

VET Teacher Training: A Comparison of University Programs in the U.S. and Norway

Chris Zirkle, Eli Smepllass & Arve Leraand

Abstract *This article is a study of Vocational Education and Training (VET) teacher training in considerably different societal contexts. Vocational education teachers contribute to the growth and development of a country's future workforce, as they bridge the gap between formal schooling and the workplace. Their training is critical, since their pedagogical knowledge and technical expertise can result in students prepared to enter their chosen field of employment. Through case studies analyzing qualitative data on 1) program entry requirements, 2) curricular and course components, 3) implementation of practical elements in the training and 4) definitions of formal qualifications, the researchers identify joint key elements in VET teacher training programs in the U.S. and Norway. The discussion highlights how quality VET teacher training programs play a pivotal role in bridging between the practical elements in vocational education and professional futures as teachers.*

Title *VET Teacher Training: A Comparison of University Programs in the U.S. and Norway*

Keywords *vocational, technical, career, teacher, training*

1 Introduction

The aim of this study was to compare and contrast the vocational teacher training programs of two universities, within Norway and the U.S., with a primary focus on identifying and understanding key aspects of vocational teacher training programs. Similar components or distinct differences between programs from different continents

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contribute to identifying such key aspects of VET teacher training. Comparing vocational teacher training across different countries can be challenging, as the requirements for, and training of these individuals are diverse and can vary significantly. This is especially prevalent when underpinning assumptions of what constitutes an effective education system and productive labor market can be significantly different. The training of vocational education teachers across the world has several similar pedagogical components and technical skill requirements (Zirkle, Laukia, Mauffret & Prudent-Vilches, 2022). However, the manner in which these individuals are vetted to qualify as a vocational education teacher and then prepared can vary significantly (Organization for Economic Cooperation and Development, 2021). Quality vocational education programs require well-prepared teachers in order to produce students ready to enter the world of work or to pursue further education and training. There are a significant number of subject matter disciplines within vocational education, and perhaps in contrast with teachers of purely academic subjects, vocational teachers must not only possess pedagogical knowledge and abilities but also high levels of technical skills. These requirements are evident on both sides. In the U.S., the prerequisite for vocational teachers to have relevant work experience has existed since the earliest government legislation supporting vocational education, the Smith-Hughes Act of 1917. This act also required each state to provide vocational teacher training (Zirkle, 2018). In Norway, the practical aspect (work skills and experience) has been a pivotal part of the VET training since the system was formalized in 1937 (Grande, et al., 2014).

These skills must be updated and refined in response to changes within society, as evidenced by the challenges presented by variables such as rapidly shifting technology and evolving workplace requirements.

This study is a comparison of important elements of how two universities design and organize their VET teacher training programs. Norway is a country with relatively high investments in education compared to other nations (OECD, 2020), and clear strategies for promoting teacher quality as a means to strengthen their workforce (Smith, 2021). In the US, education is decentralized, and each state has its own responsibility for educating its citizens. The state of Ohio has a strong reputation of supporting vocational education programming.

2 Comparative Research

Educational research of a comparative nature has a long history as well as many definitions and explanations. While there is no universal definition of comparative education research, many have been postulated over time. Some of the definitions that are aligned with this study include:

- Seeking to understand the differences and similarities among educational systems (Getao, 1996).
- Attention directed at educational ideas, process and practices in other societies (Trethewey, 1976).

- “Tracing the movement of a current educational idea from one culture to another [...] movement of ideas or practices from one country to another” (Good, 1963, p. 184).
- “A comparison of variant philosophies of education based not only on theories but the actual practices that prevail” (Kandel, 1930, p. 4).

While these definitions provide a starting point for undertaking a comparative study, challenges emerge. Schleicher (1996) identified several issues with comparing various characteristics of educational systems from an international perspective. The population(s) being compared may be different in significant ways, the methods chosen for analysis may result in unintended or unreliable results, and the manner in which the criteria for comparison are analyzed can lead to some of the same unintended or unreliable results. According to Kosmützky and Wöhlert (2015) any international comparison invites questions about the equivalence of the study populations and the data material, and also prompts a concern with “interpretative equivalence” (p.7), or the comparability of the results of a study, such as this one, between a university in Norway and one in the U.S.

As a result, comparing the processes involved with vocational teacher training between different countries is a significant challenge. In fact, only a few scattered studies have attempted comparisons, and all of them were conducted for different comparative purposes. Grollman (2008) examined differences in the way in which vocational teacher’s tasks change, depending on the institutional framework and country in which they teach. A study by Dehmel (2011) compared the vocational education systems in Germany and England with a focus on teacher training. Barabasch and Watt-Malcolm (2013) examined the German system for vocational teacher education and used it as a basis for suggesting changes in the way Canada prepared its vocational teachers, while a 2019 study (Keller et al.) compared vocational teacher training between the U.S. and Switzerland. In Europe, Misra (2011) found significant differences in how defining teachers and trainers can occur, including the learning context, i.e., whether someone works in educational institutions (Denmark, Norway), or trainers in industry or commerce (Germany, Ireland) or if someone works in initial VET or CVET system (France). Misra also found differences in terms of content where teachers are responsible for theoretical training, and trainers provide the practical pieces (e.g. Spain). However, even after comparing VET teacher training based on different policies, core VET teacher training and challenges in professionalization, Misra concluded that more attention to VET teachers is needed. More recently, Isacson et al. (2021) examined the duration and content of vocational education teacher education programs in Finland, Germany, Norway, and Spain. Hoppe & Kaizer (2021) argued VET teacher training must be seen in context of the larger VET system, even though certain models for standardization of education in Europe are in place, such as the European Qualifications Framework (Méhaut & Winch, 2012). In general, an understanding of VET teacher training comparisons, including contextual factors, are highly relevant while variation and adaptations, even within systems that share commonalities, should be expected and further investigated. Leraand and Smeplass (2022) found that local VET teacher curriculums were different between providers within the same national context as Norway – even though national legislation is binding for educational providers. The study of Leraand et al. demonstrated how local room for maneuver-

