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Self-Regulated Learning Skills in Vocational Students Based on Their Self-Evaluation

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Abstract

Context: The importance of both self-regulated and self-directed learners has been emphasised in lifelong learning. However, in theory, self-regulated learning (SRL) serves as a basis for becoming a self-directed learner. Therefore, SRL (which includes certain skills) needs to be developed in vocational education and training alongside specialist training in order to meet the demands of the labour market, where employees should be capable of continuous learning. Previous studies based on the experiences of vocational teachers, and mainly focusing on adolescent students, have highlighted that many vocational students have low levels of SRL skills. However, there is a lack of research exploring student perspectives on their own SRL skills. It is unclear what factors influence their SRL and what support they need for developing SRL. The aim of this article is to analyse and describe the differences in the SRL skills of vocational students based on their self-evaluation and the factors related to their SRL.

Methods: The author conducted diverse quantitative analyses of the responses of 244 students to achieve the research aim. First, a factor analysis was performed on the five skill areas of SRL, followed by a K-means cluster analysis based on SRL skills factors. Then SRL clusters of students were analysed according to the students' socio-demographic factors, learning difficulties, and other learning factors using cross-tabulation and variance analysis.

Findings: From an SRL perspective, the most important factors in distinguishing and characterising the clusters of students were the skills related to plan management and organisation.

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On this basis, the study identified three clusters, consisting of students with: 1) Difficulties in organisation and behaviour (30%), 2) difficulties in planning and time management (20%), and 3) good and balanced SRL skills (50%).

Conclusion: Overall, the study found that half of the students exhibited good SRL skills and these students encountered fewer learning difficulties. They also studied more through collaborative learning activities, received sufficient verbal feedback, and showed higher levels of motivation towards their schoolwork. However, the remaining students require additional support to improve their SRL skills.

Keywords: Vocational Education and Training, VET, Vocational Students, Self-Regulation, Self-Regulated Learning Skills

1 Introduction

In today's world of rapid transformation, including in the labour market, there is a demand for people who are independent, bold, creative, open to change and innovation, and able to adapt, make choices and move towards their goals (Bittner et al., 2022; Cedefop, 2023; Cosnefroy & Carré, 2014). People more frequently change occupations during their professional lives as some occupations disappear or undergo significant changes, and new occupations emerge (Bellini & Maestripieri, 2018). All of this underlines the importance of continuous or lifelong learning, and therefore the person's ability to learn, as well as the need for vocational education and training (VET) to develop learning skills alongside specialist training (Cedefop, 2023; Morris, 2019). Learning to learn is widely highlighted as a key competence at all levels of education, in everyday life, and in the world of work (Bittner et al., 2022). It is defined by the European Commission (2019) as "the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one's own learning and career" (p. 13). This includes an individual's self-awareness of their learning strategies and their competence development needs, as well the means and opportunities available to them (European Commission, 2019). However, in the context of learning to learn, the concept of self-directed (SDL) as well as self-regulated learning (SRL) has been emphasised. According to Knowles (1975, p. 18):

> *SDL is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.*

A self-directed learner is thus someone who takes responsibility for their own development and learning, as well as their learning choices, and consciously shapes their learning pathways

to acquire the knowledge, skills, and attitudes needed to achieve goals and cope with life in a changing environment (Jossberger et al., 2010; Pilling-Cormick & Garrison, 2007). However, these aspects are also at the heart of SRL (Zimmerman, 2002). Zimmerman has explained that SRL refers to the learning processes underlying a student's assumption of personal responsibility for their own learning, with or without teacher support (Saks & Leijen, 2014). This involves the use of cognitive strategies, such as goal setting, planning, monitoring, evaluating, and reflecting on one's learning progress (American Psychological Association [APA], 2015; Dawson & Guare, 2010; Pintrich, 2000). Furthermore, the timing of learning, good concentration, coping with learning difficulties and anxiety, and the motivation to learn and achieve goals are important factors in SRL (Krull, 2018; Zimmerman, 2002). Accordingly, self-regulated learners actively engage in the learning process, monitor their own learning, and adjust their strategies as needed to improve their performance (Zimmerman, 2002). Therefore, it is evident that SRL encompasses a range of skills that self-regulated learners apply during their learning process.

Therefore, both SDL and SRL emphasise learners who take an active role in their learning and have the ability to learn. However, it has been argued that SDL is a concept in adult education and SRL is a concept in educational psychology, and that the two are widely used as synonyms (Cosnefroy & Carré, 2014; Jossberger et al., 2010; Pilling-Cormick & Garrison, 2007; Saks & Leijen, 2014). Nevertheless, Jossberger et al. (2010) highlight the difference at macro and micro levels. SDL generally refers to a learning trajectory as a whole at the macro level, under which learners have the freedom to choose their learning activities, while SRL at the micro level focuses deeply on the executive function of tasks (how learners monitor and control their own learning activities) to achieve more specific or short-term goals (Jossberger et al., 2010). They have stressed that "a first step in learning to self-direct one's learning is the skill to self-regulate learning activities and task performances, because the quality of performed tasks and activities will be input for future learning" (Jossberger et al., 2010, p. 419). Therefore, both skills are important for continued successful learning and the achievement high-quality outcomes in both professional and academic settings (Jossberger et al., 2010), but it is necessary to develop SRL skills first as the foundation to becoming a self-directed learner (Cosnefroy & Carré, 2014; Jossberger et al., 2010; Pilling-Cormick & Garrison, 2007). Zimmerman (2002) has stressed that self-regulated students view their futures optimistically and are able to influence their learning and achievement in the learning process.

Acknowledging the importance of SRL, this article focuses on SRL skills in vocational students. It is known that students with good SRL skills are able to learn effectively on their own and have better coping skills (Jossberger et al., 2010), and these aspects have also been emphasised in the expanding field of online learning (Bittner et al., 2022; Morris, 2019; Saks & Leijen, 2014), which also became important during the Covid-19 pandemic. For example, during the pandemic, teachers were unable to provide direct support to their students

and to create or ensure a suitable learning environment for them. Therefore, students had to self-regulate their learning and create the best learning environment for themselves at home. However, it has been recognised that if the learning environment is conducive, a more positive impact on learning outcomes, motivation to learn and focus on learning can be observed (Brachtl et al., 2023).

Previous studies have emphasised concerns regarding low levels of SRL among vocational students (de Bruijn & Leeman, 2011), a tendency that has mainly been noted in adolescent students (Boldrini et al., 2019; Sirk et al., 2016; van Middelkoop et al., 2017). Vocational teachers have experienced adolescent students displaying a decline in learning skills of (e.g., planning learning and time management, concentration on essential activities, and focusing attention), responsibility, commitment, sense of duty and motivation, and indifference to learning (e.g., Boldrini et al., 2019; Eiriksdottir & Rosvall, 2019; Sirk et al., 2016, 2019; van Middelkoop et al., 2017). Vocational teachers who teach more adult learners have the opposite, predominantly positive, experiences with their students. Adult students are mostly motivated (Eiriksdottir & Rosvall, 2019; Sirk et al., 2019), eager to learn, and self-managing learners who expect more in-depth explanations and assistance from teachers (Sirk et al., 2016).

