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SELF-DIRECTED LEARNING USING THE QUADRIPARTITE CYCLE OF STRUCTURATION – A DESCRIPTIVE CASE STUDY

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ABSTRACT

Purpose – The purpose of this study is to explore how the internal elements and external conditions of learners shape their Self-Directed Learning (SDL). Notably, only a limited number of empirical studies have examined how learners interact between their internal and external structures within SDL environments. Accordingly, this study has employed the quadripartite cycle of structuration as a theoretical framework to analyze and describe the dynamic interplay between learners' internal and external structures within the SDL context.

Methodology – A qualitative case study approach was employed. The study focused on a 15-year-old learner enrolled in an SDL school in Malaysia. Four semi-structured interviews, as well as informal interviews with the learner's parent and facilitator were conducted. Documents related to the subject's self-directed learning were collected to enhance validity and reliability. A constant comparison approach was used to analyze these data.

Finding – The SDL school's structured guides scaffold the participant's SDL, providing essential support and resources. Over time, the participant shifted focus to internal structures, driven by his interest, motivation, and a sense of satisfaction, while mirroring strategies learned from the structured guides to direct his own learning. This study illustrates how the participant interacted between his internal and external structures that helped shape his actions in SDL.

Significance – This study provides insights into how a self-directed learner interacts between his internal and external structures in his SDL journey. It advances our understanding of the relationship between self-direction and structures. It also informs a set of flexible structures and guidance for educators, curriculum designers, and policymakers to consider when creating environments that balance learner autonomy with the necessary scaffolding.

Keywords: Self-directed learning, strong structuration theory, case study, internal, external, structures.

INTRODUCTION

At the time of our interview, 15-year-old Kai Wen (pseudonym) had just finished his extra learning activities in his chosen field of study: programming. Guided by structures and supports from his self-directed learning (SDL) school, Kai Wen exercised his agency by planning his after-school learning around Harvard's CS50 online course. Reflecting on his six years at a traditional primary school, Kai Wen noted a stark difference in learner autonomy. He described traditional schooling as "spoon-feeding," whereas in his SDL school, "learners need to find their own materials to feed themselves" (ID4, l.103). When asked what SDL meant to him, Kai Wen paused for a moment and answered confidently: "Taking charge of what you're going to learn" (ID4, l.275). When asked about the challenges that he encountered during his SDL journey, he described: "Not knowing what to do when you first take charge of your learning. You don't know what to do, but as you do more of it, you know what you want to do and how to do it" (ID4, l.279). To deal with the challenges, he adopted strategies such as searching online for information, seeking help and guidance from his peers and his facilitator.

This narrative illustrates the core aspect of SDL: the SDL skill is developed over time (Grow, 1991) and is a learning process in which learners take charge of the course of their learning, deciding what and how they learn, either independently or with guidance from others (Morris et al., 2023). The SDL has been recognized as a vital life skill and is emphasized throughout K-12 education in both formal and informal educational settings (Bonk & Lee, 2017; Teo et al., 2010; Zhu et al., 2020). Despite the growing attention to this mode of learning, the dominant focus of much SDL research has remained on traditional classroom contexts, focusing on individual learning processes, personal characteristics, contextual factors, and cognitive and meta-cognitive elements (Morris et al., 2023). The common issues raised in the literature are that learners who lack proficiency may struggle with SDL, especially in the context of digital learning environments (Bonk & Lee, 2017; Kim et al., 2021). This is particularly true for novice learners, whose limited knowledge and skill can hinder their learning experience (Vogel-Walcutt et al., 2011). This leads to the question of how learners manage their SDL in informal educational settings, where structures are less rigid and learners have greater autonomy to decide what and how they want to learn. To address this gap, the present study draws on the quadripartite cycle of structuration (Stones, 2005) to explore how learners navigate their SDL in informal educational contexts. This study contributes to the SDL literature by offering insights into how a self-directed learner interacts between his internal and external structures in his SDL journey. It advances our understanding of the relationship between self-direction and structures.