ability can create solutions and practices that further complicate ideal type comparisons based solely on the national level. Zirkle, et al. (2022), examined differences in vocational teacher training requirements between Finland and one state within the U.S. None of the aforementioned studies attempted to examine vocational teacher training through the lens of the universities offering the program. Hence, in this study we have chosen to conduct a comparison of two selected VET teacher training programs in Norway and the U.S. to examine how differences and similarities at the university level can give insights into central aspects for these programs' quality.

The two universities selected for the comparative analysis of this study are both significant in terms of student enrollment, curricular and degree offerings, and have esteemed status within their respective country.

3 University Context

The Norwegian University of Science and Technology (NTNU) dates to 1900 with a main campus in Trondheim. Several mergers between higher education institutions in the region, in 1968, 1996 and lastly 2016 – has resulted in NTNU being the largest university in Norway with a student population of 43,000 students divided between three main campuses (Norwegian University of Science and Technology, 2024a). Fourteen percent of all students in Norway attend this university which offer 398 different study programs. The university is home to the largest teacher education department in the country, where 4400 students attend a variety of teacher training programs. The university has offered training in the nationally regulated practical pedagogical training for vocational teachers since 2005 (The Directorate for Higher Education and Skills, 2024) and the bachelor's program since 2007 (Rokkones et al., 2014). The department yearly graduates on average 40 bachelor's students and 40 students with the shorter practical pedagogical training (Norwegian Directorate for Higher Education and Skills, 2024).

The Ohio State University (OSU), based in Columbus, Ohio, was founded in 1870 and is currently the third-largest university in the United States with over 56,000 students. The university offers more than 200 undergraduate majors, 278 graduate and professional programs, and over 500 specializations. OSU has one primary campus and five regional campuses across the state of Ohio and has more than half a million alumni across the globe (Ohio State University, 2024). Teacher training programs reside in five different colleges: Education and Human Ecology, Arts and Sciences, Food, Agriculture and Environmental Sciences, Nursing and Social Work. In total, approximately 1,000 students are enrolled in teacher training programs each year and over 150 of these students are in a VET teacher training program (The Ohio State University College of Education and Human Ecology, 2024). The university has a history of involvement with vocational teacher training dating back to the early 1920's as a result of federal policy legislation.

Both universities offer vocational teacher training as part of broad study portfolios and have embedded systems for quality assurance as well as answer to external agencies, ensuring their standards and relevance. In Norway, NTNU has a system that builds on the University strategy – and uses a system of evaluation and development of courses in connection with the development of their study portfolio to ensure systematic develop-

ment of program quality (Norwegian University of Science and Technology, 2024d). The system is a response to Government initiated reforms to improve education quality (Ministry of Education and Research, 2024). The University is closely evaluated by external national agencies such as the *Norwegian Agency for Quality Assurance in Education* (NOKUT) and *The Norwegian Directorate for Higher Education and Skills* (HK-dir), as required through the European Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). In the U.S., The Ohio State University must meet university requirements, established by the Ohio Department of Higher Education (ODHE) for the awarding of university degrees. Teacher training programs such as those in VET, must meet further standards and requirements set by ODHE in order to offer these programs. The alignment with these standards is evaluated every seven years through a state review process. In addition, university teacher training programs in many states, Ohio included must undergo periodic national peer review through the Council for the Accreditation of Educator Preparation (CAEP). This review requires universities to self-assess and conduct evidence-based analyses of their programs and their efficacy (Council for the Accreditation of Educator Preparation [CAEP], 2024).

These systems for quality dictate that the study programs in both of our cases for this study are constantly evaluated through indicators such as completion rates and curriculum quality – providing publicly known figures and information available for analysis. Furthermore, we have included information in our study regarding student populations and student assessments from prior and ongoing quality work and scientific analyses. This enables a holistic, yet in depth approach to addressing questions of how key elements of the study programs impact the education of VET teachers in the two contexts.

4 A Brief Discussion of VET Teacher Training in Norway and the United States

One of the main objectives of VET teacher education is to find new or improved ways to develop quality vocational education programs (UNESCO-UNEVOC, n.d.). While the U.S. has a significant history of VET programming over the last 100 years and thus, involvement with VET teacher education, Norway was much later in establishing systems for formal competence for teachers.

In Norway the formal formation of study programs for vocational teachers came after 1945, with formal requirements being implemented as late as 1967 (Frøyland, 1997). Vocational education and training became embedded in upper-secondary schools after a new national reform in 1974 (Rokkones et al., 2018), creating needs for formally qualified personnel in schools. The requirements for formal qualifications for teachers can be seen in connection to a long historical development of Norway investing in education in general (Smeplass, 2018), with vocational education being an integral part of an institutionalized system of tripart collaboration (Bjørndal, 2005; Nyen & Tønder, 2014). The contemporary education programs for VET teachers in Norway are regulated through a national legislation act implemented in 2000, revised in 2013 and 2023 (Norwegian Ministry of Education and Research, 2023a; 2023b). To become a certified vocational teacher, it is a prerequisite that the teaching competence is built upon a journeyman's or crafts-

man's certificate. Additionally, the individual must have experience in the profession, or other relevant practice that provides a foundation for further studies. Vocational teachers often have a diverse professional background, so their areas of competence can vary, especially in terms of their specialization. As an alternative, universities and colleges assess obtained work life competence of applicants for admission in accordance with the regulation on admission to higher education § 3–1 (Norwegian Ministry of Education and Research, 2017). The definition of higher education in Norway corresponds with the European Qualification Framework level 6 (EQF6) (Norwegian Ministry of Education and Research, 2022a).

