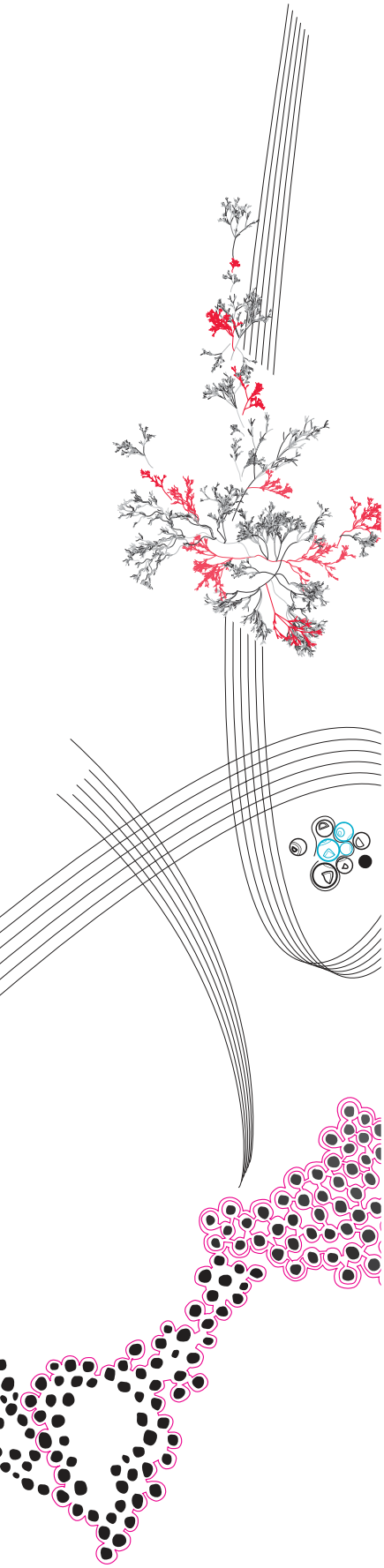

MSc Educational Science and Technology

Master Thesis

Practical Implementation of Self-Directed Learning: A Case Study

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Contents

Abstract

The current public school system is still characterized by passive, teacher-centered education. However, current research indicates that autonomy is a fundamental need for students and that student-centered approaches, such as Self-Directed Learning (SDL), lead to more active and meaningful learning as well as higher academic achievement. While the literature shows these benefits of SDL, the implementation in an effective and scalable school system requires further research.

To understand how to apply SDL in a practical context, this study is one of the first to investigate SDL as the foundation of a school's pedagogical system through a case study. The Alemannen-School was selected as it is very well recognized as a pioneer in German education, has received the German School Award, and has demonstrated higher academic achievement than other schools in Baden-Württemberg in the VERA comparison study.

The research employs a mixed-method case study design using a qualitative observation among students between grades 5 and 10 to identify the SDL methods that are expected to contribute to academic achievement. A subsequent survey investigates quantitatively how the students use and perceive the SDL elements, as well as how such elements impact their learning experience.

The study found that SDL methods, expected to contribute to academic achievement, were effectively integrated into the school's pedagogical system, supporting self-management, self-monitoring, and motivation at every step of the self-directed learning process. Among the most impactful methods identified were goal-setting, self-paced learning, and the use of structured learning materials. The results further revealed a correlation between students' positive perception of SDL methods and their perceived effectiveness.

The outcome of this study demonstrates the potential and feasibility of a well-structured SDL approach to enhance students' autonomy, engagement, and academic achievement in a scalable school system.

Keywords: Self-Directed Learning (SDL), Student-Centered Learning, Academic Achievement, School Case Study, Educational Reform

Introduction

Despite the growing interest and expanding research on innovative teaching methods and pedagogical approaches, the public school system in Germany is still, in many respects, based on militarized educational beliefs of the 19th century (Albers, 2022, pp. 161-162). Classroom instruction has long been shaped by rigid principles in which the teacher holds absolute authority—giving commands while students are expected to remain passive, listen, obey, and learn. These teacher-centered approaches, rooted in foundational texts like (Raible, 1874), have left a lasting imprint on educational practices that persist to this day. (Albers, 2022; Michel et al., 2009; Raible, 1874; Schweder, 2020). For example, in a typical history lesson, the teacher often delivers a monologue on a particular historical event while students are expected to passively take notes (Serin, 2018b). In such settings, the teacher maintains full control over all means of learning, including the selection of tasks, content, sources, and instructional structure. As a result, students have limited opportunities to engage in independent inquiry, develop autonomy, or critically analyze materials without the pressure of the teacher (Emaliana, 2017; Serin, 2018b). In contrast, student-centered approaches allow the student to individualize the learning experience. Self-directed learning, for instance, enables learners to take the initiative in identifying their learning needs, setting goals, and seeking resources. This leads to a higher satisfaction of the need for autonomy. Additionally, studies show higher levels of active and meaningful learning, as well as higher academic achievement (Lancaster, 2017; Schweder & Raufelder, 2021, 2022; Serin, 2018a). Despite the benefits, current literature lacks practical examples of functioning and scalable school systems built on self-directed learning principles. Particularly, research focusing on the practical implementation of SDL methods empirically enhancing students' achievements is missing (Kazlauskienė et al., 2015; Panadero, 2017). This gap in research limits the availability of pedagogical role models, thereby impeding the transition away from traditional teacher-centered instruction (Yurkofsky, 2022).

This study aims to address this issue by investigating the German Alemannenschule Wutöschingen. This case was chosen based on the school's innovative student-centered, self-directed learning approach and pioneering position in Germany's educational realm (Blume, 2024; Tutein, 2023; Westrup, 2023). The school is notable for its exceptional academic performance, proven by the Vera comparison study, and was recognized with the German School Award in 2019 (Alemannenschule Wutöschingen, 2022; GmbH, 2024). The school claims that its pedagogy allows for individual learning paths, self-determination, and self-paced learning in a modern learning environment, with teachers functioning more as guides than knowledge transmitters (Wutöschingen, 2024a). This study aims to understand the success of the school's pedagogical system by conducting observations to identify which SDL methods,

expected to enhance academic achievement, are implemented in the learning process. Additionally, a survey among students is used to gain insight into the practical use and perception of the SDL elements and their impact on the learning experience.

The findings of this study can offer valuable insights for both schools and policymakers on how to effectively develop the teacher-centered model into a more student-centered educational system. By contributing to the evidence-based optimization of learning environments, this research seeks to support the path toward educational innovation and future-ready schools.

Theoretical Framework

The theoretical understanding and definition of academic achievement and self-directed learning are essential for investigating their relationship. Furthermore, it is needed to explore how SDL methods can enhance academic achievement. Therefore, this section will explain academic achievement and self-directed learning before discussing the relationship between them. Finally, a practical application of SDL that can increase academic achievement will be discussed.

Self-Directed-Learning

While many authors have defined self-directed learning in different ways, one can find two unifying conceptualizations among them. Brockett and Hiemstra (2018) as well as Stockdale and Brockett (2011) identified these two themes as (1.) viewing SDL as a process where the learner takes control and assumes responsibility for their learning activities and (2.) seeing SDL as a set of personal attributes inherent to the learner. The adult educator Malcolm Knowles conceptualized SDL according to the first theme. Knowles (1975) described SDL as:

> [...] 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. (p. 18)

Similarly, Van Woezik et al. (2019), describes SDL as a learning process in which the learners gradually take responsibility for the cognitive (self-monitoring) and contextual (self-management) processes of learning.

While authors such as Knowles and Van Woezik focus on the actions of the learner, authors like Guglielmino (1977), Oddi (1987) or Lounsbury et al. (2009) highlight the learner's character and attributes. They argue that individuals can engage in self-directed learning independently of external influences. Lounsbury et al. (2009) views SDL as consistent over time. Hence, they suggest that self-directed learning is defined by the personal characteristics of the learner, by their ability to take the initiative, plan, and evaluate their learning, among other competencies (Guglielmino, 1977). Based on this conceptualization, Guglielmino (1977) created the Self-Directed Learning Readiness Scale (SDLRS) that was later adapted by M. Fisher et al. (2001) and examines how far developed the SDL attributes of a learner currently are. Several studies support the validity of the SDLRS (Akkilagunta et al., 2019; Hendry & Ginns, 2009; Müller-Ferrés et al., 2021).

Contrary to the second theme, which argues the origin of SDL skills to be rather stable character attributes, Alotaibi (2016) showed that the instructional process and the learner's environment play a significant role in shaping the development of their SDL skills. This perspective is further supported by findings from Syahputri et al. (2018), which revealed a positive enhancement of SDL skills following the implementation of SDL learning cycles.

Despite the opposing arguments, the two themes presented in the literature do not have to be mutually exclusive and can be combined to provide a more precise and comprehensive understanding of self-directed learning. As Oddi (1987) writes in "Perspectives on Self-Directed Learning" it is not enough to focus on the process alone. The learner's attributes and attitude are important for the success of SDL. They decide what actions the learner takes in the learning process. Therefore, assessing readiness for SDL based on the learner's attributes is valuable as it provides insight into the current level of SDL a student can achieve. Additionally, the learning environment and instructional processes play an important role in shaping and enhancing the student's SDL capabilities. Thus, to have a full understanding of self-directed learning, it is important to consider the concepts presented by Knowles as well as Guglielmino and understand through the more current studies the dynamic interaction between them. The current study will adopt this dynamic perspective.

Garrison's SDL Model and Its Link to Self-Determination Theory

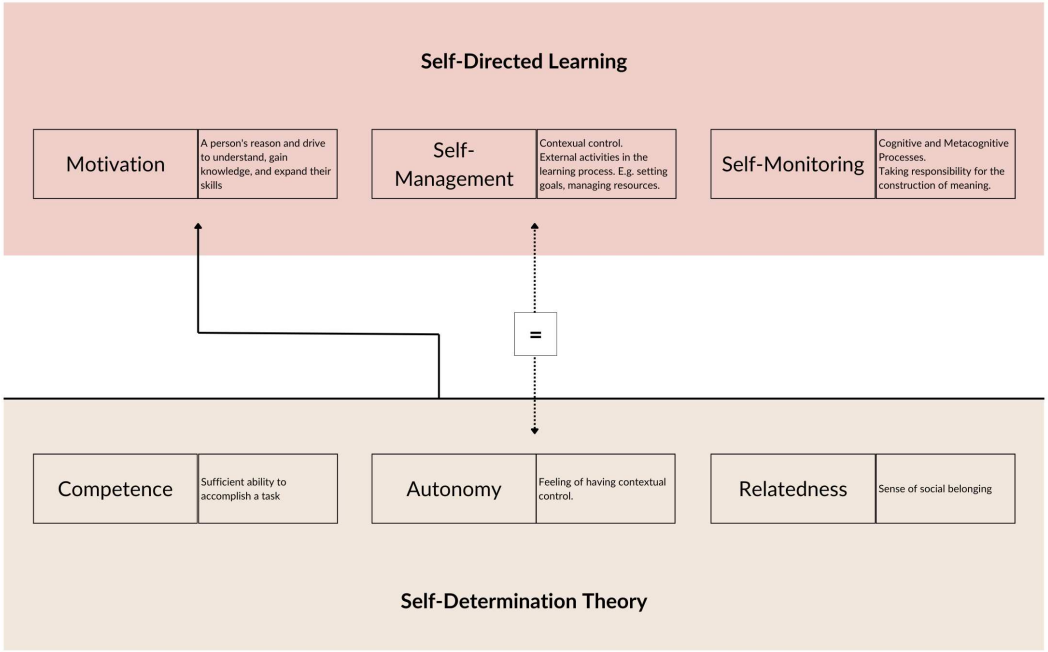
A valuable model to create an educational system that develops the SDL attributes of the learners and ensures the success of self-directed learning cycles was provided by Garrison (1997). His framework identifies three essential dimensions: self-management, self-monitoring, and entering-/task-motivation. The dimensions are also reflected in the work of the aforementioned authors. For instance, the SDL definition by Van Woezik et al. (2019) is rooted in Garrison's model. Additionally, the various personal attributes identified in the SDLRS can be categorized under the three dimensions M. J. Fisher and King (2010) and Müller-Ferrés et al. (2021). It can be concluded that an SDL system should support self-management, self-monitoring, and entering-/task-motivation with corresponding pedagogical methods to ensure a comprehensive and effective implementation.

The first dimension, self-management, describes the sense of control over the learning activities. Garrison calls this contextual control. Self-monitoring describes the cognitive and metacognitive processes during learning, which means it involves both thinking and reflecting on one's thought processes. This includes integrating new knowledge, evaluating learning strategies, and assessing one's learning progress. According to De Bruin and van Gog (2012), any action based on self-monitoring with the purpose of controlling the cognitive process can be categorized as self-regulation. This study

will therefore integrate self-regulation at this point into Garrison's model of SDL. The last dimension that defines the success of SDL is motivation. In education, motivation can be described as a person's reason and drive to understand, gain knowledge, and expand their skills (Filgona et al., 2020). The emergence of motivation can be explained through self-determination theory (SDT). SDT assumes that humans are inherently curious, active, and intrinsically motivated creatures that want to learn. However, for the optimal development of this inherent motivation, the three basic needs of autonomy, competence, and relatedness need to be fulfilled (Deci & Ryan, 2012; Filgona et al., 2020; Murray, 2011; Niemiec & Ryan, 2009; Pintrich, 2003; Ryan & Deci, 2000). Considering the basic needs are essential for motivation, they can be integrated into Garrison's framework as seen in Figure 1.

Figure 1

Requirements for SDL based on Self-Determination-Theory



The need for autonomy describes the degree to which a person can decide over their own actions and feel ownership over their own behavior (Deci, 1992; Wang et al., 2019). This can be seen as equal to Garrison's dimension of self-management and can be supported through the same pedagogical methods (Garrison & Baynton, 1987; Schweder & Raufelder, 2021). Figure 1 illustrates this through the equal sign. Competence refers to the feeling of self-efficacy, experiencing mastery, and producing desired outcomes (Filgona et al., 2020; Schweder & Raufelder, 2021; Wang et al., 2019). Relatedness describes

the social connection, meaning the feeling of belonging and being cared for (Deci & Ryan, 2012).

The connection between autonomy and self-management, which shows a connection between motivation and self-management, is not the only interconnection between the dimensions. Various studies have shown that motivation, self-management, and self-monitoring influence each other. Abd-El-Fattah (2010) and She et al. (2023) showed that self-management significantly influences self-monitoring, as students better at organizing and controlling their learning activities are more likely to engage in reflective practices to assess their progress. Zhu et al. (2020) and Zhu and Doo (2022) found that self-monitoring positively influences self-management in online learning environments, suggesting that it is essential to support the metacognitive skills of learners. Additionally, Abd-El-Fattah (2010), She et al. (2023) and Zhu et al. (2020) showed that motivation plays a mediating role between self-management and self-monitoring, underscoring the important role it has for the effectiveness of the learning process. Finally, the studies by Van Woezik et al. (2019) and Tsai et al. (2008) found that students who were given more autonomy

self-management became more motivated, as they valued the freedom to personalize their learning experience. The investigation into the intercorrelation of Garrison's dimension reinforces the idea that the success of self-directed learning relies not only on the presence of each dimension but on how effectively they interact with and support each other.

Rationale for Implementing SDL in Childhood Education

Given that our study focuses on adolescents, it is important to specify that SDL was originally developed in the context of adult education. Nevertheless, it is now recognized as a learning strategy applicable throughout an individual's lifespan (Cronin-Golomb & Bauer, 2023; Knowles, 1984; Loeng, 2020). However, when examining younger learners, scaffolding and guidance through the learning process should be emphasized, as their cognitive abilities are still developing. Since their frontal cortex is still maturing, key self-directed learning skills like metacognition and self-regulation are not fully matured yet (Ahmad et al., 2023; Reio & Davis, 2005; Schweder, 2020).

Academic Achievement

Academic achievement or academic performance are terms used to refer to the abilities of a person in an instructional environment (York et al., 2019). Every instruction in the environment has specific goals, which the learner should accomplish in the end. Academic achievement reflects on how well a person has met these objectives (Steinmayr et al., 2014). Instructional environments include schools, colleges, or universities where goals entail the acquisition of knowledge and skills in school subjects, as

defined by the corresponding state core curricula, as well as knowledge and skills across subjects like critical thinking (Böttcher, 2003; Steinmayr et al., 2014). The concrete goal of a 7th grader in a German math class would be, for example, the ability to add and subtract negative numbers (Kultusministerium, 2015).

To create comparability among the academic achievement of those 7th graders and learners in general, it is important to have a common unit of measurement. The definition of their academic achievement relies on that measurement tool (Steinmayr et al., 2014). The most common measuring tool found in schools is grades from exams and standardized tests (Fineburg, 2009). It is important to acknowledge that grades and standardized tests have advantages and disadvantages. Grades can be viewed critically, as they are a result not only of the objective but are also influenced by the teacher's subjective opinion of the student's effort. Moreover, exam questions that require more than a simple right or wrong answer might be graded inconsistently, varying based on the teacher's interpretation or even the specific context, time, and environment in which the grading occurs (Anderson, 2018). Finally, standardized high-stakes exams can lead to underachievement in students with test anxiety (Rana & Mahmood, 2010). Despite these limitations, grades and standardized tests remain the most widely used assessment tools not only in schools but also in research on academic achievement. Their prevalence makes them essential for comparing and judging academic achievement across classes, schools and countries (Steinmayr et al., 2014).

When measuring academic achievement, the individual's results depend on a variety of factors (Wong et al., 2021). Prominent internal influences include intelligence, motivation, and personality traits (Steinmayr et al., 2014). However, external influences such as the instructional process can also play an important role in the learner's success. Consequently, implementing approaches like self-directed learning can significantly impact a student's academic achievement (Omeh & Olelewe, 2021; Syahputri et al., 2018).

Self-Directed Learning and Academic Achievement

Several studies found a positive correlation between SDL and higher levels of academic achievement (Abd-El-Fattah, 2010; Alotaibi, 2016; Hsu & Shiue, 2005; Hudson & Ramamoorthy, 2009; Khiat, 2017; Lew, 2017; Lounsbury et al., 2009; Syahputri et al., 2018). Syahputri et al. (2018), for example, showed a direct positive influence of the application of SDL approaches on learning outcomes. However, most studies investigate the correlation between the personal characteristics of students, which are defined as SDL characteristics, and their academic achievement. Those characteristics are attitudes,

abilities, and personal attributes of the students from which their level of self-directedness in learning can be derived. Those SDL characteristics are also described as SDL readiness (Wiley, 1983). Studies investigating SDL and academic achievement oftentimes find a link between the level of SDL characteristics in students, meaning their SDL readiness, and their academic achievement.

The levels of SDL readiness are measured with different variations of Likert scales. A widely used example is the self-directed learning readiness scale by M. J. Fisher and King (2010), the tested items are grouped under the three elements self-management, desire for learning, and self-control. Those elements align with the aforementioned dimensions of Garrison's SDL model (Justus et al., 2022). Consequently, supporting Garrison's dimensions and the described requirements for successful SDL directly translates into positively impacting SDL levels, therefore leading to higher academic achievement. Indeed, Alotaibi (2016) demonstrated that SDL dimensions are positively related to academic achievement, with supportive elements in the learning environment, such as fostering independence and clearly defined goals, serving as mediators between SDL and academic performance. Conversely, a lack of support within the learning environment can reduce students' readiness for SDL, ultimately hindering their academic success.

Practical implementation of Self-Directed Learning

To implement SDL in a school context, methods to facilitate SDL should be incorporated into the foundational structure of the school. The learning steps of the students, planning, learning, and evaluation, should be supported through SDL facilitating methods. The requirements for successful SDL, namely self-management, self-monitoring, and motivation, have to be fulfilled along those steps. The fulfillment of motivation can be viewed in connection to self-determination theory, as shown in Figure 1. The following sections will outline the learning steps for each phase and the possible corresponding pedagogical methods.

Planning Phase

The ideal learning process starts with the planning phase. As John Dewey wrote in 1897 "Education must begin with an insight into the child's capacities, interests, and habits" This coincides with the previously discussed SDL steps. The insight into a child's capacities is here the analysis of their current skill level and possible knowledge gaps (Thornton, 2013). Methods are for instance reviewing activity records (Thornton, 2013), teacher or peer feedback (Thornton, 2013), or mastery-based testing, in which the student's full understanding of a subject or concept is evaluated (Harsy & Hoofnagle, 2020).

This analysis is vital to meet and challenge the students at their current level and fulfill their competence needs (Guay, 2022).

Further, John Dewey mentions the interests and habits of a child. These points are part of the learning needs and should also be analyzed (Thornton, 2013). In addition to the prior knowledge-based analysis, investigating learning needs provides a deeper understanding of the students' learning background. Pushpanathan (2013) includes the following points to define learning needs:

- The student's purpose for and attitude toward learning.
- Personal background, that could influence the effectiveness of learning methods.
- Preferred learning style and learning activities
- Interests and subjective importance of certain skills
- Relationship between student and teacher

Needs analysis questionnaires can help with this step but also structured interviews can be used (Thornton, 2013). Acknowledging the student's learning needs means recognizing the background of their learning process. Next to their prior knowledge, also their previous learning experiences as well as life experiences and family background can influence how they understand certain instructions and construct meaning (Pathak & Bee, 2010). Listening to and including those factors can increase students' motivation (Thornton, 2013).

Step three of the planning phase consists of goal setting. The goals should be short-term (e.g. daily, weekly) as well as long-term (e.g. quartile), to create direction for the student as well as achievable segments (Thornton, 2013). A helpful method for formulating goals is the SMART acronym (Lawlor, 2012). According to this concept, a goal should be specific, measurable, realistic/relevant, and time-bound/trackable (Brown et al., 2016). The gathered information on the student's learning needs can help with the criteria of relevance. For example, goals can be connected to their interests or real-life situations (Bolhuis, 1996; Francom, 2010). Another point is setting mastery goals to avoid knowledge gaps which, first, would have to be considered in the next planning phase and, second, could oppose feelings of competence (Schweder, 2020). Finally, one of the most important characteristics of goal-setting in SDL is individual goal-setting. Hence, students should be empowered to choose their individual learning paths to fulfill their need for autonomy/ self-management (Douglass & Morris, 2014; Francom, 2010; Guiffrida et al., 2013). Depending on their SDL levels and prior knowledge, they might need more support. Otherwise, it can lead to ineffective learning, a feeling of being overwhelmed that leads to a

decrease in motivation (Kicken et al., 2008). A solution for this is adaptive scaffolding, which gives the learner gradually increasing support. Specifically in goal setting, teachers can provide students a limited number of options to choose from and guide their goal formulation (Azevedo et al., 2004; Beckers et al., 2022; Kicken et al., 2008).

Once goals are established, students need to select appropriate resources. This includes materials, instructors, skills, information, and overall strategy necessary to achieve the desired learning outcomes (Du Toit & Kotze, 2009). Choosing resources themselves allows them to align these with their individual goals, preferences, and interests, fostering more meaningful learning experiences (Kicken et al., 2008). A method for teachers to facilitate this, is providing students a selection of tasks or thematic frameworks from which the students can choose based on their interests (Abdullah, 2001; Kicken et al., 2008). Digital learning portals can help with this, as they often provide different practices and levels of difficulty (Tan & Koh, 2014). It can be beneficial to let the students experiment with different learning strategies to help them discover which methods make learning most meaningful for them (Thornton, 2013). As mentioned before, students need scaffolding based on their SDL levels and prior knowledge. This can be provided by the teachers through offering limited options and guiding students through the decision-making process. Furthermore, clear information about the content and difficulty level of materials and tasks can help students make informed and suitable choices. Finally, it is important to give the students information on performance standards and expectations. All in all, these kinds of measures can help to reduce the complexity of choosing resources and to support students on their current level of autonomy/ self-management (Kicken et al., 2008).

