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## **Innovation Transfer in Vocational and Educational Training (VET) System Switzerland**

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### **Abstract**

Trends such as technological and digital change or globalisation are leading to an increasing dynamism in Swiss working environments (SBFI, 2017). The VET system needs to assess the significance of these developments for basic vocational training. Moreover, it constantly needs to integrate the recently identified requirements into the vocational training of learners in all three learning sites of the Swiss VET system (vocational schools, workplace and intercompany training centres). Studies show the institutionalized five-year revisions of education ordinances in Switzerland to be lagging behind the high level of innovation in the economy. For that reason, this project analyses the strategies vocational school teachers have in evaluating and integrating innovation of the industry into their teaching. Based on a qualitative survey procedure with twelve VET teachers, the analysis shows that they use both formal and informal strategies while planning and implementing new developments into their lessons. The interviewed VET teachers mentioned for example the curriculum, literature or further education courses as formal strategies to get known about the latest developments in the field. Furthermore, informal strategies as personal contacts to the field, exchange of experience between colleagues and trainees or company visits play a particularly important role. One explanation of strategies are different teachers' motives, which are described in the conclusion.

### **Keywords**

innovation transfer; crossing boundaries; vocational and educational training, formal and informal strategies; VET teacher

## **1 Introduction**

The innovation-driven Swiss economy is closely connected to the professional practice. On the one hand, innovations lead to constantly changing demands on employees. On the other hand,

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Switzerland's innovative strength requires a professional practice that keeps pace with new developments. The purpose of basic vocational training is to prepare the next generation of employees for the professional practice of the future.

A preliminary study written by Degen (2018) and supported by the University of Teacher Education Lucerne shows a lack between curricula of VET schools and the developments in the economy. Therefore, the risk arises that learners will be trained with technologies and learning content that are out of date. At the same time, the great heterogeneity between sectors and companies generates different demands and expectations for basic vocational training. This diversity increases the difficulty for vocational school teachers to recognise and evaluate the relevant developments for an occupation as a whole, and to integrate them systematically into VET.

Furthermore, in order to get and stay employed in an innovation-driven economy, young employees need to know how to operate in dynamic environments driven by sector-specific digital developments and technological innovations. Previous research has demonstrated that students experience problems in their attempts to transfer their learning and reflect on knowledge and skills developed in school when entering in complex workplace settings (Tanggaard, 2007). Therefore, cooperation between and within learning sites in the sense of crossing boundaries must come more to the fore. Aarkrog (2005), Berner (2010) as well as Jonasson (2014) show that various learning sites in VET can complete each other in student learning and offer specific opportunities for learning. However, there is no automatically school-workplace transfer. It requires complex processes of recontextualisation and transformation of the different learning impulses from the learners (Van Oers, 1998). In that sense teachers, trainers and learners need to recognise and reflect on the experience of learning in different learning sites and continuously provide possibilities for further student learning in VET (Akkerman & Bakker, 2012; Sappa, Choy, & Aprea, 2016). The learners can only be successful in this process if the learning contents of the different learning sites relate to each other (Krapp & Weidenmann, 2006).

However, there is a lack of institutionalised and sustainable forms of cooperation, which incorporate a linkage of content between the learning sites and a transfer of innovation into the training of learners (Euler, 2004). Literature shows that crossing boundaries between all three learning sites is lacking and rarely practised (Aprea & Sappa, 2014). This not only complicates the process of building up competences for learners. It also makes it impossible to continuously integrate new developments of the economy into teaching. The rigid structures of the VET system increases the discrepancy between the rapid developments in the innovation-driven economy and the educational contents. For that reason it is necessary to elaborate and define further formal and informal transfer process strategies to ensure the innovations transfer between the learning sites.

Based on the literature, there are three different approaches to innovation transfer. According to Bormann (2011), they are characterized by the terms of diffusion, dissemination and knowledge transfer. Dissemination refers to the planned and controlled dissemination of innovations within an overall system. Diffusion means a rather spontaneous, unplanned dissemination process and knowledge transfer refers to the dissemination of an innovation that has been tested in a specific context to another, similarly structured context. Wiechmann (2002) describes another transfer approach by the concept of the active use of knowledge. The transfer of extended responsibility to the schools shall initiate self-active processes of innovation use without external control. In this study, the diffusion of innovation and the active use of knowledge between learning sites are of particular interest.