Consequently, based on the experience of vocational teachers, it can be concluded that vocational students have different levels of SRL skills, which may depend on their sociodemographic factors. However, the lack of SRL in students indicates learning difficulties that can be overcome with support or intervention (Dawson & Guare, 2010). For example, these students need well-structured learning environments and materials, alongside guidance (de Bruijn & Leeman, 2011) and clear feedback (Hattie & Timperley, 2007). Similarly, research on students has shown that they prefer authentic learning tasks and guidance from teachers (Pylväs et al., 2022). However, due to a lack of motivation for learning among adolescents, some vocational teachers prioritise their role in motivating students and cultivating their interest in specialist training (Boldrini et al., 2019; Sirk et al., 2019). Furthermore, due to poor learning skills in students, some teachers continue to view themselves as knowledge transmitters, which requires them to apply teacher-centred or traditional methods (Sirk et al., 2016; Ümarik & Rekkor, 2013). At the same time, it has been emphasised as a concern that few teachers pay attention to teaching students to learn (Zimmerman, 2002).

In summary, previous studies have mainly focused on vocational teachers' experiences of student learning skills, but there are fewer studies that explore the students' own views of their learning and, more particularly, their SRL skills. In addition, these studies have indicated that vocational students have different levels of SRL skills, which may require differentiated support from vocational teachers to help develop these skills. Although it is not entirely clear how vocational students differ in terms of their SRL skills and what difficulties they face with these skills, or what factors may influence their SRL skills, Zimmerman (2002) has highlighted the significance of SRL as a crucial function in education for the development of

lifelong learning skills. Therefore, the aim of this article is to analyse and describe the differences in the SRL skills of vocational students based on their self-evaluation and the factors related to their SRL. To achieve the aim, the following research questions are posed:

- How do vocational students differ based on their evaluated SRL skills?
- How are vocational students' SRL skills related to socio-demographic factors?
- How are vocational students' SRL skills related to their own learning difficulties?
- Which learning factors (e.g., learning activities, feedback and motivation) are associated with vocational students' SRL skills?

2 Theoretical Framework

This chapter introduces the concepts of self-regulation and self-regulated learning. It then describes the development of self-regulated learning.

2.1 Self-Regulation and Self-Regulated Learning

Self-regulation belongs to social cognitive theory (Clark & Zimmerman, 2014; Zimmerman, 2000) and "refers to self-generated thoughts, feelings/emotions, and behaviours/actions that are planned to achieve goals" (Zimmerman, 2000, p. 14). Furthermore, self-regulation involves a triadic process in which an individual attempts to control personal (cognitive, affective, beliefs and ability), behavioural (actions and reactions) and environmental (social and physical) factors to reach an academic goal (Clark & Zimmerman, 2014; Zimmerman, 2000, 2013).

However, the treatment of the concept broadened in the 1990s including various specific aspects and the application of self-regulation constructs that depend on a specific context (Boekaerts et al., 2000). Consequently, the concept of self-regulated learning (SRL) has been used when studying self-regulation in education or academic learning and in the school environment (Boekaerts et al., 2000; Pintrich, 2000; Saks & Leijen, 2014). It is also highlighted that Zimmerman has used self-regulation as an umbrella term for SRL (Saks & Leijen, 2014) and similarly opened up these concepts (e.g., Clark & Zimmerman, 2014; Zimmerman, 2000, 2002, 2013) with the focus being on how students regulate their own learning (Zimmerman, 2002). Therefore, Zimmerman has stated that self-regulation in learning "is the self-directive process by which learners transform their mental abilities into academic skills. Learning is

viewed as an activity that students do for themselves in a proactive way" (Zimmerman, 2002, p. 65). In summary, Zimmerman (2013) has defined SRL "as the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning processes" (p. 137). In addition, Pintrich (2000) has drawn on several researchers in the field of SRL and defined it as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (p. 455). In this study, the focus is on vocational students' self-regulation in school-based learning, and therefore the concept of SRL will be used.

However, SRL requires a certain level of personal development such that the student is an active participant in learning and has the ability to identify their own learning goals and to use systematic motivational and cognitive-behavioural strategies to manipulate their environment in order to achieve those goals (Clark & Zimmerman, 2014; Pylväs et al., 2022; Zimmerman, 2002, 2013). Zimmerman (2013) has emphasised that "self-regulated learners use specific processes that transform their preexisting abilities into task related behavior in diverse areas of functioning" (p. 137). The self-regulated learner takes responsibility and initiative for their own learning (Pilling-Cormick & Garrison, 2007; Saks & Leijen, 2014). Students with high SRL recognise and control the impact of positive or negative environmental stimuli on their behaviour (Clark & Zimmerman, 2014) and are able to reject distractions in their environment (Zimmerman & Bandura, 1994).

Therefore, SRL includes different executive skills that are important in academic performance (Dawson & Guare, 2010; Jossberger et al., 2010; Strait et al., 2019). These SRL skills emerge in a variety of learning activities, such as goal setting, planning and directing activities, including task initiation and follow-through strategies, engaging memory, sustaining attention, monitoring performance, controlling impulses, managing time, and persisting in a goal-oriented direction (Dawson & Guare, 2010; Zimmerman, 2002, 2013). These SRL skills, which support and facilitate student learning (APA, 2015; Zimmerman, 2002), develop gradually and a clear progression is observed during the first two decades of life (Dawson & Guare, 2010).

Therefore, it can be argued that SRL skills form the basis of learning to learn (Zimmerman, 2002), which is an essential key competence (European Commission, 2019). Studies have underlined that a high level of SRL predicts academic success (Strait et al., 2019; Zimmerman, 2002). In VET, it is also pointed out that those students who are able to regulate their learning and thereby practice their skills consciously are expected to perform at higher levels (de Bruijn & Leeman, 2011; Jossberger et al., 2010), and secure higher incomes, better positions and greater job satisfaction (Bittner et al., 2022). However, a lack of SRL can result in learning difficulties, which can be overcome with support or intervention (Dawson & Guare, 2010) because SRL skills can be successfully taught and developed (APA, 2015; Strait

et al., 2019; Zimmerman, 2002) and this can have a significant impact on student motivation and achievement (Zimmerman, 2002).

SRL skills are identified in the following five skill areas: Plan management, time management, organisation, behaviour regulation and emotion regulation (Strait et al., 2019). These skill areas are closely related and sometimes difficult to distinguish (Dawson & Guare, 2010).

Plan management describes the student's ability to create an action plan to achieve a set of goals and/or to complete a task (Dawson & Guare, 2010). The student should be able to analyse the learning goals and task and decide what is important to focus on and what not (Dawson & Guare, 2010) and determine the steps of activities or strategies (Jossberger et al., 2010; Zimmerman, 2002, 2013). The following SRL skills best describe plan management: Planning or priority setting, sustained attention, flexibility (ability to change plans in response to obstacles, feedback, setbacks, new information, mistakes or changes), metacognition (self-monitoring or evaluating the process plan), and goal-directed persistence (Dawson & Guare, 2010; Strait et al., 2019). Goal-directed persistence is the student's capacity to have a purpose, to achieve the aim and not to be discouraged or distracted by other competing interests. Plan management emerges in task initiation, allowing the learner to begin a task without undue procrastination (Dawson & Guare, 2010).

Time management describes the student's ability to estimate how much time is needed to complete a task within a certain timeframe. This includes the student's understanding that time is an essential factor and knowing how to manage time and work within time constraints (Dawson & Guare, 2010). Time management includes SRL skills such as time management, task initiation, sustained attention, and working memory (Strait et al., 2019). These skills are evident in situations where students complete a task within the time set by their teacher. Sustained attention is essential here to deal with a situation or task in spite of distractions, fatigue or boredom (Dawson & Guare, 2010).