The final step of the planning process is the creation of a formal and tangible record of the decisions made in the steps before (Thornton, 2013). This can be done through weekly learning plans (digital or analog), learning contracts, individual learning plans (ILPs) as described by Lockspeiser and Kaul (2016) or the use of portfolios (Beckers et al., 2022; Moeller et al., 2012; Thornton, 2013)

Learning Phase

In the learning phase, the previously made plan will be executed (Thornton, 2013). There are different methods to support the self-directedness of the students in this phase. Allowing self-pacing and providing flexible learning spaces gives students control over the 'when' and 'where' of their learning. This contextual control, in turn, supports the self-management dimension. (Alwadaeen & Piller, 2022; Bautista, 2015; Francom, 2010; Garrison, 1997). As before, students also need support depending on their level of self-directedness and prior knowledge. Teachers can create the necessary external control

and structure that students need by acting as guides throughout the process (Alwadaeen & Piller, 2022). Helpful tools in this context are online learning platforms, as they often already provide adaptive scaffolding. Furthermore, through life feedback on the current learning activities of the students, teachers can get a quick overview of what the students are doing and who might be stuck in their current work (IXL Learning, 2024; Tan & Koh, 2014).

Another part of the learning phase is mid-task monitoring and reflection, also called metacognitive or self-regulation strategies. Next to deciding on contextual factors so engaging in self-management students also need to engage in self-regulation/self-monitoring (Du Toit & Kotze, 2009; Thornton, 2013). To help students reflect on their goals, progress, and learning strategies, it can help to introduce learning diaries (Thornton, 2013). Furthermore, regular progress updates can also increase the feeling of competence (Kicken et al., 2008). Self-testing or self-assessment can also give students a sense for their current status and the success of their strategies (Alzabidi, 2022). To help students connect new material with prior knowledge, giving them prompts before and during their engagement with the learning material can be effective (Du Toit & Kotze, 2009). This can be integrated into the material or learning platforms or expressed by teachers. As Corno (1992) states the encouragement of reflection by teachers can also enhance metacognition. A more specific method for teachers is, for instance, 'teacher guided thinking'. Here, teachers develop two criteria with the student based on which the student can assess their learning activity (Du Toit & Kotze, 2009). Another one is discussing the points from the self-directed learning readiness scale and consequently making the students more aware of their current learning characteristics (Taylor, 1995). Finally, there are partner exercises to support metacognitive behavior. For example, Blakey and Spence (1990) describes the thinking out loud task, where one person articulates their thinking process while the other person listens and asks questions.

Evaluation Phase

At the end of the learning process, learners should reflect on and evaluate all the steps they took and how their personal performance could be improved, which in turn enhances their self-regulation (Francom, 2010; Schunk & Zimmerman, 1998). A possible method is asking reflective questions. For example, Abdullah (2001) suggests questions like "How did you figure task 1 out?" or "Did you do organize your work better than yesterday?" Such questions are designed to make learners more aware of their current situation and guide their future actions. Even more guidance and support can be given through one-on-ones with teachers. This is especially helpful for students who need a lot of scaffolding throughout the process (Thornton, 2013).

The Current Study

The literature shows various pedagogical methods that can be employed in each of the steps of the SDL process. These methods can support the fulfillment of Garrison's SDL dimensions and potentially lead to improved academic achievement. However, the literature lacks an investigation of a school that effectively uses these methods and achieves higher academic outcomes compared to traditional schools. In other words, there is a need for a detailed study on the holistic integration of self-directed learning within the framework of an entire public-school system.

The Alemannenschule Wutöschingen provides an opportunity for such research. Their educational system is grounded in SDL and has shown higher academic achievement compared to other schools in the same region of Germany. It demonstrates how the literature can be translated into reality and how every step of the theory could be applied into everyday life. This research aims to identify which SDL methods the school implemented, how the students are using them and how they fulfill the SDL dimensions, therefore potentially raising academic achievement. The results of the investigation can fill the aforementioned gap in the literature by providing a connection between the theory and everyday practice. Additionally, the findings can help other schools by serving as a blueprint for a practicable working system that offers tangible evidence of the feasibility and benefits of an SDL based educational model. Schools planning similar transformations will have access to a clearer orientation and goal, simplifying the change management and restructuring process. Furthermore, this research could provide policymakers and curriculum developers with a concrete example to support the call for systemic changes in educational practices. By demonstrating the achievable outcomes of implementing SDL in a school-wide context, this study underscores the practicality of adopting student-centred educational strategies that foster independent learning among students.

Considering the aim of the study, the investigation will be led by the following research question:

'Which self-directed-learning based pedagogical methods that are expected to contribute to academic achievement are present in the Alemannenschule Wutöschingen, and how are these methods implemented and used in practice?'

To address this research question, the following sub-questions will guide the investigation:

1. How are the learning steps at the Alemannenschule designed and at which points are specific pedagogical methods implemented?
2. How do students apply and engage with the employed SDL methods?
3. How are the methods perceived by students?

4. How do the methods impact the students' learning experience?

In order to investigate the SDL methods, expected to increase academic achievement, used at the Alemannenschule Wutöschingen (ASW), we employed a case study with a sequential mixed-method design as described by Alele and Malau-Aduli (2023). The study consists of two parts: an observation (Study 1), which informs a subsequent survey (Study 2). This combination of an initial exploratory, qualitative approach followed by a targeted, quantitative investigation offers the opportunity for an in-depth insight into the SDL implementation of the ASW.

Study 1 will address the first sub-question by providing a detailed insight blueprint of the learning process the school has established for the students. Studies 1 and 2 will aim to answer the second sub-question, offering insight into how the students interact with and implement the plan designed for them. Study 2 also aims to answer the third sub-question, which focuses on how positively or negatively the students perceive the methods. Finally, independently of how they feel about a method, the fourth sub-question aims to inquire about the impact of the methods on students learning, using the SDL dimension as established by Garrison (1997).

Building upon these guiding questions and the literature findings, the following hypotheses have been formulated to enable statistical testing of the identified relationships:

H1: With advancing grade levels, increases the perceived impact of SDL methods.

H2: With advancing grade levels, increases the use of SDL methods.

H3: With advancing grade levels, decreases the perceived impact of scaffolding methods.

H4: With advancing grade levels, decreases the use of scaffolding methods.

H5: Students' positive perceptions of SDL methods are positively correlated with the frequency of use.

H6: Students' positive perceptions of SDL methods are positively correlated with the perceived impact.

H7: The frequency of use is positively correlated with the perceived impact.

The first and second hypotheses are based on the study of C.-H. Chen et al. (2022) which found that students of higher grades tend to have higher SDL levels. Furthermore, Ahmad et al. (2023), Slater and Cusick (2017) and Yuan et al. (2012) indicate that age and maturity play an important role in the development of SDL skills. These findings imply that as students progress to higher grade levels, they may become more capable of benefiting from the SDL methods.

The third and fourth hypotheses are supported by the work of Ahmad et al. (2023) and Kicken et al. (2008), who argue that younger learners especially need supportive scaffolding methods due to the

ongoing development of their SDL skills. It can therefore be assumed that the use and perceived impact of those methods decrease with progressing grade levels.

The fifth hypothesis is based on findings from Tzeng et al. (2022) and Zhu and Doo (2022), which demonstrate that students' positive attitudes and intentions played a significant role in their adoption and use of SDL strategies.

The sixth hypothesis draws from the study of Alotaibi (2016), which shows that a positive perception of the SDL elements in the learning environment has a positive impact on the SDL dimensions and skills of the students.

The seventh hypothesis assumes that if SDL methods effectively support the dimensions of self-directed learning, their continued use should have an impact on their development. This is supported by Syahputri et al. (2018), who showed that the application of self-directed learning strategies contributes to the growth of students' SDL skills.

Study 1: Method

Research Design

Study 1 consists of an overt participant observation (Whyte, 1979). By observing students' and teachers' daily actions within their authentic educational environment, the design of the learning steps and specific SDL methods from the literature can be identified. Hence, the results aim to answer sub-question 1 and connect the literature on SDL to the implementation in a practical context. During data collection, the researcher shadowed students from the ASW over the course of a full school day, logging every activity in structured jottings and subsequently detailed field notes.

School Context

The current study was done in the context of the Alemannenschule Wutöschingen (ASW), which is a comprehensive school (Gemeinschaftsschule) for grades 1 to 13 in the south of Germany (Wutöschingen, 2024b). In a comprehensive school, students have the opportunity to earn various types of academic qualifications, depending on their individual progress and abilities. This includes not only the higher-level Abitur (university entrance qualification) but also lower-level qualifications such as the Hauptschulabschluss (basic school leaving certificate) and the Realschulabschluss (intermediate school leaving certificate) (Wiechmann, 2009). Between 2011 and 2015, the Alemannenschule underwent extensive renovations and restructuring, transitioning from an elementary and basic school (Hauptschule) into the comprehensive school with modern facilities and room structures it features today (Samuelis, 2018).

The school describes its approach as student-centered and highlights self-directed learning, aiming to support individual learning paths and personal growth through self-organized and experiential learning in combination with modern technology (Wutöschingen, 2024b). A key aspect of the ASW's culture is its mission statement, which is built on three key pillars: decency, self-responsibility, and determination. Each pillar is supported by core values and guiding principles:

- Decency: We treat people, animals, and materials with respect.
- Self-responsibility: We do everything we can to ensure that each of us can learn independently.
- Self-responsibility: Each of us helps to create an environment that makes us feel comfortable.
- Determination: We are wholeheartedly engaged.

In 2019, the ASW received the German School Award, gaining recognition through various articles and television reports (Blume, 2024; GmbH, 2024; Tutein, 2023; Westrup, 2023). The ASW's popularity was further enhanced by its strong academic performance, as demonstrated by the results of the "VERA-8 Vergleichsarbeit," a standardized assessment administered in the 8th grade across Germany. These results revealed that ASW students outperformed those from traditional schools in the German state of Baden-Württemberg (Alemannenschule Wutöschingen, 2022).

The school's successful self-directed approach made it an ideal case for this thesis, serving as a practical example for other schools and offering valuable insights into success factors and the practical implementation of theoretical concepts.

Respondents

The participants of the observation were one student of each grade, 5 to 10. This range was chosen based on the request of the school and the importance of academic achievement in those years toward high school graduation. The researcher employed purposive sampling to ensure that the selected participants represented a balance in gender, included both high- and low-achieving students, and were available for the study. A teacher of a learning group at the school supported the selection process by identifying students who met these criteria and agreed to participate in the observation.

The chosen students were informed about the scope of the observation and assured that their participation was entirely voluntary and may be discontinued at any point without consequences. To ensure that the students behaved naturally they were not informed about the exact aim of the observation. Upon agreeing to participate, each student was given a consent form for their parents, which included detailed information about the study and the anonymization of data to ensure transparency and informed consent. The selected group of participants eventually consisted of four girls and three boys. Each grade had one participant, except for the seventh grade, where two girls were observed together, as they felt more comfortable participating as a pair. Table 1 shows an overview of the grade and gender distribution of the participants.

Procedure

The observation lasted 7 days, whereby the first day was solely used to familiarize the researcher with the environment, the structure of the school, and the teachers. The headmistress assigned the researcher to a learning group teacher, who serves as the equivalent of a class teacher. However, at the ASW, these teachers lead groups composed of students from multiple grade levels. Each day, a

Table 1

Participants of the observation

	Grade	Gender
Participant 1	5	Male
Participant 2	6	Female
Participant 3	7	Female
Participant 4	7	Female
Participant 5	8	Female
Participant 6	9	Male
Participant 7	10	Male

participant for the following day was selected. The teacher would ask available students from different grade levels if they were willing to have the researcher shadow them. Every student who was approached agreed to participate. The briefing on the day before included an introduction of the researcher, an explanation that the observation was being conducted as part of a master's thesis, and the general conditions of the observation. Participants were informed that they could continue their daily activities as usual and were encouraged not to feel obliged to alter their routines in any way. All participants were informed that they would be granted access to the final study after its completion. On the day of the observation, participants were asked to indicate any change in activities so the researcher could document it.

The researcher had unrestricted access to all classes and learning spaces to capture a complete understanding of the students' daily routines and educational experiences. During the observation, the researcher immersed themselves in the role of a student, participating in and experiencing their daily routines. Beyond interactions for organizational purposes, conversations were held to ensure students felt comfortable with the situation and accepted the researcher's presence. Additionally, the researcher asked questions when students did not clarify their transition between activities and their current task was unclear from an external perspective. Otherwise, interactions were kept to a minimum during learning activities to avoid disruptions.

To capture key details and ensure accuracy in the field notes, which were written after the observation, the researcher followed the approach described by Emerson et al. (2011) by taking jottings during the observation itself. These on-the-spot notes served as a foundation for later expanding into more detailed and reflective field notes. The descriptions in the field notes were subsequently utilized in

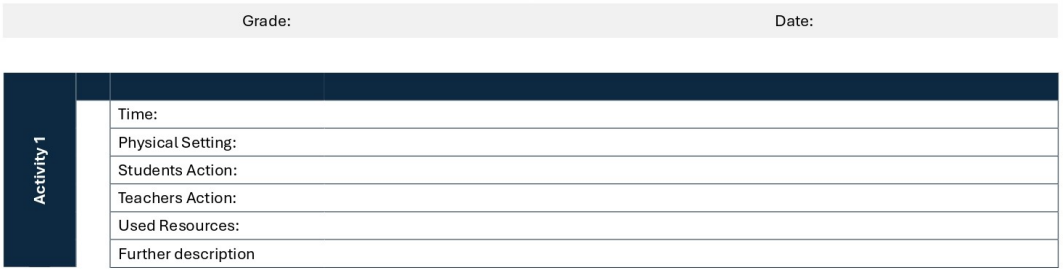
the data analysis process to identify the used SDL methods through qualitative coding.

Instrumentation

The data collection through field observation is based on the works of Emerson et al. (2011) and Chiseri-Strater and Sunstein (1997). As described by Emerson et al. (2011), the researcher immersed herself in the routine and conditions of the participants to understand how they learn and work in this particular school environment. Each learning activity was documented in structured jottings, which are comprised of predefined elements based on Kumar (2023). They include the students' actions and the teachers' actions, which are central to the data analysis. Furthermore, the physical setting, the time, and the resources were captured. The time measures the structure and duration of activities, while the students' and teachers' actions reflect their roles and interactions in the learning process. The physical setting sheds light on the spatial dynamics and how they might affect engagement, and the resources used offer insight into the tools and materials that support learning. Each time a student transitioned from one activity to another, the researcher added a digital entry. Figure 2 shows the jotting template.

Figure 2

Template for Jottings during the Observation



After the conclusion of the observation, the researcher wrote detailed field notes with descriptions of the activities, the time and date, the environment, the setting, behavior, and conversations. While the primary focus was on information relevant to the research question, additional contextual details were recorded to provide a comprehensive understanding and ensure no important aspects were overlooked. In line with the methodologies outlined by Emerson et al. (2011) and Chiseri-Strater and Sunstein (1997), interpretive and reflective sections were included alongside the descriptive elements. The interpretation involved writing down possible explanations, theories, and preliminary conclusions about the observed behavior and situations. The reflection captured the researcher's internal state, specifically the feelings, thoughts, ideas, and questions that emerged during the experience.

QDA Miner was used to conduct a structured and systematic data analysis. The software is specifically designed to support the coding process of qualitative data.

Data Analysis

The analysis of the observation data followed a predominantly deductive coding approach, guided by Pearse (2019) and Fife and Gossner (2024). Based on these authors, the analysis was conducted through the following steps: Choosing a conceptual framework, identifying propositions/operationalizing the theory, creating a codebook, and analyzing the data.

This study followed a theory-driven approach, which means the first step required selecting appropriate guiding theories. In this case, the foundation was provided by self-directed learning theory, the SDL dimensions and learning steps outlined by Garrison (1997) and Thornton (2013), along with self-determination theory.

Step two is the operationalization of the theories. In accordance with Fife and Gossner (2024), the theories were translated into usable versions within the theoretical framework by defining their relevant components and establishing the mechanisms and relationships between them. As the theoretical framework depicts, self-determination theory was integrated into Garrison's dimensions of self-directed learning, which were then connected to academic achievement. In the subsequent step, a literature review was conducted to identify SDL methods for each of Thornton's learning steps that contribute to one or more SDL dimensions.

The literature search involved selecting relevant databases, defining keywords based on the findings of the theoretical framework, and setting inclusion and exclusion criteria for study selection. Since the goal was to identify methods for each individual learning step, this process was done for every step in Thornton's framework. The identified sources were organized in an Excel sheet and categorized by learning step. This allowed for the structured extraction of the methods described in the literature. A more detailed description of the literature review can be found in Appendix E.

The third step focused on developing a codebook. To achieve this, each pedagogical method was labeled using the terminology found in the literature. For methods mentioned multiple times, the most commonly used name was selected. Furthermore, each method was logged with a definition and examples of keywords indicating its occurrence (Appendix B). These codes were then used to analyze and categorize the field notes, enabling systematic identification and classification of the SDL methods demonstrated by the observed students (Appendix C).

While the process was primarily deductive, the codebook was designed to allow for inductive

iterations, ensuring flexibility. Not only the pedagogical methods but also each learning step was assigned a code, a definition, and example keywords to facilitate identification. This approach enabled the capture and coding of pedagogical methods in the data that aligned with a learning step, even if the method was not explicitly identified in the literature review. The additional methods that emerged from the data were evaluated in a second step to determine whether they contributed to at least one of the SDL dimensions. Only those meeting both criteria were included in the results.

Upon completing the entire analysis, the identified methods were synthesized to create a comprehensive overview of how the learning steps were designed and implemented in the ASW.

Categorization of SDL-Dimensions

During the development of the codebook, each identified method was categorized under the SDL dimensions it supports, based on the available literature. The definition of self-management and self-monitoring was based on Garrison (1997). Methods that provide students with choices and control over their learning activities were classified as supportive of self-management. Methods fostering metacognitive awareness and prompting students to reflect on their learning processes and strategies were classified as supportive of self-monitoring.

The definitions of the dimensions of competence and relatedness were based on Filgona et al. (2020) and Deci and Ryan (2012), who described them in the context of self-determination theory. Methods enhancing students' self-efficacy and their perceived ability to achieve desired outcomes were considered supportive of competence. Methods that foster a sense of belonging and convey care for students were classified as supportive of relatedness.

In addition to methods directly supporting the development of an SDL dimension, authors such as Belland (2014) or Ley et al. (2010) describe methods that offer students scaffolding if their SDL levels are not properly developed yet. For instance, organizing learning tasks within thematic frameworks with clearly defined levels of difficulty guides students' choices while preserving their autonomy. Consequently, preliminary stages of SDL methods that offer students structural support in developing their independence were coded as scaffolding for a specific dimension.

The process of determining which dimension a method primarily supports was guided by the flowchart provided in Appendix A.

Quantitative Analysis

In an additional analysis, the jottings were examined quantitatively regarding the amount of time spent with teacher-centered learning, self-paced learning with free task selection, and planning or evaluation activities. For the analysis, the data was transferred to Excel, initially assessed by grade level,

and subsequently evaluated across all grades.

Study 1: Results

The first study investigated the application of SDL methods, which are expected to increase academic achievement across grades 5 to 10 at the ASW through overt observation. The study aimed to answer the research question and first sub-question: Which of these SDL methods are present in the ASW, and how are these methods applied at different stages of the learning process.

The detailed analysis of the field notes revealed that each SDL learning step described in the literature - across the planning, learning, and evaluation phases - is actively supported through SDL methods, expected to increase academic achievement. The following sections will present the results for each learning phase and its corresponding steps.

Planning Phase

Activities related to planning individual learning were an integral part of students' daily routines across all grades, but they did not follow a fixed sequence. While tools, such as coaching sessions with a teacher and creating a learning planner, were mandatory once a week, planning itself was an ongoing process. Students continuously revisited and adjusted their learning paths, often blending planning with execution. Tools like activity records, competence grids, and learning material packages supported this process, and students moved between them as needed. Despite the non-linear process, every learning step, as described by Thornton (2013), was identifiable and supported by specific SDL methods, which will be examined in more detail in the following sections.

The first step of the planning phase consists of analyzing the current skills and knowledge of the students (Thornton, 2013). During the observation, students were observed navigating the school's Learning Management System (LMS) to review their progress and determine their current level of knowledge. The records give a digital overview of what learning materials the students have already completed and what tests they have already passed. Consequently, students can decide on which tasks to take according to their level of knowledge. For instance, a boy in the 5th grade was observed reviewing his progress in the LMS to select his next learning materials. This activity was coded as the method "activity record," as described by Thornton (2013) and E. Chen et al. (2005). Based on the categorization of SDL dimensions, this method aligns with the ability to achieve desired outcomes and is thus assigned to the dimension of competence.

Another observed tool is the "competence grid," which provides students with detailed criteria for what they need to achieve in specific subjects in the school year to attain low, middle, or high skill levels. This observation data does not align with the descriptions of a method from the literature. How-

ever, it does align with the code definition of the learning step "analyzing the current skills and knowledge" and was, for this reason, coded as the method "competence grid" in this step. By offering clear benchmarks for progress and enabling students to track their own skill development, the competence grid supports the dimension of competence, reinforcing their confidence in their abilities. Additionally, since the method guides students in assessing their knowledge and managing their learning process, it is categorized as scaffolding for self-management.

A part of the learning materials of the students is a list of subgoals that state, for example, "I know the rules of rounding numbers" or "I can round numbers to specified decimal places". Next to the subgoals are the corresponding learning materials so students can analyze their current state of knowledge and choose materials based on that. Similar to the competence grid, this method can be assigned to "analyzing the current skills and knowledge". The subgoals support the dimension of competence by helping students in tracking their knowledge and choosing tasks that do not over- or under-challenge them.

The second step of the learning process is to analyze the learning needs of a student. The data showed students attended coaching sessions in which a learning coach asked them about their personal situation, their motivation, as well as how and what they want to learn. While this activity did not fully align with the method of "structured interviews" (Grant, 2002), it aligned with the coding description for the learning step "analyzing learning needs." Therefore, the method of "coaching sessions" was coded for this step.

A specific focus in coaching sessions is set on building trust and establishing a supportive relationship. Because the dimension of relatedness includes creating a sense of belonging and care for the student, this method is categorized as supportive of this dimension.

For the third step, goal setting, students, for example, a girl from the 7th grade, were observed writing down individual learning goals in a learning planner. The specific method was additionally coded as "setting goals (learning planner)". Goal-setting is also supported through coaching, as coaches guide the students through the general planning and the establishment of long-term and short-term objectives. Given that the learning planner provides the students with choices and control over their learning, it was assigned to self-management. The coaching sessions assist students in making informed decisions regarding their goals and were therefore categorized as scaffolding self-management.

The observed activities also align with the definition of the method "choosing individual learning paths/goals" described by Francom (2010). Allowing students to choose their personal goals that do not have to equal the goals of a class or other students gives them control and is supportive of self-

management as well.

