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Sense of Coherence Among Apprentices in Vocational Education and Training in Norway: Exploring General Resistance Resources in Work-Based Learning

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Abstract

Purpose: In the face of constant and rapid development achieving a work–life balance requires highly qualified and motivated professionals who can deal with stress and the demands of the future. In response, by facilitating school- and work-based learning, upper secondary vocational education and training (VET) prepares and qualifies adolescents for professional practice. In relation to VET, two fundamental salutogenic concepts can explain how humans cope with stressful and demanding situations: *Sense of coherence* (SOC), which entails comprehensibility, manageability and meaningfulness, and general resistance resources (GRRs), theorised as resources within individuals themselves (i.e., internal) and/or in their surroundings (i.e., external). Against that background, in our study we aimed to identify and explore which GRRs contribute to SOC among apprentices in VET and how they influence work-based learning.

Methods: Data were collected from 11 VET student in Norway at three time points—at interviews during their final semester of school-based learning (i.e., spring 2020), at interviews during their work-based learning (i.e., spring 2022) and, for register data, following their completion of trade certificates (i.e., autumn 2022). The students' experiences of work-based learning as apprentices formed the basis of this study's analysis. The stepwise deductive–inductive method was used to generate and analyse the data.

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Findings: The apprentices' GRRs emerged in emotional, cognitive, physical, professional, social, relational, material and cultural dimensions. Identification and utilisation of GRRs were both individually and socially conditioned. The apprentices were able to identify, both consciously and unconsciously, internal GRRs to further identify external GRRs, and vice versa. Each identified GRR appeared to affect at least one, if not all, of the three components of SOC.

Conclusion: Salutogenic VET can provide personal, social, environmental and physical resources (i.e., GRRs) that ensure coherent learning experiences. For that reason, by supporting VET students in identifying GRRs, teachers and supervisors can promote their SOC and work-based learning and thereby prepare them to be highly qualified and motivated professionals.

Keywords: Vocational Education and Training, VET, Apprentice, Work-Based Learning, Sense of Coherence, General Resistance Resources

1 Introduction

In the face of constant rapid development, working life today requires skilled workers who can adequately deal with unexpected situations, stress and the demands of the future. Companies need well-trained, highly qualified, healthy and motivated employees with a strong capacity for restructuring (Bringsén et al., 2012; Dede, 2010; Hilsen et al., 2021; Vaandrager & Koelen, 2013), handling stress and meeting a wide range of job demands (Bakker & Demerouti, 2007). In that context, vocational education and training (VET) has a social mission to ensure the development of skills needed in an array of occupational fields through school- and work-based learning. The VET model differs across countries (Organisation for Economic Co-operation and Development, 2020). In Norway, where we conducted our study, the primary VET model involves two years of upper secondary education, followed by two years of apprenticeship in a training establishment (Lensjø, 2020; Utdanningsdirektoratet, 2020). However, in most of VET models, students must face the school-to-work transition, integrate common core and vocational subjects and combine hard and soft skills. In learning in multiple arenas and from diverse sources, the skills developed need to be purposefully connected and integrated in order to ensure meaningful knowledge and understanding (Sappa et al., 2016).

Research on VET has indicated that students have to not only meet all of those expectations and requirements but also be able to make connections between subject, integrate theory and praxis, and ultimately, experience coherence in order to develop vocational competence, which can be both demanding (Aakernes, 2018; Baartman & de Bruijn, 2011; Gessler, 2017; Hiim, 2020, 2022) and stressful (Govaerts & Grégoire, 2004; Wegner et al., 2021).

Apprentices are exposed to demands and stressful situations just as full-fledged employees are (Duc & Lamamra, 2022). Although demands are not necessarily negative or insufficient coherence decisive for students learning, they may turn into stressors (Antonovsky, 1987). Beyond that, it can be challenging for VET students to grasp the coherence between the theoretical content taught in their vocational education programmes and their practical experiences (Aarkrog & Wahlgren, 2022; Gessler, 2017; Hiim, 2017, 2020). Because the lack of coherence between school-based learning and work-based learning (Hanssen, 2022; Hiim, 2017; Louw & Katznelson, 2019) is liable to create undue demands and hinder learning, cultivating coherence in VET is essential.

Over the decades, several researchers have explored the link between demands, stress, coping, learning and health (Folkman, 2011; Lazarus & Folkman, 1984). Among them, medical sociologist Aaron Antonovsky (1979, 1987), founder of salutogenic health theory, who introduced two fundamental concepts: Sense of coherence (SOC) and general resistance resources (GRRs). Whereas GRRs help to navigate stress, SOC was developed to explore a basic coping disposition in which people orient themselves towards factors of stress and the challenges that they face in effective, proactive ways (Antonovsky, 1987). Although both concepts have been explored in studies related to coherence in professional education and work (e.g., Hanson, 2004; Hatlevik & Hovdenak, 2020; Tartas et al., 2014), to our knowledge they have never been applied as a theoretical framework for exploring learning in VET. Against that trend, we assume that SOC and GRRs are highly relevant for learning in VET.

1.1 Sense of Coherence (SOC)

According to Antonovsky (1987, p. 19), SOC is:

> A global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli from one's internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement.

Following that definition, SOC is conceptualised as a life orientation involving three components: Comprehensibility, manageability and meaningfulness. First, *comprehensibility*, the cognitive component of SOC, refers to the extent to which an individual perceives stimuli as rationally understandable and as information that is orderly, coherent, clear and structured instead of chaotic, disordered, random, unexpected and inexplicable (Antonovsky, 1987). Second, *manageability*, the instrumental or behavioural component, refers to individuals' beliefs that resources are at their disposal and can be used to meet the daily demands and requirements of life. Third, *meaningfulness*, the motivational component of SOC, refers to

the extent to which an individual feels that life is emotionally meaningful, worthy of investment and a source of satisfaction (Antonovsky, 1987). In our study, we understood comprehensibility to be linked to the participating apprentices' ability to understand work tasks and requirements when developing vocational skills (i.e., cognitive component). Meanwhile, manageability was linked to their mastery of daily tasks and the challenges that they have encountered in training (i.e., instrumental component). Last, meaningfulness was linked to an inner drive and a desire to put forth effort in order to learn and become skilled workers (i.e., motivational component). Together, the cognitive, instrumental and motivational components provide the foundation necessary for humans—in our study, apprentices—to move towards health and learning (Antonovsky, 1987; Eriksson, 2022; Eriksson & Lindström, 2006; Lindström & Eriksson, 2010). Having a strong SOC enables individuals to view life—in our participants' case, VET—as coherent, comprehensible, manageable and meaningful.