Organisation, including working memory, describes the student's ability to design and maintain systems for keeping track of information and materials (Dawson & Guare, 2010; Strait et al., 2019). This skill is demonstrated, for example, in the way that a student organises and finds their tools, keeps their learning space neat, retains information in their mind while performing complex tasks, and hands in homework assignments on time (Dawson & Guare, 2010).

Behaviour regulation, which includes the SRL skills of response inhibition and goal-directed persistence, describes the student's self-control as well as their ability to monitor their own actions (Strait et al., 2019; Zimmerman, 2002, 2013). This ability is demonstrated in situations where students first think (evaluate the situation) and then act according to the situation. For students who have difficulties with inhibition, it is also hard to maintain planning, attention and goal-directed persistence (Dawson & Guare, 2010). Moreover, Zimmerman (2002) has stated that it is important that students self-monitor their behaviour and reflect

on their effectiveness according to goal(s) because this is one aspect of enhancing their motivation to improve their SRL skills.

Emotion regulation describes the student's ability to manage their emotions for the purpose of achieving goals, completing tasks and controlling behaviour. This may be demonstrated if students ask for assistance when given tasks they find hard or frustrating (Dawson & Guare, 2010). For example, it is emphasised that self-regulated students ask for help from others to improve their learning (Zimmerman, 2002).

In conclusion, students with reasonable SRL skills can be described as independent learners that are motivated to learn (Zimmerman, 2002), able to structure their own learning process (Jossberger et al., 2010; Saks & Leijen, 2014), initiate and direct activities in order to acquire knowledge and skills based on their academic goals, and are engaged in learning that involves specific strategies (Pylväs et al., 2022; Zimmerman, 2013). However, it is possible to develop SRL skills (APA, 2015; Strait et al., 2019; Zimmerman, 2002), and this will be discussed further in the following chapter.

2.2 Development of Self-Regulated Learning

The development of SRL in students takes place in various ways (Jossberger et al., 2010; Zimmerman, 2002) but begins with active social guidance (Zimmerman, 2000, 2013) and the provision of structured tasks (van Grinsven & Tillema, 2006). These can be systematically reduced as the student acquires SRL skills (Zimmerman, 2013). SRL can be developed through clear instruction, modelling, support, and an organised learning environment (APA, 2015; Clark & Zimmerman, 2014; Zimmerman, 2002). In VET, the provision of guidance is primarily manifested through personalised assistance and support from a teacher or an experienced practitioner (Pylväs et al., 2022).

One approach to developing SRL is for the teacher to act as a role model by demonstrating how to learn a certain topic or skill. Subsequently, they should provide step-by-step guidance to students in managing the process more and more independently (Clark & Zimmerman, 2014). Teachers can also support students in developing SRL by guiding, asking and encouraging them to set their own clear goals for themselves, such as completing a certain number of smaller tasks to acquire a certain skill, then to plan strategies to achieve them, to implement and monitor their planned strategies, and then to self-evaluate or reflect on the process as well as the outcomes (Bittner et al., 2022; Dawson & Guare, 2010; Jossberger et al., 2010; Zimmerman, 2002). It has been reported that students who have done this have achieved better results and a greater sense of self-efficacy (Zimmerman, 2002). Therefore, students should have a more active role, comprising control of and responsibility for their own learning process (Bittner et al., 2022; Dawson & Guare, 2010; Morris, 2019). However, it is essential that students understand the purpose and importance of the topic being studied or the task to be performed

(van Grinsven & Tillema, 2006), including explanations of unpleasant topics/tasks (Ilishkina et al., 2022). For instance, completing an authentic task linked to everyday life or the labour market can enhance student motivation and commitment to learning, as revealed in the case of vocational students (Pylväs et al., 2022). Accordingly, the task performed has to be relevant, interesting and also demanding (van Grinsven & Tillema, 2006). Therefore, even when the student has sufficient SRL skills, motivation to perform the task also plays an important role (Zimmerman, 2000, 2013).

Teachers should provide students with options for tasks and strategies (Dawson & Guare, 2010; Zimmermann, 2002), and suggest appropriate learning strategies (Zimmermann, 2000, 2002). A learning environment that does not allow students to make decisions has a negative impact on their motivation (van Grinsven & Tillema, 2006). Therefore, in order to support SRL, students need to be enabled or guided to make independent decisions and/or choices, which will also increase their initiative, responsibility and motivation (Deci & Ryan, 2008; Jossberger et al., 2010; van Grinsven & Tillema, 2006). It is also recommended that students are engaged or directed in the self-assessment of their work or processes using predetermined criteria and guidance (Jossberger et al., 2010; van Grinsven & Tillema, 2006; Zimmermann, 2002), which contributes to the construction of new knowledge. This means that students need to be guided to reflect more on their learning process and outcomes, and to learn from their mistakes (Ion et al., 2017; Pilling-Cormick & Garrison, 2007; van Grinsven & Tillema, 2006). Unfortunately, research in VET has indicated that, while vocational teachers recommend certain strategies for task performance, their students are often not directed to set their own goals or to self-monitor and evaluate their own achievement (Pylväs et al., 2022). The learning process does not include sufficient opportunities for students to reflect on their own performance and learning strategies, and does not provide critical learner support in these activities (de Bruijn & Leeman, 2011).

In addition, to enhance the students' SRL, Van Grinsven and Tillema (2006) have argued that teachers should engage in supportive behaviour for their students and undertake learning activities based on interaction between teacher and learner, along with collaborative learning. Through interaction with their teacher and others, students can reach higher levels of performance in academic activities (Jossberger et al., 2010). These practices have a positive impact on SRL and increase beliefs in self-efficacy, convincing students that they are able to cope with the task (van Grinsven & Tillema, 2006). Zimmerman and Bandura (1994) have noted that students with a strong belief in their academic capabilities also set higher goals, are more persistent in the face of difficulties, have better control over their working time, and are more flexible in their testing strategies.

The significance of feedback for student performance has been highlighted as a key factor in supporting the development of SRL (Ion et al., 2017; Jossberger et al., 2010; Pylväs et al., 2022; Zimmerman, 2000, 2013), as well as having the greatest impact on learning and achievement (Jossberger et al., 2010). Feedback "as information provided by an agent regarding aspects of

one's performance or understanding" (Hattie & Timperley, 2007, p. 81) should be provided systematically (Bittner et al., 2022; Zimmerman, 2013). Feedback can be received from teachers, peers, other sources such as books, and experiences, as well as through self-evaluation (Hattie & Timperley, 2007), but it requires teachers to plan various learning activities (e.g., collaborative learning activities) that allow students to receive feedback in different ways during the learning process. Bittner et al. (2022) have stated that "the feedback loop is crucial because people set goals, monitor their progress toward these goals and use feedback to modify their behavior to ensure goal attainment" (p. 310). Therefore, the aim of feedback is to close the gap between the current level of performance/knowledge and the desired level to be achieved (Hattie & Timperley, 2007; Jossberger et al., 2010).