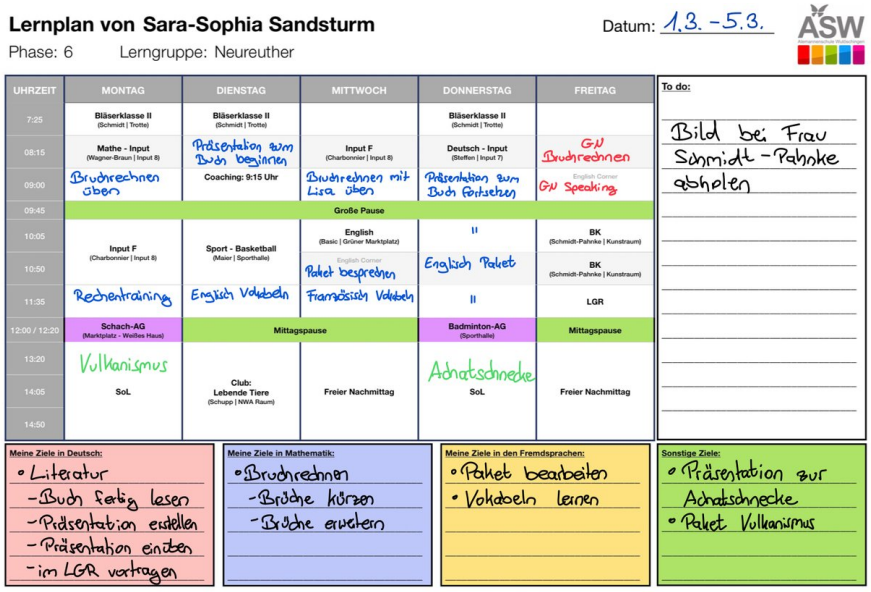
The fourth step of the planning process is choosing resources. The observed students selected tasks independently and without teacher input. This is coded as the method "free tasks selection" (Kicken et al., 2008). However, students chose from a preselected, thematically organized collection of learning materials, which they called "learning material packages". This approach corresponds to the description of the method "thematic frameworks" as outlined by Abdullah (2001). Each package contains informational content and exercises focused on a specific subject topic. The packages are organized in the recommended order of completion, and students are encouraged to work through them progressively. Nonetheless, students retain the autonomy to select and download any package on their iPads independently from the teachers and the order. Each topic offers materials across three levels of difficulty, intended to be tackled sequentially. However, if students demonstrate proficiency in a given area, they can proceed directly to a higher difficulty level. The material packages are complemented with so-called "input classes". These lessons are teacher-centered and introduce and support students throughout the recommended topic sequence of the learning material packages.

The method "free task selection" provides students with choices and control over their learning activities and is therefore categorized as supportive of self-management. The material packages provide students with a structured pathway, making the step of choosing resources more accessible and concrete. Students reportedly know how to proceed and can do so without time and place constraints. Thus, the material packages guide the choices students have to make and are categorized as scaffolding self-management.

In the final step of the planning process, making a plan, learning planners were identified as a method used by students. A girl from 7th grade was for example observed filling out her learning planner with not only her goals for the upcoming week but also a timetable where she allocated specific time slots for independent study to achieve her goals. Additionally, scheduled input classes were documented in the timetable. An example of a learning planner is presented in Figure 3. The method was coded as "weekly learning plans" as mentioned by Thornton (2013) As the method gives students free choice over their learning activities in that week, the method is categorized as supportive of self-management.

Figure 3

Example for a timetable/learning plan at the ASW



Note. From *Die Schmetterlingspädagogik*, by Alemannenschule Wutöschingen, 2024. Retrieved November 19, 2024. https://asw-wutoeschingen.de/sekundarstufe-1

Learning Phase

The next phase is the learning phase, characterized by executive activities. Actively engaging in learning occupied most of the observed students' time, as working on their exercises was the baseline of their daily routine across grades. The observations showed that while structured guidelines and rules were present, students had the freedom to navigate within these parameters and make choices about how they engaged with their tasks.

One of the two learning steps in this phase is 'implementing the plan and engaging in learning. During designated free learning times, all observed participants actively worked on tasks from the learning material packages at their own pace without receiving direct prompts from teachers. If they had questions, they would take the initiative to go to the teacher, who was always available to guide them. Coding these activities resulted in the identification of "self-paced learning" (Francom, 2010) and "teacher availability as a guide" (Alwadaeen & Piller, 2022). The method of "self-paced learning" provides students control over their learning activities and is therefore categorized as supportive of self-management. The method "teacher availability as a guide" assists students in navigating this freedom, offering scaffolding for self-management. It is also important to note that this method conveys care for the student, thereby creating a sense of relatedness.

The observed physical setting revealed that students changed their learning spaces flexibly. Instead of traditional teacher-centered classrooms, they learned in so-called "learning studios"—large open spaces filled with individual desks where students have a quiet working atmosphere to concentrate.

Figure 4

Example of Learning Studios at the ASW

Note. From *Die Schmetterlingspädagogik*, by Alemannenschule Wutöschingen, 2024. Retrieved November 21, 2024. https://asw-wutoeschingen.de/sekundarstufe-1

Additionally, students were observed going to another open learning space called the "marketplace" with tables and couches as well as meeting rooms to learn alone or with others (figure 5). The participants worked there together and challenged each other to finish segments of the learning material packages. The coding of this data resulted in the identification of the method "flexible learning spaces" (Alwadaeen & Piller, 2022). The method offers students choices in their learning activities and can therefore be categorized under the dimension of self-management. As it also creates a social environment where students can connect and develop a sense of belonging, the dimension of relatedness is also applicable.

Though the observed students could choose their learning space, they followed a system called "levels of autonomy". The school offers four levels of autonomy. New students start at level 2 ("Starter"), where they can only visit the marketplace with a time-bound ticket issued by a teacher. This was documented during the observation of a 5th-grade boy who approached a teacher after deciding he wanted to work at the marketplace. After four weeks, if they show they can handle learning on their own, they can apply for a contract to advance to level 3 ("go-getter") and gain more autonomy. To secure this contract, students must obtain supporting signatures from teachers who believe in their readiness for increased

Figure 5

Example of Marketplaces at the ASW

Note. From *Die Schmetterlingspädagogik*, by Alemannenschule Wutöschingen, 2024. Retrieved November 21, 2024. https://asw-wutoeschingen.de/sekundarstufe-1

responsibility. At this level, students are permitted to leave the learning studios and select their own study spots more freely. Since the school has multiple buildings, students with this autonomy can also meet friends from other houses to work together at their respective marketplaces. If students struggle to manage the given freedom, they may be moved down to level 2 or even to level 1 ("New-starter"). At this level of autonomy, students receive closer supervision and guidance from teachers and are not permitted to work in the marketplace. The method does not correspond to the codes of other methods but aligns with the codes of the learning step "implementing the plan and engaging in learning." Consequently, it is categorized under this learning step. While the method of "flexible learning spaces" provides students with control and choice, the "levels of autonomy" provide preliminary steps and guidance toward managing that independence. For that reason, it was categorized as scaffolding self-management.

The final step of the learning phase is mid-task monitoring and reflection. The observations revealed that the learning material packages include self-tests to guide students in assessing their understanding. This aligns with the codes of the method "self-testing/self-assessment," mentioned by Alzabidi (2022). Moreover, the participants reviewed their progress in the activity record within the LMS, which served as a process update during their tasks. As a result, the method "process update" (Kicken et al., 2008) was coded in this context. The two methods promote the use of metacognitive strategies, encouraging students to reflect on their progress, thereby supporting the self-monitoring dimension.

Evaluation Phase

Activities coded as part of the evaluation phase, much like those in the planning phase, were often carried out individually by students, blending with other phases rather than taking place at a set time for everyone. The analysis of the observation identified teacher-led reflection as well as self-responsible evaluation methods. Summative feedback occurred in a structured form through tests, while formative feedback, whether through teacher discussions or internal reflection, depended more on the individual student and their assigned coach. The following section provides a more detailed examination of these findings.

After the participants had studied a certain topic with the exercises of the learning material package, they were observed requesting the corresponding test from a teacher to asses their knowledge. In the 5th grade, a boy was seen studying a math topic during the morning and eventually taking the test on the topic independently, without any prompting from a teacher. In the 7th grade, two girls were observed studying together, encouraging each other to take the test. The activity was coded as "self-scheduled exams", a method found in a study by Ghosh et al. (2020). An explanation by the students and teachers

revealed that a minimum score of 25 out of 30 points is required to pass the self-scheduled exams, and students are given up to three attempts to achieve this score. If students have already mastered a topic, they are not required to attend the corresponding input classes. However, in the observation, students said they chose to participate in these classes even after passing the topic.

Allowing students to take the test when they feel prepared promotes their self-efficacy and accordingly supports the sense of competence. Furthermore, it gives students control and a choice over how much time they want to spend learning and when they want to finish a topic. This indicates the dimension of self-management. By requiring students to reflect on their learning process and understanding, self-scheduled tests also demonstrate support for self-monitoring.

Another observation coded as an evaluation activity was coaching sessions. Based on the observed coaching session and explanations from both the teacher and students, it was concluded that these sessions involved discussing whether learning goals had been achieved and reflecting on the overall learning experience. This activity aligns with the definition of the method "teacher feedback", described by Embo et al. (2010). However, as it is a bit more specific, it was coded as "teacher feedback in coaching sessions". As previously mentioned, the approach of coaching sessions is considered supportive of relatedness and scaffolding self-management. Through the reflective character of the discussion, it is also categorized as scaffolding self-monitoring.

In addition to the coaching sessions, it was observed that teachers offer students regular feedback through a dedicated page in the school's LMS, known as the "learning diary". Teachers can share results from self-scheduled tests there, as well as offer feedback on students' progress and behavior. Participants from 7th grade were observed reading feedback on their social behavior on this page. Similar to "coaching sessions," "learning diaries" also align with the code definition of "teacher feedback". To create a greater specificity, it will be coded as "teacher feedback through learning diary" to acknowledge the specific channel. As the feedback prompts students to reflect on their progress or behavior, it was also categorized under the dimension of self-monitoring.

Table 2 gives an overview of the mentioned SDL methods in the ASW and the supported SDL dimension. It can be noted that 9 out of the 13 identified SDL methods either scaffold or support self-management.

Table 2

SDL Methods of the per Learning Phase and Learning Step

Learning Phase	Learning Step	Method	Description	Supported SDL Dimension
Planning (Preparatory Activities)	Analyzing Current Skills and Knowledge	Activity Record	Digital overview of what materials have been completed at what difficulty level in the school LMS	Competence
		Competence Grid	Overview of the skills students are expected to achieve within a school year	Competence, Scaffolds Self-Management
		Subgoals in Learning Material Packages	Students can check the subgoals to assess their knowledge and determine the next appropriate learning materials	Competence
	Analyzing Learning Needs	Coaching	Each student has a learning coach. In coaching sessions, the coach and student discuss personal situations, progress, motivation, and set short/long-term goals	Relatedness, Scaffolds Self-Management
	Goal Setting	Choosing individual learning paths/goals	Students decide what learning goals they want to reach in the next week	Self-Management

Learning Phase	Learning Step	Method	Description	Supported SDL Dimension
		Goal Setting with a Learning Planner	Students write down their learning goals in a learning planner	Self-Management
		Goal Setting in Coaching Sessions	The coach discusses the student's learning goals with them	Scaffolds Self-Management
	Choosing Resources	Free Task Selection	Students independently select which tasks they want to work on	Self-Management
		Thematic Framework / Learning Material Packages	Students can select learning resources from freely accessible material packages with three difficulty levels, skipping to a higher level if already proficient. Subgoals are provided to assess understanding.	(Scaffolds) Self-Management
	Making a Plan	Learning Plan	Students write down when they will work on a subject and what tasks they will complete	Self-Management
Learning (Executive Activities)	Implementing the Plan	Self-paced Learning	Students independently manage and progress through tasks without external prompts	Self-Management
		Teacher Availability as a Guide	Teachers are available to guide students in their learning	Relatedness, Scaffolds Self-Management

Learning Phase	Learning Step	Method	Description	Supported SDL Dimension
		Flexible Classroom Spaces	Students can choose their learning space freely	Relatedness, Self-Management
		Levels of Autonomy	Students gain increased freedom when they demonstrate the ability to work independently and manage responsibility	Scaffolds Self-Management
	Mid-task Monitoring and Reflection	Self-Tests in Learning Materials	Tasks for self-reviewing	Self-Monitoring
		Process Updates	Activity records also serve as process updates, allowing students to check progress mid-task and see what remains to be completed	Scaffolds Self-Monitoring
Evaluation (Closing Activities)	Evaluating	Self-Scheduled Tests	Students can schedule a test when they feel ready. They have three tries. If they pass (minimum 25/30 points), they can move on to the next topic.	Competence, Self-Management, Self-Monitoring

Learning Phase	Learning Step	Method	Description	Supported SDL Dimension
		Teacher Feedback through Coaching Sessions	Students discuss their progress with their coach and whether they achieved their goals	Relatedness, Scaffolds Self-Management, Scaffolds Self-Monitoring
		Teacher Feedback through Learning Diaries	The LMS includes a page where students receive regular feedback from teachers on their learning progress and behavior	Scaffolds Self-Monitoring

Observational Insights on Learning and Teaching Dynamics

The observation revealed that students do not follow the learning process strictly sequentially; instead, they move fluidly between steps. For instance, a 7th-grade student would engage in a learning activity, then review teacher feedback in the learning diary, followed by a check of their activity record for a progress update, and to plan her next steps, and finally start a vocabulary quiz with a classmate. The flexible learning flow is supported by the open learning environment in which students can choose learning spaces based on their current needs.

The observation also included teacher-centered learning sessions, aligning with a more traditional school setting. Next to the "input lessons", students spent up to three afternoons per week in teacher-centered “clubs.” While these sessions resemble more traditional lessons, the school still emphasizes group work, interactive elements, for example, quiz games, and student choices, such as individually scheduled tests.

The allocation of morning hours was analyzed based on the time students spent in teacher-centered lessons versus self-directed learning activities. The quantitative analysis of the observation data showed that the observed students spent 53% of the time on self-paced learning with free task selection, 4% on planning and evaluation, and 43% in teacher-centered lessons. This data does not include a coaching session, as it was observed separately from the one-day student observations.

Study 1: Discussion

Study 1 aimed to investigate which SDL methods, expected to enhance academic achievement, are implemented at the ASW and how these methods are integrated into the design of each learning step. By observing the students' daily activities, the learning process, and the pedagogical methods supporting SDL could be effectively mapped out. This study thus demonstrates how self-directed learning can be integrated into a functional and successful school system.

The results found SDL methods throughout the planning, learning, and evaluation phases, indicating the support of the SDL dimensions of self-management, self-monitoring, and motivation. These dimensions have been associated with academic achievement in the theoretical framework. The findings contribute to the perspective that fulfilling the SDL dimensions could be essential for creating an effective learning environment with high academic performance.

While evidence for all SDL dimensions was found, self-management was identified as the most strongly supported and scaffolded through the pedagogical methods. This finding is similar to Abd-El-Fattah (2010), who identified self-management as the SDL dimension that has the greatest impact on academic achievement and, consequently, one that should receive particular support. Additionally, it is in accordance with studies by Van Woezik et al. (2019) and Tsai et al. (2008), which found that self-management positively influences self-monitoring and motivation. Van Woezik et al. (2019) highlighted the importance of self-management for consistent performance, especially in self-directed or blended learning models. Tsai et al. (2008) further supported this by showing that self-management is an essential factor for sustaining motivation. Together, these findings suggest that self-management may be one of the most influential SDL dimensions, as it supports the development of the other SDL dimensions, thereby positively impacting academic achievement.

Another important result to highlight is the school's use of various scaffolding approaches, such as coaching, limited choices, and levels of autonomy depending on students' SDL levels. This aligns with literature findings, such as Kicken et al. (2008), that emphasize scaffolding as a critical success factor, given that younger students require structured support to prevent overwhelm and to effectively develop their SDL skills. The case demonstrates how guidelines and structure can be provided while still preserving the students' sense of autonomy.

In addition to the identified self-directed learning methods, the results indicate that the school utilizes a teacher-centered approach. The observed students spent 43% of their mornings in "input lessons," which are teacher-centered. However, unlike traditional schools, these lessons are not regarded as the primary method of knowledge transmission but rather as support for each student's self-paced

learning process. The school also tries to integrate student-centered elements in those lessons. These findings demonstrate that SDL and teacher-centered elements can coexist effectively, and schools do not need to choose between one approach or the other. Studies by Murphy et al. (2021) and Elen et al. (2007) support this, indicating that students favor a combination of both approaches. Elen et al. (2007) further suggests that these methods may have a mutually reinforcing effect. While research indicates that student-centered learning creates higher academic achievement (Precious & Feyisetan, 2020; Rathore et al., 2022), a mix of the two approaches can create a successful learning environment as well. Moreover, a combination can serve as a transitional strategy for shifting from a predominantly teacher-centered to a more student-centered educational framework.

A common concern among teachers in traditional schools regarding student-centered methods is the struggle to redefine their role and the reluctance to give up control over the learning process (Hewitt-Taylor, 2001; Hiemstra, 2013). Teachers may fear that shifting towards self-directed learning diminishes their authority in the classroom, making it harder to ensure students follow structured learning paths (Hiemstra, 2013). The results demonstrate how methods like coaching, teacher guidance, and teacher-centered lessons can provide structure, and the insights might be able to guide educators in clearly defining their roles. As described by Robinson and Persky (2020), many scaffolding methods rely on teachers, and since students depend on their support to develop their SDL skills, teachers seem to take a key position in the learning system. For teachers to understand their role and effectively support students, it is important that they are well-versed in SDL concepts and clearly understand their responsibilities within the process (Robinson & Persky, 2020). Implementing quality management for teacher-led methods and educating teachers could help to ensure consistent support and development.

Limitations

In Study 1, the observation was conducted with a limited sample size and restricted observation period. As a result, the researcher could only capture a limited excerpt of the students' daily routines, observing, for example, only one coaching session. This limitation may have led to the potential oversight of additional methods or practices employed by the school and may have affected the observed distribution and frequency of activities (David Ferguson et al., 2012).

An apparent limitation of the observational method is a possible adjustment of the participant's behavior in response to being observed. Although students were not informed of the purpose of the research and were encouraged to work as they naturally would, there remains a risk that they may have adjusted their learning behaviors to present a certain image to the researcher. This phenomenon known

as the "Hawthorn effect" can lead to increased performance, as described by Oswald et al. (2014). This could include students engaging more actively in learning or employing learning strategies they would not typically use. To verify whether students genuinely use the methods they are expected to, Study 2 incorporates an anonymous survey.

Finally, as David Ferguson et al. (2012) noted, descriptive data is particularly susceptible to bias. In this study, the researcher's prior knowledge may have influenced the data collection process, as certain behaviors could have been interpreted through the lens of the theoretical framework. This may have resulted in an alignment with pre-existing expectations, potentially limiting the objectivity of the observations. Due to the context of the study, it was not possible to have the data reviewed by a second coder. However, the theoretical knowledge also served as an advantage, allowing for the development of detailed deductive codes beforehand, which are vital for creating high inter-observer reliability (Bakeman & Gottman, 1997). The anonymous quantitative research conducted in Study 2 also has the potential to validate whether the coded methods identified in the qualitative analysis were indeed present and accurately represented.

Conclusion of Study 1 and Implications for Study 2

Prior to the study, it was assumed that the school uses SDL methods and that the students follow the SDL learning process. The observation validated these assumptions and showed that the SDL methods - expected to increase academic achievement - are implemented at each step of the learning process as described in theory. Thus, a preliminary framework of the school's learning steps was established.

The framework was developed through exploratory observation involving a limited number of participants, therefore, a quantitative approach with a larger sample size is necessary to validate the insights gained. Study 2 builds on the identified methods by incorporating 15 of them into a survey among all students to examine whether they use these methods as assumed. Additionally, it aims to deepen the understanding of each method by gathering insights into students' preferences and their perceptions of the method's impact on their learning. Consequently, this approach helps to uncover the key success factors of the identified methods, providing an understanding of which practices most effectively support students' learning and contribute to the success of self-directed learning strategies.

The following methods were investigated in Study 2, with the selection process detailed in the Method Section of Study 2:

- Coaching (to analyze learning needs)
- Competence Grid

- Subgoals in Learning Material Packages
- Coaching (goal setting)
- Learning Plan (goal setting)
- Free task choice
- Learning Plan (record of plan)
- Self-Paced Learning
- Flexible learning spaces
- Learning guides
- Self-Tests in Learning Material Packages
- Self-Scheduled Tests
- Feedback Learning Guide
- Levels of Autonomy
- Learning Material Packages

Study 2: Method

Following the identification of the SDL methods and the design of learning steps at the ASW, Study 2 consisted of a quantitative approach using a student survey. After the exploratory approach of the observation, the survey provided the opportunity to systematically assess students' experiences with the SDL methods across a broader sample (Groves et al., 2011). Additionally, it offered deeper insights into how SDL practices are generally used and perceived in the daily school life at ASW.

Research Design

Based on the identified methods in Study 1, a digital questionnaire was developed to examine each SDL method among the entire student population. Specifically, this study seeks to answer the following sub-research questions: (2) How do students apply and engage with the employed SDL methods? (3) How are the methods perceived by students? and (4) How do the methods impact the students' learning experience? To answer these questions, the questionnaire employed Likert-type scales with five response options. For example, the frequency of use was assessed with the options: Never, Rarely, Sometimes, Often, and Always.

By collecting input from a wide range of students, the survey seeks to explore the identified relationships between usage, perception, and impact, as well as their variation across grade levels, thereby establishing a foundation to test the hypotheses.

Respondents

The survey was distributed to all 620 students in grades 5 through 10 at ASW. Participation was voluntary and anonymous. A total of 394 students responded, with 264 completing the survey in full. Of the respondents, 55% were female and 45% male. The distribution of participants across grade levels shows that 5th and 10th graders had the lowest participation, with 54 and 38 responses, respectively. The participation among 6th to 9th graders was relatively similar, ranging from 68 to 78 responses. No grade level or gender exhibited a disproportionately unbalanced number of participants that would significantly impact the study's findings. The full distribution of gender and grade levels is presented in Table 3.

Table 3

Gender and Grade Distribution of Survey Participants

	Percentage	Count
Gender		
Female	54 %	206
Male	44 %	169
Other	2 %	8
Grade		
5	14%	54
6	18%	70
7	20%	76
8	18%	68
9	20%	78
10	10%	38

Instrumentation

Prior to the data collection, preliminary questionnaire items were developed based on the learning steps and SDL methods, expected to increase academic achievement, that could be present at the school. For example, the item for the Learning Step "Analyzing Current Skills and Knowledge" contains the question "How often do you use method X to figure out your current skill level?" for "Use", the question "To what extent do you like method X?" for "perception", and the question "To what extent do you feel confident in completing the upcoming tasks using method X?" for "impact". Once the final methods were identified through Study 1, the structure of the preliminary questionnaire items was used to develop a questionnaire.