1.2 General Resistance Resources (GRRs)

GRRs are essential to successfully managing tension while coping with a wide variety of stressors and being adaptable in psychosocial, social and cultural spheres. GRRs arise from environmental living conditions and early childhood rearing and socialisation experiences, in addition to idiosyncratic factors and pure chance (Antonovsky, 1979; Eriksson & Lindström, 2006). To be clear, a *GRR* is a physical, biochemical, artefactual–material, cognitive, emotional, valuative–attitudinal, macro-sociocultural characteristic of an individual, primary group, subculture or society that is effective in avoiding or combating a wide variety of stressors and thus preventing tension from being transformed into stress (Antonovsky, 1979).

GRRs are categorised as either internal or external. Internal GRRs include self-esteem, knowledge and intelligence, healthy attitudes and being in touch with one's feelings, whereas external GRRs include social relationships, clothing, culture, adequate food and access to artefacts (Antonovsky, 1979, 1987). In either case, GRRs can be regarded as tools that create a precondition for cognition and learning and are the cornerstones in the development of a strong SOC (Eriksson, 2015).

In a thematic analysis of Antonovsky's work and in more recent studies, researchers have identified 15 themes of GRRs: (1) Structure in life, (2) predictability in life, (3) social support, (4) coping strategies, (5) meaning in life, (6) responsibility, (7) comprehension, (8) expression of confidence, (9) challenges worth investing time and effort in, (10) health and illness, (11) future orientation, (12) past orientation, (13) positive, solution-focused outlook, (14) emotional connection and (15) ensuring one's fair treatment. Notably, no resource-related theme has emerged that does not align with the concept of SOC (Griffiths et al., 2011).

1.3 Relationship Between SOC and GRRs

The salutogenic theory assumes that an individual's health depends on how they handle different environmental stressors and demanding situations. The stronger their SOC, the greater their capacity to identify, mobilise and use GRRs. According to Antonovsky (1987), GRRs have a dynamic, reciprocal relationship with SOC (Lindström & Eriksson, 2010). For students, who in VET are mostly adolescents and regularly face demanding situations, cognitive assessments and coping processes play a crucial role in everyday life (Kristensson & Öhlund, 2005). Even so, in Antonovsky's (1987) stated that adolescents with a stronger SOC are better equipped to cope with stressful situations by creating order in chaotic situations. In that light, stressors, as a natural, central part of human development and learning, have a purpose beyond simply needing to be overcome. Indeed, stress can be positive as long as the person experiencing it believes that they possess the resources (e.g., GRRs) to solve the challenges before them (Antonovsky, 1987). An SOC helps people to identify the repertoire of GRRs that are appropriate for specific situations, including individual resources as well as resources available within their networks. For that reason, the resources should be regarded as existing within flexible resource pools, not as rigid response patterns. Because an SOC triggers the brain to send messages to activate appropriate bodily resources and enables people to achieve mastery, both instrumentally and emotionally (Antonovsky, 1979, 1987), a person's ability to master stressful and demanding situations in life depends on their SOC.

1.4 SOC and GRRs Related to Learning and VET

Salutogenesis can be conceived as a constant learning process that supports movement toward health and other desired aspects of an individual's existence (Eriksson, 2022), including the development of competence related to a future profession. The process of relating to others produces learning, and the knowledge gained from practice expands one's area of knowledge (Eriksson, 2022).

The salutogenic theory is backed by evidence showing that people with a stronger SOC more easily cope with stress, seek resources and see solutions in challenging situations (Haugan & Eriksson, 2021; Mittelmark et al., 2017). Studies involving students in upper secondary school have revealed that SOC is also related to performance (Kristensson & Öhlund, 2005; Torsheim et al., 2001). A high SOC correlated significantly and positively with good school grades and success (Kristensson & Öhlund, 2005), a low SOC in childhood was associated with dropping out of vocational education (Winding et al., 2013). Nilsson and Lindström (1998) have described how learning can be regarded as a health-promoting process, not only when health is learned about but also because the learning process itself promotes health. By combining pedagogical theories and the salutogenic theory, the so-called salutogenic school has emerged, the most important elements of which are meaningful

learning situations, clear structures for curricula and schoolwork and committed teachers who support each other, provide adequate support to students and act as good role models.

Because VET consists of both school- and work-based learning, research on SOC and GRRs in the context of working life is central when exploring the salutogenic approach in VET. To date, studies have indicated that health in the workplace depends on everyday technical, social and personal GRRs, as well as employees' capacities to use them. A strong SOC protects individuals exposed to risks at work, including stress and high demands for physical performance (Holmberg et al., 2004; Olsson et al., 2009). Research has also shown that workplaces that encourage employees to develop knowledge and skills, combined with an atmosphere that allows for feedback, discussion and influence, foster internal GRRs associated with open-mindedness and reflective skills. Flexibility and responsibility are other internal resources that promote SOC in the workplace. At the same time, research has additionally demonstrated that social climate is an important external resource in workplaces characterised by a culture of humour, joy and the sharing of responsibilities among employees (Nilsson et al., 2012). Added to that, Bringsén et al. (2012) have identified central GRRs such as control over one's job, the meaningfulness of work tasks and recognition at the individual level, as well as social relations and cohesion at the group level. Implementing a salutogenic approach at work that facilitates those GRRs requires employee engagement and interdisciplinary collaboration (Bringsén et al., 2012). Vaandrager and Koelen (2013) have added that a salutogenic organisation indeed provides personal, social and environmental resources that offer coherent work experiences.

