms the second phase of (vocational) teacher education. Finally, the third phase is the actual teaching profession, which is accompanied by compulsory in-service training (Jonas-Ahrend et al., 2023). This complex process of teacher education aims to ensure professional development of teacher students but simultaneously may discourage some students to enter teacher education at all (as seen in the results of this study). After all, it takes a minimum of 6,5 years to become a vocational teacher. The present project is situated in the first phase of teacher education, as it is aimed students who, after completing their Bachelor's degree, wish to take up a Master of Education. Although the project does not shorten the time it takes to become a vocational teacher, it offers the possibility for the students to have both an engineering and a teaching degree in the end, offering them multiple vocational pathways and therefore improving the attractiveness of teacher education. In order to address the shortage of teachers at vocational schools, it is also possible to enter teacher education after completing a subject-specific bachelor's and master's degree (e.g. a bachelor's and master's degree in mechanical engineering). In this case, teacher students need a specific amount of practical experience in the field they are going to teach and then enter a slightly different pre-service teacher training with additional pedagogical content. These different routes into teacher education were established and permanently institutionalized in the last 10 to 15 years. Lastly, it is also possible to teach at a vocational school without any prior pedagogical teacher training. In this case, people only receive a licence that allows them to teach, but they do not become actual teachers. This is why this career path comes with disadvantages like lower salary and is not as common as the other described paths (for a more detailed description of teacher education in Germany, see Porsch & Reintjes, 2023). In order to understand, why people choose to enter a career in teaching, career choice motives have proven to be an important influence (Fray & Gore, 2018). In the following chapter, the theoretical foundations and existing research results will be discussed.

2.2 Motives for Choosing a Career in Teaching

There are different theories when it comes to career choice processes, ranging from Trait-and-Factor Theory (Holland, 1997) to Gottfredsons Theory of Circumscription and Compromise (Gottfredson, 1981) or more motivationally oriented theories like Self-Determination-Theory (Deci & Ryan, 2008). When looking at peoples' personal motives to choose a career in teaching, studies mostly focus on three kinds of motives: altruistic, intrinsic and extrinsic (Fray & Gore, 2018). For this, the majority of existing research relies on expectancy-value-models (Eccles, 1983; Eccles et al., 2005). These state that the motivation to perform a certain action depends on the expectation that the respective action will be carried out successfully. Additionally, it depends on the value assigned to the respective action. The motivation to perform the action then arises from weighing up these two aspects (Eccles et al., 2005; Wigfield & Eccles, 2000). In the context of research on the career and study choice motivation of pre-service teachers, the two survey instruments FEMOLA (Pohlmann & Möller, 2010) and FIT-Choice (Richardson & Watt, 2014; Watt & Richardson, 2007), which are also based on the described expectation-value-theories, attract a great deal of attention. These differ slightly in their operationalization. The FIT-choice scales are divided into the following dimensions: intrinsic motives like self-perceptions (self-perceived teaching abilities) and intrinsic motivation (intrinsic value), altruistic motives like social utility value (making a social contribution, working with children/young people), and extrinsic motives like personal utility value (job security, compatibility of job and family), task demand (expert career, high demand), usefulness (social status, salary) and fallback career (Watt et al., 2012) and are used particularly in an international context (see e.g. Alvariñas-Villaverde et al., 2022; Fray & Gore, 2018; Heinz, 2015; König & Rothland, 2012; Watt et al., 2012). Meanwhile, the FEMOLA questionnaire is mostly used in German-speaking countries (see e.g. Bauer et al., 2010; Retelsdorf & Möller, 2012; Stellmacher, 2023; Stellmacher & Ohlemann, 2021; Stellmacher & Paetsch, 2023) and is divided into the dimensions of pedagogical interest, professional interest, self-perceived ability, usefulness, social influences and low difficulty (Pohlmann & Möller, 2010). Altruistic motives like helping other people can be found in the scales of pedagogical and professional interest, whereas extrinsic motives like a good salary or encouragement by significant others can be found in the scales of usefulness, low difficulty and social influences. Intrinsic motives can be found in the scale of self-perceived abilities. The present research is based on the FEMOLA questionnaire. The peculiarity of the research at hand is that the quantitative scales of the original questionnaire are used in a qualitative way, conducting guideline-based interviews which are based on the scales appearing in the questionnaire. In the qualitative application of the FEMOLA questionnaire, particular attention is paid to ascertaining both the motives themselves and their influence on the decision to attend the (subject-specific) didactic courses. This is only partially the case in the quantitative survey instrument (see chapter three) as it is focussed merely on how pronounced specific motives are.