A vocational teacher has after certification competencies in vocational subjects at a higher level than secondary education (Norwegian Ministry of Education and Research, 2023a). They are educated in facilitating relevant learning processes in schools and businesses that lead to certification of students in the vocational subjects in the relevant program area of their expertise. Currently there are 10 clusters for VET, and a VET teacher is certified to teach in one of the clusters. A vocational teacher is also expected to have in-depth knowledge of vocational training, learning processes, practical teaching methods, and how the professions are performed in the workforce.

One can become a vocational teacher in Norway through two different pathways, either by taking higher vocational education at a technical college followed by one year of practical pedagogical education (called PPU in Norway), or by obtaining a bachelor's degree in vocational teacher education at a higher education institution. Common to these programs is that they combine what is termed *vocational pedagogy*, *vocational didactics*, and various forms of formal *practice* training. All programs that qualify for a vocational teacher are governed by the mentioned national framework, which is designed to ensure broad competence to teach in the vocational program areas, all leading to one of 204 vocational certificates (The Norwegian Directorate for Education and training, 2024a). There are a substantial number of vocational teachers working in schools who do not have the formal requirements to teach, i.e. lacking formal pedagogical training (Turmo & Aamodt, 2008). Because vocational education is an area of strong policy interest in Norway and there is a shortage of teachers in technical subjects, the government is also signaling increased investments in vocational teacher training as one of several means to support the labor market (Norwegian Government, 2022). Yearly around 200 students complete a bachelor's degree as vocational education teacher— which is offered at three universities in Norway, while 80–100 people complete the practical pedagogical training for vocational teachers (The Directorate for Higher Education and Skills, 2024a). At the same time, there are uncertainties to how many actually work as vocational teachers in schools, as available statistics are poorly designed to separate between various types of teachers (Grande et al, 2014; Gunnes et al., 2023).

The United States “official” beginnings of VET started in 1917 with the federal passage of the Smith-Hughes Act, which provided funding for vocational training in the areas of agriculture, trade and industry and home economics. The act also provided funding for teachers, supervisors and directors in each of the three areas. Training of vocational teachers was a specific focus of the act, and federal funding for vocational education continues to this day, with the most recent act, *The Strengthening Career and Technical Education for the 21st Century Act* having been signed into law in 2018. Individual states are free

to determine how much of the federal funding is utilized for teacher training; some states place considerable emphasis in this area, while others do not, which has led to variations in teacher quality (Zirkle, 2018). These variances in the training of vocational teachers have also led to issues with the quality of some vocational programs at the secondary level across the U.S. (Zirkle, 2021). Public perceptions of the training of vocational education teachers, the resulting quality of teachers, and thus the abilities of these individuals to prepare students for the workplace or further education and training have long been a source of concern for educational leaders involved with VET (Zirkle & Martin, 2012; Bruening, et al, 2001; Lynch, 1996; Cramer, 1994).

According to the United States Department of Labor (2024), there were 212,100 VET teachers at the secondary (middle and high school) and postsecondary (two-year community or technical college) level in the U.S. in 2022. In the state of Ohio there are approximately 1,800 vocational teachers employed at the secondary level (Ohio Department of Education, 2023), teaching a broad range of subjects from agriculture production to nurse assisting to carpentry and welding. At the present time, there are shortages of VET teachers in Ohio and across the country (Frost, 2022; Petrus, 2022) due to a variety of factors, with the primary issue being salary disparities between schools and the private sector. These disparities have increased in recent years, as a strong job market and an aging workforce in many areas associated with skill trades, has increased private sectors salaries in many areas. Other reasons for teacher shortages include a lack of professional development, funding challenges leading to vocational programs being discontinued, and a lack of prestige associated with teaching (Zirkle, 2005; Zirkle, et al., 2022). These factors have affected both the recruitment and retention of VET teachers.

With 50 states, and each one responsible for their own educational system(s), drawing generalizations regarding teacher training in the U.S. can be challenging, particularly with VET. However, VET teacher training across the U.S. does share some significant commonalities in this area. Historically, there have been two pathways to vocational teacher certification/licensure (Zirkle, 2018). The first pathway requires a university degree consisting of general education, technical content, and teacher pedagogy, including field experiences (observations in a VET setting), student teaching, and in most states, passage of some type of written examination over teaching or technical content, or both. An alternative pathway has relied on significant work experience in the discipline in which a teaching credential is sought, supplemented by either a modified teacher education program at a university or some type of state-approved teacher professional development and training. As with Norway, both of these pathways require pedagogy focused on vocational subjects, vocational didactics, and some type of teaching practice. These differing pathways have existed for over 100 years with numerous variations, particularly in the alternative pathway.

5 Method

While the literature has identified several issues with comparing educational systems from an international perspective, this comparative study seeks to align with Rojewski (2004) who cited the need for exploring and describing a given nation's progress toward

vocational-technical education goals within the context of other developed countries. This study compared the vocational teacher training programs at two universities: The Norwegian University of Science and Technology in Trondheim, Norway, and The Ohio State University in Columbus, Ohio, USA.