1.5 Research Question

Considering that work today requires, highly qualified and motivated professionals who can deal with the stress and demands and that VET has a social mission to develop skilled workers through school- and work-based learning, the purpose of our study was to identify and explore the importance of SOC and GRRs, both internal and external, among apprentices in VET. Research on the role of GRRs in building SOC remains scarce (Eriksson, 2022), and pedagogy has rarely been encompassed within the salutogenic perspective (Idan et al., 2022; Lindström & Eriksson, 2010). Moreover, there have been calls for studies that apply salutogenesis to fields beyond healthcare (Bauer et al., 2020; Eriksson, 2015). Against that background, we hypothesised that apprentices who manage to identify and use GRRs available to them develop a strong SOC that promotes learning and vocational competence. Further knowledge about the relationship between GRRs and SOC could help teachers and supervisors to provide coherent VET characterised by comprehensibility, manageability and meaningfulness. Therefore, in our study, we sought to answer the following research question: Which GRRs contribute to SOC among apprentices in work-based learning?

2 Methods

Adopting a qualitative approach centred on interviews, in our study we followed Tjora's (2021) stepwise deductive–inductive method to generate and analyse data. The method has six steps: (1) Empirical data generation, (2) raw data processing, (3) empirical coding, (4) code grouping, (5) concept and main topic development and (6) theory development. Each step features an inductive upward process that involves checking empirical data against theory and a downward process that involves checking theory against empirical data.

2.1 Data Generation

In the early spring of 2020, the first author sent an email to vocational teachers at nearby vocational schools to request participants for our study. To be recruited, students had to be participating in basic vocational training and have an apprenticeship contract. Beyond that, the sample was formed in consideration of its representativeness of diverse vocational schools, various vocational programmes, and gender. Overall, we aimed to explore the experience of an ordinary group of young VET students in a variety in programmes and schools. Although our study design does not permit the generalisation of our findings, we wanted to explore GRRs in a breadth of VET programmes and school affiliations in a population of students.

Ultimately, 12 students participated in semi-structured interviews conducted in the late spring of 2020 (Hanssen et al., 2022). Two years later, from January to August 2022, a second round of interviews was conducted with 11 of the 12 participants. By that time, the students were in the final semester of their apprenticeship period at different companies. Those 11 apprentices thus provided the data analysed in our study. They came from nine professions in three sectors: Health, service and technology. An overview of the research participants is described in table 1. Eight of the second-round interviews were conducted in person at the apprentices' workplace or former school or else digitally using Microsoft Teams due to geographical distance. Audio-recorded and lasting 35–47 minutes, the interviews were carefully developed based on two core concepts: SOC and GRRs. The wording of questions during the interviews was also adapted to learning in a VET context. The questions addressed the participants' experiences as apprentices in terms of their motivation, coping and learning in VET. They were also asked about which internal and external resources they considered to be important in acquiring vocational competence. Along those lines, they were specifically encouraged to discuss their experiences when they found the training to be comprehensible, manageable and meaningful. Due to time limits imposed by their workplaces, however, three apprentices provided written responses to the questions; nevertheless, generating written qualitative data via email interviews can work well if the participants are engaged in the topic and give detailed answers to open questions (Tjora, 2021).

The 11 apprentices were again contacted in the autumn of 2022. At that time, they were asked to report whether or not they had completed trade certification and become skilled workers within the standard timeframe.

Table 1: Description of the Research Participants

School	Upper secondary level 1	Upper secondary level 2	Designation	Gender	Age (in years) at second interview	Interview code
School 1	Restaurant and food processing	Cookery and waiting	Cook	Man	20	A-1
	Restaurant and food processing	Cookery and waiting	Cook	Man	20	A-2
	Sales, service, and tourism	Sales and tourism	Salesperson	Man	20	A-3
	Sales, service, and tourism	Service, safety, and administration	Office and administration worker	Woman	20	A-4
School 2	Healthcare and childhood and youth development	Health work	Health worker	Woman	25	A-5
	Electrical engineering and computer technology	Electrical power	Electrician	Man	20	A-6
	Electrical engineering and computer technology	Electrical power	Electrician	Man	20	A-7
	Electrical engineering and computer technology	Electrical power	Power-supply fitter	Man	21	A-8
School 3	Technological and industrial production	Motor vehicles	Heavy vehicles mechanic	Man	21	A-9
	Technological and industrial production	Motor vehicles	Light vehicles mechanic	Woman	22	A-10
School 4	Building and construction	Construction techniques	Carpenter	Man	20	A-11

2.2 Analysis

To process the raw data, we listened to the audio files several times, transcribed them verbatim and translated the transcripts into English. For empirical coding, the transcripts were read sentence by sentence and coded by making marks in the margins, which provided a

guide while identifying statements in the apprentices' stories that could be described as GRRs that promote SOC. The codes were formulated as both words and phrases and described the apprentices' thoughts, feelings and experiences in VET. The codes were also related to their everyday practice, including "understanding", "finding solutions" and "thinking self". In grouping codes, we compared the codes to determine whether the meaningful content could be grouped into fewer codes for further categorisation and deductively compared with the theory of GRRs and SOC. For example, the three abovementioned codes were categorised as a GRR labelled "solution-oriented", whereas the codes "being spontaneous", "meeting new people" and "adapting" were labelled as "flexible". As we progressed from inductive to abductive analysis, the core concept of GRR became increasingly prominent. Afterwards, the code groups were re-examined to determine which ones could be categorised as internal and external GRRs based on their meaning. Overall, 37 code groups representing the major internal GRRs were reduced to 10, while the 12 representing external GRRs were reduced to 6. In developing the concepts and main topic, the latter, formed based on the code groups and the study's theoretical perspective, was determined to be "GRRs that support apprentices in work-based learning". To consolidate our work, we developed a model (Figure 1), which brought us closer to achieving Step 6—that is, developing theory from a future-oriented perspective.

2.3 Ethical Considerations

Approval for processing the students' personal data was obtained from the Norwegian Centre for Research Data (NSD; Ref. No. 715305). All participating students provided their informed consent after receiving written information about the study's purpose and being told that they could withdraw from the study at any time, that their names would be anonymised and that the researchers would ensure confidentiality. The audio files and transcribed interviews have been stored in compliance with the NSD's guidelines.