As part of the survey design, efforts were made to keep the questionnaire as short as possible while still covering a sufficient range of methods, in order to minimize participation fatigue among the children (Baxter, 2011). The method selection was done in collaboration with a teacher and the headmistress of the school and included the following changes to the list of methods of Study 1: In the final questionnaire, the methods “activity records” (from the learning step “Analyzing Current Skills and Knowledge”) and “process updates” (from “Mid-task Monitoring and Reflection”) were excluded. This decision was based on the suggestion that students might have difficulty understanding these terms and concepts. From the learning step "goal setting", the method "choosing individual learning goals/paths"

was not included as the school had a bigger interest in the examination of the more specific methods "goal setting with a learning planner" and "goal setting in coaching sessions". Finally, the two forms of teacher feedback (digitally and in coaching sessions) were combined into "teacher feedback".

To ensure clarity and accessibility for all students, including younger participants, the questionnaire was revised in a second feedback loop with the headmistress and the teacher. Revisions were made to align with school-specific terminology and improve comprehensibility. Subsequently, the questionnaire was pilot-tested with five students, resulting in additional adjustments, such as simplifying the language, to further refine clarity and ensure ease of understanding while making sure that the original meaning was not lost.

The final questionnaire addressed thirteen SDL methods. Seven for the planning phase, four for the learning phase, and two for the evaluation phase. Each method was assessed using three questions to measure the frequency of use, attitude, and perceived support of the tested dimension. Additionally, the two scaffolding methods - levels of autonomy and learning material packages - were included. However, since students are always required to use these methods, their frequency of use was not evaluated. Table 4 presents a few questions taken from the questionnaire as an example. The full questionnaire is in Appendix D. The question order was structured according to the learning phases, beginning with questions about methods used in the planning phase, followed by those in the learning and evaluation phases. Questions regarding the two scaffolding methods were asked at the end.

Procedure

The final version of the questionnaire was published on the school's LMS, accompanied by a note indicating that the survey was part of a master's thesis. At the beginning of the questionnaire, students were informed that their responses would remain confidential and could not be traced back to them. Participation was entirely voluntary, and students could stop the survey at any point without providing a reason. The link was accessible for three weeks, during which students could complete it at their convenience. The average completion time was 86.07 minutes with a median of 8.5 minutes.

Data Analysis

The survey data was exported from Qualtrics and processed in RStudio. The categorical responses were assigned numerical values ranging from 1 to 5. Regarding questions on the use of a method, scores below 3 ("Never", "Rarely") were interpreted as indicating a lower frequency of use, a score of 3 ("Sometimes") as a moderate, and scores above 3 ("Often", "Always") as a higher frequency.

Table 4

Example Items for Method "Free Task Selection" of the Planning Phase

Item
Use
How often can you select your tasks freely?
Never Rarely Sometimes Often Always
Perception
How much do you like selecting your tasks?
Not at all Slightly Moderately Significantly Very much
Impact (Testing Dimension: Self-Management)
How much does the free task selection help you to feel independent?
Not at all Slightly Moderately Significantly Very much

Note. The presented items were translated from German.

Similarly, for questions addressing the perception of a method, scores below 3 ("Not At All", "Slightly") were interpreted as a lower preference, a score of 3 ("Moderately") as a moderate preference, and scores above 3 ("Significantly", "Very Much") as a higher preference. For questions on the impact of methods, responses scoring below 3 ("Not At All", "Slightly") were interpreted as a lower impact, a score of 3 ("Moderately") as a moderate impact, and scores above 3 ("Significantly," "Very Much") as a higher impact. It should be noted that the stated scale items were translated from German.

As a first step in the data analysis, a descriptive analysis was done, calculating the median, mean, standard deviation, and range for the categories use, perception, and impact across all methods. In this manner, a general tendency of the responses on the SDL methods could be gathered. Boxplots were calculated for a visual analysis of the median and quartiles. Additionally, these statistical metrics were also assessed individually for each method to examine which methods are most and least used, liked, and perceived as having the biggest impact. To further explore the impact, the methods were grouped according to the SDL dimensions they are expected to primarily support. The dimension of motivation included methods supporting relatedness, competence, and autonomy/self-management. The median and mean were calculated for each dimension group, and boxplots were generated to visualize the impact of individual methods, organized by SDL dimension.

To examine the first and second hypotheses, which posit that the perceived impact and use of SDL methods increase with advancing grade levels, the correlation between the mean of the impact

item responses and the grade level was analyzed using Spearman's Rho, a statistical test recommended for Likert-scale data. Additionally, Spearman's Rho was calculated for each individual impact item to provide a more detailed understanding of the relationships. The effect size will be interpreted using the cut-off labels formulated by Cohen (2013). Specifically, Pearson r values of 0.10 will indicate a small effect, 0.30 a medium effect, and 0.50 a large effect.

The third and fourth hypotheses, which propose that the perceived impact and use of scaffolding methods decrease with advancing grade levels, were analyzed using the same approach.

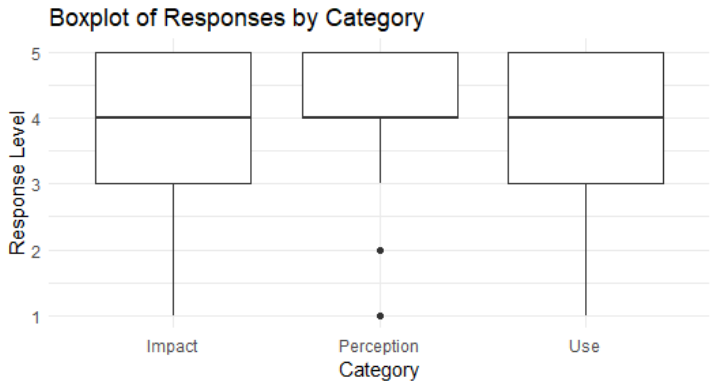
To test the third, fourth, and fifth hypotheses, the correlations between the perception of the methods the frequency of use, and the perceived impact were analyzed. Additionally, the influence of the frequency of use on the perceived impact was examined. Spearman's Rho was used for all these analyses (Jamieson, 2004). Data aggregation was performed when summarizing responses across methods, grouping methods by SDL dimensions, calculating means for correlation analysis, and analyzing individual methods.

Study 2: Results

The results of the descriptive analysis show a positive tendency with a median of 4 in all three categories: use, perception, and impact. As seen in Figure 6, the interquartile ranges (IQR), representing the middle 50% of responses and indicating the range between the 25th and 75th percentiles, show moderate variability for use and impact, with a span from 3 to 5. The IQR from perception appears to be narrower with a span from 4 to 5. While the responses from all categories range from 1 to 5, the responses on perception are more consistent on the positive spectrum. Two outliers below the lower perception whisker indicate that a small number of students have rated this category significantly lower.

Figure 6

Boxplots of the Categories Use, Perception, and Impact



Among the individual methods, goal setting through coaching was reported as the most frequently used, with a median score of 5 and a mean of 4.3. In contrast, the competence grid, used to check students' levels of knowledge, was reported as the least used method, with a median of 3 and a mean of 3.3. All other methods have a median usage rating of 4.

In the category of perception, four methods received a median score of 5: self-paced learning, flexible learning spaces, levels of autonomy, and learning material packages. All other methods were rated with a median of 4. The highest mean was calculated for flexible learning spaces, with 4.6. Goal setting through the learning planner was reported as the least liked method, with a mean of 3.7.

In terms of impact, self-paced learning and learning material packages were viewed as the most impactful methods, both with a median score of 5 and mean scores of 4.3 and 4.2, respectively. The remaining methods had a median impact score of 4. The lowest mean in this category was again found with goal setting through the learning planner, at 3.7. An overview of the means is shown in the Figures 7 to 9.

The responses concerning the impact of the SDL methods were further analyzed based on the dimensions they are designed to support. The median for all dimensions was 4. The mean values were closely aligned across the dimensions, with 4.04 for self-management, 3.91 for motivation, and 4.02 for self-monitoring. Methods scaffolding self-management had a mean of 4.043. The distribution of individual methods within each category is illustrated in the boxplots shown in the Figures 10 to 12.

Figure 7

Means of Use Items

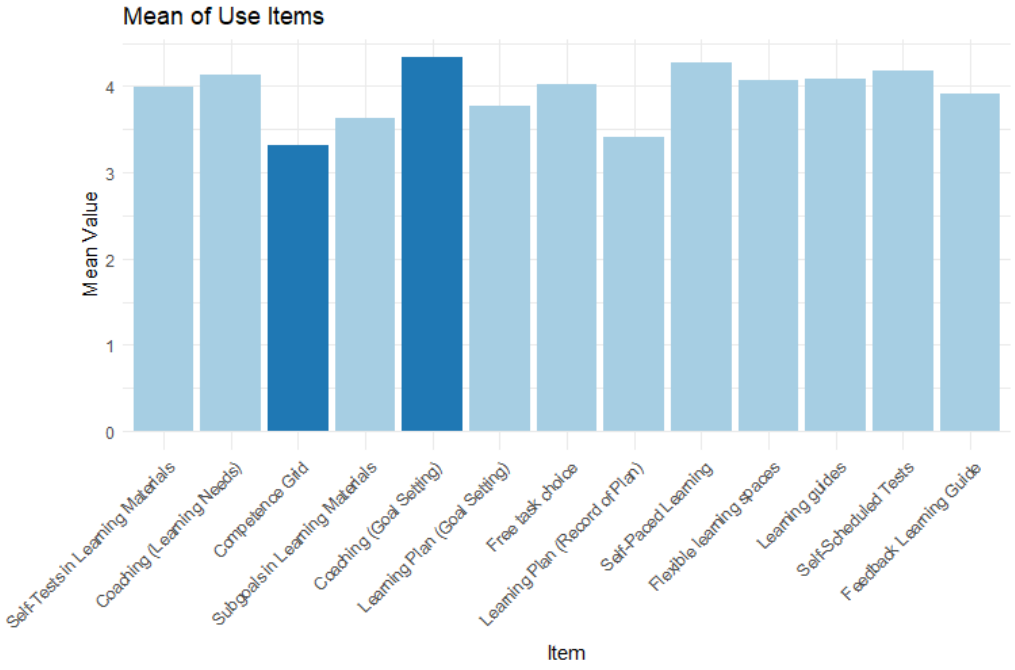


Figure 8

Means of Perception Items

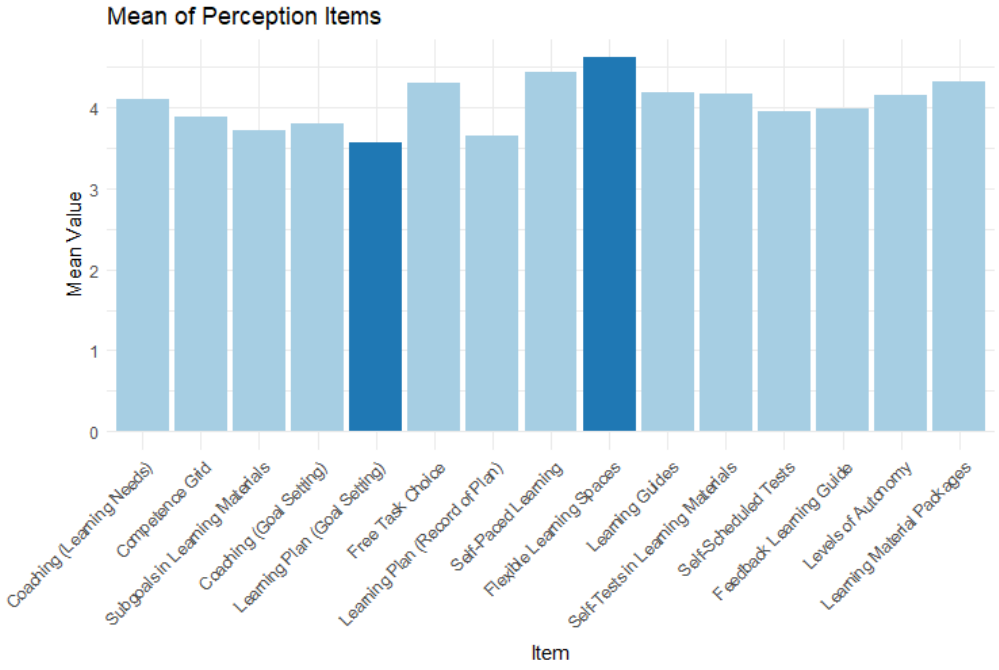


Figure 9

Means of Perception Items

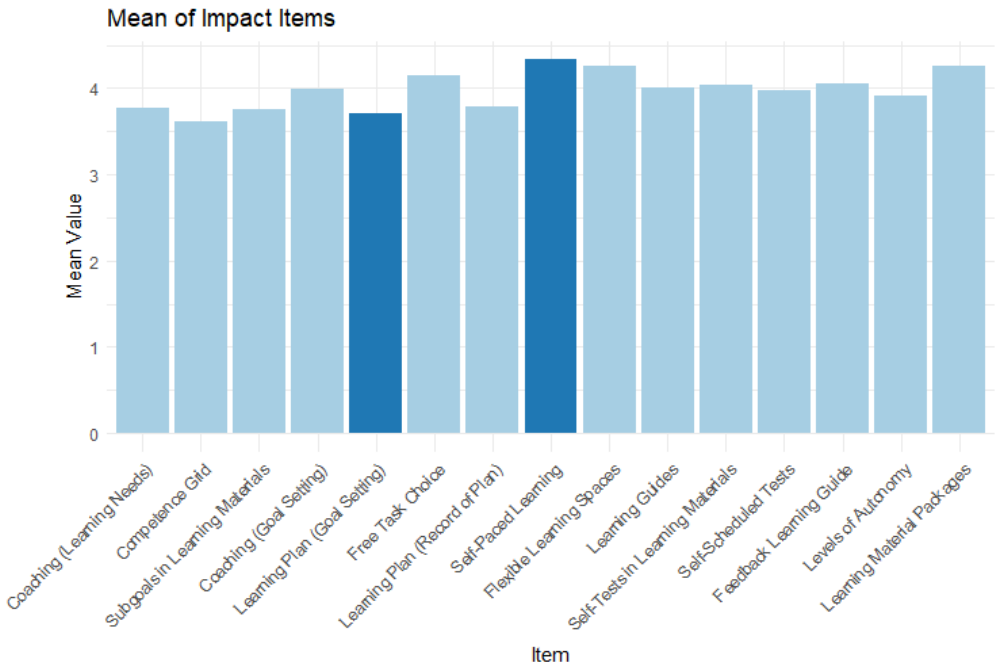


Figure 10

Boxplot of Methods Supporting Self-Management

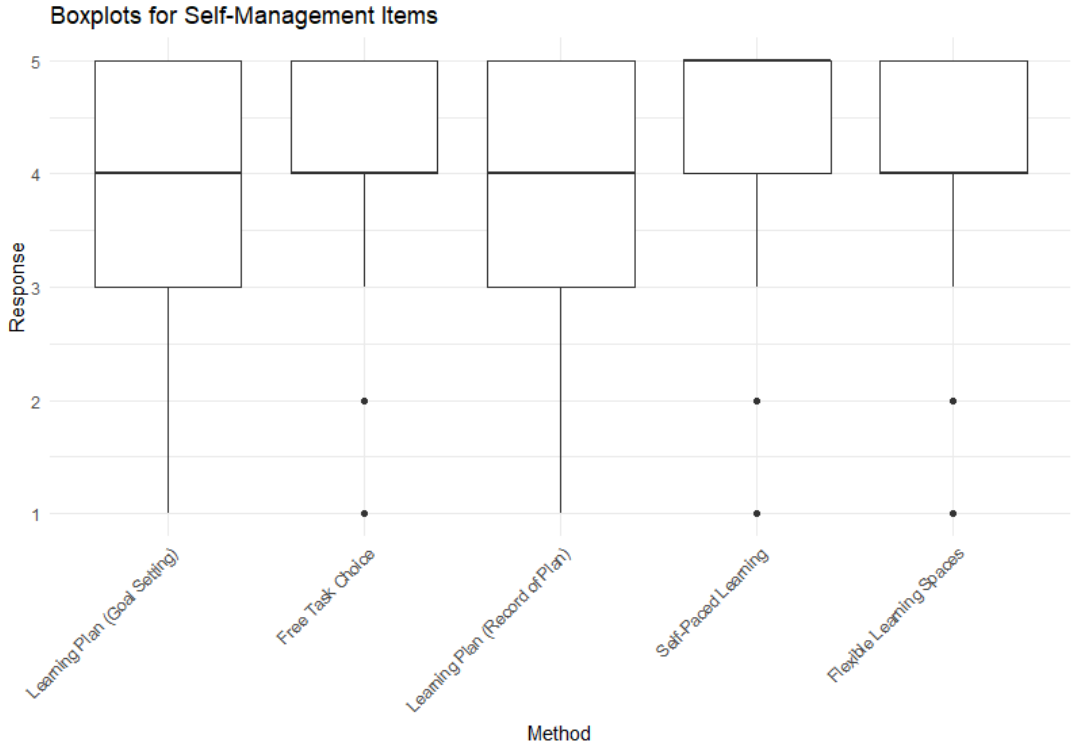


Figure 11

Boxplot of Methods Supporting Motivation

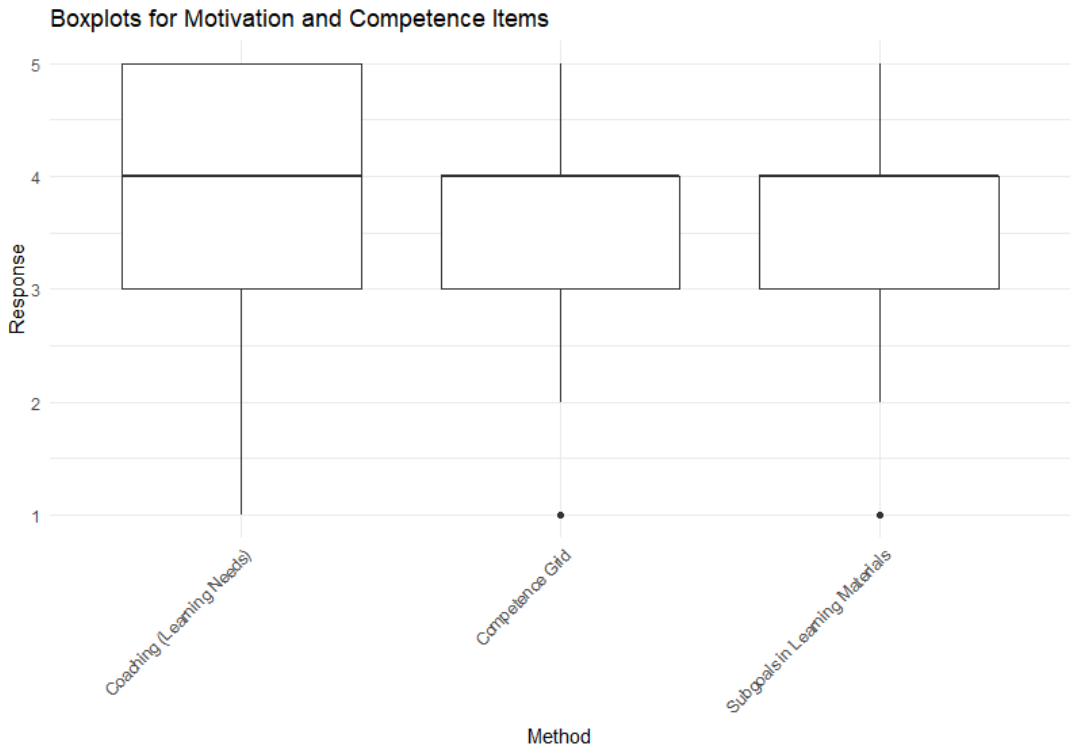
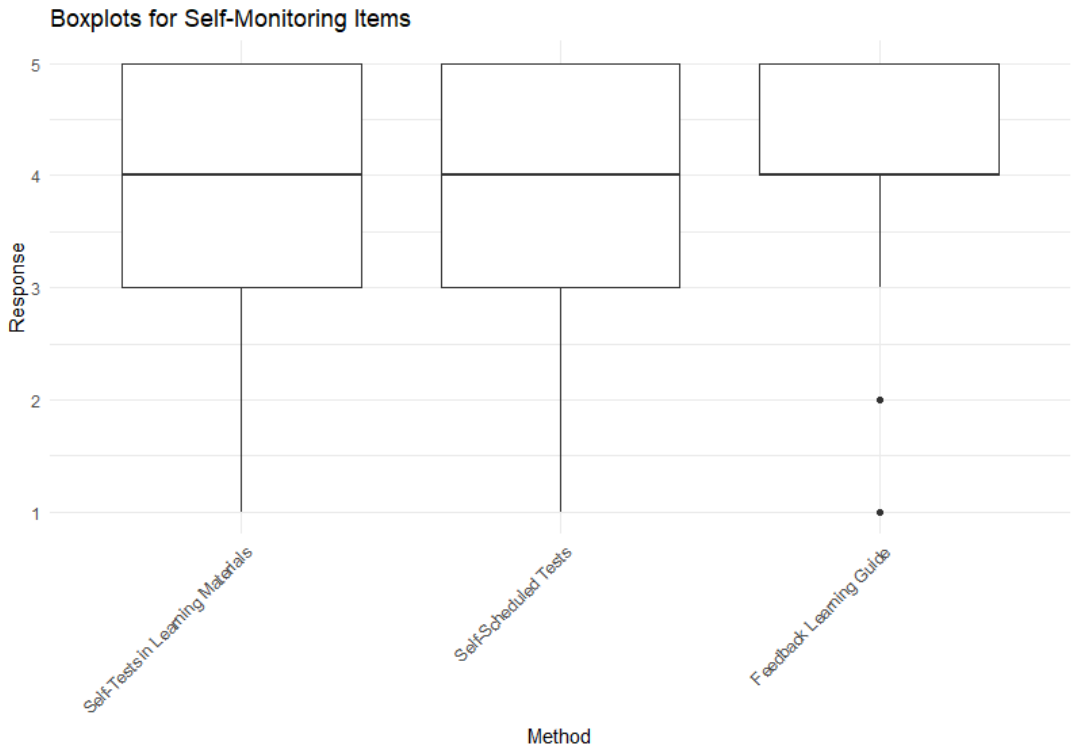


Figure 12

Boxplot of Methods Supporting Self-Monitoring



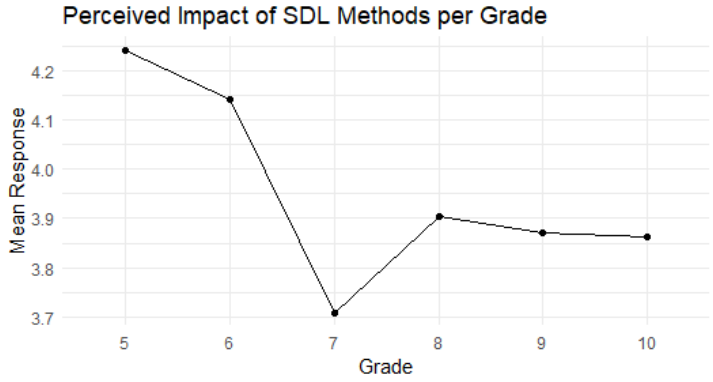
This study examined seven hypotheses, the results of which are detailed in the following section.

H1: The Relationship of Grade Level Progression and the Perceived Impact of SDL Methods

The relationship between grade level and the mean of the impact items was analyzed using Spearman's Rho correlation. The analysis revealed a small negative correlation ($\rho = -0.219$), which was statistically significant ($p < .001$). The development of the responses is illustrated in Figure 13.