Various studies identify factors that influence the rate of innovation transfer (ex. Aprea & Sappa, 2014; Sappa, Choy, & Aprea, 2016, Wiechmann, 2002). Wiechmann (2002, p. 98)

analysed these factors in relation to schools. He identified the following four different spheres of influence:

- **general conditions** as the size and the location of school
- **organisational characteristics** as the relation between learners and teachers, collegiality or women's quota in teaching team
- **different impulses for development** as requirements from the local environment or perception of teachers for new developments
- **importance of transfer channels** like literature usage, willingness of teachers for further education or personal contacts. Fürstenberg (2005) emphasises the importance of the social acceptance of the stakeholders for a successful innovation transfer. Based on this principle, Tilmann (2019) examines in his work the social acceptance of an innovation and the subjective willingness to its transfer. In order that the transfer takes place, innovations must be confirmed by the various actors through their actions based on their subjective interests. A reason for a positive interest can for example be a relative advantage for the acting person. Therefore, the expected benefit represents the motive for the corresponding action. In their study, Pareja Roblin et al. (2018) analysed the willingness of teachers to use tablet PCs. In this process, they identified further motives that influence teachers in their decision to adapt an innovation. Teachers guided the decision to integrate innovation for example on the compatibility with their pedagogical beliefs or with course content, on the familiarity with the task or on the opportunities to achieve instructional goals more efficiently.

When the strategies of VET teachers in innovation transfer are presented in the following explanations, the mentioned influencing factors and motives must also be taken into account.

## 2 Methods

Flick (2016) describes the actions and interactions of subjects in everyday life as an object of qualitative social research. As we are primarily interested in the subjective perspective of the interviewees and the associated contexts, we have decided to use a qualitative survey procedure in this project. The aim was to examine formal and informal innovation transfer strategies as well as cooperation schemes based on twelve qualitative semi-standardised guideline interviews with vocational school teachers from German-speaking Swiss vocational schools. We conducted guideline interviews with vocational school teachers from the technical field based on the assumption that digitalisation and constant innovation affect this specific sector strongly. The study focuses on the technical occupations of computer scientist, electronic engineer and automation engineer. Being a full-time employed teacher was another important selection criterion as they do not work part-time in the industry in order to stay up to date with the latest technological state-of-the-art and therefore need to develop their own strategies to keep track of current developments.

In order to evaluate our data, we followed Mayring's qualitative content analysis. Since we also wanted to identify the personal mindset of the teachers in addition to the implemented strategies, the categories were determined both inductively and deductively. The goal was to narrow down the text elements without distorting the core content and essence of the material. The intent was to create a clear and structured overview of the data using this reduction but still adhering to the basic form of the material (Mayring, 2010, p. 65). Lastly, we wanted to compile initial findings on formal and informal strategies that show for what reason and how new training content is adapted and integrated in a high-quality manner into basic vocational training in times of rapid technological change.

### 3 Results

The analysis of the interviews confirms the assumption that vocational school teachers pursue different strategies in order to obtain information about innovations in the occupational fields. It turns out that they use both formal and informal strategies for this purpose. In addition, further subcategories as well as combinations of formal and informal strategies were identified. In order to obtain information about the strategies that vocational school teachers pursue, we describe the strategy categories in more detail below and illustrate them using representative extracts from the interviews.

#### 3.1 Formal strategies

When planning their lessons, a group of VET teachers orient themselves in particular on the contents and specifications of the training plan. They justify this procedure with a 1:1 reference of qualification procedure to the curriculum. However, the data show that some VET teachers switch to other strategies when it comes to incorporating current developments into teaching, as these fast-moving trends have not yet been integrated into the training plan.

For example, in the profession of automation technician the technical standards change at regular intervals. Since these standards change more quickly than the training plans are adapted, the VET teachers must keep up to date. They do this by reading technical journals or books, which are considered as a formal medium.

"Unless we take the reference book, we work with the European books, and in there everything is up to date, there's always the newest stuff."

Furthermore, VET teachers regularly attend further training courses offered directly by the industry. In these trainings they keep their knowledge up to date, upgrade their competences and expand their professional network by establishing contacts to representatives from other learning sites.