3 Findings

This section reports the findings of our analysis. The findings are summarised in Figure 1 to illustrate the relationship between the GRRs and the three components of SOC.

3.1 Internal GRRs

In this part we will present the key internal GRRs that emerged from the data.

3.1.1 Professional Interest

All of the apprentices said that being interested in the chosen profession was crucial for their desire to put forth effort in the short and long term. Professional interest promotes the joy of learning and engagement and is thus an essential GRR for promoting the meaningfulness component of SOC, which is linked to motivation. For example, the apprentice light vehicles mechanic stated: "If you like the thing that you'e started, then you'll learn"(A-10), while the apprentice electrician said, "It has an impact on motivation, having found what you want to do" (A-7). All apprentices, except the one working with heavy vehicles, applied to upper secondary school based on their interest in a specific field. By contrast, the apprentice heavy vehicle mechanic, who underwent two years of general education before choosing a vocational track, stated that his motivation for learning increased when he became interested in mechanical subjects. Professional interest was also mentioned as arousing a curiosity for knowledge. As the apprentice health worker indicated: "I'm going to be a health worker, so I want to learn everything" (A-5).

3.1.2 Utilitarian Value

Viewing their tasks from a future-oriented perspective increased apprentices' desire to learn and their joy of learning. They also identified learning as useful, even at the moment. When asked what brings meaning in VET, the apprentice power-supply fitter stated: "Right now, there's more than finishing tasks. From a longer-term perspective, it's to get the certificate of apprenticeship and then get a position in the company" (A-8). Some apprentices found working with the competence goals set by the curriculum to be useful for their motivation to learn, which is important for experiencing meaning from a future-oriented perspective. The apprentice office and administration worker said: "It's important that the competence goals have been covered so that I'm prepared for the trade examination. It's also important for my further education" (A-4).

Assisting others provided meaningfulness and a sense of usefulness, for the apprentices stated that caring for others and helping people with practical tasks was motivating. For example, the apprentice health worker said: "I like to help older adults or people who need help; that has motivated me" (A-5). Even for those in technological subjects that do not involve human encounters in their primary tasks, meaning was found from helping others. The apprentice light vehicle mechanic displayed that sentiment:

> At work, it's so meaningful to fix a car because there are others who need my help. It's always fun to help people. I see that clearly. On my own car, I do nothing because I'm the only one who will drive it. It's a lot more fun when I can assist others (A-10).

3.1.3 Professional Pride

Most apprentices appeared to have high morale at work and were proud of their choice of profession. The apprentice power-supply fitter said: "Be happy with what you're assembling and don't rush through the work to get it done quickly. Take your time to get the best out of it. There's pride in being professionally good" (A-8). Being ambitious was also a characteristic of other apprentices. One of the apprentice cooks stated: "I hate failing. So, when I see things being served that don't look good, I get annoyed and dissatisfied. I hate it. I want to do a good job" (A-1). Thus, thoroughness and accuracy were emphasised by the apprentices in several professions and are thus important GRRs in promoting the SOC components of manageability and meaningfulness.

3.1.4 Work Capacity

Being able to handle work- and time-related stress was identified as not only a central skill in VET and professional life but also an important GRR for promoting manageability. The apprentice power-supply fitter discussed deadlines in relation to contracts, the apprentice electrician discussed overtime when the company had deadlines, the apprentice cooks discussed long workdays due to shift work, and the apprentice health worker mentioned extra night shifts due to illness among other staff. Maintaining a sense of calmness in such demanding situations is challenging, and the apprentices indeed described complex learning situations in which many processes were occurring all at once. One of the apprentice cooks compared his apprenticeship period to his experience with military service and described how demanding the training could be. He sometimes experienced more stress than he could handle: "The workdays were extremely long and hard, with a lot going on. There was a lot of stress. Woefully high standards were set, and I was unable to meet them" (A-2).

Nevertheless, pressure at work was described as being both negative as well as positive. Some apprentices wanted to have a tighter schedule and a lot of work because quiet days made them lethargic. Working efficiently supplied them with a good feeling later on and a sense of mastery. The apprentice cook mentioned above described the feeling: "I'm glad that I feel that kind of stress and that kind of workload. I know how much chaos there can be when you have several different things happening at the same time" (A-2). The apprentice carpenter also underscored the importance of having a high capacity for physical labour in order to handle the workdays: "I'm quite happy working with my body; it's important to becoming physical strong" (A-11). Mobilising the body for action in physically demanding occupations thus requires good physical health.

3.1.5 Willpower

The apprentices considered having courage and a whatever-it-takes attitude, even when training was perceived as a challenge, to be an important GRR for managing VET. Past struggles with motivation and mastery were not regarded as obstacles to success. Several apprentices shared stories about their growth from being the least motivated in school to being among the brightest in their classes. Learning through practice at both school and companies was described as an indication of their willingness to work hard and master the challenges that they had previously faced.

The apprentice office and administration worker discussed the importance of repeatedly giving oral presentations on vocational subjects in upper secondary school. Despite finding them to be a challenge, she gave several presentations: "That created a drive and a desire to learn" (A-4). Similarly, the apprentice electrician was discouraged from pursuing a career as an electrician by his middle school counsellor but was driven by a will to prove that he could succeed.

3.1.6 Flexibility

The apprentices described having to constantly adapt and demonstrate flexibility. Some discussed how they have needed to relate to different people (e.g., colleagues, customers, patients and relatives) during the workday, while others had to move between places, depending on their work assignment, and still others had various work hours (e.g., shift work and overtime). The apprentice power-supply fitter, who works in the construction industry, stated the following:

> You have to be spontaneous because you never know where you're going. I've been called many times on Sundays. I have no idea where to go on Monday morning. You have to like going to new places, meeting new people and such (A-8).