Figure 13

Perceived Impact of SDL methods per Grade Level



Looking closer at individual SDL methods, the Spearman's Rho on each impact item revealed that 5 out of the 11 SDL methods correlated statistically significantly with the grade level. As shown in Table 5, the learning plan, used as a record of the planning phase, demonstrates the strongest negative correlation.

Table 5

Spearman's Rho Correlation Between Grade Level and Perceived Impact of SDL Methods

Method	ρ	p
Coaching (Learning Needs)	-0.16	.003**
Competence Grid	-0.14	.011*
Subgoals in Learning Materials	-0.08	.179
Learning Plan (Goal Setting)	-0.19	.001***
Free Task Choice	-0.11	.052
Learning Plan (Record of Plan)	-0.22	.000***
Self-Paced Learning	-0.09	.122
Flexible Learning Spaces	0.07	.244
Self-Tests in Learning Materials	0.05	.465
Self-Scheduled Tests	-0.17	.006**
Feedback Learning Guide	-0.04	.559

The learning plan used for goal-setting, coaching to analyze learning needs, self-scheduled tests, and the competence grid show small negative correlations.

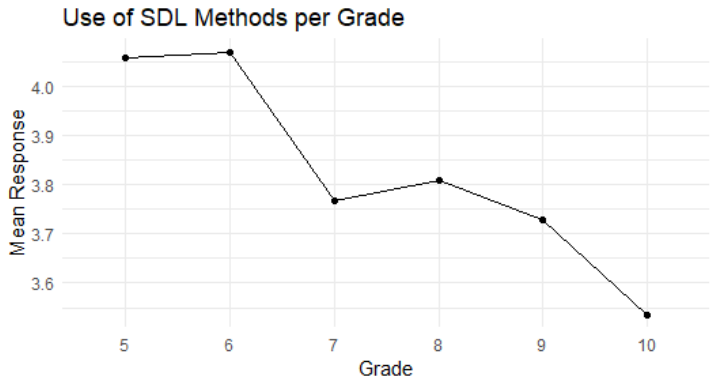
Free task choice, self-paced learning, subgoals in learning materials, and feedback from learning guides have a non-significant, small to trivial negative correlation. Lastly, flexible learning spaces and self-tests in learning materials demonstrate trivial positive correlations with grade level, that are not statistically significant.

H2: The Relationship of Grade Level Progression and the Use of SDL Methods

The analysis reveals a statistically significant, small negative correlation between grade level and the use of SDL methods ($\rho = -0.253$, $p < .001$). The development can be seen in Figure 14. Analyzing the individual methods revealed that 5 out of the 11 methods correlate statistically significantly with the grade level. An overview of the results is presented in Table 6. The use of the learning plan for goal setting shows a moderate negative correlation. Furthermore, small, statistically significant correlations were found for free task choice, the learning plan as a record, and the competence grid.

Figure 14

Use of SDL Methods per Grade Level



An even smaller but still statistically significant correlation has been found for sub-goals in learning materials. Non-significant negative effects were observed for feedback from learning guides and self-paced learning. No correlation was identified for coaching to analyze learning needs and self-scheduled tests. Flexible learning spaces and self-tests in learning materials displayed small positive ρ values, though they were not statistically significant.

H3: The Relationship of Grade Level Progression and the Perceived Impact of Scaffolding Methods

As presented in Table 7, learning guides, levels of autonomy, learning material packages, and coaching for goal-setting do not have significant correlations.

Table 6

Spearman's Rho Correlation Between Grade Level and Use of SDL Methods

Method	ρ	p
Coaching (Learning Needs)	-0.04	.501
Competence Grid	-0.20	<.001***
Subgoals	-0.15	.009**
Learning Plan (Goal Setting)	-0.33	<.001***
Free Task Choice	-0.26	<.001***
Learning Plan (Record of Plan)	-0.23	<.001***
Self-Paced Learning	-0.03	.596
Flexible Learning Spaces	0.01	.851
Self-Tests in Learning Materials	0.09	.148
Self-Scheduled Tests	-0.00	.962
Feedback Learning Guide	-0.05	.455

Table 7

Spearman's Rho Correlation Between Grade Level and Perceived Impact of Scaffolding Methods

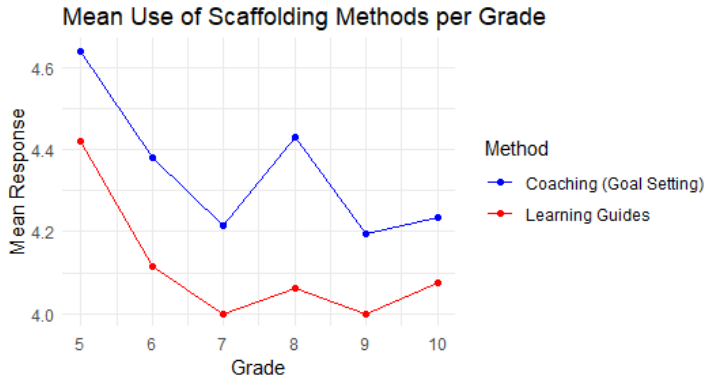
Method	ρ	p
Coaching (Goal Setting)	-0.01	.914
Learning Guides	-0.12	.058
Levels of Autonomy	-0.11	.088
Learning Material Packages	-0.07	.283

H4: The Relationship of Grade Level Progression and the Use of Scaffolding Methods

The Spearman's Rho on the scaffolding methods revealed a statistically significant, small negative correlation between the grade level and the use of coaching for goal-setting ($\rho = -0.142$, $p = .012$). The use of the learning guide does not show a statistically significant correlation with grade level ($\rho = -0.106$, $p = .083$). Figure 15 illustrates the development of both methods.

Figure 15

Use of Scaffolding Methods per Grade Level



H5: The Relationship of Students' Positive Perception of SDL Methods and Their Usage Frequency

The analysis using Spearman's Rho demonstrated a large, statistically significant positive correlation between students' perceptions of SDL methods and the frequency of their use ($\rho = 0.758$, $p < 0.001$).

H6: The Relationship of Students' Perception of SDL Methods and the Impact on the SDL Dimensions

A significant positive correlation with a large effect size was found between students' perceptions of SDL methods and the perceived impact of these methods on the SDL dimensions ($\rho = 0.803$, $p < 0.001$).

H7: The Relationship of Students' Use of SDL Methods and the Impact on the SDL Dimensions

A Spearman's Rho analysis revealed a significant positive correlation between the use of the SDL methods and the perceived impact on the SDL dimensions with a large effect size ($\rho = 0.703$, $p < 0.001$).

Study 2: Discussion

Study 2 aimed to examine how students at the Alemannenschule Wutöschingen use the SDL methods implemented at the school, how they perceive them, and what impact they have on their learning experience in relation to the SDL dimensions. The survey results indicate an overall positive trend across all three areas: students generally use the implemented methods, view them favorably, and perceive them to have the intended impact on self-management, self-monitoring, and motivation. Beyond this general trend, several important patterns and exceptions emerged. The findings suggest that some SDL methods are more integral to students' learning routines than others, perception and impact ratings vary across methods, and engagement with SDL methods declines with grade level. These aspects are discussed in more detail below.

Main Findings

The medians and means of the methods were generally closely aligned and above the midpoint of 3, indicating that the SDL methods identified in Study 1 are frequently utilized and well-perceived by the students. This alignment also reflects their implementation in a manner consistent with descriptions in the literature, suggesting that the methods function in practice as theorized, effectively supporting the goals of self-directed learning (Thornton, 2013).

The use of SDL methods

Starting with the results on the frequency of use, the highest usage was reported for goal-setting in coaching sessions. This finding suggests that goal-setting is a particularly essential component of the coaching process, even more so than the analysis of students' learning needs. However, the mean scores for both methods are closely aligned, with each exceeding 4, indicating that both practices are highly used and play a significant role in supporting the learning processes of students at the ASW. This aligns with the findings of Wolff et al. (2020), which show an improvement of SDL through coaching. In particular, by creating a better development of learning goals and leading to a more frequent implementation of these goals compared to students who do not receive coaching.

Self-paced learning and self-scheduled tests were reported as being used to a comparable extent, suggesting that these methods are also integral components of students' daily academic routines. The study thus supports self-paced learning as a fundamental approach to promoting self-directed learning, consistent with the principles outlined by Setlhodi (2019).

The competence grid appears to be the only method used sporadically, as indicated by its lower usage scores. While its perception and impact scores also fall below 4, they are not significantly lower

than those of other methods. Yet, this discrepancy may suggest that the competence grid is not being fully utilized or valued by students. One possible explanation is that students might not fully understand the grid's purpose or potential benefits. Alternatively, they may be relying on other tools or strategies to analyze their current skills and knowledge, making frequent use of the competence grid less necessary. For instance, Thornton (2013) identified peer or teacher feedback as an alternative approach in this context. Considering that only one coaching session was observed in Study 1, it is possible that this method may have been used for this learning step in other coaching sessions not captured in the observation. Additionally, students may already gain sufficient insight into their current abilities from the results of self-scheduled tests. Exploring these possibilities further could help ensure the effective implementation of this learning step while potentially identifying measures to enhance the grid's utility and impact.

The perception of SDL methods

The responses on the perception of the SDL methods were the most consistently positive, as evidenced by the narrow interquartile range. This suggests that the implemented educational strategies effectively created an engaging and supportive learning environment. This finding is consistent with research by Alotaibi (2016), which shows that students' positive perceptions of their learning environment can support the SDL dimensions, enhance the SDL skills, and consequently positively influence the student's academic achievement.

Methods such as self-paced learning and flexible learning spaces received particularly high perception ratings, indicating that autonomy and adaptability are appreciated and valued by students. Notably, the two scaffolding methods, levels of autonomy and learning material packages, also achieved a median score of 5. This indicates that while students enjoy the freedom to direct their own learning, they equally value the structured support these methods offer. This ties well with previous studies on scaffolding, such as Ley et al. (2010), which found that scaffolding tailored to individual students can help students feel more supported in their learning process.

The lowest perception scores were observed for goal-setting with the learning planner and recording the learning plan in the learning planner. The method of goal-setting with the learning planner was also the lowest-rated method in terms of impact. In contrast, goal-setting in coaching sessions was rated higher. This suggests that students may prefer engaging in the planning process collaboratively with a coach, instead of on their own. This preference can be linked to the general need for personal support in their independence. The analog learning planner, on its own, may not provide the level of personalized guidance that students seem to require. Previous research on individual learning plans, such as Kastenmeier et al. (2018) and Chitkara et al. (2016), has demonstrated the potential to enhance

academic achievement and showed an overall positive perception among students. However, in these studies, the implementation of the individual learning plans was very guided, incorporating support from directors and clerkships, clear instructions, and other scaffolding methods. As a result, the observed outcomes cannot be attributed solely to the learning planner itself but rather reflect the effectiveness of the comprehensive process. Returning to the current study, the responses for the learning planner, while the lowest in comparison to other methods, still fall within the positive spectrum. This suggests that the planner itself may not be the primary determining factor in the success of the planning process but rather one component of a larger system of support.

The perceived impact of SDL methods on the SDL dimensions

In the category of impact, the overall highest-rated methods were self-paced learning and learning material packages, closely followed by flexible learning spaces. Since these methods also received high perception ratings, this aligns with the confirmation of hypothesis 6, which demonstrated a positive correlation between students' perception of the methods and their perceived impact. Furthermore, this is consistent with the findings of Alotaibi (2016), who showed that a positive perception positively impacts the SDL dimensions.

The analysis of the impact per SDL dimension revealed that the methods, when grouped according to the dimension they are intended to support, all achieved a median score of 4. Examining the mean ratings further highlighted that methods designed to scaffold self-management and those supporting self-management received the highest average scores. Considering that self-paced learning (supporting self-management) and learning material packages (scaffolding self-management) were the highest-rated methods overall, this outcome is in accordance with the previous findings. Additionally, it contributes to the recurring theme that students value the balance between the freedom to work independently and the structured guidance that helps them navigate their learning process effectively. The importance of the dimension of self-management was similarly highlighted in the study by Abd-El-Fattah (2010), which identified it as the strongest predictor of academic achievement.

Grade level progression

An unanticipated finding of Study 2 was the negative correlation between the students' grade level and the use and perceived impact of the SDL methods. Especially the competence grid, the learning plan for goal-setting, and the learning plan as a record demonstrate a significant decrease in use and impact with progressing grade level. This result contrasts with the findings of Thuy et al. (2024), C.-H. Chen et al. (2022) and Yuan et al. (2012), who reported higher SDL levels among older students. However, it aligns with the observations of Padmapriya and Sudhakar (2023) and Premkumar et al.

(2018), who identified a decline in students' SDL levels over the years of training. They attributed this decline to students possibly shifting their focus toward achieving high grades and excelling in exams, rather than engaging in learning for its intrinsic value. This transition from deep to surface learning can negatively affect SDL. A similar dynamic may be at play in this study. Moreover, as students have to prepare for high school graduation and the pressure rises, they might not have as much time to use the SDL methods. Supporting this argument is also the confirmation of hypothesis 7, which showed that the use of the methods correlates positively with the perceived impact.

Another point to consider is that the participants in the studies by Padmapriya and Sudhakar (2023) and Premkumar et al. (2018) were older than the students in this study. In the case of adolescents, as in this study, puberty may be a factor in influencing their learning behavior and attitudes. As demonstrated by Martin and Steinbeck (2017), hormonal changes during puberty can contribute to lower academic achievement and a decreased valuing of school-related activities. Consequently, there might be a need for different SDL approaches to maintain engagement in upper grades Uus et al. (2022).

A more in-depth analysis of students' SDL skill development is needed to provide a definitive explanation. If SDL skills remain consistent or improve, the observed trends could also be attributed to increased learner autonomy, reducing the need for structured SDL tools. Supporting this speculation is that the ratings for flexible learning spaces and self-tests in the learning materials, thus very independent working methods, remain consistent.

Another interesting development across the grades is that the use, perception, and impact of the methods show a noticeable dip in the 7th grade. To understand the reason for this sudden decrease, a closer investigation into the specific changes or challenges students encounter in the 7th grade would be necessary. This could include examining curriculum shifts, teaching strategies, or developmental factors that might influence their engagement with SDL methods (Martin & Steinbeck, 2017; Rockoff & Lockwood, 2010).

Future Studies

The findings of this study reveal several areas for further investigation. First, future research could explore the decline of use, perception, and impact across grade levels. While previous studies have linked this trend to increased academic pressures and a shift from intrinsic to extrinsic motivation, further investigation is needed to validate the negative trend and confirm these explanations Padmapriya and Sudhakar (2023) and Premkumar et al. (2018). Additionally, developmental factors such as the hormonal and cognitive changes during adolescence could be examined to better understand how they

influence students' engagement with SDL methods Martin and Steinbeck (2017). Research focusing on interventions to sustain SDL engagement in upper grades, particularly as students approach high school graduation, would provide valuable insights Uus et al. (2022).

Second, the noticeable dip in the use, perception, and impact of SDL methods in the 7th grade highlights an area requiring closer investigation. Future studies could examine potential factors contributing to this anomaly, such as shifts in curriculum, teaching strategies, or social and developmental changes specific to this grade level (Martin & Steinbeck, 2017; Rockoff & Lockwood, 2010).

Third, future studies could focus on experimentally testing the effectiveness of the highest-rated methods, such as self-paced learning, learning material packages, and flexible learning spaces, to better understand their impact on academic achievement. Longitudinal studies could track the long-term effects of these methods on students' academic trajectories and their ability to self-direct their learning. This approach would help validate the observed benefits and provide robust evidence for the broader adoption of these methods in educational practice.

Limitations

It is important to recognize that Study 2 has certain limitations. First, the analysis of Likert-scale data is controversial, as it is often strictly classified as ordinal data due to potential variability in the distances between response categories (Harpe, 2015). However, treating Likert-scale data as interval can be justified by empirical research, particularly when the sample size is sufficiently large (Norman, 2010). As the sample size in this study exceeds 100 participants, statistical measures such as the mean are considered appropriate.

Second, given that the participants of the study range from grades 5 to 10, the inclusion of a younger demographic presents a potential limitation. Even though the questionnaire was reviewed by teachers and tested with students to ensure comprehensibility, the risk remains that some students may have found the questions and the gradations of agreement or disagreement challenging to understand, even if no direct indication of this was observed. This could lead to inconsistencies in responses and reduced reliability of the data (Mellor & Moore, 2014).

Third, a limitation associated with using a Likert scale is related to test reliability. Research by Dolnicar and Grün (2013) indicates that Likert scales tend to perform less effectively on strict measures of stability. This means that participants may not consistently provide the same response to the same survey question when asked at different times, even if their circumstances or attitudes have not changed. Such variability in responses can undermine the reliability of the data and the conclusions drawn from

it. While no direct evidence suggested that this limitation impacted the results, the possibility cannot be completely ruled out.

Theoretical Implications

Both Study 1 and 2 offered valuable insights into the successful implementation of SDL in a school context, thereby contributing to and expanding the existing body of literature. Various studies have examined SDL levels across diverse contexts, the effectiveness of SDL interventions, as well as individual supportive tools, and the impact of SDL on academic achievement. However, research focusing on the practical application of SDL methods for middle school-aged students and on a school system designed around its principles has been limited. The results of this study allowed us to see if the theoretical concepts of the literature can be found in an organically grown SDL environment. Indeed, Study 1 demonstrated that the methods hypothesized to be used in SDL and expected to increase academic achievement are applied in the practical context. In addition, Studies 1 and 2 established a comprehensive foundation for a connection between the practical literature on pedagogical methods and the theoretical framework of SDL dimensions, including the integration of Self-Determination Theory (Deci, 1992; Garrison, 1997; Thornton, 2013). The research thus provides a valuable understanding of how the theoretical concepts translate to a practical application. Moreover, it enables a new perspective on investigating the pedagogical methods and dynamics in established SDL environments through observation and student surveys. The combination of Studies 1 and 2 complemented each other by linking exploratory observation and a focus on present methods with students' perceptions and experiences, thereby offering a comprehensive understanding of how SDL methods are implemented and experienced in a real-world school context.

Regarding potential success factors, the study both validates and builds upon existing knowledge. The significant correlation between the perception of the pedagogical methods and the perceived impact on SDL dimensions further enhances the understanding of the importance of a positive attitude toward the learning environment. This relationship was also demonstrated in the study by Alotaibi (2016) with nursing and medical emergency students. The current research extends these findings to the 5th to 10th grades. Furthermore, the correlation was analyzed for each identified SDL method, providing method-specific insights that contribute to a nuanced understanding of how the perception of individual methods influences students' self-directed learning.

Next, the combined results of Studies 1 and 2 suggest that the support of self-management, complemented by scaffolding methods, is a key success factor in unlocking the benefits of SDL. Similarly, Ley et al. (2010) demonstrated the importance of this balance in a controlled lab setting. The present study offers these insights from the perspective of a successful real-life example in a middle school context, illustrating how the balance between self-management and structured support can be

practically implemented. Future research can draw from these insights for an improved understanding of the dynamics within an SDL-based school system.

The results on the decline of use and impact of the methods per grade contradict the work of Thuy et al. (2024) and Yuan et al. (2012) but align with the studies of Padmapriya and Sudhakar (2023) and Premkumar et al. (2018). The findings therefore add to the existing research by providing another case where a decrease in SDL characteristics was observed, offering insights for future studies on the phenomenon.

Finally, this was the first study to investigate the prominent pedagogic example of the Alemannenschule Wutöschingen. The findings help move beyond anecdotal praise by offering concrete evidence of how theoretical principles of SDL are operationalized within the school system. The two-study design, which combines observational insights with student perceptions, seems to be an effective research approach for capturing the complexity of SDL implementation in a real-world context. This methodology highlights the value of linking theory and practice while focusing on the learner's perspective, offering a way for future studies to examine similar educational innovations. This study highlights the potential of SDL-based pedagogy, aiming to inspire further meaningful research in this area.

Practical Implications and Recommendations

The results of the current study provide relevant practical implications that can inform the development of noteworthy recommendations for schools as well as policymakers.

The investigation into the case of the ASW showcased the feasibility of an SDL-based school system. It provides schools and policymakers with a clear example of how student-centered learning environments can be implemented. Moreover, the findings support the idea that every step of the learning process should be supported by at least one SDL method, consistent with the recommendations of Ley et al. (2010) and Thornton (2013) who argue for structured support to help students cultivate their SDL skills. While replicating the exact ASW method design may not be necessary, an effective implementation should form a coherent system that supports each SDL dimension throughout the learning process, as this is also expected to increase academic achievement. This holistic approach aligns with the work of Garrison (1997) who introduced the necessity of supporting all SDL dimensions within an educational system.

According to Study 2, it is important to ensure that SDL methods are not only well designed but also well perceived by students, as their preference seems to play a role in how impactful they consider the methods. A similar conclusion was drawn by Alotaibi (2016) who showed that the perception of

the learning environment supports their SDL skills and academic performance. To cultivate a positive attitude, self-management-supporting methods should be utilized in combination with scaffolding methods, which is also described by Ley et al. (2010). The balance between independent learning and structured guidance appears to be a key factor in the success and positive reception of SDL methods. More schools can be encouraged to place similar trust in their students' independence while providing guidance tailored to their needs.

Based on the results, the identified methods that appear to be most significant from the students' perspective are self-paced learning, learning material packages, flexible learning spaces, and coaching for goal setting. Given the success and relevance of these methods, schools looking to implement SDL should prioritize incorporating them.

Conclusion

The current study investigated the case of the Alemannenschule Wutöschingen, a school known for its high student performance. It aimed to address the increasing demand for guidance on the successful implementation of self-directed learning and utilizing digital tools to support it (Brookes, 2017; Voskamp et al., 2022). The mixed-method study examined which SDL methods, expected to increase academic achievement, are present at the ASW and how they are implemented and used in the student's learning process.

Study 1 identified the SDL methods used at the school, which are expected to enhance academic achievement, for each learning step. The findings indicate that the pedagogical methods support all dimensions of SDL, with a strong presence of approaches that promote independence in combination with those that provide structural support.

Subsequently, Study 2 showed that students frequently use the methods, view them positively, and perceive them as impactful on the SDL dimensions. Furthermore, the results demonstrated how students appreciate and value the balance between freedom and guidance.

Together, the results of Studies 1 and 2 demonstrated that creating the opportunity for students to develop their skills to self-manage, self-monitor, and sustain internal motivation can lead to an effective school system with higher academic achievement. The approach of the ASW serves as a compelling example of how self-directed learning can be successfully implemented, proving that SDL-based pedagogy is not just an idealistic vision but a tangible reality. It is time to create student-centered schools that children actually want to attend. Schools that empower rather than constrain. By demonstrating both the feasibility and the success of this approach, this study leaves no excuses for strictly teacher-centered

institutions. Instead, it calls for a broader integration of SDL into the education system, paving the way for future-ready schools.