The researchers involved in this study are program managers at their respective universities. As such, they adhered to their roles as “insider-researchers” (Breen, 2007). This role provided the researchers with unique perspectives with respect to the comparative analysis, specifically having an explicit understanding (Bonner & Tolhurst, 2002) of the vocational teacher training programs.

Through document analysis and webpage descriptions, program entry requirements as defined by various government legislation and university administrative regulations were examined, as were university curriculum (courses, credit hours), faculty qualifications, and program exit criteria (exams, tests, etc.). Interviews were also held with university faculty and government officials in both countries. Responses across these various data sources were cross-checked to ensure the reliability of the findings. In the following analysis, our main findings are presented through a narrative approach, first explaining core components of the NTNU programs, followed by the OSU programs supplemented by explanations to how these elements can be understood in light of each other.

6 Comparative Aspects of the Two Universities

6.1 University and Program Entry Requirements

At NTNU there are three VET training programs have different requirements for admission. One is a master’s program in vocational didactics designed for certified teachers (Smeplass, 2023), and will not be substantiated further here. The two others are the practical pedagogical training (PPE) program, equivalent to a year of full-time studies (but taught over two years), and a three-year bachelor’s program.

To become a teacher, the university conducts a suitability assessment throughout the entire program, and students must provide an official statement from the police proving no records of illegal conduct at the beginning of their studies. The two-year parttime program requires either a three-year higher degree from a university or two-year higher VET training in addition to two years of documented vocational practice after obtaining a certificate or students can be assessed based on their work experience and obtained formal competences at an upper secondary level (EQ3) (Norwegian University of Science and Technology, 2024b). The latter entry requirement is termed ‘competence assessment’ and is done through an evaluation process conducted by an administrative representative, and in some cases after obtaining advice from a scientific staff member.

For the bachelor’s program (BVET) the students must have a documented VET certificate, a minimum of two years professional practice in the field of their certificate, as well as either an upper-secondary diploma or they would go through the same process of ‘competence assessment’ as mentioned in the other study program (Norwegian University of Science and Technology, 2024c).

In Norway, higher education is for the most-part free and open to all who are qualified. This means that each institution has a limited number of spaces for students, decided through considerations between the universities and Ministry of Education and Research. These limited spaces are part of a larger system for producing the 'right amount' of qualified personnel (Gunnes et al., 2023). However, this also puts pressure on the university, who have to provide rather small cohort groups with specialized training to ensure quality. As a result, NTNU clusters students between VET study programs under the umbrellas 'vocational pedagogy' and 'vocational didactics'. These terms are also used in the national curriculum (Norwegian Ministry of Education and Research, 2023a) to signal that there is a need for a specialized approach to vocational learning and teaching for these teachers (Hiim & Hippe, 1999). While the PPE program has more than 200 applicants for 50 places each year, the BVET program has five different cluster programs, whereas the health and youth development has 150 % more applicants than study places (20), the other four programs of building and construction, electrical trades, restaurant and food processing and technical and industrial production in general have fewer students than the predefined quota. The yearly cohorts are separated by cluster for higher vocational training and joined together for general courses in vocational pedagogy and vocational didactics, referred to as 'teacher profession subjects'. In the PPE program, students have multiple courses in even larger groups, together with students from general teacher tracks. This entails that student groups are multidisciplinary in a significant part of their studies.

At The Ohio State University there are also three VET training program options. One is based on completion of bachelor's degree. The second requires prospective teachers to have significant work experience for initial qualification as a VET teacher but does not require a bachelor's degree for admission, and a third option which is also a master's degree program. This third option will also not be part of this comparative research as it is not widely attended. Both of the two VET teacher training programs at OSU have different requirements for admission. Students in the degree-seeking option must submit an application, transcripts from their high school, test scores from either the American College Testing (ACT) or Scholastic Assessment Test (SAT) and an optional letter of recommendation from a school official. The Ohio State University is classified as a "highly selective" university (The Princeton Review, 2024), meaning admission to the university for the purpose of completing a bachelor's degree is not guaranteed, and admission to the university is competitive. In each yearly admission cycle, approximately 55–60 % of total applicants are accepted for admission across all of the more than 200 undergraduate programs.

Once a student is admitted to the university as a degree-seeking student, admission to the VET bachelor's degree teacher training program is a separate process, and there are specific requirements for admission. An application for admission to VET teacher training program must be completed. A minimum grade-point average (GPA) of 2.75 on a 4-point scale is required. A criminal background check must be completed, and a writing sample must be submitted. The admission process culminates with an interview with program faculty and the faculty make the final decision based on the required components.

Individuals entering the VET program based on their work experience have a different admissions process. For admission to the university, they are excluded from supplying test scores and letters of recommendation and only need to provide evidence of a high school diploma, although many already hold bachelor's and master's degrees in various technical disciplines. They may also hold other types of credentials, such as the completion of a registered apprenticeship program through the U.S. Department of Labor or credentials earned through military service. These lesser admission requirements are as a result of being "non-degree" students, and their course-taking requirements are significantly less (discussed in the next section). As a result of their work experiences, as a group they are significantly older than the degree-seeking students. Their admission to the teacher training program is automatic: they are admitted as a result of their employment as a VET teacher in a local school district and are exempt from the many processes the bachelor's degree students must complete for both admission to the university and to a teacher training program.