Flexibility is thus an important GRR for handling the unforeseen work environments that apprentices encounter. Although the apprentices had supervisors who oversaw their training, they also had different colleagues who acted as supervisors, performed tasks and guided the apprentices in different ways. As one apprentice cook said: "You have to learn to work differently based on whom you're working with. I think that that's a good thing because then I learn more ways to do one thing—a broader perspective" (A-1). Adaptability in relation to how one relates to different supervisors is therefore also an important GRR that strengthens the manageability component of SOC.

3.1.7 Social Competence

Interacting with people and communicating with colleagues, managers, supervisors, customers, patients and relatives were considered to be central requirements for understanding and managing VET and future careers. Our analysis revealed that communication skills are an important GRR in all professions and comprise both informal and professional skills. According to the apprentice electrician, being able to talk to customers has been a central part of the services that he has performed in other people's homes. Furthermore, the apprentices appeared to use social competence and communication skills when dealing with stressful situations. The apprentice electrician found it to be particularly stressful when customers watched him work over his shoulder. To avoid feeling monitored, he engaged in "small talk" to shift the customer's focus. Meanwhile, the apprentice health worker reported having to have relatively difficult conversations:

> For example, if someone dies at a nursing home, I find it difficult if relatives come to visit. It's hard because we're not allowed to tell them that their loved one has passed because it's the next of kin who has to inform the family (A-5).

Collaboration in life at work occurs at the personal and professional levels. The apprentice health worker, cook and office and administration workers were trained in that skill during their vocational education, whereas those in technological fields were not. For example, the electrician apprentice stated: "We [my classmates and I] didn't work as a team at school; we each got our own station where we did our installations. (…) Since I started as an apprentice, I've experienced that working in teams and collaborating are central" (A-6).

Companies have different cultures with formal and informal norms for apprentices. As a case in point, the apprentice heavy vehicle mechanic described the use of jargon among employees: "When you start as an apprentice, everything is new; you have to retreat slightly and get to know the culture and create experiences" (A-9). He added, "Finding your place and being recognised in the corporate culture is important to thrive" (A-9). Social competence in the form of communication skills and understanding the corporate culture seem to be important GRRs that promote the SOC components of comprehensibility and manageability.

3.1.8 Being Guidable

The apprentices also considered being able to accept supervision as an important GRR for increasing vocational competence. Being aware of one's own competence and having the courage to ask for help when needed are crucial to learning, for they affect the SOC components of comprehensibility and manageability. For instance, the apprentice electrician stated: "If I don't have a leg up on what I'm doing, then I'll call all kinds of colleagues whom I know,

those who know the most and those who probably did it before"(A-6). Constructive criticism was also considered to be important. When asked about experiences with positive feedback, the apprentice office and administration worker stated the following:

> It's important, but constructive criticism is also important. Once, I gave a presentation to someone from the communication department. Afterwards, she told me how I could improve my presentation, and it helped a lot. I think that it's nice to get constructive criticism. I'm very receptive to that as long as it makes me better at my job (A-4).

3.1.9 Reflexivity

While the apprentices considered practice to be the most important aspect of becoming a skilled worker, they also emphasised the importance of theoretical knowledge. The apprentice cooks relied on theoretical knowledge to offer healthy meals in consideration of nutritional and potential allergic reactions. Meanwhile, the apprentice light vehicle mechanic used theory to understand elements that are not visible:

> If you have a theory in mind and discover a leak in the engine, then you start thinking, *What is this? Where is the leak coming from? What could be causing the leak?* Then, you need theory. Not everything in an engine is visible, so you have theory to tell you what's going on inside (A-10).

The ability to implement theory in practice and to transfer knowledge appeared to be related to the awareness and application of experience via reflexive processes. For example, the apprentice heavy vehicle mechanic said:

> I have experience from the past that I can compile together to create knowledge, maybe not knowledge exactly relevant to the area of the job I'm going to do, but I have experience with something relevant that I can somehow compile together (A-9).

Cognitively and practically, reflecting on experience was considered to be crucial for developing vocational competence and is thus an important GRR for strengthening the SOC component of comprehensibility. Experience with practical training strengthened the apprentices' handiness, a skill that several mentioned as an important GRR for their development of competence. One of the apprentice cooks said:

> You get the job with your hands; you learn motor skills using your body instead of sitting and reading a book. I've been told that you can read as many books as you want, but you can never learn the technique by reading. By actually implementing the technique, you learn it. Then, you manage to do it faster and better every time you do it (A-2).

3.1.10 Solution Oriented

A significant part of everyday work in VET involves problem-solving. The apprentice power-supply fitter stated, "You have to find solutions all of the time. There's always something to devise, and that's quite fun". When under time pressure or lacking equipment, the apprentices found it important to be able to improvise by rethinking situations and considering new responses, and such creative problem-solving requires both cognitive understanding and practical creativity in performing work. All of the apprentices also considered being responsible and working independently to be important GRRs for learning by developing the SOC component of comprehensibility. Their understanding increased when they were challenged to solve tasks on their own, as represented by what the apprentice heavy vehicle mechanic stated:

> For example, if you're alone at work on Saturday and you don't have anyone to help you with two-person work, then you just have to do it [yourself]. For that, you have to be solution oriented. Being solution-oriented is really the most important skill to have (A-9).

3.2 External GRRs

In this part we will present the key external GRRs that emerged from the data.

3.2.1 Various Supports

Support from others when facing professional challenges was considered to be a central GRR for understanding and coping and thus affects the SOC components of comprehensibility and manageability. Such support includes guidance in professional work as well as mental and social support. The apprentices referred to bosses, supervisors, colleagues, employees in training offices, other apprentices, former teachers and peers as people who can provide support. An apprentice cook said: "I'd say that I've had excellent vocational teachers in school, and I'm working with very good chefs now. It's important to have supporters around me who can help me with what I need" (A-1). With respect to mental and social support, interest and supportive feedback from family and friends were important motivating factors in continuing education. For example, the apprentice electrician said: "A lot of what's been important to me is the support that I get in private. The fact that family and friends show interest in what I do and that I get support to follow my own path is particularly vital" (A-7).