References

Abd-El-Fattah, S. M. (2010). Garrison's model of self-directed learning: Preliminary validation and relationship to academic achievement. *The Spanish Journal of Psychology*, *13*(2), 586–596. https://doi.org/10.1017/S1138741600002262

Abdullah, M. H. (2001). Self-directed learning. https://files.eric.ed.gov/fulltext/ED459458.pdf

Ahmad, B. E., Saad, Z. A., Aminuddin, A. S., & Abdullah, M. A. (2023). Self-directed learning of Malay undergraduate students. *Studies in Self-Access Learning Journal*, *14*(3). https://doi.org/10.37237/140302

Akkilagunta, S., Kar, S. S., Premarajan, K., Lakshminarayanan, S., Ramalingam, A., Chacko, T. V., & Bhandary, S. (2019). Assessment of reliability and adaptation of Fisher's 52-item self-directed learning readiness scale among medical students in southern India. *International Journal of Advanced Medical and Health Research*, *6*(1), 7–11. https://doi.org/10.4103/IJAMR.IJAMR_39_18

Albers, S. (2022). Institutionalisierte machtverhältnisse in schule durch militarisierte beziehungsgestaltung. In S. Leitner & R. Thümmler (Eds.), *Die Macht der Ordnung. Perspektiven auf Veranderung in der Pädagogik* (pp. 158–164). Beltz Juventa.

Alele, F., & Malau-Aduli, B. (2023). *An introduction to research methods for undergraduate health profession students*. James Cook University Townsville, Qld. https://jcu.pressbooks.pub/intro-res-methods-health

Alemannenschule Wutöschingen. (2022). Ergebnisse der vera 8 vergleichsarbeiten des landes baden-württemberg aus dem jahre 2022.

Alotaibi, K. N. (2016). The learning environment as a mediating variable between self-directed learning readiness and academic performance of a sample of saudi nursing and medical emergency students. *Nurse Education Today*, *36*, 249–254. https://doi.org/10.1016/j.nedt.2015.11.003

Alwadaeen, N. B., & Piller, B. (2022). Enhancing self-directed learning readiness at elementary level; a study from American schools. *Journal of Curriculum and Teaching*, *11*(4), 24–38. https://doi.org/10.5430/jct.v11n4p24

Alzabidi, A. S. (2022). Self-assessment as an effective learning strategy in e-learning: Promoting learner contribution. *Journal of Language and Linguistic Studies*, *17*(2). https://www.jlls.org/index.php/jlls/article/view/3830/1022

Anderson, L. W. (2018). A critique of grading: Policies, practices, and technical matters. *Education Policy Analysis Archives*, *26*(49). https://doi.org/http://dx.doi.org/10.14507/epaa.26.3814

Asoodeh, M. H., Asoodeh, M. B., & Zarepour, M. (2012). The impact of student-centered learning on academic achievement and social skills. *Procedia-Social and Behavioral Sciences*, *46*, 560–564. https://doi.org/10.1016/j.sbspro.2012.05.160

Azevedo, R., Cromley, J. G., & Seibert, D. (2004). Does adaptive scaffolding facilitate students' ability to regulate their learning with hypermedia? *Contemporary Educational Psychology*, *29*(3), 344–370. https://doi.org/10.1016/j.cedpsych.2003.09.002

Bakeman, R., & Gottman, J. M. (1997). *Observing interaction: An introduction to sequential analysis*. Cambridge University Press. https://doi.org/10.1017/CBO9780511527685

Bautista, R. G. (2015). Optimizing classroom instruction through self-paced learning prototype. *Journal of Technology and Science Educaton (JOTSE)*, *5*(3), 184–193. http://hdl.handle.net/2117/81744

Baxter, S. (2011). It's not kids' play! reflecting on the child-orientated research experience. *International Journal of Market Research*, *53*(1), 63–74. https://doi.org/10.2501/IJMR-53-1-063-074

Beckers, J., Dolmans, D., & Van Merriënboer, J. (2022). Student, direct thyself! facilitating self-directed learning skills and motivation with an electronic development portfolio. *Journal of Research on Technology in Education*, *54*(4), 617–634. https://doi.org/10.1080/15391523.2021.1906363

Belland, B. R. (2014). Scaffolding: Definition, current debates, and future directions. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of research on educational communications and technology* (pp. 505–518). Springer New York. https://doi.org/10.1007/978-1-4614-3185-5_39

Blakey, E., & Spence, S. (1990). Strategies for developing metacognitive behaviors. https://selfregulation.pbworks.com/f/Metacongition+Article+-Eric.pdf

Blume, B. (2024). Doch, schule kann funktionieren – wie diese vier beispiele zeigen [Accessed on December, 2024]. https://www.spiegel.de/panorama/bildung/bildung-schule-kann-funktionieren-wie-diese-vier-beispiele-zeigen-a-f5fac0b4-c966-458a-ae05-6a823a869877

Bolhuis, S. (1996). Towards active and self-directed learning. preparing for lifelong learning, with reference to dutch secondary education. https://files.eric.ed.gov/fulltext/ED396141.pdf

Böttcher, W. (2003). *Kerncurricula und die steuerung der allgemeinbildenden schulen*. https://doi.org/10.25656/01:3977

Brockett, R. G., & Hiemstra, R. (2018). *Self-direction in adult learning: Perspectives on theory, research and practice*. Routledge. https://doi.org/10.4324/9780429457319

Brookes, M. (2017). Capstone teacher of record october 11, 2017.

Brookfield, S. D. (2009). Self-directed learning. In *International handbook of education for the changing world of work: Bridging academic and vocational learning* (pp. 2615–2627). Springer. https://link.springer.com/book/10.1007/978-1-4020-5281-1

Brown, G., Leonard, C., & Arthur-Kelly, M. (2016). Writing smarter goals for professional learning and improving classroom practices. *Reflective Practice*, *17*(5), 621–635. https://doi.org/10.1080/14623943.2016.1187120

Cazan, A.-M., & Schiopca, B.-A. (2014). Self-directed learning, personality traits and academic achievement. *Procedia-Social and Behavioral Sciences*, *127*, 640–644. https://doi.org/10.1016/j.sbspro.2014.03.327

Chen, C.-H., Chen, K.-Z., & Tsai, H.-F. (2022). Did self-directed learning curriculum guidelines change taiwanese high-school students' self-directed learning readiness? *The Asia-Pacific Education Researcher*, *31*(4), 409–426. https://doi.org/10.1007/s40299-021-00582-w

Chen, E., Heritage, M., & Lee, J. (2005). Identifying and monitoring students' learning needs with technology. *Journal of Education for Students Placed at Risk*, *10*(3), 309–332. https://doi.org/10.1207/s15327671espr1003_6

Chiseri-Strater, E., & Sunstein, B. (1997). Fieldworking: Reading and writing research. https://doi.org/10.58680/tetyc20043031

Chitkara, M. B., Satnick, D., Lu, W.-H., Fleit, H., Go, R. A., & Chandran, L. (2016). Can individualized learning plans in an advanced clinical experience course for fourth year medical students foster self-directed learning? *BMC Medical Education*, *16*, 1–6. https://doi.org/10.1186/s12909-016-0744-8

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. routledge. https://doi.org/10.4324/9780203771587

Corno, L. (1992). Encouraging students to take responsibility for learning and performance. *The Elementary School Journal*, *93*(1), 69–83. https://doi.org/10.1086/461713

Cronin-Golomb, L. M., & Bauer, P. J. (2023). Self-motivated and directed learning across the lifespan. *Acta Psychologica*, *232*, 103816. https://doi.org/10.1016/j.actpsy.2022.103816

David Ferguson, T., Briesch, A. M., Volpe, R. J., & Daniels, B. (2012). The influence of observation length on the dependability of data. *School Psychology Quarterly*, *27*(4), 187. https://doi.org/10.1037/spq0000005

De Bruin, A. B., & van Gog, T. (2012). Improving self-monitoring and self-regulation: From cognitive psychology to the classroom. https://doi.org/10.1016/j.learninstruc.2012.01.003

Deci, E. L. (1992). The relation of interest to the motivation of behavior: A self-determination theory perspective. *The role of interest in learning and development*, *44*. https://doi.org/10.4324/9781315807430

Deci, E. L., & Ryan, R. M. (2012). Self-determination theory. *Handbook of theories of social psychology*, *1*(20), 416–436.

Dehnad, A., Afsharian, F., Hosseini, F., Arabshahi, S. K. S., & Bigdeli, S. (2014). Pursuing a definition of self-directed learning in literature from 2000–2012. *Procedia-Social and Behavioral Sciences*, *116*, 5184–5187. https://doi.org/10.1016/j.sbspro.2014.01.1097

Dolnicar, S., & Grün, B. (2013). Validly measuring destination image in survey studies. *Journal of Travel Research*, *52*(1), 3–14. https://doi.org/10.1177/0047287512457267

Douglass, C., & Morris, S. R. (2014). Student perspectives on self-directed learning. *Journal of the Scholarship of Teaching and Learning*, 13–25. https://doi.org/10.14434/josotl.v14i1.3202

Du Toit, S., & Kotze, G. (2009). Metacognitive strategies in the teaching and learning of mathematics. *Pythagoras*, *2009*(70), 57–67. https://hdl.handle.net/10520/EJC20916%20PDF

Elen, J., Clarebout, G., Léonard, R., & Lowyck, J. (2007). Student-centred and teacher-centred learning environments: What students think. *Teaching in Higher Education*, *12*(1), 105–117. https://doi.org/10.1080/13562510601102339

Emaliana, I. (2017). Teacher-centered or student-centered learning approach to promote learning? *Jurnal Sosial Humaniora (JSH)*, *10*(2), 59–70. https://www.jlls.org/index.php/jlls/article/view/5582/1986

Embo, M. P., Driessen, E. W., Valcke, M., & Van der Vleuten, C. P. (2010). Assessment and feedback to facilitate self-directed learning in clinical practice of midwifery students. *Medical Teacher*, *32*(7), e263–e269. https://doi.org/10.3109/0142159X.2010.490281

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2011). *Writing ethnographic fieldnotes*. University of Chicago press. https://www.paas.org.pl/wp-content/uploads/2014/07/OPTIONAL-Emerson-Writing-Ethnographic-Fieldnotes.pdf

Fife, S. T., & Gossner, J. D. (2024). Deductive qualitative analysis: Evaluating, expanding, and refining theory. *International Journal of Qualitative Methods*, *23*, 16094069241244856. https://doi.org/10.1177/16094069241244856

Filgona, J., Sakiyo, J., Gwany, D., & Okoronka, A. (2020). Motivation in learning. *Asian Journal of Education and Social Studies*, *10*(4), 16–37. https://doi.org/10.9734/AJESS/2020/v10i430273

Fineburg, A. (2009). Academic achievement. *The Encyclopedia of Positive Psychology*, *1*, 4–6.

Fisher, M., King, J., & Tague, G. (2001). Development of a self-directed learning readiness scale for nursing education. *Nurse Education Today*, *21*(7), 516–525. https://doi.org/10.1054/nedt.2001.0589

Fisher, M. J., & King, J. (2010). The self-directed learning readiness scale for nursing education revisited: A confirmatory factor analysis. *Nurse education today*, *30*(1), 44–48. https://doi.org/10.1016/j.nedt.2009.05.020

Francom, G. M. (2010). Teach me how to learn: Principles for fostering students' self-directed learning skills. *International Journal of Self-Directed Learning*, *7*(1), 29–44.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult education quarterly*, *48*(1), 18–33. https://doi.org/10.1177/074171369704800103

Garrison, D. R., & Baynton, M. (1987). Concepts: Beyond independence in distance education: The concept of control. *American Journal of Distance Education*, *1*(3), 3–15. https://doi.org/10.1080/08923648709526593

Ghosh, P., Jacob, J., Goldman, E., & Manikoth, N. (2020). Optimizing the use of an online self-assessment exam to promote self-directed learning behaviors in medical students. *Medical Science Educator*, *30*(1), 81–85. https://doi.org/10.1007/s40670-019-00883-2

GmbH, R. B. S. (2024). Alemannenschule wutöschingen wutöschingen, baden württemberg - preisträger 2019 [Accessed on December, 2024]. https://www.deutscher-schulpreis.de/preistraeger/alemannenschule-wutoeschingen

Grant, J. (2002). Learning needs assessment: Assessing the need. *Bmj*, *324*(7330), 156–159. https://doi.org/10.1136/bmj.324.7330.156

Groves, R. M., Fowler Jr, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2011). *Survey methodology*. John Wiley & Sons.

Guay, F. (2022). Applying self-determination theory to education: Regulations types, psychological needs, and autonomy supporting behaviors. *Canadian Journal of School Psychology*, *37*(1), 75–92. https://doi.org/10.1177/08295735211055355

Guglielmino, L. (1977). Development of the self-directed learning readiness scale. *University of Georgia*. https://psycnet.apa.org/record/1979-14573-001

Guiffrida, D. A., Lynch, M. F., Wall, A. F., & Abel, D. S. (2013). Do reasons for attending college affect academic outcomes?: A test of a motivational model from a self-determination theory perspective. *Journal of College Student Development*, *54*(2), 121–139. https://doi.org/10.1353/csd.2013.0019

Hammond, M., & Collins, R. (2013). *Self-directed learning: Critical practice*. Routledge. https://doi.org/10.4324/9780203770924

Harpe, S. E. (2015). How to analyze likert and other rating scale data. *Currents in Pharmacy Teaching and Learning*, *7*(6), 836–850. https://doi.org/10.1016/j.cptl.2015.08.001

Harsy, A., & Hoofnagle, A. (2020). Comparing mastery-based testing with traditional testing in calculus ii. *International Journal for the Scholarship of Teaching and Learning*, *14*(2), 10. https://doi.org/10.20429/ijsotl.2020.140210

Hendry, G. D., & Ginns, P. (2009). Readiness for self-directed learning: Validation of a new scale with medical students. *Medical Teacher*, *31*(10), 918–920. https://doi.org/10.3109/01421590802520899

Hewitt-Taylor, J. (2001). Self-directed learning: Views of teachers and students. *Journal of Advanced Nursing*, *36*(4), 496–504. https://doi.org/10.1046/j.1365-2648.2001.02001.x

Hiemstra, R. (2013). Self-directed learning: Why do most instructors still do it wrong. *International Journal of Self-Directed Learning*, *10*(1), 23–34.

Hsu, Y.-C., & Shiue, Y.-M. (2005). The effect of self-directed learning readiness on achievement comparing face-to-face and two-way distance learning instruction. *International Journal of Instructional Media*, *32*(2), 143. https://www.proquest.com/docview/204263398?pq-origsite=gscholar&fromopenview=true

Hudson, T., & Ramamoorthy, N. (2009). Self-directed learning readiness, individualism–collectivism and adult student learning in online environment: Development and test of a causal model. In *Real learning opportunities at business school and beyond* (pp. 71–79). Springer. https://doi.org/10.1007/978-90-481-2973-7

IXL Learning, I. (2024). Ixl analytics [Accessed on July, 2024]. https://www.ixl.com/analytics

Jamieson, S. (2004). Likert scales: How to (ab) use them? *Medical Education*, *38*(12), 1217–1218. https://doi.org/10.1111/j.1365-2929.2004.02012.x

Justus, B. J., Rusticus, S. A., & Stobbe, B. L. (2022). Does self-directed learning readiness predict undergraduate students' instructional preferences? *Canadian Journal for the Scholarship of Teaching and Learning*, *13*(1), n1. https://doi.org/10.5206/cjsotlrcacea.2022.1.10879

Kastenmeier, A. S., Redlich, P. N., Fihn, C., Treat, R., Chou, R., Homel, A., & Lewis, B. D. (2018). Individual learning plans foster self-directed learning skills and contribute to improved educational outcomes in the surgery clerkship. *The American Journal of Surgery*, *216*(1), 160–166. https://doi.org/10.1016/j.amjsurg.2018.01.023

Kazlauskienė, A., Gaučaitė, R., & Pocevičienė, R. (2015). Implementation of the self-directed learning system in general education schools: Analysis of manifestation of changes. *Journal of Education and Training*, *2*(1), 155–167. https://doi.org/10.5296/jet.v2i1.6747

Kek, M., & Huijser, H. (2011). Exploring the combined relationships of student and teacher factors on learning approaches and self-directed learning readiness at a malaysian university. *Studies in higher education*, *36*(2), 185–208. https://doi.org/10.1080/03075070903519210

Khiat, H. (2017). Academic performance and the practice of self-directed learning: The adult student perspective. *Journal of further and Higher Education*, *41*(1), 44–59. https://doi.org/10.1080/0309877X.2015.1062849

Kicken, W., Brand-Gruwel, S., Van Merriënboer, J., & Slot, W. (2009). Design and evaluation of a development portfolio: How to improve students' self-directed learning skills. *Instructional Science*, *37*, 453–473. https://doi.org/10.1007/s11251-008-9058-5

Kicken, W., Brand-Gruwel, S., & van Merriënboer, J. J. (2008). Scaffolding advice on task selection: A safe path toward self-directed learning in on-demand education. *Journal of Vocational Education and Training*, *60*(3), 223–239. https://doi.org/10.1080/13636820802305561

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

Knowles, M. S. (1984). *The adult learner: A neglected species*. Gulf Publishing Company. https://files.eric.ed.gov/fulltext/ED084368.pdf

Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2014). *The adult learner: The definitive classic in adult education and human resource development*. Routledge. https://routledgetextbooks.com/textbooks/%5C_author/knowles/

Kultusministerium, N. (2015). Kerncurriculum für das gymnasium schuljahrgänge 5-10 mathematik [Accessed on September, 2024].

Kumar, A. (2023). Observation method. *Library Philosophy and Practice*, *13*, 1–14. https://digitalcommons.unl.edu/libphilprac/7820

Kusmaryono, I., Wijayanti, D., & Maharani, H. R. (2022). Number of response options, reliability, validity, and potential bias in the use of the likert scale education and social science research: A literature review. *International Journal of Educational Methodology*, *8*(4), 625–637. https://doi.org/10.12973/ijem.8.4.625

Lancaster, R. W. (2017). *A comparison of student-centered and teacher-centered learning approaches in one alternative learning classroom environment* [Doctoral dissertation, Arkansas State Uni-

versity]. https://www.proquest.com/openview/2f65e17bc76b393acd44d101a5b21efd/1?cbl=18750&pq-origsite=gscholar

Lawlor, K. B. (2012). Smart goals: How the application of smart goals can contribute to achievement of student learning outcomes. *Developments in business simulation and experiential learning: Proceedings of the annual ABSEL conference*, *39*. https://absel-ojs-ttu.tdl.org/absel/article/view/90

Lee, D.-C., & Chang, C.-Y. (2024). Evaluating self-directed learning competencies in digital learning environments: A meta-analysis. *Education and Information Technologies*, 1–22. https://doi.org/10.1007/s10639-024-13083-2

Lew, K.-H. (2017). The relationship among self-directed learning ability, academic self-efficacy and academic achievement. *Journal of the korea Academia-Industrial cooperation society*, *18*(10), 462–470. https://doi.org/10.5762/KAIS.2017.18.10.462

Ley, T., Kump, B., & Gerdenitsch, C. (2010). Scaffolding self-directed learning with personalized learning goal recommendations. *User Modeling, Adaptation, and Personalization: 18th International Conference, UMAP 2010, Big Island, HI, USA, June 20-24, 2010. Proceedings 18*, 75–86. https://doi.org/10.1007/978-3-642-13470-8_9

Lockspeiser, T. M., & Kaul, P. (2016). Using individualized learning plans to facilitate learner-centered teaching. *Journal of Pediatric and Adolescent Gynecology*, *29*(3), 214–217. https://doi.org/10.1016/j.jpag.2015.10.020

Loeng, S. (2020). Self-directed learning: A core concept in adult education. *Education Research International*, *2020*(1), 3816132. https://doi.org/10.1155/2020/3816132

Lounsbury, J. W., Levy, J. J., Park, S.-H., Gibson, L. W., & Smith, R. (2009). An investigation of the construct validity of the personality trait of self-directed learning. *Learning and Individual Differences*, *19*(4), 411–418. https://doi.org/10.1016/j.lindif.2009.03.001

Martin, A. J., & Steinbeck, K. (2017). The role of puberty in students' academic motivation and achievement. *Learning and Individual Differences*, *53*, 37–46. https://doi.org/10.1016/j.lindif.2016.11.003

McCall, G. J. (1984). Systematic field observation. *Annual Review of Sociology*, 263–282. https://www.jstor.org/stable/2083176

Mellor, D., & Moore, K. A. (2014). The use of likert scales with children. *Journal of Pediatric Psychology*, *39*(3), 369–379. https://doi.org/10.1093/jpepsy/jst079

Michel, N., Cater, J. J., & Varela, O. (2009). Active versus passive teaching styles: An empirical study of student learning outcomes. *Human resource development quarterly*, *20*(4), 397–418. https://doi.org/10.1002/hrdq.20025

Moeller, A. J., Theiler, J. M., & Wu, C. (2012). Goal setting and student achievement: A longitudinal study. *The Modern Language Journal*, *96*(2), 153–169. https://doi.org/10.1111/j.1540-4781.2011.01231.x

Müller-Ferrés, P. A., Rivilla, A. M., & Vera, N. (2021). Self-directed learning: Validation of Fisher, King, and Tague's scale in engineering students. *The International Journal of Adult, Community and Professional Learning*, *28*(1), 15. https://doi.org/10.18848/2328-6318/CGP/v28i01/15-27

Murad, M. H., & Varkey, P. (2008). Self-directed learning in health professions education. *Annals Academy of Medicine Singapore*, *37*(7), 580. https://pubmed.ncbi.nlm.nih.gov/18695772/

Murphy, L., Eduljee, N. B., & Croteau, K. (2021). Teacher-centered versus student-centered teaching: Preferences and differences across academic majors. *Journal of Effective Teaching in Higher Education*, *4*(1), 18–39. https://doi.org/10.36021/jethe.v4i1.156

Murray, A. (2011). Montessori elementary philosophy. *Montessori Life*, *23*(1), 22–33. https://mch2learn.org/articles/murray1.pdf

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and research in Education*, *7*(2), 133–144. https://doi.org/10.1177/1477878509104318

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in Health Sciences Education*, *15*, 625–632. https://doi.org/10.1007/s10459-010-9222-y

Oddi, L. F. (1987). Perspectives on self-directed learning. *Adult Education Quarterly*, *38*(1), 21–31. https://doi.org/10.1177/0001848187038001003

Omeh, C. B., & Olelewe, C. J. (2021). Assessing the effectiveness of innovative pedagogy and lecture method on students academic achievement and retention in computer programming. *Education Research International*, *2021*(1), 5611033. https://doi.org/10.1155/2021/5611033

O'Shea, E. (2003). Self-directed learning in nurse education: A review of the literature. *Journal of advanced nursing*, *43*(1), 62–70. https://doi.org/10.1046/j.1365-2648.2003.02673.x

Oswald, D., Sherratt, F., & Smith, S. (2014). Handling the hawthorne effect: The challenges surrounding a participant observer. *Review of Social Studies*, *1*(1), 53–73. https://www.pure.ed.ac.uk/ws/portalfiles/portal/21376155/Hawthone%5C_RoSS%5C_copy.pdf

Padmapriya, K., & Sudhakar, H. (2023). Self-directed learning readiness in mbbs students of private medical college in bengaluru. *National Journal of Physiology, Pharmacy and Pharmacology*, *13*(7), 1421–1424. https://doi.org/10.5455/njppp.2023.13.12583202216122022

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*, 422. https://doi.org/10.3389/fpsyg.2017.00422

Pathak, A., & Bee, S. B. (2010). Identifying learning needs: Using narrative analysis. *Humanising Language Teaching*, *13*(4), 2–7. https://www.academia.edu/1841793/Identifying%5C_Learning%5C_Needs%5C_Using%5C_Narrative%5C_Analysis

Pearse, N. (2019). An illustration of deductive analysis in qualitative research. *18th European conference on research methodology for business and management studies*, 264. https://doi.org/10.34190/RM.19.006

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, *95*(4), 667. https://doi.org/10.1037/0022-0663.95.4.667

Precious, E. C., & Feyisetan, A.-V. A. (2020). Influence of teacher-centered and student-centered teaching methods on the academic achievement of post-basic students in biology in Delta State, Nigeria. *Teacher Education and Curriculum Studies*, *5*(3), 120–124. https://doi.org/10.11648/j.tecs.20200503.21

Premkumar, K., Vinod, E., Sathishkumar, S., Pulimood, A. B., Umaefulam, V., Prasanna Samuel, P., & John, T. A. (2018). Self-directed learning readiness of indian medical students: A mixed method study. *BMC Medical Education*, *18*, 1–10. https://doi.org/10.1186/s12909-018-1244-9

Pushpanathan, L. T. (2013). A need for needs analysis. *International Journal of Applied Research & Studies*, *2*(1), 1–7.