Overall, when comparing the entry requirements for the university programs for VET teacher training, we find that admission to the NTNU programs follows a nationally adapted system, while the OSU admission system is more selective and locally-based within the university. In either case, these methods ensure that students have sufficient prerequisites to complete their courses, as well as holds certain formal requirements to be regarded as a 'suitable candidate. In Norway the certificate from a VET track is a requirement, while in the U.S. students must pass the standardized tests to a specific level to be found suited as a candidate. In both cases, these entry requirements are a central aspect of only allowing suitable candidates into the existing programs.

6.2 Curricular and Course Components

At NTNU, the training programs are required to follow the national legislation for the two programs. The small cohorts at NTNU requires that the training is efficiently organized, while at the same time contributes to specialized training in the specific cluster programs. This is done by having few courses per semester, but specialized tasks for different groups within the cohort. In the PPE program, students are required to have at 30 European Student Credit Points (ECTS) in pedagogy and 30 ECTS in vocational pedagogy (Norwegian Ministry of Education and Research, 2023b). The program provides a total of 60 ECTSs. The pedagogical training is provided through one course with key pedagogical topics running over all four semesters (Norwegian University of Science and Technology, 2024b). The course is designed to provide students with theoretical and scientific tools to function as teachers in a Norwegian education setting – where pedagogical skills are highly valued. Furthermore, students have a course in vocational didactics focusing on leadership in learning processes and connections between education and society. The students are in this course trained to translate issues from the vocational profession into the field of teaching through Research and development (R&D) projects.

In the BVET program consisting of a total of 180 ECTS, the pedagogical and didactical training is complemented by a requirement of 60 ECTS in broader vocational subjects (i.e. the other professions in their cluster) as well as 60 ECTS in vocational specialization, meaning that they will be required to further develop their vocational skills. In total six

courses are taught students, ensuring both the requirements for broader and specialized 'higher VET training'. The BVET students attend six semesters and start with a course in 30 ECTS that integrates the vocational subjects with professional training (Norwegian University of Science and Technology, 2024c). They continue to learn about central pedagogical themes and youth culture second semester, and industries and business knowledge the third. Fourth semester involves a course to develop their own vocational specialization in combination with adapted training, which is pivotal for all teacher programs in Norway. The last year, students have a subject of 30 ECTS in a course containing societal perspectives on vocational pedagogy, while a bachelor thesis (30 ECTS) is the culmination of the training – a research and development project where students work in groups and gather data on a chosen subject with supervision from a university teacher. Through the training students are exposed to a variety of tasks and assignments often designed to combine their prior knowledge with new insights from either practice or course curriculum and combine these to support the professional development and a professional identity as vocational teacher. Students are required to attend a minimum of 80 % of the sessions in all courses and are required to complete all obligatory assignments prior to any of their exams.

At The Ohio State University, both of the training programs are required to follow the state of Ohio Department of Higher Education standards (Ohio Department of Higher Education, 2024), as well as Ohio State University policies for program completion. The bachelor's degree program requires 120 semester hours of study (approximately 30 per year). In the U.S., one semester hour is equal to 15 hours of lecture time in a course, and most courses are three semester credits. The degree also requires completion of general education (courses in mathematics, English, natural sciences, humanities, etc.), vocational courses in the subject to be taught (such as agriculture, business or family and consumer sciences), pedagogy, and practical training. In the second year, students begin taking both vocational courses and courses focused on pedagogy, and these include such courses as educational psychology, teaching methods and assessment, educational technology and working with special-needs students. In year three, this course-taking pattern continues and includes the beginnings of practical training (see the next section for a discussion of practical training). At the conclusion of the fourth year, students take state-required written assessments of their vocational subject knowledge and their knowledge of pedagogy and receive a diploma from the university. They also receive a teaching license from the state of Ohio upon payment of a small fee (\$80 USD). At this point, they are able to seek employment as a VET teacher. This type of teacher training program is known as a pre-service type of training, as the students must complete all aspects before they receive a teaching credential and a potential teaching position.

In the VET program based on work experience, when students are hired as fully licensed teachers, and enroll in the teacher training program, they are granted a teaching license "up-front" and begin to take courses at the same time they begin teaching. The process is completely opposite of the bachelor's degree students and is known as an in-service teacher training program, as the teachers are completing the courses while they are beginning their teaching employment. Teachers are hired in the summer and attend a summer "bootcamp" for 2.5 weeks designed to provide basic pedagogical knowledge and to provide an opportunity to perform some actual teaching in front of their

peers. During their first year of teaching, these individuals are supervised by a university teacher educator, who observes and provides constructive feedback as part of practical training. The teachers continue teaching full-time and attend one course a semester for three more years, for a total of 27 semester hours, all focused on pedagogy. These students take many of the same pedagogy courses as the bachelor's degree students, including teaching methods, curriculum and assessment, educational technology, as well as a course on the foundations of workforce development and education, and a course on work-based learning. These courses are populated by both groups of students and the networking and sharing of knowledge and experiences is beneficial to both groups.

When comparing the curricular and course components, we find similarities in how the programs all are designed to provide students with tools to understand and orient themselves in the world of education – as well as build upon technical and practical training they have either completed prior to the study program or will be exposed to during their studies. In general, there seems to be more explicit pedagogical and didactic focus in the Norwegian programs than in the U.S. case – however, these differences are mostly related to how Norwegian teacher training contains quite specific references to pedagogical ideals from profession debates and a VET curriculum in Norwegian schools that is also focusing on social missions in education. When we look at the concrete components of the training the university provides, the educational programs are in both cases built upon the existing scientific evidence of how teachers can work with youth and learners in the context of vocational education and training. Therefore, we see that the universities can offer programs that have what can be termed 'scientific authority', meaning that topics and literature for VET teachers are substantiated with evidence-based insights and are designed to provide students with abilities of critical assessment and individual authority as professional teachers in the contexts they will work.