3.2.2 Digital and Material Aids

Currently, in most vocations, digital and material aids are central GRRs for understanding and mastering a professional practice. All participants in our study reported using digital training books during their apprenticeship as a means to work towards achieving the competence goals in the curriculum and diverse artefacts. Ones in the technological professions described using various wiring diagrams, applications and assembly instructions. Digital and martial aids are therefore necessary GRRs that promote the SOC components of comprehensibility and manageability. The apprentice light vehicle mechanic shared the following experience from a training course:

> Although they [the supervisors] offered an explanation, you're trying to think about what's going to be done and what it looks like, but you don't really have a clue. When the car app is used, a concept becomes much easier to understand. You can see what it looks like. So, the app is an important tool (A-10).

The apprentice health workers and cooks also identified digital online resources, including the National Digital Learning Arena, textbooks, procedures, manuals and the encyclopaedia, as necessary tools. Access to materials and updated equipment, including proper workwear, tools and good-quality raw materials, was also considered to be important for doing a good job.

3.2.3 Work Community

The apprentices additionally emphasised the importance of good work communities, which include safe, positive school and work environments, as well as academic environments in which they can learn from experienced colleagues. The work community is a GRR that seems to affect all three components of SOC and can be related to both daily tasks and official as well as unofficial meetings involving evaluation and planning. For young apprentices living away from family and friends, it is important that such communities extend support beyond work hours. Common professional interests can lead to long-lasting friendships and life situations. Furthermore, interactions with older, more experienced colleagues allow apprentices to learn quickly and socialise better. For example, one of the apprentice cooks highlighted, "If we're done with what we have to do early, then we try to figure out what we can do together in the afternoon. We've also developed good bonds outside the kitchen" (A-2).

3.2.4 Professional Role Models

Professional role models can demonstrate or explain new topics to apprentices. Although the apprentices in our study were aware that tasks could be solved in different ways, they wanted explanations for how to perform new tasks. For example, the apprentice health worker had wanted a demonstration on how to replace wound bandages on patients. Skilled colleagues who are knowledgeable and possess a high degree of professional pride can provide inspiration for learning and professional development. Professional role models are therefore a GRR who promote the SOC components of comprehensibility and meaningfulness. The apprentice heavy vehicle mechanic stated the following:

> Those who know are skilled in their profession; I find that inspiring. The person who is really good at what they are doing, someone everyone in this company knows and the person you go to whenever you have questions: I want to be that person (A-9).

3.2.5 Network and Competence Gained From VET

Although the curriculum's competence objectives govern the professional vocational competencies that the apprentices seek to develop, schools and companies also have their own interpretations of those competencies. Vocational competencies are linked not only to individual coping levels but also to what is prioritised in vocational education, which can influence the SOC components of comprehensibility and manageability. One of the apprentice cooks said, "I've noticed since becoming a second-year apprentice that the first-year apprentices and I have received different forms of schooling. Things I can do and am sure of, they don't understand, and vice versa" (A-1). That apprentice's company was decisive about the work tasks given to apprentices. Meanwhile, the apprentice electrician considered being employed in a small local business as being central to developing broad competence. By contrast, the apprentice power-supply fitter, who was working in a massive national company, said that larger companies offer diverse possibilities and opportunities. By working closely with other teams, apprentices developed interdisciplinary competence and networks.

3.2.6 Upbringing Environment

Vocational experiences while growing up were considered to be beneficial in fostering the apprentices' vocational interest. The apprentice light vehicle mechanic recalled how spending time at her family's car repair shop had piqued her interest in mechanics, whereas both apprentice cooks discussed how various dining experiences during childhood had sparked their passion for food. Meanwhile, the apprentice salesperson emphasised that his family had been important in developing his competence: "I grew up in a family that has worked in a

shop. I have learned a lot about the sales profession from them and their employees" (A-3). The apprentice power-supply fitter discussed how practical skills were recognised during his upbringing: "I always screwed around with everything when I was a kid. During my adolescence, my buddies and I screwed around on mopeds. This fellowship has been important for me. Today, all of us are going for a practical profession" (A-8). Thus, an upbringing environment where children and adults participate in practical occupational tasks and are recognised for them can influence comprehensibility, manageability and meaningfulness in VET.

Last, we found a close relationship between apprentices' internal and external GRRs, all of which were identified inductively during analysis. Figure 1 depicts the dynamic relationship between the 10 internal (i.e., inner circle) and 6 external GRRs (i.e., outer circle) and the 3 components of SOC (i.e., middle circle). In addition, the code groups in the inner and outer circles are presented in bold, while the dotted lines in the middle indicate the flow between the apprentices' GRRs and the three components of SOC. The main theme "GRRs that promote apprentices' SOC in VET" is reflected in the text of the figure.

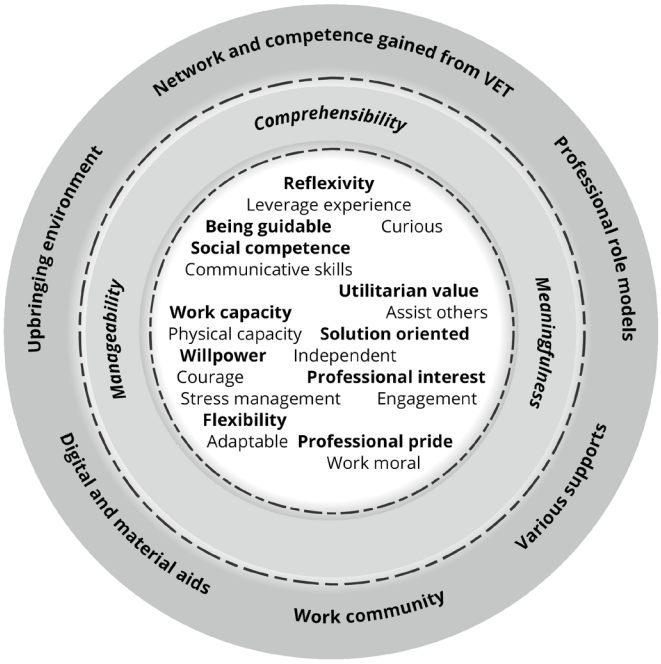

Figure 1: The Dynamic Relationship Between Internal and External GRRs That Promote SOC Among Apprentices in Work-Based Learning (own compliation)

4 Discussion

Following Antonovsky's (1979) salutogenic theory that GRRs are foundational in the development of a strong SOC, in our study we explored VET students' GRRs and SOC in relation to work-based learning. From the salutogenic perspective, learning is a health-promoting process (Nilsson & Lindström, 1998), and organisational learning in particular can increase individuals' capacity for action by augmenting their knowledge and understanding (Vaandrager & Koelen, 2013). The following subsection illustrates how the GRRs that we identified, whether emotional, physical, social, cognitive or material in nature (Antonovsky, 1979), may have contributed to the participating apprentices' SOC and development of competence. The relationships between the various GRRs and the components of SOC in the context of vocational learning are also addressed.