Giving feedback can focus on different aspects (Hattie & Timperley, 2007; Jossberger et al., 2010). For example, it can focus on a task (or product) based on clear instruction that helps students move from task to processing and then from processing to regulation (Hattie & Timperley, 2007). Feedback can also focus on the implemented process, including strategies for completing a task (Hattie & Timperley, 2007; Ion et al., 2017). This helps to identify errors that may occur during the process and suggest that students use more effective strategies or seek help (Hattie & Timperley, 2007). For example, feedback on strategies used by learners should support their knowledge of possible new strategies and their usefulness.

Hattie and Timperley (2007) have highlighted that "effective feedback needs to be clear, purposeful, meaningful, and compatible with students' prior knowledge and to provide logical connections" (p. 104). Furthermore, feedback should be simple and moderated (Hattie & Timperley, 2007; Ion et al., 2017), so that the students understand what is working well and what needs to be changed or improved (Hattie & Timperley, 2007). Providing too much feedback can have a negative effect, as students may not be able to prioritise the information they receive and will therefore not be able to apply it effectively to subsequent tasks (Ion et al., 2017; Jossberger et al., 2010).

It has been established that verbal or written feedback is more effective than a simple mark or grade (Hattie & Timperley, 2007). A study by De Bruijn and Leeman (2011) showed that students expected more substantive feedback and they considered there to be lack of feedback if they only received a mark on their submitted work and there was no substantive feedback or discussion of performance. Moreover, feedback with a clear objective should highlight strengths as well as observations or aspects that need improvement that should be given more attention in the future when performing new tasks. Students found that this constructive feedback helps them to self-assess and monitor their learning (Ion et al., 2017), as well as increasing and maintaining their motivation (de Bruijn & Leeman, 2011; Ion et al., 2017) and willingness to invest more time and effort in new tasks. In addition, when students are engaged in the learning process then given feedback, it helps them to positively improve their learning and to become better self-regulated learners, as it supports them in taking an active role or the initiative in their own learning (Ion et al., 2017).

3 Methodology

The study is based on a quantitative survey research design, which is understood as a survey conducted at a specific point in time to describe, for example, respondents' evaluations, experiences, behaviours, opinions and characteristics in a particular context, using a questionnaire to collect numerical data (Cohen et al., 2007; Creswell, 2012). When studying SRL skills, using rating scales in questionnaires has been suggested, which allows for the study of executive skills that occur in the students' daily lives in natural environments over time (Strait et al., 2019). Furthermore, this type of research a larger group of respondents to be involved in the study, thereby gathering more information about the problem being studied and allowing for more in-depth decisions to be made based on the results (see Creswell, 2012).

3.1 Sample and Instrument

The article is based on quantitative data collected using a web-based questionnaire on the LimeSurvey platform and developed in the context of the Tallinn University research project: "Experiences of distance learning due to an emergency situation and its impact on the Estonian education system". The data was collected from 27 May 2020 to 27 June 2020, immediately after a period of online learning. All ethical aspects of the research project, including the questionnaire, were approved by the Ministry of Education and Research and the Ethics Committee of Tallinn University (Tammets et al., 2021). This study only analyses the answers of vocational students. Estonian VET is part of the education system and is mainly school-based at secondary level between basic and higher education, including both initial and continuing vocational training (Vocational Educational Institutions Act [VEIA], 2013). According to the Estonian Qualifications Framework, which is in line with the European Qualifications Framework, VET is arranged at qualification levels from two to five (VEIA, 2013). Estonian VET includes both theoretical and practical studies and has flexible types of education and study forms. For example, VET is also provided for students without basic education or VET based on basic education without secondary education. The forms of study include both full-time (divided into school-based or workplace-based training) and non-stationary (where independent work accounts for more than half of the training) study options. Therefore, Estonian VET is open and accessible to all who wish to acquire vocational education and the main purpose is to prepare individuals both socially and professionally for employment and for the lifelong learning process (VEIA, 2013). However, this means that the VET student population is highly diverse, for example, in terms of age, experience and basic skills and learning skills (Sirk et al., 2019).

All Estonian VET schools were included in the sample and the invitation to participate in the study was sent to the principals of VET schools by email, asking that electronic

questionnaires be forwarded to the students. Before the data collection period started, information about the study was sent through the school system to all parties involved (i.e., parents (as some of the students were under 18), students and vocational teachers). The information explained the purpose, necessity and ethical aspects of the study. Participation in the survey was voluntary for all learners and the data was collected anonymously. As the data collected is non-intrusive and the participants cannot be identified, signed parental consent was not sought separately. All ethical aspects were also made clear in the introductory part of the questionnaire and each participant had the opportunity to withdraw at any time. The anonymised data is stored on an external hard drive and is only accessible to project staff who have been trained in the ethical aspects of the study.

The survey was conducted in both Estonian and Russian, and 244 completed questionnaires were received. Students participating in the study ranged in age from 16 to 64 years, and the average age was 23 years; 57% of the students were 16 to 19 years old, 19% were 20 to 24 years old, and 23% were 25 to 64 years old. Three participants did not add their age. Furthermore, 71% were female, 25% male and 4% did not add their gender. Most of the students spoke Estonian as their first language (86%), 11% spoke Russian and 3% were bilingual. Most of the students studied a specialist field that they had taken up after compulsory education, and 39% studied a field which was based on their secondary education.

The student questionnaire was developed by the project members based on the research task, and consisted of different parts and scales (Tammets et al., 2021). In accordance with the aim of the study, the following parts of the questionnaire were used: Demographic information, SRL skills, learning difficulties, learning activities, feedback practices, and motivation.

In the questionnaire, items assessing student SRL skills were selected from Dawson and Guare's (2010) instrument according to the five skill areas presented in the study by Strait et al. (2019) and described in the theoretical part of the article. The items were translated and adapted to the context of Estonian students. In the study, vocational students had to self-report their SRL skills on a six-point scale (1 = *strongly disagree - this doesn't describe me at all, 6 = strongly agree - this totally describes me*). Consequently, higher scores indicated more SRL problems. Initially, there were 25 items evaluating SRL skills as follows: Plan management (10 items), time management (5 items), organisation (4 items), behaviour regulation (4 items) and emotion regulation (2 items). During the analysis process, the 15 most common items describing SRL in vocational students were identified (see Table 1).

Studying learning difficulties involved an instrument developed within the framework of the study *Kooliuuring* (2020). Students were asked to respond to five items about how often they generally perceived themselves as having learning difficulties (e.g., You feel that learning is difficult for you; Understanding what you are learning takes longer than your peers, etc.) on a seven-point scale (1 = *never*, 7 = *very often*). The Cronbach's alpha was .88.

Learning activities were measured using two constructs: Various collaborative learning activities (comprising 4 items, Cronbach's α = .72) and various individual learning activities (comprising 4 items, Cronbach's α = .56) on a 4-point scale (1= *not at all*, 4 = *very often*).

Feedback practices comprised 4 items. Students had to rate on a 4-point scale (1 = *not at all*, 4 = *very often*) how often they had experienced a particular type of feedback or assessment. In addition, students were asked to rate their satisfaction with the feedback from their teacher on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*).

Motivation to learn was measured based on the instrument by Salmela-Aro et al. (2009), comprising 3 variables on a 6-point scale (1 = *strongly disagree*, 6 = *strongly agree*). These motivational aspects included the concept of cynicism, which consists of aspects such as loss of interest in schoolwork, disengagement from schoolwork, and doubts about the meaningfulness of schoolwork (Salmela-Aro et al., 2009).