"This is, of course, a prerequisite for us as teachers, [...] from a technical point of view, to constantly adapt to current circumstances and our training regulations usually ensure that."

Institutional support plays an important role for VET teachers in order to use formal strategies for innovation transfer. This support reveals itself in form of school-specific further training regulations or timetable reductions. With regard to the qualification procedure, institutionalised and formalised exchanges with other VET professionals are very important for the transfer of new developments.

"This is what we discuss with the professional organisations. More precisely, we discuss this with our department manager, who is in contact with the professional organisation. We have expert commission meetings, where I'm also part of. The last agenda was, when we plan to implement the new technical standards."

#### 3.2 Informal strategies

In order to orient their teaching to current developments in the practice, our study indicates that VET teachers particularly depend on informal strategies. All teachers interviewed highlight personal contacts to representatives of industry or professional organizations, to the vocational trainers, to the examiners or other VET teachers as a very important informal strategy. The importance of these networks arises on the one hand from knowing about current developments, on the other hand from asking questions or also clarifying the quality of new developments, their relevance for the industry and thus the importance for the learners.

"I have various companies where I know the people responsible for apprenticeships or training and then when I have a technical question, then I call them and ask them."

In addition, VET teachers also visit companies, where they can learn about new developments and current technological changes. There are VET teachers who carry out these company visits on a regular basis and others who also explicitly use these company visits, for example to expand their knowledge about new machines.

"For me, these rare company visits are relatively valuable. While visiting the companies I sometimes realise, this and that has changed quite a bit and is no longer the way I knew it before."

"Yes, I know all our training companies; I've actually been to all of them before. Well, I wanted myself to know the companies. And as I'm an examiner too, I always go to different companies to perform the exams."

In the last interview quote a further factor becomes apparent which favours the transfer of innovation. VET teachers, who find themselves in various functions within vocational education and training, also have the opportunity not only to be better informed about current developments, but also to better assess their relevance. Some of them are examiners, so called experts in qualification procedures, others are examiners at a university of applied science, yet others are involved in the professional organisations, or take up a position as department manager at school and thus repeatedly receive input about current changes in industry.

"Because of my work as an examiner at the university of applied science, I also get many inputs about what is in demand. From that point of view I think it is good for me. I have the feeling that I recognize what's important, what I should do."

The data also point to the importance of public media as an informal source of information. In contrast to trade journals, which have a formal character, the public media play a subordinate role. Nevertheless, it could be stated that knowledge about current developments does not necessarily have to be found in the specialist literature.

"Much of what is about to come is not hidden, which means that I do not necessarily have to read a trade journal, but these are often concepts which are carried by the media."

VET teachers also rely on their practical experience in the occupational field when it comes to incorporating new content into teaching, informing themselves about innovations in the field of work or also when trainees bring their own experiences into class and these experiences have to be assessed for their quality. In general, one's own experiences seem to serve as quality assurance when it comes to assessing new developments, current events and information that could potentially be included in the classroom.

All VET teachers interviewed use their own experience in the occupational field to assess the relevance of new information or developments.

"Much is of course manifested. I must confess, after 25 years of practical experience in the occupational field. Well, in that case it is actually already relatively clear what is really important in the technical industry."

Trainee's experience is another subcategory when it comes to how VET teachers integrate current developments and technological changes into their teaching. However, there are differences in how they deal with the experiences of the learners. Some teachers conduct regular conversations with the learners in a formalised form. They have thus created a method for themselves to receive information on current developments in the companies.

"Every year I have a semester interview. Then I always ask them, that's my style, that I ask them, what are you doing in the company right now? What are you working on?"

The interviews also showed that almost all VET teachers have designed their lessons in such a way that there is room for an exchange of experiences. For example, homework is set in such a way that learners can or must solve these homework tasks in their company and then share their experiences in class. As a result, VET teachers get insights into the everyday working life of the learners and, at best, gain insights into current developments in industry. Digital tools also seem to favour this exchange of experience.

"Thanks to the fact that we now have smartphones, I can say ok, take a picture, bring these pictures to class and show them to each other."

If the shared professional experiences of learners contain elements that are not part of the curriculum, teachers can learn about these new developments through the exchange of experiences.