4.1 Importance of Internal GRRs in Relation to SOC in VET

This study shows that apprentices who identify emotional resources find meaning in VET. Identifying the utilitarian value of learning is one of the emotional resources highly associated with finding joy in learning. Previous studies involving VET students have shown that both intrinsic motivation and identification of the utilitarian promote the perceived meaningfulness of studying both common core and vocational subjects (Hanssen et al., 2022; Utvær, 2014). Moreover, professional interest, another central GRR that inspires joy in learning and academic engagement, can drive motivation and increase the SOC component of meaningfulness. Such interest is thus important in creating meaning, even if the goal is not imminent or visible.

Assisting others also creates meaning, as is well-known among health professionals, for whom the opportunity to provide care is considered to be a motivational resource (Nilsson et al., 2012). By extension, our study's apprentices, even if in technological industries, perceived the value of helping others, including the apprentice light vehicle mechanic who found joy in repairing customers' cars. Thus, assisting others beyond providing care and nursing creates meaning. Another emotional GRR identified is professional pride. Most of the apprentices expressed pride in their vocational choices as well as the intention to perform well at their jobs and succeed instead of getting frustrated and dissatisfied, as was reflected in their strong work ethic, appreciation of accuracy and ambitions. Those findings align with what Nilsson et al. (2012) have pointed out: that being satisfied with one's work and having professional pride are important resources for finding meaningfulness in one's job. That component of SOC seems to be strongly associated with the apprentices' emotional GRRs, and Antonovsky (1987) indeed linked the component to such GRRs.

The apprentices also reported regularly having to manage stress and pressure resulting from long workdays and deadlines. To that end, having a high capacity for work seems to be a central physical and cognitive GRR at work in order to meet the demands of the job. At the same time, a high work capacity can also be regarded as an emotional GRR, for handling tight timelines and schedules and completing jobs were found to give the apprentices a feeling of the manageability of their work. According to Antonovsky (1979, 1987), the ability to manage stress is the core element in developing a strong SOC and helps to moderate and even prevent stress in school (Torsheim et al., 2001) and at work (Holmberg et al., 2004; Olsson et al., 2009).

Along with work capacity, willpower was also identified as a GRR, for the apprentices considered having courage and a whatever-it-takes attitude to be important. The GRR of willpower involves not quitting despite difficulties, an attitude that can be both a cognitive and an emotional resource. For example, one of the apprentice electricians was driven by a strong will to achieve his long-term goals, both to succeed and to exceed his middle school counsellor's expectations. Meanwhile, the apprentice office and administration worker who had worked to develop more confidence in their oral presentation skills said doing so had "created a drive and a desire to learn"(A-4). Therefore, a commitment to training fostered by willpower is a key GRR that promotes manageability.

Other GRRs related to manageability that we identified include flexibility, spontaneity and adaptability. Those skills are related to the management of people, tasks, time schedules and work processes, among other things. Past studies have indicated that flexibility is indeed important in promoting manageability (Antonovsky, 1979; Eriksson, 2015; Nilsson et al., 2012), because it allows people to choose strategies to solve problems that give them stress (Antonovsky, 1979), including the unpredictable workdays that apprentices often encounter. Being flexible and adaptable are thus important resources for getting the job done and facing a constantly evolving professional life (Dede, 2010).

We also identified social competence and communication skills as other central GRRs, ones that the apprentices considered to be important in all professions. Similar to the GRR of assisting others, those skills are common in health and service industries; even so, apprentices in technological professions also emphasised the importance of communication skills for their success and social skills for stress management. For example, an apprentice electrician engaged in small talk as a means to deal with customers in stressful working situations, a tactic also used by the apprentice heavy vehicle mechanic who respected different cultures and norms by being aware of and behaving respectfully during interactions with colleagues. If employees have common values, a distinct group identity and clear normative expectations, then the atmosphere at work can be characterised by internal coherence, established by way of common symbols and a common language (Antonovsky, 1987). Those examples

corroborate the findings of Eriksson (2015), who identified flexibility and social skills as important GRRs for coping with unpredictability and countering stress.

Another GRR important for learning and developing competence in VET is the ability to take guidance. Being aware of one's own strengths and limitations makes it easier to ask questions and reflect on advice from supervisors and colleagues. In promoting both comprehensibility and manageability taking guidance is a cognitive and social GRR. The apprentice office worker, for instance, considered constructive criticism central to her development. Because having the courage to acknowledge a lack of competence when performing certain work tasks requires self-confidence, being guidable can also be characterised as an emotional GRR. According to Eriksson (2015), self-esteem, a concept similar to self-confidence, ranks among the most central GRRs, for believing in one's resources can enable a person to handle challenges in life. Beyond that, being responsive to guidance can positively impact whether VET students continue their education and avoid dropping out when they face educational difficulties (Aarkrog et al., 2018).

The core of learning a vocation is understanding the connection between theory and practice (Aarkrog & Wahlgren, 2022; Sappa et al., 2016). Although the apprentices considered practice to be the most important facet of becoming skilled workers, they were also conscious of the importance of theoretical knowledge. According to Antonovsky (1987), people rarely experience a high degree of manageability and meaningfulness combined with a low degree of comprehensibility. In our study, the apprentices did not always need to understand in order to learn, for they found it possible to learn techniques and perfect practical skills during training. For example, an apprentice cook said: "You get the job with your hands; you learn motor skills using your body instead of sitting and reading a book" (A-2). Nevertheless, professional skilled workers also have to leverage their experience, be able to transfer knowledge in work situations and be innovative in meeting the demands and expectations in their professional lives. Integrating theory and practice, the cognitive dimension and reflectivity is important for comprehension (Nilsson et al., 2012).