3.2 Analysis

To achieve the article's aim and answer the research questions, the following data analysis steps were applied using the IBM SPSS 28.0 software.

The first step was to employ confirmatory factor analyses (CFA) in order to reduce the items which all evaluated SRL skills. The analysis of student SRL skills was based on the theory by Dawson and Guare (2010) and Strait et al. (2019) that SRL involves five factors of skills: Plan management, time management, organisation, emotion regulation and behaviour regulation. For this purpose, fixed five-factor numbers were entered in the CFA. In the CFA, the extraction method of principal components analysis with Varimax rotation was used.

Table 1: SRL Factors

Items	*M* *SD*	*F 1*	*F2*	*F3*	*F4*	*M* *SD*	*α*
I had trouble with tasks without clear instructions and I had to come up with my own ideas how to approach/ solve them	3.02 1.77	.78				2.89 1.46	0.91
I didn't know how better to learn one or another thing	2.86 1.70	.76					
It was hard for me to analyse how well I succeeded in learning/doing something	2.77 1.74	.74					
It was hard for me to see a bigger picture in my individual learning tasks (e.g., why it is necessary, how it relates to other things)	2.50 1.67	.70					
I got annoyed when tasks seemed too hard, pointless or not relevant	3.27 1.86	.68					
I ran out of energy before I finished a planned schoolworks for that day	2.90 1.79	.68					

I put off doing schoolwork until the last minute before the deadline	3.16 1.83	.86			3.00 1.52	0.87
It was hard for me to finish schoolwork on time	2.88 1.82	.68				
If I was studying and something fun interrupted me, then I had trouble forcing myself to keep studying	2.79 1.74	.68				
It was hard for me to put aside fun activities and start learning	3.16 1.78	.67				
I forgot where I left my things (e.g., textbook, headphones)	2.31 1.65		.77		2.51 1.40	0.76
I had trouble keeping my learning place clean	2.39 1.74		.66			
I forgot to do some learning tasks	2.83 1.73		.64			
It was hard for me to wait for my turn and not interrupt others when studying together	1.84 1.33			.83	1.82 1.18	0.73
I said things which I later regretted	1.80 1.33			.81		

Note. Factor 1 Plan management, Factor 2 Time management, Factor 3 Organisation, Factor 4 Behaviour regulation.

Communalities among all items were more than .60, but some items were crossloaded almost equally into multiple factors, and therefore these items were removed. In addition, it emerged that items which evaluated emotion regulation did not load into a separate factor and were loaded into the factor of plan management. Therefore, a factor analysis with four factors was tested and then the loaded factors matched to the four other factors highlighted in the theory (see Table 1). The reliability of the factors was controlled using Cronbach's alpha and factors were considered reliable and accepted if $\alpha \geq .70$ (Cohen et al., 2007).

After this, the students were grouped on the basis of their SRL factors using a K-means cluster analysis. The three-cluster model was the best, as it provided the most distinctive means of the clusters. After this, the means of all clusters of SRL factors were compared with each factor using one-way analysis of variance (ANOVA) and Bonferroni multiple comparison tests (see Table 2).

The second step was to analyse the relationship between clusters of vocational students based on their SRL and socio-demographic factors. Cross-tabulation was used and the statistical significance of the differences between the clusters was controlled by applying the Chi-Square test (see Table 3).

The third step was to analyse the association between clusters of vocational students based on their SRL and learning difficulties, learning activities, feedback and motivation. In this process, the one-way ANOVA and Bonferroni test was implemented for multiple comparisons (see Table 4).

4 Results

This chapter presents the research findings in the order of the research questions outlined in the introduction.

4.1 The Differentiation of Vocational Students Based on How They Evaluated Their SRL

The three-cluster model proved to be the best at describing SRL skills in vocational students. The clusters were as follows: Students with 1) difficulties in organisation and behaviour, 2) difficulties in planning and time management, and 3) good and balanced SRL skills (see Table 2). According to the F results in Table 2, the clusters differ most in terms of plan management and organisation skills.

The first cluster includes 30% of the students who are reasonably able to manage their time but experienced difficulties with other SRL skills. Accordingly, they have the ability to prioritise their activities based on time, but they have some problems with plan management, such as creating strategies to solve tasks or understanding how better to learn and do things. However, they have most difficulty in organisation and behaviour regulation. Therefore, they forget things or tasks and find it difficult to keep their learning place clean. Behaviourally, they had problems with self-control and were very impulsive, later regretting things they had said or done. They differ significantly from students in other clusters in terms of these difficulties (see Table 2). Therefore, this cluster was named *students with difficulties in organisation and behaviour*.

Table 2: Clusters of Vocational Students Based on Their SRL Skills

Factors of self-regulation	*M SD*	*I Cluster n= 30% Difficulties in organisation and behaviour*	*II Cluster n=20% Difficulties in planning and time managem ent*	*III Cluster n=50% Good and balanced SRL skills*	*F*	*Sig*
Plan management	*M*	.27 II&III	1.27 I&III	-.65 I&II	149.57	.001
	SD	.76	.82	.53		
Time management	*M*	.05	.44 III	-.20 II	7.72	.001
	SD	.96	1.19	.88		
Organisation	*M*	1.12 II&III	-.75 I&III	-.37 I&II	151.61	.001
	SD	.76	.87	.49		
Behaviour regulation	*M*	.55 II&III	-.47 I	-.14 I	20.14	.001
	SD	1.34	.91	.57		

Note. A factor's negative mean indicates that the students did not experience difficulties in the assessed SRL skills. Conversely, a higher positive score indicates that the students experienced more difficulties in this skill. The means of the clusters show how the clusters differ at a statistical significance level of $p < 0.05$.

The second cluster contains 20% of the students, those who considered that they had the most difficulty in plan management. They were less able to create and manage plans independently, they were poor at time management and identifying the activities required to complete tasks, and evaluating how well things went. This SRL difficulty emerged at a significant level when compared to other clusters (see Table 2). They also struggled with time management and admitted doing tasks at the last minute. They had problems finishing schoolwork on time and found it hard to concentrate on learning when having fun. Despite these difficulties, they evaluated their organisational skills the highest compared to the other clusters and differ significantly on this factor. They were therefore best at maintaining systems for keeping the learning space clean and tracking things, materials and tasks. In addition, they had good self-control in regulating their behaviour. Therefore, this group includes students with balanced behavioural and organisational skills and with a lack of planning and time management skills. As a result, this cluster can be named *students with difficulties in planning and time management skills* (see Table 2).

The third cluster contains the remaining 50% of students whose SRL skills were good and balanced. They had the best ability to create and manage plans to complete tasks and schoolwork. This meant that they knew how to learn better and were able to solve tasks creatively without clear instructions, and also to evaluate what they had achieved. Therefore, they differ significantly from the other clusters in terms of plan management skills (see Table 2). They planned activities well, not leaving things to the last minute. They had good skills in maintaining systems to keep their learning place clean and keep track of things, materials and tasks. Like the second cluster, they also had good self-control in regulating their behaviour.

4.2 Association Between SRL Skills and Socio-Demographic Factors

The clusters of vocational students formed on the basis of their SRL skills were then compared in terms of their socio-demographic background. This revealed that the clusters did not differ in terms of age, gender and relationship between their specialist training and their previous education. However, statistically significant differences emerged based on their primary spoken language. The results indicated that a greater number of students who spoke Russian as their first language belonged to the first cluster, where they faced the greatest challenges in terms of organisation and behaviour regulation. Conversely, fewer Russian-speaking students were associated with the third cluster (see Table 3).