"They are allowed to bring in new topics which are not in the curriculum. [...] If anything special happens, like if there's one, who can enter the Internet with a Raspberry, I need to say, I haven't done that yet. I think that's great. Even if I don't know anything about that topic. Those situations are inputs for me."

When different trainees from different classes of the same profession address the same current developments, it is easier for VET teachers recognise the relevance of these new developments in industry

"Well, new information won't just be addressed by one class. That will be addressed in most system classes. They will come with that issue and say, well, today we configure our servers with Powershell and not with the graphical tools that are available here in school. Why is it, that we can't learn that? And then I just have to make it clear that we're not there yet, but we'll integrate that development in a later revision."

#### **4 Conclusion**

The results of the study show that VET teachers surveyed are well aware of the dynamic developments in the occupational fields. To a large extent, they also recognise the importance of not closing their minds to these developments and incorporating innovations into their teaching. In doing so, they pursue different strategies. Some teachers refer to the formally regulated structures that the vocational training system or their own institution prescribe.

One group of VET teachers implement training plans or school curricula without major deviations. They justify this approach with different arguments. On the one hand, the training plans are revised at regular intervals and new developments are thus implemented in the school curricula. If more frequent changes impact the curriculum, they see a danger of overstrain the system. On the other hand, they see it as their primary task to implement the training plan one to one and prepare trainees as best as possible for the qualification procedure. As Roblin Paraja et al. (2018) identified, these teachers focuses on the compatibility with course content in making their decision to integrate new teaching material. They pursue the motive of enabling their trainees to complete their apprenticeship with success by strictly following the curriculum.

Some VET schools offer their teachers a relatively wide range of opportunities to identify and exploit innovations in the occupational fields. Teachers are therefore expected to participate regularly in further training, for which they also receive appropriate financial support. In addition, round tables are held with VET professionals, where an exchange on new developments and teaching content is facilitated. According to Wiechmann (2002), these are influencing factors that have the potential to promote the transfer of innovation.

Many VET teachers interviewed supplement the existing formal structures with informal strategies in order to find out about the latest developments in the occupational field. They do this for different motives. Interest in the occupational field can certainly be mentioned as one of the central reasons why teachers want to familiarise themselves with the developments. This seems to happen primarily out of personal, intrinsic motivation and only secondarily for reasons of an ongoing innovation transfer and for the benefit of a high quality education in the sense of crossing boundaries in the VET system. Roblin Paraja et al. (2018) describe this motive as the desire for familiarity with the task.

Some VET teachers seem to act on methodological-didactical considerations. They collect the occupational experiences of their trainees in class. In this way, they support their learning effect and increase their competence as demanded by Akkerman and Bakker (2012) by linking the previous knowledge and experiences of the trainees with action-guiding knowledge. The central motive seems to be the implementation of the teachers own pedagogical belief (Roblin Paraja et al., 2018). The transfer of innovation from new developments in the occupational field to the classroom is a practical side effect, but appears more as a secondary motive.

There is another group of VET teachers who find themselves in additional functions which require knowledge of new developments in the occupational field. As examiners or representatives in occupation-specific offices, they must be informed about new trends in the occupational field. According to Tilmann (2019), their motive results from the expected personal benefit of the innovation transfer.

Besides these rather unconscious motives regarding a transfer of innovation, also very consciously executed informal strategies are mentioned in order to be able to incorporate new developments into teaching. It is explicitly pointed out that the formal structures are not sufficient, for example, to meet the frequently appearing new technical standards. Some VET teachers see it as their responsibility to keep their teaching content up to date through personal contacts in professional practice. According to Wiechmann (2002), both the teachers' perception of new developments and the teachers' willingness to use them play an important role here.

The interviewed teachers seem to act basically on their own initiative and less on the basis of external requirements. According to Fürstenberg (2005), the majority of them act on the principle of social acceptance while transferring new developments into the lessons. Methodological-didactical considerations regarding teaching and learning at different learning sites play only a secondary role. With regard to the personal professional development of the VET teachers, the vocational schools apparently grant them a relatively large degree of autonomy. This is hardly surprising, since it is part of the professionalism of a teacher to undergo continuous further training. In view of the increasing dynamism in many occupational fields, however, supporting structures on the part of the institution or more intensive cooperation between learning sites would be highly desirable.

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