6.3 Practical Training Elements

Both of the NTNU study programs in focus have minimum requirements for the number of days the students must have in practical training. The PPE program has 60 days of practice spread between the four semesters. Practice training is carried out in the student's own vocational cluster. All practice is mandatory and supervised and occurs in authentic vocational situations with students/apprentices in schools, or possibly in a training office (Norwegian University of Science and Technology, 2024e). Students must undergo practice training both in middle school and in secondary education, since they will be certified to teach at grade levels 8–13. Their practice in middle school is 10 days. Up to 20 practice hours can be conducted in a training office. Further, students who are already employed in schools must have a minimum of 20 hours in a different school than their workplace. All practice is required to be documented, and students often have tasks and reports connected to their practice.

At the BVET program the legislation upholds that 'The practice study should consist of at least 130 days of supervised, varied, and assessed practice and be an integrated part of the education. The practice study should be distributed over all semesters of the education, with 70 days of supervised vocational pedagogical practice in school and 60 days of supervised vocational practice related to the workforce' (Norwegian Ministry of Educa-

tion and Research, 2023c). At NTNU, this is operationalized through obligatory courses. Students have practice periods all semesters, starting with 20 days in upper secondary, 10 days in secondary and 15 days in a company (year 1), 20 days in upper secondary and 25 days in a company (year 2) and 20 days school practice and 20 days in a company (year 3). Since the practice is integrated in the other courses, students are obligated to follow the schedule. The main principle of the training is, however, that each student acquires new experiences from various educational and practical contexts where they can build their knowledge and skills to support their professional development. Nevertheless, since students have different professional backgrounds and life situations, as well as live in various parts of the country, the organization of the practice periods require individually adapted plans as well as extensive bureaucracy to ensure that every student meet the requirements during their training. Because the practical training elements are adapted to the individual learner, and the program caters five different vocational clusters, each cohort has a designated cohort coordinator – who keeps an overview of the progress of all students practice training. Through digital platforms, advisors in schools, the students themselves and the practice supervisors register and approve the students' practice throughout their training. This coordination is important, since students have multiple practices and 'follow up teachers' through their training.

The two licensure pathways available through The Ohio State University also contain practical training elements. The licensure pathway culminating in a four-year bachelor's degree requires two "field experiences" in the student's third year of university. These field experiences consist of 75 clock hours each, of observation and participation in a VET classroom and lab. The two field experiences are in different situations, either by grade level (one field experience in a middle grades school, the other in a high school) or by school location (one field experience in a rural school, the other in an urban or suburban school). The field experiences are designed in this way because the teaching license is for grades 7–12 and in Ohio, there are more than 600 school districts, split between rural, urban and suburban areas. As a result, students are required to complete practical training in a diversity of settings. This is helpful to the students, as they have an opportunity to experience different environments before they begin their job search.

In the student's fourth year, they complete student teaching (sometimes referred to as "clinical practice"). The student is the teacher of record for the class for 12 weeks and is supervised by both a university faculty member and the hosting mentor teacher. Student teaching is typically completed in the student's last semester of university study, just prior to graduation. It should be noted that both the field experiences and the student teaching are considered part of the student's university course requirement, and thus, the students pay tuition to the university as part of their completion of these components. In addition, they are not financially compensated for their participation in either field experiences or student teaching.

As previously mentioned, students in the VET program based on work experience are employed as full-time teachers and receive a full salary, but as part of the program at The Ohio State University, the teachers are observed by a university teacher educator in their first year, three times in the autumn semester and three in the spring semester and provided with feedback. This feedback is not provided to school administrators, as the teacher educator functions as a mentor providing constructive feedback only to the

teacher and is not involved with the actual teacher evaluation process conducted by the school. Teachers also attend a once-a-month seminar on campus for the entire year as part of the practical training, where topics such as classroom/lab management, parent-teacher relationships and teacher professionalism are discussed.

We find that although the practice is somewhat differently organized, some of the components are similar, and could be regarded as key for the programs analyzed. In Norway, the practice is designed to give both student groups experiences that expand on their already achieved certificate – and prepare them for various teaching positions related to their vocational cluster. The requirements are formulated in the national curriculum as ‘days’, but the framework states little detail to how the practice should be conducted. This gives some room for flexibility for the university and the students, but also creates conflict in some cases, since students in many cases lose income in practice periods. In Ohio, the practice is perhaps more structured, as students in both the bachelor’s degree and work experience options have fairly prescriptive standards for how the practice must be conducted and what skills and knowledge the student must demonstrate. Achievement of these standards is documented through teaching observation via validated checklists and rubrics for each student.

In both cases, the practical training elements are integrated requirements for becoming a teacher yet have different ways of standardizing in terms of days and hours. The Norwegian NTNU model has more hours than the OSU version (60 and 130 days is equivalent to 450 and 975 hours of practice), but since the students often teach only around 30–50 % of their time in schools, whereas students in the Ohio system are generally teaching for about 70 % of the time they are in school – the models are difficult to compare in a quantitative logic. What we do see, however is that the practical training requires integration with the other parts of the training, as well as is conducted in collaboration with schools and companies. Both universities use a combination of learning arenas to ensure that the teacher students are equipped with directly relevant experiences for their present and future jobs, as well as have systematically conducted teaching and documentation tasks connected to their practice to ensure quality and relevance (Rokkones et al., 2018; The Ohio State University, 2023). In both cases, university teachers with specialized academic profiles within VET teacher training follow up on students to ensure that the training is not only a mechanical obligation but contributes to preparing teachers for concrete requirements of planning, leading and documenting learning processes either for students or themselves. This necessitates that the programs all use the formal requirements as tools to empower students to tackle the practical aspects of being a vocational teacher in a labour market that requires professionalism and systematic approaches to education and training.