Table 3: Association Between Clusters and Demographic Factors

	I cluster	*II cluster*	*III cluster*	*Sum*	*df*	χ^2	*p*
The age of the students							
16 to 19 years old	35%	17%	48%	100%	4	5.38	.25
20 to 24 years old	27%	20%	53%	100%			
25 years and older	19%	26%	55%	100%			
Gender of the students							
Female	28%	20%	52%	100%	4	6.08	.19
Male	39%	20%	51%	100%			
First language of the students							
Estonian	26%	20%	54%	100%	6	19.50	.003
Russian	65%	11%	23%	100%			
Both	34%	33%	33%	100%			
Relationship between specialist training and previous education							
Specialist training based on compulsory education	32%	18%	50%	100%	2	.83	.66
Specialist training based on secondary education	27%	22%	51%	100%			

4.3 Association Between SRL Skills and Learning Difficulties, Learning Activities, Feedback and Motivation

Analysing the association between SRL clusters and learning difficulties, learning activities, feedback and motivation brought forth many important observations (see Table 4).

First, Table 4 shows that students who had difficulties with SRL skills also perceived they had more general learning difficulties. This was in contrast to students in the third cluster, who had good SRL skills, and perceived having fewer learning difficulties, and this difference was at a significant level.

Table 4: Association Between Clusters and Learning Difficulties, Learning Activities, Feedback and Motivation

Variables	*M* *SD*	*I cluster*	*II cluster*	*III cluster*	*M*	*F*	*Sig*
General learning difficulties on a 7-point scale							
Perceived learning difficulties	*M* *SD*	3.57^{III} 1.21	3.47^{III} 0.99	2.80^{I}&^{II} 0.89	3.16 1.08	15.95	.001
Learning activities on a 4-point scale							
Varied collaborative learning activities	*M* *SD*	1.87^{II} .73	1.57^{I} .53	1.68 .59	1.72 .63	3.77	.02
Varied individual learning activities	*M* *SD*	2.39III .72	2.21 .58	2.11I .59	2.22 .64	4.35	.01

Implemented feedback practices on a 4-point scale							
I got marks for the work submitted	*M* *SD*	2.73 .87	2.60 .82	2.64 .89	2.66 .87	.33	.72
I got a pass/fail result for the work submitted	*M* *SD*	2.96 .79	2.98 .81	3.08 .69	3.02 .74	.73	.48
I received peer feedback	*M* *SD*	1.51 ^{II} .78	1.19 ^{I} .49	1.46 .68	1.42 .69	3.55	.03
I received verbal feedback from the teacher on the work submitted	*M* *SD*	2.53 .87	2.4 .87	2.60 .81	2.54 .84	1.05	.35
Student satisfaction with received feedback on a 7-point scale							
Teacher feedback on learning was sufficient	*M* *SD*	4.34 ^{III} 1.78	3.96 ^{III} 2.19	5.41 $^{I\&II}$ 1.74	4.81 1.95	13.99	.00
I would have liked it if the teachers had given me more feedback on my progress in studying the subject/topic	*M* *SD*	4.53 ^{III} 1.94	4.44 ^{III} 2.25	3.19 $^{I\&II}$ 1.99	3.84 2.13	12.67	.00
Learning motivation on a 6-point scale							
I felt I was losing interest in my schoolwork	*M* *SD*	4.25^{III} 1.71	4.17^{III} 1.75	2.52$^{I\&II}$ 1.65	3.34 1.88	23.19	.001
I constantly doubt whether my schoolwork has any meaning	*M* *SD*	3.95^{III} 1.81	3.42^{III} 1.81	1.96$^{I\&II}$ 1.36	2.85 1.83	29.41	.001
I used to have higher expectations of my schoolwork than I do now	*M* *SD*	4.29^{III} 1.93	3.89^{III} 1.85	2.37$^{I\&II}$ 1.66	3.25 1.99	22.63	.001

Note. The cluster means have marks indicating how clusters differ at a statistical significance level of $p < 0.05$.

Regarding learning activities, it can be seen that students in the first cluster experienced various individual learning activities more often than students in the third cluster, and that these clusters differ from each other at a significant level. The second cluster of students experienced less varied collaborative learning activities than the students in the first cluster, and the clusters differ from each other at a significant level. However, the students in the third cluster experienced these varied collaborative learning activities slightly less than students in the first cluster, but this difference is so small that it is not significant (see Table 4).

The analysis of the feedback practices implemented shows that the students in the different clusters experienced relatively similar types of feedback and assessment. However, the analysis shows that students in the third cluster were a bit more likely to receive verbal feedback from the teacher, but this difference was not at a significant level. Students in the second cluster experienced the least peer feedback and those in the first cluster the most, and this difference was at a significant level. The analysis of student satisfaction with the sufficiency of feedback received showed that students in the third cluster were most satisfied that the teacher's feedback on their learning was sufficient and that they did not expect to receive more feedback on their progress in studying the subject/topic. Therefore, students in the third cluster differ significantly from the other clusters in this respect (see Table 4).

The analysis of the association between SRL skills and learning motivation shows that students who have good and balanced SRL skills also have higher motivation. However, students in the other clusters who struggled with some SRL skills felt they were losing interest and positive expectations in their schoolwork and had more doubts about whether their schoolwork was meaningful. This difference between the third and other clusters was significant (see Table 4).

5 Discussion

The aim of this article was to analyse and describe the differences in the SRL skills of vocational students based on their self-evaluation and the factors related to their SRL. The findings indicated that the students could be divided into three clusters. Accordingly, half of the vocational students that comprised the third cluster have good and balanced SRL skills, whereas the others face certain difficulties. The study shows that 30% of students (the first cluster) struggled with most of the SRL skills, but the most significant problems for them were with organisation and behaviour regulation skills. Therefore, these students need more support than others in organising themselves so that they do not forget to do some learning tasks or where they have left their things. They also need clear guidance from teachers to help them better regulate their behaviour, as well as instructions on how to solve tasks or what strategies to use to learn better. Finally, 20% of students (the second cluster) reported having most problems in plan management and time management. This means that they mostly need support from teachers in getting clear aims, structured instructions and strategies/learning activities to complete their tasks and learn better. In addition, they need more help to develop skills in analysing the results of their own work. In the area of time management, they need more guidance on how to complete and present their schoolwork in time, as well as how to deal with fun activities that can interrupt their learning.

Analysing the clusters on the basis of socio-demographic factors revealed that the first cluster included more Russian-speaking students. Previous studies have not indicated the association between difficulties in SRL and the students' primary spoken language, which emerged in this study. Other research, including international studies, has highlighted the relationship between student age and SRL. Accordingly, based on the experiences of vocational teachers, adolescent students have lower SRL skills, as well as greater learning difficulties (Boldrini et al., 2019; Eiriksdottir & Rosvall, 2019; Sirk et al., 2016, 2019; van Middelkoop et al., 2017). However, this result was not confirmed in this study. Therefore, students' self-evaluations of their SRL skills did not match teachers' experiences. In addition, teachers have noted that adult learners have good learning skills and are able to manage their own learning difficulties (Sirk et al., 2016, 2019). This study revealed that SRL skills are not dependent on student age and that adult learners may also need support in developing their SRL skills.