LITERATURE REVIEW

Self-Directed Learning

Malcolm Knowles defines SDL as a process in which individuals take the initiative to determine their learning needs, establish objectives, find resources, select appropriate learning strategies, and evaluate the outcomes of these personal individual efforts (Knowles, 1973). That is, SDL has mainly focused on adult learning (andragogy), which is viewed as a maturing process. However, not all adults are fully capable of SDL. Children can also engage in SDL depending on the situation, as Van der Walt (2019) claimed. According to Ponton (2023), learners who embark on SDL may lack access to a mentor or support system, or they may wish to learn things beyond the knowledge of others. In addition, SDL involves selecting the preferred learning path and having agency over every aspect of that learning, including engaging with a particular network or learning community, or inviting others to participate in that activity.

While SDL is often associated with independent learning, studies have discovered that internal and external elements do play a key role in SDL. Grow (1991) suggested that self-direction is a skill that can make headway and is influenced by task-specificity, teaching style, learning context, and the activity's complexity. Meanwhile, Van Deur and Murray-Harvey (2005) described SDL as a process involving internal and external influences. As such, internal influences such as personal characteristics, personal learning strategies, and meta-cognitive strategies affect how learners approach their learning activities, take the initiative, plan, put in effort, and persist despite challenges. In contrast, external influences involve "the context that directs and structures" (p. 167) the activity to achieve goals. For instance, Jaffar et al. (2022) revealed that using 3D anatomy software increases students' engagement and information acquisition, emphasizing the significance of concrete materials for improving comprehension and recall. Building on this, the interaction between personal motivation and environmental factors is key to an effective SDL. Similarly, other studies support the idea that students' interests are vital for motivating and sustaining learning (Bartholomew et al., 2017; Schweder & Raufelder, 2021; Brennan, 2021).

SDL poses several challenges, particularly regarding balancing learners' internal elements and external support structures. In a formal educational setting, the question arises: how much guidance should educators provide while effectively promoting SDL (Damrow & El Faye, 2022)? In addition, researchers also highlight concerns about learners' internal elements, such as a mismatch between their interests and abilities. Consequently, learners may struggle with selecting appropriate materials, using specific digital technology features, or knowing what they should learn (Kirschner & van Merriënboer, 2013). Researchers also argue that learners lack the skills to solve information problems or the knowledge to determine what they do and do not know in digital learning contexts. They may not always prefer or benefit from controlling tasks (Bartholomew et al., 2017; Beckers et al., 2019, 2021). Thus, excessive autonomy with limited knowledge can inhibit SDL, especially in the absence of direct instructions (e.g., Candy, 1991; Kirschner & Merriënboer, 2013; Lapidow & Walker, 2022).

Successful SDL requires prior knowledge of learning strategies and meta-cognitive skills (Uus et al., 2022). For example, children must first learn and practice meta-cognitive strategies to efficiently control their learning; otherwise, they risk cognitive overload, leading to insufficient or superficial knowledge (Uus et al., 2020). On the other hand, Uus et al. (2020) in their research on middle school emphasized the

significance of teaching meta-cognitive skills and offering guidance to prevent cognitive overload when students take part in online assignments for SDL. Prior studies have consistently indicated the significance of external support, for example, from the teacher in helping learners use digital technology efficiently in SDL, i.e., where immediate feedback is essential (Bartholomew et al., 2017; Beckers et al., 2019; Gann & Carpenter, 2018). Moreover, the transition from teacher-directed to student-directed can be supported by instructional scaffolding techniques to guide students toward developing SDL (Beckers et al., 2021; Roberson et al., 2021).

Structuration Theory

Structuration Theory (Giddens, 1984) is one of the social theories that has sparked the most attention across information systems, social, organizational, and management domains (e.g., Feeney & Pierce, 2016; Kennedy et al., 2021; Pozzobon & Pinnsonneault, 2005). Recently, Brennan (2021) used it to investigate how kids manage self-directed programming at home for informal computer science learning. Brennan's study noted that participants' strategies were used concerning the following three fundamental structures: personal interests, access to others, and time. Notably, these structures and actions influenced each other with both enabling and constraining effects. Simultaneously, Brennan's study contributes to debates about SDL, providing new perspectives on the relationship between structures and self-direction. Thus, the present study would like to advance Brennan's theorizing about self-directed learners' purposeful actions connected to their internal and external structures.

According to Giddens (1984), an individual's behavior is influenced by structures, which in turn are influenced by that very behavior (Stones, 2005). This duality of structure and purposeful action implies that an individual's self-directed activities and structure are mutually constructed by each other in ways that can be either facilitating or inhibiting (Brennan, 2021; Giddens, 1984; Schwartz & Okita, 2009). In addition, Brennan (2021) asserted that trying to eliminate all structure in the name of self-direction is mistaken since a structure less environment does not exist.