6.4 Definitions of Formal Qualifications

The standardized national legislation ensures that students with a degree from either of the Norwegian programs are approved to teach in their vocational cluster after completing their training, and no further qualification is needed after obtaining the diploma. Students at these programs are recruited from all parts of the geographically spread nation, and students can use their degree to work as teachers nationwide. The PPE pro-

gram builds upon a specialization that the students have already completed, either as a diploma in higher education – or higher vocational education (Norwegian University of Science and Technology 2024b). Because of this – the training is shorter and is designed to ensure that the vocational teachers first and foremost are provided with pedagogical, didactical and practical training.

The BVET program on the other hand, provides students with more comprehensive training, and results in a bachelor's degree after completion. Both NTNU student groups are after completion qualified to teach students from class 8–13. Because of the different entry requirements, the programs attract different student groups in terms of prior qualifications but provides students with similar forms of training. Both groups can continue towards a master's degree afterwards, given that they have a bachelor.

A completed teacher training program gives the student a diploma as 'vocational teachers', which is a formal requirement for permanent positions in Norwegian schools. While there is a national requirement in Norway that teachers working in schools have completed formal training, the legally responsible provider can decide to hire staff without the formal training (The Norwegian Directorate of Education and Training, 2024b). To dampen a teacher shortage in schools, principals have an option to hire necessary staff with the proper certifications from the vocations – demanding that they are formally qualified after three years. There are many uncertainties regarding how many teachers are needed for the future in Norway, and there are some indications that there will be too many teachers with the PPE educations within 2040 (Gunnes et al. 2023).

The bachelor's degree program at The Ohio State University concludes with both a degree and a teaching license recognized by the state of Ohio. This license is effective for two years, during which time a new teacher must complete the Ohio Resident Educator Program (RESA), a comprehensive, two-year initiative to assist beginning teachers with mentoring and professional development as they start their education careers (Ohio Department of Education, 2024). After successfully completing RESA, the teacher is eligible for a five-year license. During that five-year period, the teacher develops and implements an Individualized Professional Development Plan (IPDP), which is designed to allow the teacher to continue their professional development and improve their teaching skills and knowledge through workshops, university courses, technical update training and other self-improvement activities. This plan is mutually developed between the teacher and either a school administrator or mentor teacher. It is important to note that this requirement for a five-year Individualized Professional Development Plan requirement continues for the duration of the teacher's career. This requirement is designed to ensure teachers are on a cycle of continuous improvement.

VET teachers in the program based on work experience receive the initial two-year teaching license when they are initially employed. During these first two years of teaching, they must make satisfactory progress on the university courses by completing approximately half of the 27 semester hours. At that point, the license can be renewed for two more years, and all remaining courses must be completed. These teachers do not participate in the Ohio Resident Educator Program (RESA), instead they complete a university conducted Performance-Based Assessment (PBA), where the university completes one final teaching observation and the teacher constructs a teacher portfolio. At that point, the teacher is eligible for a five-year license. During that five-year period, the

teacher develops and implements the same Individualized Professional Development Plan as the bachelor's degree-based teachers

In Norway, there is currently a requirement of having a master's degree to be an upper secondary teacher in all other fields, than vocational subjects. Other teacher training programs equivalent to the PPE program, have recently also implemented a requirement of a master's degree prior to admission. These differences are important contextual factors, as they illustrate how the Norwegian teacher training in general is becoming longer and more academic. At the same time, the requirements for entry into VET teacher programs, and requirements for degree level is kept at the same level, equivalent to an EQF 6 level. This is intentional and reflects how Norwegian VET training is designed to build upon former certification and training. While there is no requirement in the state of Ohio for teachers to obtain a master's degree to retain a teaching position, the majority of teachers in Ohio continue their education and obtain a master's degree. According to the National Center for Educational Statistics (2022), 60.8 % of all Ohio teachers have a master's degree. In addition to using credits earned during a master's degree to renew a teaching license, the degree can also provide a salary increase, or if the degree is in a specific area, such as educational administration, it can be a springboard to a principal or other administrative position.

On the theme of formal qualifications, we find that the programs provide acknowledged certification for teachers to work in schools and companies where vocational education and training is provided. The diplomas functions as stamps of approval to VET providers in the sector, and signals that students have obtained formal qualifications essential to plan, conduct and continuously improve training for students in the specific VET cluster they are specialized in. At the same time, students are not guaranteed employment as teachers, and in both contexts, there are uncertainties regarding VET teacher retention and turnover. One reason for this is that the attractiveness of teacher positions in formal educational settings is influenced by other opportunity structures in society. If the students have managed to obtain a teaching degree, they might find relevant work outside of the formal systems too, meaning that salary differences between private and public sector, or other factors related to work conditions, can influence the careers of VET teacher students. The reputation of the university and the formalized requirements to complete the programs ensures that students with the formal degrees from both universities have accomplished all aspects of their training and through completion of the various requirements of the programs, have proven their abilities to employers in multiple fields.