The results of the study confirm the indicators of previous research that students with good SRL skills are able to cope with learning difficulties (Krull, 2018; Zimmerman, 2002). Therefore, students with good and balanced SRL skills perceived much fewer general learning difficulties than other students in the first and second clusters. Hence, these findings suggest that the learning difficulties of the student population stressed by vocational teachers in previous studies (e.g., Boldrini et al., 2019; Eiriksdottir & Rosvall, 2019; Sirk et al., 2016, 2019; van Middelkoop et al., 2017) may be indicative of a problem with those students' SRL skills.

However, it has been emphasised that development of SRL skills can be supported in various ways (Strait et al., 2019; Zimmerman, 2002); for example, through different learning activities (Jossberger et al., 2010; van Grinsven & Tillema, 2006) and feedback (Hattie & Timperley, 2007; Ion et al., 2017; Jossberger et al., 2010; Pylväs et al., 2022; Zimmerman, 2013). The results showed that students in the second cluster with difficulties in plan and time management experienced the least varied collaborative learning and more individual learning activities. In addition, they experienced the least peer feedback and verbal feedback from teachers compared to the others. Students in the first cluster practised similar individual learning activities to the students in the second cluster, but slightly more collaborative learning activities, and they reported slight difficulties with plan management. However, students in the first cluster had significantly more peer feedback. Students in the third cluster experienced similar collaborative learning activities to those in the first cluster, and the least individual learning activities, and they did not face difficulties with plan and time management. Moreover, they experienced the most regular verbal feedback from teachers, but this difference was not at a significant level. A key finding was that students who struggled with SRL also felt that feedback on their learning was not sufficient and that they would have liked teachers to give them more feedback on their progress in studying the topic. Moreover, it has previously been stressed that collaborative learning has a positive impact on SRL and can increase beliefs in self-efficacy (van Grinsven & Tillema, 2006), as well as help by providing more varied feedback (Hattie & Timperley, 2007) and results in better academic achievements (Jossberger et al., 2010). It can be concluded, based on this study's findings, that students who have difficulties in plan management need to be helped more through the implementation of collaborative learning than individual learning activities, and also provided more frequently with verbal feedback as well as peer assessment to support them in dealing with their shortcomings in SRL skills. Previous studies have also underlined that verbal and substantive feedback is more effective (Hattie & Timperley, 2007) and that students expect this substantive feedback more than a simple mark or grade (de Bruijn & Leeman, 2011). This accords with this study's findings because students who had good SRL skills say they also experienced more verbal feedback from teachers and were satisfied with the amount of feedback they received.

Previously, Zimmerman (2002) has indicated that SRL skills can significantly impact student motivation and achievement. This study's findings can confirm this, as it revealed that students with good SRL skills had higher motivation for completing schoolwork compared to others. Accordingly, these students did not lose interest, a sense of meaning or positive expectations when doing schoolwork and differed significantly in this from the other clusters.

The data for this study was collected after a period of online learning, but this context was not analysed, as the study focus was on SRL skills generally, so this could be a limitation of the study. However, to decrease this limitation, the study's findings were compared with previous studies. In addition, this study could be replicated in the future, and more effort could be made to involve learners in the study. In addition, the data collection period should be extended, as the data in this study was only collected over one month.

6 Conclusions

In summary, it emerged that students with good SRL skills encounter fewer learning difficulties, study more through collaborative learning activities, receive sufficient verbal feedback, and display greater levels of motivation in their schoolwork. Therefore, it can be concluded that all these factors are also important for the development of SRL skills, which have also been highlighted previously (e.g., Bittner et al., 2022; Dawson & Guare, 2010; de Bruijn & Leeman, 2011; Ion et al., 2017) and can serve to support students in becoming self-directed learners (Jossberger et al., 2010; Pilling-Cormick & Garrison, 2007), who are in demand in the labour market and society (European Commission, 2019).

From a practical perspective, these results provide vocational teachers with knowledge about difficulties with SRL skills that vocational students may experience and ideas on how teachers can support students in this area. However, students have dissimilar gaps or deficits in their SRL skills and for this reason they also need differentiated support. This implies that vocational teachers need to possess appropriate knowledge of SRL and the skills to support the development of SRL skills in vocational students in a differentiated way, alongside specialist training. So far, for example, studies of vocational teachers in Estonia have highlighted the fact that learning difficulties in vocational students have been associated with deficiencies in basic education (e.g., not teaching students to learn) and few vocational teachers see their role in supporting students with their learning difficulties (Sirk et al., 2016, 2019). All of this suggests that more attention needs to be paid to the nature of SRL in the training of vocational teachers and the importance of ways to develop it so that they are able to provide appropriate support for their students.

Although these findings on SRL skills in vocational students emerged in the context of Estonian VET, previous international studies have also generally underlined concerns about poor learning skills in vocational students through the experiences of vocational teachers

and mainly among adolescents (e.g., Boldrini et al., 2019; de Bruijn & Leeman, 2011; Eiriksdottir & Rosvall, 2019; van Middelkoop et al., 2017). However, based on the results of this study, it can be said that the views of vocational students and teachers may not coincide, so that the actual support that students need to develop SRL skills may be lacking and the wider function of education to develop lifelong learning skills may not have been achieved (Zimmerman, 2002). It is therefore important to explore SRL skills in vocational students internationally, which would provide a more informed basis for tackling learning skills issues.

From a theoretical perspective, the results contributed to the theory as follows. Dawson and Guare (2010) developed an instrument to study SRL skills which Strait et al. (2019) developed further and identified SRL skills in five areas. In this study, a further step was added where K-means cluster analysis was applied building on the previous research, and the differentiation of students on the basis of SRL skills became clear. Previously, this instrument had been applied more in general and higher education, but in this study, it was applied to vocational students, which in turn broadened the applicability of the instrument. It also provided insights into the learning factors associated with vocational students' SRL skills. Therefore, Dawson and Guare's (2010) instrument could be further used internationally to investigate SRL skills in vocational students, which in turn would allow international comparisons of results in the context of vocational education.

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Ethics Statement

All ethical aspects of the research, including the questionnaire, were approved by the Ethics Committee of Tallinn University. The author states that ethical principles via informed consent have been implemented in this study in line with the IJRVET ethics statement.

References

American Psychological Association, Coalition for Psychology in Schools and Education. (2015). *Top 20 principles from psychology for preK–12 teaching and learning.* American Psychological Association. http://www.apa.org/ed/schools/cpse/top-twenty-principles.pdf

Bellini, A., & Maestripieri, L. (2018). Professions within, between and beyond. Varieties of professionalism in a globalising world. *Cambio*, *8*(16), 5–14. https://doi.org/10.13128/cambio-24947

Bittner, J. V., Stamov Roßnagel, C., & Staudinger, U. M. (2022). Educational self-regulation competence: Toward a lifespan-based concept and assessment strategy. *International Journal for Educational and Vocational Guidance*, *22*, 307–325. https://doi.org/10.1007/s10775-021-09491-2

Boekaerts, M., Pintrich, P. R., & Zeidner, M. (2000). Self-regulation: An introductory overview. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 1–9). Academic Press. http://doi.org/10.1016/B978-012109890-2/50030-5

Boldrini, E., Sappa, V., & Aprea, C. (2019). Which difficulties and resources do vocational teachers perceive? An exploratory study setting the stage for investigating teachers' resilience in Switzerland. *Teachers and Teaching*, *25*(1), 125–141. https://doi.org/10.1080/13540602.2018.1520086

Brachtl, S., Ipser, C., Keser Aschenberger, F., Oppl, S., Oppl, S., Pakoy, E. K., & Radinger, G. (2023). Physical home-learning environments of traditional and non-traditional students during the COVID pandemic: Exploring the impact of learning space on students' motivation, stress and well-being. *Smart Learning Environments*, *10*(7). https://doi.org/10.1186/s40561-023-00222-4

Cedefop. (2023). *The future of vocational education and training in Europe: Synthesis report*. Publications Office. https://data.europa.eu/doi/10.2801/08824

Clark, N. M., & Zimmerman, B. J. (2014). A social cognitive view of self-regulated learning about health. *Health Education & Behavior*, *41*(5) 485–491. https://doi.org/10.1177/1090198114547512

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). Routledge/ Taylor & Francis Group.