Studies using one of these instruments show that different motive profiles can be identified and separated from another according to their intrinsic and extrinsic motives. In general, intrinsic and altruistic motives are shown to be predictors of later job satisfaction and well-being and are therefore characterised as more desirable for people choosing a career in teaching, while extrinsic motives are shown to be less favourable (Driesel-Lange et al., 2017; Stellmacher & Ohlemann, 2021; Stellmacher & Paetsch, 2023). In many studies, altruistic motives are identified as the most important influence (see e.g. Bakar et al., 2014; Reeves & Lowenhaupt, 2016) followed by intrinsic motives. Extrinsic motives (like salary) are often described as less important, especially in western countries (see e.g. Jungert et al., 2014). With respect to extrinsic motives, an underrepresentation due to effects of social acceptance may also be possible (see results of this study).

3 Research Design

In the following sections, the research design of the study at hand will be discussed. First, the research question and subsequent hypothesis will be described. After this, the research and analysis methods will be discussed, followed by a detailed description of the sample used in the presented research.

3.1 Research Question and Hypothesis

The aim of the present research is to identify motives why engineering students choose a career in teaching or show an affinity towards this career. Therefore, the following research question is articulated:

RQ: Why do undergraduate engineering students choose to take part in extra pedagogical courses?

With regard to the existing literature, almost all studies use quantitative approaches to analyse career choice motives. Therefore, hypotheses have to be drawn from these results:

H: It is expected that the motives of the FEMOLA scales are also adaptable to the present sample. As in the existing literature, altruistic and intrinsic motives should be most prominent and connected to positive career choice motives, whereas extrinsic motives can be identified as less promising. As the students in the present sample have not yet fully committed to a career in teaching, additional motives are possible.

3.2 Research and Analysis Method

To answer this question, a qualitative interview study is conducted. The research methodology of this study is a special feature, as it uses a combination of qualitative content analysis according to Kuckartz (2018) and narrative analysis according to Schütze (2016). This methodology also has an impact on the conducted interviews. The interview begins with a narrative, conversation-generating question in which the participants report as openly as possible on their previous academic and professional path up to the interview situation. This is based on Schütze's (2016) explanations of the narrative interview, followed by a questioning section in which possible ambiguities or peculiarities are worked out from the narrative accounts. This narrative introduction is then followed by the guideline-oriented part of the interview, which focuses on the motives based on the FEMOLA questionnaire (Pohlmann & Möller, 2010). Here, the items used in the quantitative questionnaire (e.g. 'I chose the profession of teaching because I am good at explaining' and 'I chose the profession of teaching because I am good at conveying subject-specific content in an interesting way') are replaced in the interview guideline by more open questions (e.g. 'How would you generally rate your ability to explain things to others?' and 'How did these self-assessments influence your decision to attend the (subject-specific) didactic events?'). In this way, both the shape and the influence of the respective motive are considered in the interview. As mentioned before this is only partially the original quantitative instrument. Therefore, the qualitative use of the FEMOLA scales poses a promising extension of existing literature. On average, the interviews lasted an average of around 37 minutes, with the shortest interview lasting around 20 minutes and the longest around 70 minutes. In order to analyse the conducted interviews, firstly, the narrative parts of the interviews are structured and organised into a coherent biography according to narrative inquiry (Schütze, 2016). Secondly, the structured part of the interviews is analysed using a qualitative content analysis (Kuckartz, 2018). Coding categories are mostly built deductively based on the motives of the FEMOLA instrument (Pohlmann & Möller, 2010). The narrative and content analysis are then compared to each other to map out coherent themes or contradictions between both parts, allowing a more

thorough analysis. The coded segments are then analysed with respect to the performed narrative analysis. Through this, distinctive types of students are characterised which are separated from another by their motive profiles that lead them to take part in the pedagogical extra courses.