Raible, C. (1874). *Lesebuch für volksschulen, 1. schuljahr*. Wäschbeuren.

Rana, R., & Mahmood, N. (2010). The relationship between test anxiety and academic achievement. *Bulletin of Education and research*, *32*(2), 63–74. https://ssrn.com/abstract=2362291

Rathore, E., Riaz, F., Habib, N., Anjum, O., Zahra, R., & Salahuddin, M. B. (2022). A comparison between teacher centered and student centered medical education approach: An experimental research. *Pakistan Journal of Medical & Health Sciences*, *16*(09), 104–104. https://doi.org/10.53350/pjmhs22169104

Reio, T., & Davis, W. (2005). Age and gender differences in self-directed learning readiness: A developmental perspective. *International Journal of Self-Directed Learning*, *2*(1), 40–49.

Ritz, M., Noltemeyer, A., Davis, D., & Green, J. (2014). Behavior management in preschool classrooms: Insights revealed through systematic observation and interview. *Psychology in the Schools*, *51*(2), 181–197. https://doi.org/10.1002/pits.21744

Robinson, J. D., & Persky, A. M. (2020). Developing self-directed learners. *American Journal of Pharmaceutical Education*, *84*(3), 847512. https://doi.org/10.5688/ajpe847512

Rockoff, J. E., & Lockwood, B. B. (2010). Stuck in the middle: Impacts of grade configuration in public schools. *Journal of Public Economics*, *94*(11-12), 1051–1061. https://doi.org/10.1016/j.jpubeco.2010.06.017

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68. https://doi.org/10.1037/0003-066X.55.1.68

Samuelis, T. (2018). Schulporträt: Alemannenschule wutöschingen [Accessed on December, 2024]. https://www.bpb.de/lernen/digitale-bildung/werkstatt/274599/schulportraet-alemannenschule-wutoeschingen/

Schunk, D. H., & Zimmerman, B. J. (1998). *Self-regulated learning: From teaching to self-reflective practice*. Guilford Press.

Schweder, S. (2020). Mastery goals, positive emotions and learning behavior in self-directed vs. teacher-directed learning. *European Journal of Psychology of Education*, *35*(1), 205–223. https://doi.org/10.1007/s10212-019-00421-z

Schweder, S., & Raufelder, D. (2021). Needs satisfaction and motivation among adolescent boys and girls during self-directed learning intervention. *Journal of Adolescence*, *88*, 1–13. https://doi.org/10.1016/j.adolescence.2021.01.007

Schweder, S., & Raufelder, D. (2022). Examining positive emotions, autonomy support and learning strategies: Self-directed versus teacher-directed learning environments. *Learning Environments Research*, *25*(2), 507–522. https://doi.org/10.1007/s10984-021-09378-7

Serin, H. (2018a). A comparison of teacher-centered and student-centered approaches in educational settings. *International Journal of Social Sciences & Educational Studies*, *5*(1), 164–167. https://doi.org/10.23918/ijsses.v5i1p164

Serin, H. (2018b). A comparison of teacher-centered and student-centered approaches in educational settings. *International Journal of Social Sciences & Educational Studies*, *5*(1), 164. https://doi.org/10.23918//ijsses.v5i1p164

Setlhodi, I. I. (2019). The value of pacing in promoting self-directed learning. In *Self-directed learning strategies in adult educational contexts* (pp. 1–22). IGI Global. https://doi.org/10.4018/978-1-5225-8018-8.ch001

She, C., Liang, Q., Jiang, W., & Xing, Q. (2023). Learning adaptability facilitates self-regulated learning at school: The chain mediating roles of academic motivation and self-management. *Frontiers in Psychology*, *14*, 1162072. https://doi.org/10.3389/fpsyg.2023.1162072

Simons, P. R.-J. (2000). Towards a constructivistic theory of self-directed learning. *Self-learning*, 1–12.

Slater, C. E., & Cusick, A. (2017). Factors related to self-directed learning readiness of students in health professional programs: A scoping review. *Nurse Education Today*, *52*, 28–33. https://doi.org/10.1016/j.nedt.2017.02.011

Steinmayr, R., Meiner, A., Weideinger, A. F., & Wirthwein, L. (2014). *Academic achievement*. Oxford University Press Oxford. https://doi.org/10.1093/OBO/9780199756810-0108

Stockdale, S. L., & Brockett, R. G. (2011). Development of the pro-sdls: A measure of self-direction in learning based on the personal responsibility orientation model. *Adult Education Quarterly*, *61*(2), 161–180. https://doi.org/10.1177/0741713610380447

Syahputri, N., Alfina, O., Indriani, U., & Tahel, F. (2018). Enhancement of independence and students learning outcomes by using self-directed learning. *2018 6th International Conference on Cyber and IT Service Management (CITSM)*, 1–5. https://doi.org/10.1109/CITSM.2018.8674284

Tan, L., & Koh, J. (2014). *Self-directed learning: Learning in the 21st century education*. Educational Technology Division, Ministry of Education.

Taylor, B. (1995). Self-directed learning: Revisiting an idea most appropriate for middle school students. https://files.eric.ed.gov/fulltext/ED395287.pdf

Thornton, K. (2013). Supporting self-directed learning: A framework for teachers. *Research and practice in English language teaching in Asia*, 59–77. https://doi.org/10.5746/LEiA/10/V1/A14/Thornton

Thuy, D. T. T., Hung, L. T., & Lien, V. P. (2024). Self-directed learning readiness among undergraduate students. *Journal of Educational and Social Research*, *14*(5), 233. https://doi.org/10.36941/jesr-2024-0135

Tsai, Y.-M., Kunter, M., Lüdtke, O., Trautwein, U., & Ryan, R. M. (2008). What makes lessons interesting? the role of situational and individual factors in three school subjects. *Journal of Educational Psychology*, *100*(2), 460. https://doi.org/10.1037/0022-0663.100.2.460

Tutein, G., Juliane und Cross. (2023). Die alemannenschule - eine gelebte utopie [Accessed on December, 2024]. https://www.zdf.de/nachrichten/panorama/schule-lernen-zukunft-paedagogik-alemannenschule-100.html

Tzeng, S.-Y., Lin, K.-Y., & Lee, C.-Y. (2022). Predicting college students' adoption of technology for self-directed learning: A model based on the theory of planned behavior with self-evaluation as an intermediate variable. *Frontiers in Psychology*, *13*, 865803. https://doi.org/10.3389/fpsyg.2022.865803

Uus, Õ., Mettis, K., & Väljataga, T. (2022). Cognitive skills in adolescents' self-directed learning efficacy. *Creative Education*, *13*(2), 583–598. https://doi.org/10.4236/ce.2022.132035

Van Woezik, T., Reuzel, R., & Koksma, J. (2019). Exploring open space: A self-directed learning approach for higher education. *Cogent Education*, *6*(1), 1615766. https://doi.org/10.1080/2331186X.2019.1615766

Voskamp, A., Kuiper, E., & Volman, M. (2022). Teaching practices for self-directed and self-regulated learning: Case studies in dutch innovative secondary schools. *Educational Studies*, *48*(6), 772–789. https://doi.org/10.1080/03055698.2020.1814699

Wang, C. J., Liu, W. C., Kee, Y. H., & Chian, L. K. (2019). Competence, autonomy, and relatedness in the classroom: Understanding students' motivational processes using the self-determination theory. *Heliyon*, *5*(7). https://doi.org/10.1016/j.heliyon.2019.e01983

Warchulski, D. (2015). Promoting learner autonomy through self-assessment and goal-setting. *New Directions in Teaching and Learning English Discussion*, *3*, 215–222.

Westrup, A. (2023). Supermodern auf dem dorf - die alemannenschule in wutöschingen [Accessed on December, 2024]. https://www.swr.de/swraktuell/baden-wuerttemberg/suedbaden/schulstart-an-der-alemannenschule-in-wutoeschingen-moderne-vorzeigeschule-100.html

Whyte, W. F. (1979). On making the most of participant observation. *The American Sociologist*, 56–66. http://www.jstor.org/stable/27702360

Wiechmann, J. (2009). Gemeinschaftsschule-ein neuer begriff in der bildungslandschaft. *Zeitschrift für Pädagogik*, *55*(3), 409–429. https://doi.org/10.25656/01:4258

Wiley, K. (1983). Effects of a self-directed learning project and preference for structure on self-directed learning readiness. *Nursing Research*, *32*(3), 181–185. https://journals.lww.com/nursingresearchonline/abstract/1983/05000/Effects%5C_of%5C_a%5C_Self%5C_Directed%5C_Learning%5C_Project%5C_and.11.aspx

Wolff, M., Stojan, J., Buckler, S., Cranford, J., Whitman, L., Gruppen, L., & Santen, S. (2020). Coaching to improve self-directed learning. *The Clinical Teacher*, *17*(4), 408–412. https://doi.org/10.1111/tct.13109

Wong, F. M. F., Tang, A. C. Y., & Cheng, W. L. S. (2021). Factors associated with self-directed learning among undergraduate nursing students: A systematic review. *Nurse education today*, *104*, 104998. https://doi.org/10.1016/j.nedt.2021.104998

Wutöschingen, A. (2024a). Die schmetterlingspädagogik [Accessed on August, 2024]. https://asw-wutoeschingen.de/sekundarstufe-1

Wutöschingen, A. (2024b). Die schule der zukunft [Accessed on December, 2024]. https://asw-wutoeschingen.de/

York, T. T., Gibson, C., & Rankin, S. (2019). Defining and measuring academic success. *Practical assessment, research, and evaluation*, *20*(1), 5. https://files.eric.ed.gov/fulltext/EJ1059739.pdf

Yuan, H. B., Williams, B. A., Fang, J. B., & Pang, D. (2012). Chinese baccalaureate nursing students' readiness for self-directed learning. *Nurse Education Today*, *32*(4), 427–431. https://doi.org/10.1016/j.nedt.2011.03.005

Yurkofsky, M. (2022). Environmental, technical, and representational uncertainty: A framework for making sense of the hidden complexity of educational change. *Educational Researcher*, *51*(6), 399–410. https://doi.org/10.3102/0013189X221078590

Zhu, M., Bonk, C. J., & Doo, M. Y. (2020). Self-directed learning in moocs: Exploring the relationships among motivation, self-monitoring, and self-management. *Educational Technology Research and Development*, *68*, 2073–2093. https://doi.org/10.1007/s11423-020-09747-8

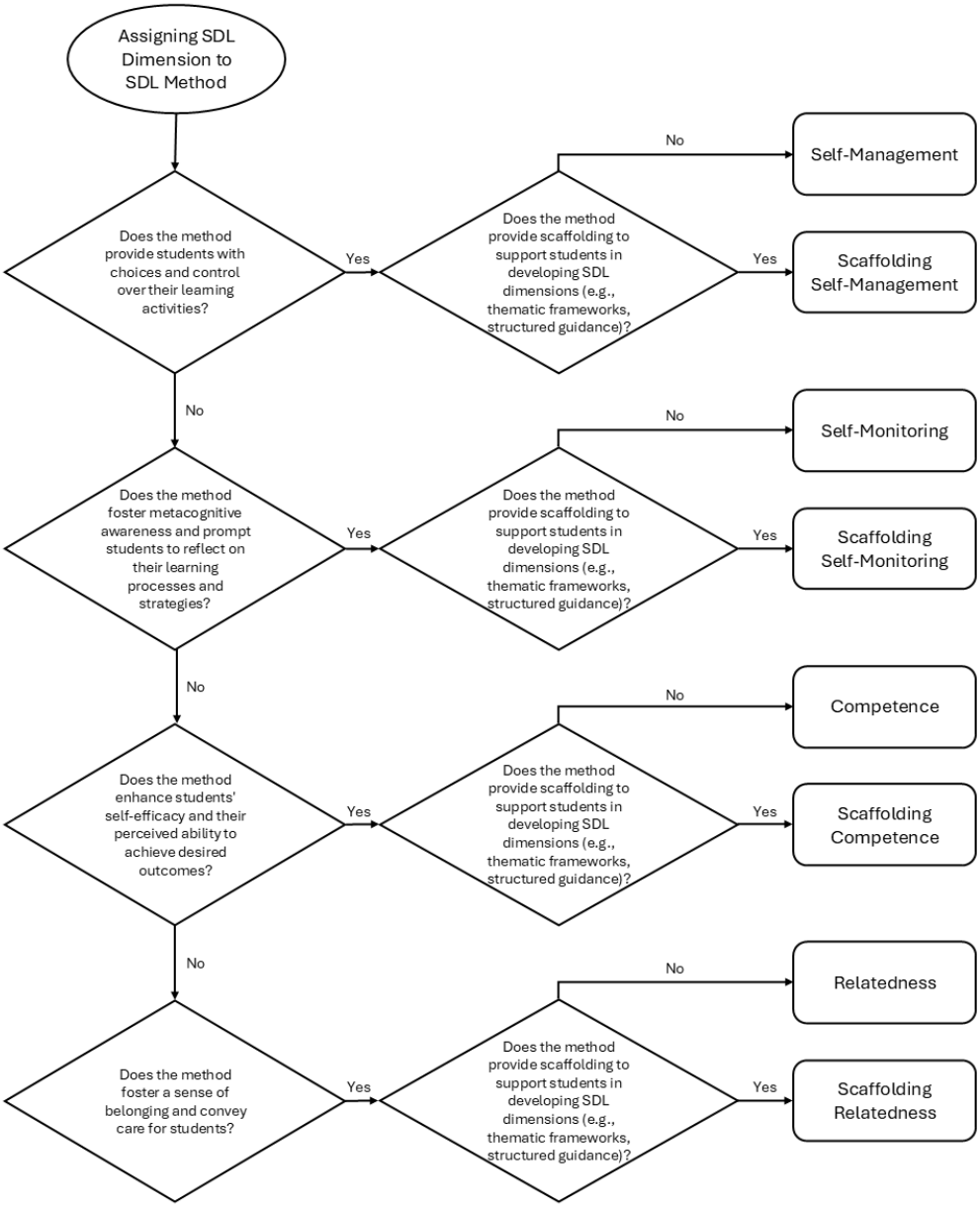
Zhu, M., & Doo, M. Y. (2022). The relationship among motivation, self-monitoring, self-management, and learning strategies of mooc learners. *Journal of Computing in Higher Education*, *34*(2), 321–342. https://doi.org/10.1007/s12528-021-09301-2

AI-Statement

During the preparation of this work, the author used no artificial intelligence tools.

Appendix

Appendix A



Appendix B

Learning Phase	Learning Step	Methods	Coding Description	Possible Keywords
Preparatory Activities (Planning)	Analyzing current skills and knowledge		Students assess their existing competencies relevant to the learning task	"assessing skills", "assessing skill-level", "assessing knowledge", "assessing competencies"
		Activity record (Thornton, 2010; Chen, Heritage & Lee, 2005)	Students use documentation of prior knowledge or skills related to the task.	"review exams", "review tests", "check record", "review progress"
		Teacher or peer feedback (Thornton, 2010)	Teachers provide input, assessments, or guidance to help students evaluate their current skills and knowledge relating to the learning tasks; Students provide input from peers to get insight into their current skills, knowledge, or performance relating to the learning tasks.	"Teacher evaluates skills", "Teacher gives guidance on skill level", "Teacher evaluates skill level", "Teacher provides suggestions for tasks"; "Classmates evaluates skill level", "Classmates give feedback on knowledge", "Classmates provide suggestions for tasks"
		Mastery Testing (Harsy & Hoofnagle, 2020).	Students completing structured assessments or tests designed to evaluate their mastery of specific skills or knowledge before proceeding with further learning steps.	"Assessment for mastery", "Testing comprehension", "Demonstrating skills", "Knowledge verification", "Testing knowledge", "Testing skills"
		Use of a portfolio (Beckers et al., 2016; Moeller et al., 2011)	Students document their skills in a learning portfolio and review it related to the task.	"Recording progress in a portfolio", "Recording current abilities in a portfolio", "Reviewing progress in a portfolio", "Checking skill level in portfolio", "Portfolio review for tasks"
	Analyzing learning needs		Students evaluate their wants and needs, specifically their learning purpose, attitude, preferences, context, personal background, learning style, interests, and relationship with the teacher.	"Evaluate wants and needs", "Analyze wants and needs", "consider wants and needs", "consider interests, background, purpose attitude, learning style, and relationship with the teacher"
		Need analysis questionnaire (Thornton, 2010)	Students completing or utilizing a structured questionnaire to systematically identify their wants and needs.	"Questions on wants and needs", "Questionnaire on learning needs"

		Structured Interviews (Grant, 2002)	Students participate in guided interviews where they reflect on and articulate their wants and needs in response to a predefined set of questions.	"Participating in a guided interview", "Answering reflective questions on learning needs", "Analyzing learning needs in an interview", "Structured discussion of wants and preferences"
	Setting goals		Students formulate objectives for their upcoming learning activities.	"Setting learning goals, "Deciding what to achieve", "Defining learning objectives", "Establishing goals for tasks", "Planning to improve specific skills"
		Choosing individual learning paths/goals (Francom, 2010)	Students choose personal learning goals or preferences that do not have to align with the goals and preferences of others.	"Personal goals", "Individual goals", "Choosing based on preferance", "Based on needs", "Based on what they know"
		Setting long-term and short-term goals e.g. weekly (Thornton, 2010)	Students formulate specific, time-bound learning objectives that include short-term and long-term milestones.	"Goals for the week", "Weekly goals", "Goals for the month", "Monthly goals"
		Setting mastery goals (Schweder, 2019)	Students formulate learning objectives focused on achieving a full understanding and competence in a specific skill or subject, rather than simply completing tasks or outperforming peers.	"Setting learning goals, "Deciding what to achieve", "Defining learning objectives", "Establishing goals for tasks", "Planning to improve specific skills"
		Connection of goals to real life (Bolhuis, 1996; Francom, 2010)	Students linking their learning objectives to practical, real-life applications, demonstrating relevance and personal significance.	"Mastery goals", Goal to master", "Goal to fully understand", "Aiming for full comprehension"
		Use of a portfolio (Beckers et al., 2016; Moeller et al., 2011)	Students select learning goals in a learning portfolio.	"Setting goals in a portfolio", "Writing objectives in portfolio", "Updating portfolio goals", "Documenting goals in learning portfolio"
	Choosing resources		Students select specific tools, materials, or sources that align with their learning goals and support their planned activities.	"Selecting tools", "Choosing materials", "Selecting sources", "Deciding on resources"
		Free task selection (Kicken, 2008)	Students independently selecting tasks or activities.	"Independently selects tasks", "Choosing tasks without teacher input", "Self-selected task", "Student decides what to work on"

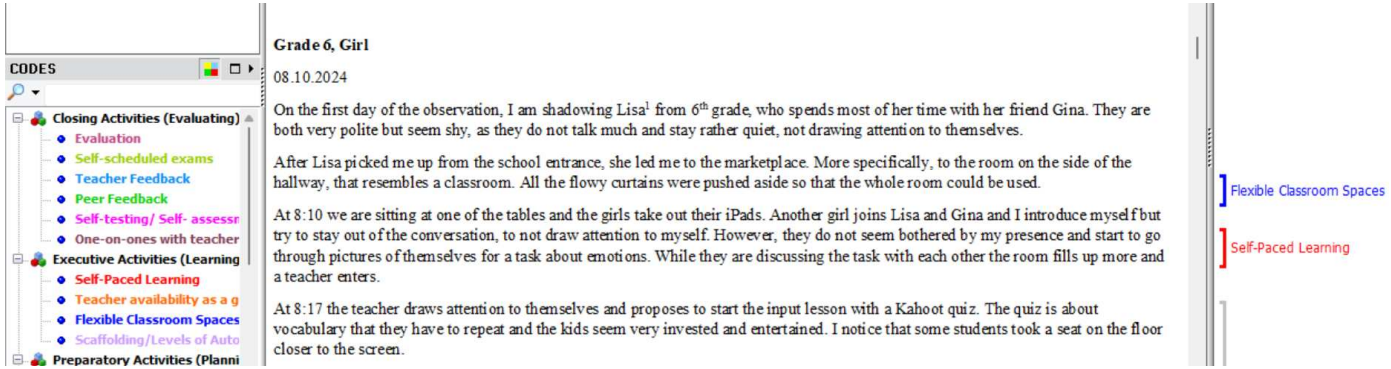
		Thematic Frameworks in which students can choose based on interest (Abdullah, 2001)	Students selecting resources, tasks, or activities within a thematic framework aligned with their personal interests.	"Selecting based on topics of interest", "Choosing within a thematic framework", "Choosing from thematic options"
	Making a plan		Students create a written evidence of their learning objectives; Students organize or outlining specific actions, resources, or timelines to achieve their learning goals.	"Writing down plan", "Creating a learning plan", "Defining actions for learning", "Detailed action plan"
		Weekly learning plans (Thornton, 2010)	Students create a written plan of the next week including what they aim to learn, when they intend to work on it, and the resources they will use.	"Learning plan", "weekly learning plan"
		Learning contracts (Thornton, 2010)	Students creating a formal agreement, signed by both the student and teacher, that specifies the type of study, resources, and time commitment for their learning over a set period.	"Learning contract", "Signed commitment", "Formal learning agreement"
		Individualized learning plans (ILPs) (Lockspeiser, et al., 2016; Li, et al., 2010)	Students create a plan following the concept of the ILP (individualized learning plan) containing multiple goals, a detailed action plan, and criteria or measures to assess whether the goals have been achieved.	"ILP", "Individualized learning plan",
		Use of a portfolio (Beckers et al., 2016; Moeller et al., 2011)	Students document their goals, planned actions, selected resources, and timelines for achieving those goals in a learning portfolio.	"Documenting learning plan in portfolio", "Recording plan in portfolio", "Writing down plan in porfolio"
Executive Activities (Learning)	Implementing the plan and engaging in learning		Students actively carrying out their planned actions, using selected resources, and engaging in learning activities to achieve their goals.	"Engaging in learning", "Using planned resources", "Following the learning plan", "Working on tasks"
		Self-paced learning (Francom, 2010)	Student independently selects and manages tasks without external prompts; Student progresses through materials at a self-determined pace.	"Without teacher prompt", "Independently", "In their own pace"
		Flexible classroom spaces (Alwadaeen & Piller, 2022)	Students use different areas of a flexible learning environment to engage in learning activities.	"Switching to quiet study spaces", "Choosing the best space for focus", "Working in a collaborative zone", "Choosing areas that match the task", "Changing the workspace", "Going to another area to work"