Cosnefroy, L., & Carré, P. (2014). Self-regulated and self-directed learning: Why don't some neighbors communicate? *International Journal of Self-Directed Learning*, *11*(2), 1–12.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson Education.

Dawson, P., & Guare, R. (2010). *Executive skills in children and adolescents. A practical guide to assessment and intervention* (2nd ed.). The Guilford Press.

De Bruijn, E., & Leeman, Y. (2011). Authentic and self-directed learning in vocational education: Challenges to vocational educators. *Teaching and Teacher Education*, *27*(4), 694–702. https://doi.org/10.1016/j.tate.2010.11.007

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, *49*(1), 14–23. https://doi.org/10.1037/0708-5591.49.1.14

Eiriksdottir, E., & Rosvall, P.-Å. (2019). VET teachers' interpretations of individualisation and teaching of skills and social order in two Nordic countries. *European Educational Research Journal*, *18*(3), 355–375. https://doi.org/10.1177/1474904119830022

European Commission. (2019). *Key competences for lifelong learning*. Publications Office. https://data.europa.eu/doi/10.2766/569540

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81–112. https://doi.org/10.3102/003465430298487

Ilishkina, D. I, de Bruin, A., Podolskiy, Volk, M. I., & van Merrienboer, J. J. G. (2022). Understanding self-regulated learning through the lens of motivation: Motivational regulation strategies vary with students' motives. *International Journal of Educational Research*, *113*, 101956. https://doi.org/10.1016/j.ijer.2022.101956

Ion, G., Cano-Garcíab, E., & Fernández-Ferrerb, M. (2017). Enhancing self-regulated learning through using written feedback in higher education. *International Journal of Educational Research*, *85*, 1–10. https://doi.org/10.1016/j.ijer.2017.06.002

Jossberger, H., Brand-Gruwel, S., Boshuizen, H., & van de Wiel, M. (2010). The challenge of self-directed and self-regulated learning in vocational education: A theoretical analysis and synthesis of requirements. *Journal of Vocational Education and Training*, *62*(4), 415–440. https://doi.org/10.1080/13636820.2010.523479

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers*. Follett.

Kooliuuring. 2020. *Õpilasuurimus* [Student survey]. Tallinna Ülikool, Haridusteaduste instituut. https://www.tlu.ee/hik/opilasuurimus#opilasuurimus-2020

Krull, E. (2018). *Pedagoogilise psühholoogia käsiraamat* [Handbook of educational psychology]. Tartu Ülikooli Kirjastus.

Morris, T. H. (2019). Self-directed learning: A fundamental competence in a rapidly changing world. *International Review of Education*, *65*, 633–653. https://doi.org/10.1007/s11159-019-09793-2

Pilling-Cormick, J., & Garrison, D. R. (2007). Self-directed and self-regulated learning: Conceptual links. *Canadian Journal of University Continuing Education*, *33*(2), 13–33. https://doi.org/10.21225/D5S01M

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451–502). Academic Press. https://doi.org/10.1016/B978-012109890-2/50043-3

Pylväs, L., Nokelainen, P., & Rintala, H. (2022). Vocational students' perceptions of self-regulated learning in work-based VET. *Vocations and Learning*, *15*, 241–259. https://doi.org/10.1007/s12186-022-09286-8

Saks, K., & Leijen, Ä. (2014). Distinguishing self-directed and self-regulated learning and measuring them in the e-learning context. *Procedia - Social and Behavioral Sciences*, *112*, 190–198. https://doi.org/10.1016/j.sbspro.2014.01.1155

Salmela-Aro, K., Rantanen, J., Hyvönen, K., Tilleman, K., & Feldt, T. (2011). Bergen burnout inventory: Reliability and validity among Finnish and Estonian managers. *International Archives of Occupational and Environmental Health*, *84*(6), 635–45. https://doi.org/10.1007/s00420-010-0594-3

Sirk, M., Liivik, R., & Loogma, K. (2016). Changes in the professionality of vocational teachers as viewed through the experiences of long-serving vocational teachers in Estonia. *Empirical Research in Vocational Education and Training*, *8*(13), 1–26. https://doi.org/10.1186/s40461-016-0039-7

Sirk, M., Liivik, R., Ümarik, M., & Loogma, K. (2019). How professional memory influences vocational teachers' perception of changes related to students. *Estonian Journal of Education*, *7*(1), 101–127. https://doi.org/10.12697/eha.2019.7.1.05

Strait, J. E., Dawson, P., Walther, C. A. P., Straitm G. G., Barton, A. K., & McClain, M. B. (2019). Refinement and psychometric evaluation of the executive skills questionnaire-revised. *Contemporary School Psychology*, *24*, 378–388. https://doi.org/10.1007/s40688-018-00224-x

Tammets, K., Ley, T., Eisenschmidt, E., Soodla, P., Sillat, P. J., Kollom, K., Seitlinger, P., Väljataga, T., & Kori, K. (2021). *Eriolukorrast tingitud distantsõppe kogemused ja mõju Eesti üldharidussüsteemile* [Experiences of distance learning due to an emergency situation and its impact on the Estonian education system]. Tallinna Ülikool.

Van Grinsven, L., & Tillema, H. (2006). Learning opportunities to support student self-regulation: Comparing different instructional formats. *Educational Research*, *48*(1), 77–91. https://doi.org/10.1080/00131880500498495

Van Middelkoop, D., Ballafkih, H., & Meerman, M. (2017). Understanding diversity: A Dutch case study on teachers' attitudes towards their diverse student population. *Empirical Research in Vocational Education and Training*, *9*(1), 1–19. https://doi.org/10.1186/s40461-016-0045-9

Vocational Educational Institutions Act. (2013). *Riigi Teataja, RT I, 02.07.2013*. https://www.riigiteataja.ee/en/eli/ee/525092023001/consolide/current

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal*, *31*(4), 845–862. https://doi.org/10.3102/00028312031004845

Zimmerman, B. J. (2013). From cognitive modeling to self-regulation: A social cognitive career path. *Educational Psychologist*, *48*(3), 135–147. https://doi.org/10.1080/00461520.2013.794676

Ümarik, M., & Rekkor, S. (2013). Diversification of students and professional roles of vocational teachers: Teachers' individual approaches to negotiate work identities. In J. Mikk, M. Veisson & P. Luik (Eds.), *Change in teaching and learning* (pp. 9–26). Peter Lang.

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