Last, we identified the importance of being solution-oriented, which the apprentice heavy vehicle mechanic stated was the most vital resource in VET. Being solution-oriented requires apprentices to have a high degree of autonomy and independence, which can be characterised as physical, emotional and cognitive GRRs that affect all three components of SOC.

4.2 Importance of External GRRs in Relation to SOC in VET

We identified internal GRRs by exploring the resources used by individual apprentices in our sample. Learning not only involves individual processes but also occurs during interactions with others (Antonovsky, 1979, 1987), as we describe in what follows by elucidating the external GRRs identified among the apprentices.

In most cases, external GRRs affected multiple components of SOC, and the relational GRR of experiencing a variety of support proved to be central. As an apprentice cook pointed out, the availability of people who can provide support is important during workdays: "It's important to have supporters around me who can help me with what I need" (A-1). Beyond that, receiving explanations from others helps to increase comprehensibility (Antonovsky, 1987).

At the same time, though apprentices indeed need support to understand and master their tasks, family and friends are also important motivating factors in whether and, if so, then when and how they complete their education. Per our findings, having various forms of support is an important GRR that affects all three components of SOC.

Being part of a work community is another essential GRR in learning and developing vocational competence, one that also provides a sense of being part of a community of practice. In vocational contexts, a *community of practice* is a developed community that represents a set of values, knowledge and skills (Lave & Wenger, 1991). Antonovsky (1987) pinpointed three important aspects of such communities: social relations, balance in the distribution of work tasks and the ability to participate in decision-making. Furthermore, having good role models who are proud of their profession promotes meaning and influences apprentices' professional pride, an internal GRR. Thus, a work community with inspiring role models promotes positive emotions, including a desire to learn and commit (i.e., motivation and meaning). Along those lines, past studies have shown that former teachers who serve as role models are important in the development of SOC among students (Nilsson & Lindström, 1998).

Networks, including those maintained from school-based learning in VET, are also valuable resources. For example, the power-supply fitter apprentice had accepted help from both former classmates and teachers when needed. Added to that, artefacts—the participants mentioned computers, wiring diagrams, proper workwear and good raw materials—were considered to be important GRRs for understanding and performing different tasks. The annual apprenticeship survey revealed that the apprentices considered updated equipment and tools in VET to be important for further learning and the development of competence in their respective companies. Having updated equipment and tools in schools, as well as VET teachers with insight into what is expected of them during an apprenticeship, fosters the comprehensibility of the curriculum and prepares apprentices for the trade examination (Utvær & Wendelborg, 2020). Thus, having artefacts in school- and work-based learning seems to create coherence. By contrast, the absence of certain GRRs, including a lack of relevant equipment, can become a stressor (Antonovsky, 1979).

Last, experiences during one's upbringing are also important GRRs. The competencies and professional support that the apprentices received while growing up were found to be strongly connected to their chosen professions or to strengthen their professional interests and skills. Thus, GRRs can be established based on preferences shaped by life experiences,

which in turn foster a strong SOC (Antonovsky, 1987). Beyond that, being recognised by the social circle of one's vocation promotes a good feeling, which in turn improves motivation, willpower, professional pride and the sense of meaningfulness. GRRs indeed arise from environmental conditions and early childhood rearing and socialisation experiences, in addition to idiosyncratic factors and chance. By identifying and using GRRs, individuals can influence the impacts of stressors (Antonovsky, 1979; Eriksson & Lindström, 2006).

5 Conclusions

Overall, we found that apprentices' internal GRRs include motivation, attitudes and values, mental and physical capacity as well as social, theoretical and practical skills, whereas external GRRs include personal and professional relationships, the learning environment and culture in schools and companies, materials and equipment and the environment of one's upbringing. Many of the GRRs identified are emotional in nature, which aligns with Antonovsky's description of the emotional dimension as central to dealing with stressors and demands and developing a strong SOC. In fact, each GRR that we identified affected one, two or all three components of SOC. Furthermore, the apprentices managed to identify resources quite well, even if some did so subconsciously. They had also deployed internal GRRs to make use of external GRRs, and vice versa, and the identification and exploitation of GRRs were both individually and socially conditional. Mere access to those resources is insufficient, however, for people have to be able to identify those resources in themselves or in their surroundings and apply them in ways that promote learning and competence in VET. Therefore, it is important for teachers and supervisors in companies to support VET students in identifying GRRs and thereby promote their SOC and work-based learning.

Strengths and Limitations

Empirical research on GRRs in the context of VET has rarely been conducted. Against that trend, we sought to expand upon such limited research by exploring internal and external GRRs among apprentices. The GRRs that we identified following interviews with the participating apprentices contributed to their trade certification based on their experiences with their work's comprehensibility, manageability and meaningfulness, which underpins the supportive role of the GRRs learning.

Even so, our findings have some limitations. First, we have both worked in VET, which might have affected our preconceptions and thus our results, even if we sought to remain cognizant of that fact. Second, from a methodological standpoint, three of the participants wanted to answer the questions in writing, which prevented us from asking them to elaborate on answers and/or to confirm or deny any interpretations. Third, our list of internal and external GRRs is not exhaustive, for our study was an initial exploration of such

resources in relation to apprentices' learning in VET. Fourth, although VET consists of many programmes for a variety of professions, our sample included a limited number of apprentices and professions. Moreover, all apprentices were 20–25 years old, and their experiences with and perceptions of GRRs likely contrast with those of older students. For example, peers can be more important for younger students, whereas a stable economy can be more important for older ones. Age may have indeed influenced the findings shown in Figure 1. Fifth and finally, Antonovsky's questionnaires were not integrated into our semi-structured interview guide; nevertheless, the guide was carefully developed based on two core concepts—SOC and GRRs—and the wording was adapted for learning in a VET context.

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