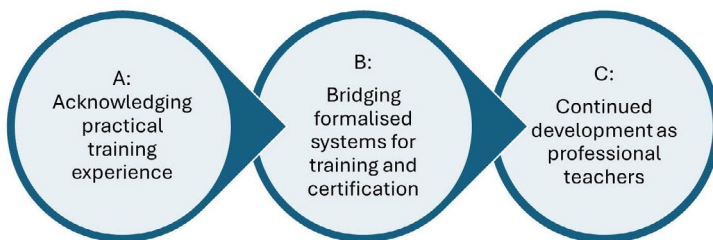
7 Discussion: Designing Programs that Acknowledge and Prepare

We have now detailed and explained some of the central characteristics of the VET teacher programs at the two universities in Norway and the U.S. We find that although some of the organizational principles may vary, there are also important similarities to discuss. Our analysis of the programs is also based on our in-depth knowledge of each of the national and organizational features that constitute the institutional landscape that defines the core functions the programs are designed to serve. Since higher education

in Norway is part of a welfare state's system for de commodification (Willemsen & De Beer, 2021), students at NTNU do not pay tuition for their studies. However, many have personal costs connected to loss of income during training weeks and practice as well as travel to campus for week-long gathering sessions for some demanding both travel and accommodation. In the U.S. students, particularly those in the bachelor's degree program, must pay tuition as part of their studies, although scholarships and financial aid may be available. For the students who are already VET teachers, and in the program based on work experience, they may have tuition reimbursement or waivers from their employing school. However, they have some of the same financial costs as students from Norway, with travel to campus for classes. In general, to understand the attractiveness of these training programs comparatively – one should include information regarding the investments done by students and how this affects the recruitment process. In both cases, we see that student's investments in their education is significant, even though Norwegian students do not pay tuition like in the US. This 'investment' from the students' side might be an important aspect of understanding the dynamic and relevance of these programs. In both university cases, students have high expectations to how the courses they take should be useful and relevant for their future profession.

Based on insights from our comparative study, we have developed a model illustrating what we find to be core elements of VET teacher training programs. The ABC's of VET teacher training is focused on connecting different logics in the world of vocational work and production, the formalized systems that universities can offer, and the future development for our VET teachers through continued development. See Figure 1.

Figure 1: The ABC's of VET teacher training



The first aspect of *acknowledging* practical training and experience is evident in all of the four programs we have described, but in different ways and as different parts of the education. At the Norwegian university, having prior vocational certification is an entry requirement. This can be seen in connection to how Norway has designed several pathways into higher education as part of a national system for documentation and appreciation of adult' non-formal and informal competence (Orr & Hovdhagen, 2014). In the OSU programs, prior vocational/work experience is an entry requirement for one program, but not for both. However, practical training is highly focused in the program that does not require work experience. In all four of the programs, the practical training elements are pivotal to not only train teachers with theoretical skills relevant for administrative aspects of teacher professionalism, but also to give insights into the world of

vocational learning, which is also to a large extent influenced by physical elements, production procedures, routines and a changing world of work. In Norway, prior studies have documented that even though VET teacher students often have ample experience, they are less comfortable with traditional academic practices such as written exams, documented in several studies conducted at the BVET program (Hylander & Smepllass, 2022; Smepllass & Hylander, 2021). In the OSU bachelor's degree training program, while the students may lack experience, their orientation to traditional academic practices is not an issue, as admission to the university is significantly competitive and a high percentage of students are academically focused and prepared. In both university cases, the meeting between vocational worlds and the systems of teacher training, entails that universities and educators must find the right balance between acknowledging VET systems as a source for knowledge and skills with students' new roles as future educators.

The similarities between how the two universities incorporate both curricular and practical elements in their programs show the next important joint feature of VET teacher training. By using a series of formalized systems such as obligatory school and vocational practice and systems for assessing students' suitability upon entry and through the programs, both universities *bridge* between various competence systems at the higher levels of education to the professional worlds where definitions of quality are continuously evolving. In VET teacher literature, this can be referred to as a form of professional duality, where VET teacher identity is developed in relation to both occupations and school (Andersson & Köpsén, 2019; Köpsén, 2014). It might be that since both universities are subject to external systems for quality assurance, a focus on relevance ensures that the programs at focus constantly are adjusted to be relevant to both funders, students and those stakeholders who employ them after their training. VET teacher training models that intentionally incorporate vocational elements must constantly evolve in accordance with VET systems development. Both universities therefore have models that ensure students are not only formally qualified, but also have tools and strategies to handle their jobs in the double practice field.

This brings us to the last aspect of the model, where *continued* development as professional teachers seem to be incorporated into the programs through training students to critically evaluate curriculum, adopt their teaching to various situations and develop their teaching through systematic evaluation and utilization of research. Perspectives on lifelong learning and professional development is important for many professions but proves key to vocational teacher training as students are expected to maneuver evolving vocational demands in their clusters, not single vocations. The broader nature of the programs investigated mirror how the educational systems in both Ohio and Norway have structured their vocational training for youth. This entails that professional VET teachers always must work in a space balancing between specialization and generalization, where what is regarded key components not only can, but is likely to change over time.

Designing consistent VET teacher training programs is complicated as universities must find balance between labor market needs, their own student recruitment, legislation, internal and external standards, and ideals for professionalism. Therefore, we find that flexibility also is key to ensure that VET teacher programs cater to the diverse world of VET.

The ABC's of vocational teacher training illustrates that even though the two VET teacher training programs are situated in different political and economic surroundings, they can also incorporate similar elements that likely contributed to their creation, core functions and maintenance. None of the programs in focus are mere certification systems, they also incorporate science in combination with experience and craftsmanship to provide students with a professional competence where the “the whole is greater than the sum of its parts”.

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