3.3 Sample

The sample consists of $n=7$ engineering students of the project. In order to obtain a sample-size sufficient for a qualitative analysis, all project partners of the project were contacted, which in turn forwarded prepared information to their students currently participating in the project. Due to the small population of the target group (appr. 15 to 20 people), a sample size of five to ten students was aimed for. All interviews are performed in a face-to-face environment. Participants are distributed approximately equally across the four UoAS (one participant is recruited directly from Paderborn University, as this participant has recently started their Master of Education after completing their Bachelor of Engineering). All participants are male and between 23 and 33 years old (average age 26,7 years) and report having completed a dual apprenticeship before starting their Bachelor of Engineering.

4 Results Derived from the Interviews

In line with the articulated research question and the discussed analysis method, different types of students are characterised based on the interviews at hand. The results show three discernible types of students, which can be distinguished from one another based on their characterization of intrinsic and extrinsic motives. This is comparable to existing, quantitative research on personal career choice motives (e.g. Stellmacher & Paetsch, 2023). The motives identified in the interviews are in line with the scales used in the FEMOLA-questionnaire (pedagogical interest, subject interest, self-perceived abilities, utility and social influences). Additionally, the general organisational conditions of the project were mentioned. Here, the duality of completing an engineering degree and having the possibility of entering teacher training was mentioned.

4.1 Type 1: The Altruist

The first type of student can be characterised three times in the present material. They display high intrinsic and altruistic motivations, especially in the areas of pedagogical and subject-specific interest, as well as in the dimension of self-perceived abilities.

And I've known since secondary school at some point, sometime around the ninth grade, that I was definitely interested in being a teacher, because I often helped a lot of people in my class back then, doing little tutorials at home or something like that, (.) where there were problems. I had fun helping other people, for example. (IP01, pos. 7)

As in the example above, this type of student often describes that their interest in becoming a teacher already sparked in their own time at school as a student. Like seen in the example, the general interest of becoming a teacher already sparks in secondary school, the specific interest in becoming a vocational teacher is then formulated during their time at vocational school. This high pedagogical interest becomes apparent in both the narrative and the guideline-based part of the interview, raising the question of why this type of student did not enter teacher education right away. The utility of a teaching career is perceived positively by this type, although it does not appear to be the primary motivation for pursuing a career in teaching.

Um, I think that they are important [talking about utility values]. So, if I had realised that I could only become a teacher if I could barely make a living afterwards, then I think it would have been a job that I wouldn't have taken on because it's been quite a long time to get there. Um, but it wasn't decisive for me in a way, that I said, “teachers have great vacation times, um, so I'm going to become a teacher”, rather that was more the basic prerequisite, so that I wanted to become one at all. (IP06, pos. 37).

Here, also the long time it takes to become a teacher is mentioned (although the present project allows new pathways into teacher education, it does not shorten the time it takes to become a vocational teacher). This may explain, why this type of student is hesitant to enter vocational teacher education from the start. This positive perception of the utility of the teaching profession only is mentioned when specifically asked for in the guideline-based part of the interview and not in the narrative part, which underlines the smaller effect on entering a career in teaching. In addition, social influences exert only a partial influence on this decision.

4.2 Type 2: The Pragmatist

The second type of student can only be identified once in the material at hand. However, because its motivational structure is so different from the other two types, it seems reasonable nevertheless to define an additional student type here. For this type, extrinsic motivations exert the greatest influence on their decision to pursue a career in teaching. In particular, the utility values of a high salary and an optimal work-life balance represent pivotal motivations for this type.

That's [extrinsic factors] also a strong factor, of course. [...] I'm not out to have as much free time as possible, then I'd be bored, [...]. But the security of having money and more free time than others, [...] having enough free time during the job, even though you (.) earn well. And this security, [...], where else can you get that? (IP02, pos. 52)

This main motive of a high salary and a healthy work-life balance is mentioned by this type of student throughout the interview. In the narrative parts, even at very early stages of their academic and vocational biography, decisions are often based on earning money and becoming independent. Therefore, it does not seem surprising that this type of student characterises the utility as a “strong factor”, like seen in the example above. In addition, social influences can be identified as a further significant motivating factor. Here, this type is driven by a desire to demonstrate their value to others.

and one of my goals is to graduate next year, probably, and with the certificate, disguised as a mailman, I go to his workshop, ring the bell and then of course there's a note on it with [...] a copy of my certificate inside. And then I give it to him, pretending of course that I didn't make it and then when he unpacks his package, he has to see this note with maybe a little reminder behind it about why I did it so that he might remember. (IP02, pos. 12).