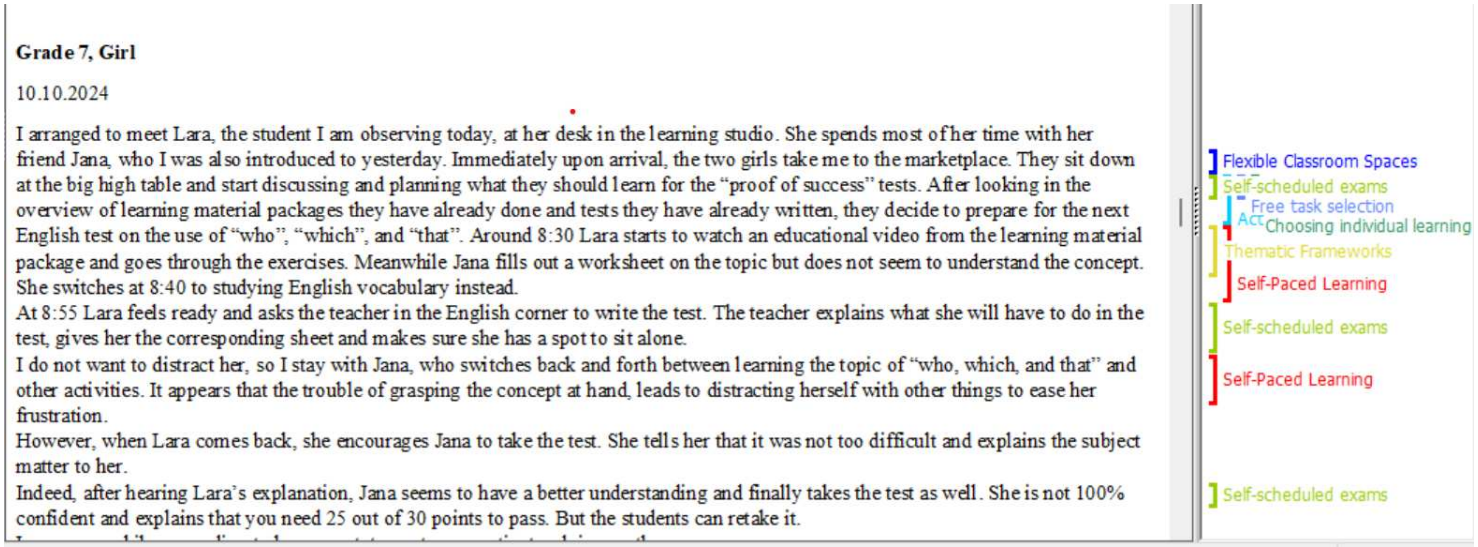
		Teacher availability as a guide (Alwadaeen & Piller, 2022)	Teacher remains accessible and responsive, providing guidance or feedback to support students' learning activities during the execution of their plan, particularly when students seek help or have questions.	"Teacher freely available", "available as a guide", "available for questions", "Accessible teacher feedback", "Asking teacher when needing help", "Teacher there when needed"
	Mid-task monitoring and reflecting/Metacognitive Strategies		Students actively monitoring their progress, evaluating their strategies, and making adjustments to their approach during the task to improve learning outcomes.	"Assessing approach", "Checking progress", "Assessing how it's going", "Reflecting current learning", "Reassessing strategies", "Making adjustments to approach", "Changing strategy", "Adjusting learning"
		Learning diaries (Thornton, 2010)	Students recording reflections on their learning progress, strategies, challenges, and adjustments during a task in a structured diary or journal format.	"Learning diaries", "Recording reflections", "Writing in Journal", "Documenting challenges", "Describing what worked", "Writing about task strategies", "Writing down what they learned"
		Process Updates (Kicken, 2008)	Students receiving information about their progress toward learning goals during the task to evaluate and adjust their approach.	"Process Updates", "Feedback on Progress", "Progress Updates", "Getting progress insights", "Information on current status", "Progress shows they are behind/on track"
		Encouragement of reflection from teachers (Corno, 1992)	Teachers prompting students to reflect on their progress, strategies, or challenges during the task, fostering metacognitive awareness and adjustments.	"Teacher prompts reflection", "Teacher asks about challenges", "Teacher asks reflective questions", "Teacher encourages strategy evaluation", "Teacher asks about learning approach", "Discussing task challenges with teacher", "Teacher-led relfection"
		Self-testing/ Self-assessment (Alzabidi, 2021)	Students actively evaluate their understanding, progress, or performance during the task through self-testing or self-assessment checks.	"Self-Testing", "Self-Assessment", "Testing own knowledge", "Self-quiz during task", "Checking understanding", "Practicing with self-assessment", "Assessing understanding", "Performing a self-check", "Independent assessment of task"

		Guiding questions (Du Toit & Kotze 2009)	Students using or responding to guiding questions posed by themselves or the teacher to monitor their understanding, evaluate strategies, and refine their approach during the task.	"Guiding questions", "Teacher asks guiding questions", "Asking themselves about understanding/strategies/approach", "Responding to guiding prompts"
		Teacher guided thinking (Du Toit & Kotze, 2009)	Students engage in guided self-evaluation or reflection on their thinking processes and actions during the task, using criteria or prompts provided by the teacher.	"Teacher prompts self-evaluation", "Guided self-evaluation", "Teacher gives criteria to self-evaluate", "Criteria-driven self-evaluation"
		Thinking aloud (Du Toit & Kotze, 2009)	Students verbally articulate their thought processes during problem-solving to reflect on and regulate their actions, supported by teacher prompts, peer interactions, or structured questions.	"Thinks aloud", "Explaining thinking process", "Saying thoughts out loud", "Verbalizing strategies", "Teacher asks to verbalize thinking",
		Discussions about points from the self-directed learning readiness scale (Taylor, 1995)	Teachers introduce and discuss points of the SDLR scale, promoting reflection and strategy adjustment.	"Teacher introduces SDLR points", "Teacher prompts SDLR reflection", "Discussing self-directed learning skills", "Guided discussion on readiness factors"
Closing Activities (Evaluating)	Evaluating		Students assessing their progress, outcomes, and learning strategies to determine the effectiveness of their efforts and identify areas for improvement.	"Evaluating results", "Reflecting on results", "Determining effectiveness of efforts", "Evaluating achievements", "Checking if goals were met", "Identifying improvement areas", "Reviewing completed work",
		Reflective questions (Abdullah, 2001)	Teacher promt reflective questions that create awareness of the current and a possible future situation e.g. ‘How did you figure X out?’, ‘Did you do X better than yesterday’	"Teacher asks reflective questions", "Prompts for evaluating results", "Questions focusing on self-awareness", "Answering reflective prompts"
		Controlled comparison (Thornton, 2010)	Students conduct a structured comparison between their current skill level and their initial skill level to assess progress and evaluate the effectiveness of their learning strategies.	"Comparing initial and current skills", "Structured progress assessment", "Comparison of before and after", "Measuring change over time", "Comparing past and present performance", "Comparing test results",

		Teacher Feedback (Embo et al, 2010)	Students receive structured feedback from teachers to assess their competencies, reflect on their learning experiences, and identify areas for improvement.	"Structured feedback", "Teacher feedback", "Teacher provides feedback", "Receiving evaluation from teacher", "Teacher assesses performance", "Teacher gives guidance for improvement", "Feedback session with teacher", "Teacher advises on improvement"
		Learning Portfolio (Murad & Varkey, 2008)	Students using a learning portfolio to assess their progress, reflect on their learning journey, and evaluate the achievement of their goals based on documented activities and outcomes.	"Learning portfolio", "Assessing progress through portfolio", "Using portfolio for reflection", "Evaluating goals with portfolio", "Reviewing documented outcomes in portfolio", "Reviewing past work in portfolio", "Comparing current and past entries"
		Self-scheduled exams (Ghosh et al., 2019)	Students independently scheduling and completing self-assessment exams to evaluate their knowledge, identify learning gaps, and inform future study strategies.	"Student schedules own test", "Student schedules exam", "Scheduling tests independently", "Self-planned assessment", "Completing self-scheduled test", "Scheduling a knowledge check"

Appendix C


CODES
Closing Activities (Evaluating)
Evaluation
Self-scheduled exams
Teacher Feedback
Peer Feedback
Self-testing/ Self- assessr
One-on-ones with teacher
Executive Activities (Learning
Self-Paced Learning
Teacher availability as a g
Flexible Classroom Spaces
Scaffolding/Levels of Auto
Preparatory Activities (Planni
Grade 6, Girl
08.10.2024
On the first day of the observation, I am shadowing Lisa[1] from 6th grade, who spends most of her time with her friend Gina. They are both very polite but seem shy, as they do not talk much and stay rather quiet, not drawing attention to themselves.
After Lisa picked me up from the school entrance, she led me to the marketplace. More specifically, to the room on the side of the hallway, that resembles a classroom. All the flowy curtains were pushed aside so that the whole room could be used.
At 8:10 we are sitting at one of the tables and the girls take out their iPads. Another girl joins Lisa and Gina and I introduce myself but try to stay out of the conversation, to not draw attention to myself. However, they do not seem bothered by my presence and start to go through pictures of themselves for a task about emotions. While they are discussing the task with each other the room fills up more and a teacher enters.
At 8:17 the teacher draws attention to themselves and proposes to start the input lesson with a Kahoot quiz. The quiz is about vocabulary that they have to repeat and the kids seem very invested and entertained. I notice that some students took a seat on the floor closer to the screen.
Flexible Classroom Spaces
Self-Paced Learning


Grade 7, Girl
10.10.2024
I arranged to meet Lara, the student I am observing today, at her desk in the learning studio. She spends most of her time with her friend Jana, who I was also introduced to yesterday. Immediately upon arrival, the two girls take me to the marketplace. They sit down at the big high table and start discussing and planning what they should learn for the "proof of success" tests. After looking in the overview of learning material packages they have already done and tests they have already written, they decide to prepare for the next English test on the use of "who", "which", and "that". Around 8:30 Lara starts to watch an educational video from the learning material package and goes through the exercises. Meanwhile Jana fills out a worksheet on the topic but does not seem to understand the concept. She switches at 8:40 to studying English vocabulary instead.
At 8:55 Lara feels ready and asks the teacher in the English corner to write the test. The teacher explains what she will have to do in the test, gives her the corresponding sheet and makes sure she has a spot to sit alone.
I do not want to distract her, so I stay with Jana, who switches back and forth between learning the topic of "who, which, and that" and other activities. It appears that the trouble of grasping the concept at hand, leads to distracting herself with other things to ease her frustration.
However, when Lara comes back, she encourages Jana to take the test. She tells her that it was not too difficult and explains the subject matter to her.
Indeed, after hearing Lara's explanation, Jana seems to have a better understanding and finally takes the test as well. She is not 100% confident and explains that you need 25 out of 30 points to pass. But the students can retake it.
Flexible Classroom Spaces
Self-scheduled exams
Free task selection
Choosing individual learning
Thematic Frameworks
Self-Paced Learning
Self-scheduled exams
Self-Paced Learning
Self-scheduled exams

Appendix D

Questionnaire

Start of Block: Part 1

Q32 In den ersten Fragen wird es darum gehen, wie du dich auf das Lernen vorbereitest.

End of Block: Part 1

Start of Block: Vorbereitende Aktivitäten - Analyse der Lernbedürfnisse

Nutzung Coaching

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft achtet ihr im Coaching darauf, was du beim Lernen brauchst und dir wünschst? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es, dass durch das Coaching, auf deine Wünsche geachtet wird? (1)	○	○	○	○	○

Einfluss

	Gar nicht (1)	Eher nicht (2)	Neutral (3)	Hilft eher (4)	HIlft sehr (5)
Wie sehr hilft dir das Coaching motiviert zu sein? (1)	○	○	○	○	○

End of Block: Vorbereitende Aktivitäten - Analyse der Lernbedürfnisse

Start of Block: Vorbereitende Aktivitäten - Analyse der Fähigkeiten und des Wissensstandes

Nutzung Kompetenzraster in DiLer

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft nutzt du das Kompetenzraster in DiLer, um deinen Wissensstand zu überprüfen? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es, im Kompetenzraster deinen Fortschritt zu sehen? (1)	○	○	○	○	○

Einfluss

	Gar nicht sicher (1)	Eher unsicher (2)	Neutral (3)	Eher sicher (4)	Sehr sicher (5)
Wie sicher bist du dir, die nächsten Lernmaterialien schaffen zu können, nachdem du das Kompetenzraster überprüft hast? (1)	○	○	○	○	○

Nutzung Teilziele in den Materialpaketen

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft nutzt du die Teilziele, um deinen Wissensstand zu überprüfen? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es, die Teilziele überprüfen zu können? (1)	○	○	○	○	○

Einfluss

	Gar nicht sicher (1)	Eher unsicher (2)	Neutral (3)	Eher sicher (4)	Sehr sicher (5)
Wie sicher bist du dir, die nächsten Lernmaterialien schaffen zu können, nachdem du die Teilziele überprüft hast? (1)	○	○	○	○	○

End of Block: Vorbereitende Aktivitäten - Analyse der Fähigkeiten und des Wissensstandes

Start of Block: Vorbereitende Aktivitäten - Ziele setzen

Nutzung Coachings

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft setzt du dir Lernziele im Coaching? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es dir Ziele mit dem Lernbegleiter im Coaching zu setzen? (1)	○	○	○	○	○

Einfluss

	Hilft gar nicht (1)	Hilft eher nicht (2)	Neutral (3)	Hilft eher (4)	Hilft sehr (5)
Wie sehr hilft dir das Setzen von Zielen im Coaching dabei dich zu organisieren? (1)	○	○	○	○	○

Nutzung Lernplan

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft setzt du dir Lernziele im Lernplan? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es dir Ziel mit dem Lernplan zu setzen? (1)	○	○	○	○	○

Einfluss

	Hilft gar nicht (1)	Hilft eher nicht (2)	Neutral (3)	Hilft eher (4)	Hilft sehr (5)
Wie sehr hilft dir das Setzen von Zielen mit dem Lernplan dabei dich zu organisieren? (1)	○	○	○	○	○

End of Block: Vorbereitende Aktivitäten - Ziele setzen

Start of Block: Vorbereitende Aktivitäten - Ressourcen wählen

Nutzung Freie Wahl der Aufgaben

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft kannst du dir deine Aufgaben selbst aussuchen? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es dir deine Aufgaben selbst auszusuchen? (1)	○	○	○	○	○

Einfluss

	Hilft gar nicht (1)	Hilft eher nicht (2)	Neutral (3)	Hilft eher (4)	Hilft sehr (5)
Wie sehr hilft dir die Wahl der Aufgaben dich frei und selbstständig zu fühlen? (1)	○	○	○	○	○

End of Block: Vorbereitende Aktivitäten - Ressourcen wählen

Start of Block: Vorbereitende Aktivitäten - Einen Plan erstellen

Nutzung Lernplaner

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft planst du was und wann du lernst mit dem Lernplaner? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es dir einen Lernplan zu erstellen? (1)	○	○	○	○	○

Einfluss

	Hilft gar nicht (1)	Hilft eher nicht (2)	Neutral (3)	Hilft eher (4)	Hilft sehr (5)
Wie sehr hilft dir der Lernplan dabei dich alleine zu organisieren? (1)	○	○	○	○	○

End of Block: Vorbereitende Aktivitäten - Einen Plan erstellen

Start of Block: Part 2

Q33 In den nächsten Fragen geht es darum, wie du aktiv lernst. Weiter geht's!

End of Block: Part 2

Start of Block: Ausführende Aktivitäten - Den Plan implementieren und aktiv lernen

Nutzung Im eigenen Tempo lernen

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft lernst du in deinem eigenen Tempo? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es dein Lerntempo bestimmen zu können? (1)	○	○	○	○	○

Einfluss

	Hilft gar nicht (1)	Hilft eher nicht (2)	Neutral (3)	Hilft eher (4)	Hilft sehr (5)
Wie sehr hilft dir das Lernen im eigenen Tempo dabei dich selbstständig zu fühlen? (1)	○	○	○	○	○

End of Block: Ausführende Aktivitäten - Den Plan implementieren und aktiv lernen

Start of Block: Ausführende Aktivitäten - Den Plan implementieren und aktiv lernen

Nutzung Flexible Lernräume

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft hast du das Gefühl deinen Lernort flexibel wählen zu können? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es deinen Lernort selbst auszuwählen? (1)	○	○	○	○	○

Einfluss

	Hilft gar nicht (1)	Hilft eher nicht (2)	Neutral (3)	Hilft eher (4)	Hilft sehr (5)
Wie sehr hilft dir die Auswahl des Lernorts dabei dich selbstständig zu fühlen? (1)	○	○	○	○	○

End of Block: Ausführende Aktivitäten - Den Plan implementieren und aktiv lernen

Start of Block: Ausführende Aktivitäten - Den Plan implementieren und aktiv lernen

Nutzung Lernbegleiter

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft stehen dir Lernbegleiter zur Verfügung, um dir beim eigenständigen Lernen zu helfen? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es, dass Lernbegleiter dir nicht nur was beibringen, sondern dich auch unterstützen alleine zu lernen? (1)	○	○	○	○	○

Einfluss

	Gar nicht (1)	Eher nicht (2)	Neutral (3)	Eher (4)	Stark (5)
Wie sehr fühlst du dich durch die Lernbegleiter im eigenständigen Lernen unterstützt? (1)	○	○	○	○	○

End of Block: Ausführende Aktivitäten - Den Plan implementieren und aktiv lernen

Start of Block: Ausführende Aktivitäten - Reflexion und Selbstbeobachtung während der Aufgaben

Nutzung Teste dein Wissen

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft nutzt du ein „Teste dein Wissen“, um kritisch über deine Ziele, die ausgewählten Aufgaben und deinen Fortschritt nachzudenken? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es ein „Teste dein Wissen“ zu nutzen, um über deine Ziele, die ausgewählten Aufgaben und deinen Fortschritt nachzudenken? (1)	○	○	○	○	○

Einfluss

	Helfen gar nicht (1)	Helfen eher nicht (2)	Neutral (3)	Helfen eher (4)	Helfen sehr (5)
Wie sehr helfen dir die „Teste dein Wissen“, um über deinen Lernplan, die ausgewählten Aufgaben und deinen Fortschritt nachzudenken? (1)	○	○	○	○	○

End of Block: Ausführende Aktivitäten - Reflexion und Selbstbeobachtung während der Aufgaben

Start of Block: Part 3

Q34 Im letzten Teil geht es darum, wie du dein Lernen reflektierst. Du hast es fast geschafft!

End of Block: Part 3

Start of Block: Abschließende Aktivitäten - Evaluation

Nutzung Gelingensnachweise

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft nutzt du die Gelingensnachweise, um deine Lernziele und deinen Fortschritt zu überprüfen? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es Gelingensnachweise zu schreiben, wenn du dich bereit fühlst? (1)	○	○	○	○	○

Einfluss

	Helfen gar nicht (1)	Helfen eher nicht (2)	Neutral (3)	Helfen eher (4)	Helfen sehr (5)
Wie sehr helfen dir Gelingensnachweise dein Wissen zu überprüfen? (1)	○	○	○	○	○

End of Block: Abschließende Aktivitäten - Evaluation

Start of Block: Abschließende Aktivitäten - Evaluation

Nutzung Feedback vom Lernbegleiter

	Nie (1)	Selten (2)	Manchmal (3)	Oft (4)	Immer (5)
Wie oft nutzt du das Feedback deines Lernbegleiters, um über deinen Lernplan nachzudenken? (1)	○	○	○	○	○

Wahrnehmung

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es Feedback vom Lernbegleiter zu bekommen? (1)	○	○	○	○	○

Einfluss

	Helfen gar nicht (1)	Helfen eher nicht (2)	Neutral (3)	Helfen eher (4)	Helfen sehr (5)
Wie sehr hilft dir das Feedback der Lernbegleiter, über dein Lernen nachzudenken? (1)	○	○	○	○	○

End of Block: Abschließende Aktivitäten - Evaluation

Start of Block: Strukturelle Hilfe

Wahrnehmung Neustarter, Starter, Durchstarter

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es, dass es die verschiedenen Level – Neustarter, Starter, Durchstarter und Lernprofi – gibt? (1)	○	○	○	○	○

Einfluss

	Helfen gar nicht (1)	Helfen eher nicht (2)	Neutral (3)	Helfen eher (4)	Helfen sehr (5)
Wie sehr hilft dir die Graduierung (Neustarter, Starter, Durchstarter) dabei, deine Selbstständigkeit zu entwickeln? (1)	○	○	○	○	○

Wahrnehmung Materialpakete

	Gar nicht (1)	Wenig (2)	Mir egal (3)	Gerne (4)	Sehr gerne (5)
Wie sehr magst du es, Aufgaben zum Lernen zur freien Verfügung zu haben? (1)	○	○	○	○	○

Einfluss

	Helfen gar nicht (1)	Helfen eher nicht (2)	Neutral (3)	Helfen eher (4)	Helfen sehr (5)
Wie sehr helfen dir die Materialpakete dabei selbstständig zu arbeiten? (1)	○	○	○	○	○

End of Block: Strukturelle Hilfe

Appendix E

Literature Review

The literature search involved selecting relevant databases, defining keywords based on the findings of the theoretical framework, and setting inclusion and exclusion criteria for study selection.

The databases used include Scopus, ERIC, IBSS, and PubMed. Additionally, Google Scholar and Consensus.app were used as supplementary search tools to identify additional relevant studies that may not have been indexed in the primary databases.

To systematically identify studies on SDL methods, the search strategy was designed to capture relevant research by combining the names of self-directed learning steps (or their synonyms) with terms related to education, self-directed learning, and methods. The search queries were created using Boolean operators (AND, OR). Examples include:

- Goal Setting: ("learning goals" OR "goal setting" OR "self-set goals") AND ("method" OR "strategy")
- Goal Setting: ("learning goals" OR "goal setting" OR "self-set goals") AND ("method" OR "strategy") AND ("self-directed learning)
- Evaluating: ("Evaluation" OR "Reflection") AND ("method" OR "Strategy")
- Evaluating: ("Evaluation" OR "Reflection") AND ("method" OR "Strategy") AND ("self-directed learning")

Inclusion criteria for the studies were: relevance to Self-Directed Learning, meaning the study explicitly discusses at least one self-directed learning step (e.g., goal-setting, planning, resource selection, self-monitoring, reflection) or at least one SDL dimension (e.g., self-management, self-regulation, motivation); description of an Educational Method, requiring the study to present a specific method, strategy, or intervention that facilitates the identified SDL step or dimension; applicability to school settings, ensuring that the method is suitable and feasible for use in formal educational settings, including primary and secondary education; language and accessibility, meaning the study is published in English or German. Exclusion criteria were: theoretical paper without practical application; the mentioned methods are not suitable for an SDL school environment.

A standardized framework was used to extract key data: author, year, identified SDL methods, and corresponding self-directed learning step. The extracted data was synthesized in an Excel sheet,

mapping SDL methods and their data to their respective learning steps. This organization laid the foundation for the development of the codebook, which was the subsequent step in the deductive coding approach (see Study 1: Method).