In the example above, the participant wants to show his degree to a former teacher in order to prove to them, that they completed their Bachelor's degree and therefore show their own value to this teacher. Interestingly, although the theme of proving oneself to others is a coherent topic throughout the narrative part of the interview, in the guideline-based part of the interview, this type of student denies the influence of social factors. With respect to intrinsic motives, this type evinces a lesser degree than the first type. Nevertheless, this group also exhibits a high level of self-perceived teaching ability.

4.3 Type 3: The Moderate

The last type of student lies between the first two types and can be identified three times. They show moderate levels of intrinsic motives, as well as moderate self-perceived abilities.

Sure, and then I sort of grew into it here during my time at university. So, at the beginning I read the module description [of the pedagogical courses of project EduTech-Net OWL] and thought to myself, “okay, that sounds interesting. But I didn't think that's what was behind it. And then I started, um and during that time my interest in the subject and the didactic direction in general grew. (IP07_LE_SK, pos. 33)

As it can be interpreted from the example above, this type of student often enters the project and therefore teacher education mainly because of the positively perceived organizational conditions. In the narrative parts, this type of student often describes that they just wanted to get an idea, what the extra pedagogical courses would entail, but they have mostly not yet decided whether they actually want to become a vocational teacher. This may seem negative at first but also poses a chance: through easier pathways and allowing students to get in touch with VET more easily, more future teacher students may be addressed. The role of social influence and utility values appears to be minor to moderate, with positive implications.

Yes, of course, it definitely made me want to continue. [...] And, um, yes, when you get positive feedback, positive feedback that it's well received, of course, that encourages you to continue anyway. (IP07, pos. 47)

Like the pedagogical and subject-specific interest, social influences are only mentioned during the guideline-based part of the interview and not in the narrative parts. Generally, this last type of student is characterised by an uncertainty when it comes to choosing teaching as a career. Nevertheless, all three types of students developed an interest in a teaching career during their time at vocational school or even earlier. Intrinsically motivated students appear to demonstrate greater certainty about their desire to become teachers after completing their Bachelor of Engineering.

5 Discussion

The results show three different types of students who choose to participate in extra pedagogical courses during their Bachelor of Engineering degree and therefore showing an affinity to choosing a career in teaching. With respect to existing literature, the highly intrinsically motivated type can be identified as the most favourable type of student, followed by type three. The second type, which is mostly extrinsically motivated, can be identified as less favourable regarding later well-being and job satisfaction. Regarding recruitment potential for possible future students, it seems that engineering students with the affinity to a career in teaching tend to develop this tendency during their own vocational education (or even earlier).

Regarding the limitations of the present research, the small sample size needs to be considered. Due to the small number of students participating in the project, only seven students (who are all male) could be recruited to participate in the conducted interviews. Because of this, the generalizability of the results is questionable. Nevertheless, it seems reasonable that three different types of students are characterised, as they differ clearly in their motives of why they chose to take on extra pedagogical courses and to pursue or consider a career in teaching. Notwithstanding this, the results show promising implications. On the one hand, the vocational schools themselves seem to be of high value when it comes to recruiting new vocational teacher students. Although vocational systems vary across Europe it seems probable that this implication is also transferable to other countries, as people who themselves have come into contact

with the vocational education system in their respective country may show a higher affinity to become a vocational teacher than people with no contact to the vocational education system. On the other hand, it seems interesting that altruistic and intrinsic motives seem to have a high influence on the decision of taking part in the project at hand (even the highly extrinsically motivated type of student shows high altruistic motives). Especially for altruistic motives, social desirability needs to be considered. In order to attract new teachers in the future, image campaigns should focus on these parts more than on extrinsic values like salary or vacation times. Further research is needed to validate the results presented with different target groups and larger sample sizes. Longitudinal research design could enhance the understanding of the stability of career choice motives and how pronounced their influence is on staying in teacher education. Additionally, these longitudinal studies could enhance the understanding on how career choice motives develop over time and why teacher students who already show an affinity towards teaching during their own VET experiences do not enter vocational teacher education right away but often enter later through projects like the one presented in the paper at hand.

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