Alternatively, Giddens (1984) defined structure as comprising rules and resources, including institutions like families, schools, and organizations that shape behavior. Giddens also positioned the individual's "purposeful action" in support of their goals as necessarily connected to their comprehension of the structures to which they have access (Stones, 2005). Human actors who play various social roles have the capability to use resources and follow social rules of conduct to produce purposive action and engage in social interaction with both intended and unintended consequences (Giddens, 1984). While resources improve one capacity to act, rules influence interaction patterns, either constraining or facilitating actions (Giddens, 1984).

Meanwhile, Stones (2005) further conceptualized these "rules and resources" into external and internal structures. External structures refer to "conditions of action" (p.84), including personal relationships, family, friends, organization, and society. Internal structures encompass values and knowledge influenced by external structures, affecting agents in creating new external and internal structures (Hvidt et al., 2021). Similarly, Stones (2005) introduced the "quadripartite nature of structuration" to explain interactions between individuals and others. This includes external structures, internal structures, active agency (strategic use of internal structures), and outcomes. Additionally, Kennedy-Reid (2012) investigated

internal and external structures using the quadripartite nature of the structuration framework and discovered that the structures co-evolved during the trans-formative learning process, helping the individual to better understand the relationship between the individual and others. In the study, participants explained how their internal and external structures were interrelated and how they were aware of the external influences and could change their own perspectives when they changed their attention within themselves. At the same time, Kennedy et al. (2021) demonstrated that applying the recurrent steps of Stones (2005) analytical framework has allowed the researchers to identify and capture the interactions and inter-dependencies of structure and agency within the illustrative case study.

The present study explores how learners' SDL is shaped by their internal and external structures using the quadripartite nature of structuration as a framework. By examining the interaction between internal and external structures of learners in an informal learning environment and how these structures shape their SDL, we have the following one specific research question to guide us: what SDL strategies and processes do the learner utilize, particularly in terms of his internal and external structures?

METHODOLOGY

Case Study

A case study approach was employed to understand participants' experiences and perspectives. The case study method was selected for its ability to capture and describe the complexity of real-life events (Stake, 1995; Yin, 2014). Particularly, this qualitative research seeks to understand how self-directed learners make sense of their learning, interpret their experiences, and engage in meaning-making while interacting with others.

The participant was selected based on "information considerations" (Lincoln & Guba, 1985:202), enabling an in-depth exploration and understanding of the situation (Patton, 2001). The information-rich case pertains to individuals engaged in SDL with extensive experience in SDL, a willingness to provide rich and detailed descriptions through interviews, learning documents, and discussions, and accessibility for participation in ongoing data collection. The researcher initially met the participant, referred to by the pseudonym Kai Wen, through a sports club and was impressed by his athletic ability and willingness to help younger kids in the club. Upon learning about his SDL experiences, the researcher invited Kai Wen to participate in this study, anticipating that his SDL journey could provide valuable insights. Kai Wen's experience fits the study criteria. His father felt that after the son had attended public school for six years, the traditional education system lacked future-oriented provisions. Seeking a more independent learning environment, Kai Wen and his father decided to transition to an alternative education model. Note that they valued greater autonomy and also acknowledged the significance of structured support in facilitating Kai Wen's transition from a highly structured formal schooling to an SDL environment.

To ensure informed and voluntary participation in the study, an information sheet was provided, once the study has obtained the assent of the participant and a duly signed consent form from his parents. This research has been reviewed and approved by the University of Malaya Research Ethics Committee (UMREC) (Ref no: UM.TNC/UMREC_2456).

Description of the SDL School

SDL schools are occasionally referred to as democratic or free schools (Gray, 2017). These schools do not function using traditional school practices but offer a supportive environment emphasizing SDL principles. They allow learners to pursue their interests, organize their learning, and take accountability for their progress, with adults serving as facilitators and collaborators in the learners' learning.

The SDL school that Kai Wen enrolled in operates without bells or lectures. Without traditional teachers, learners are in control of their own learning. The adults in the school function as guides, setting up scenarios and asking reflective questions to improve the learners' critical thinking. Building on this, the school fosters a tightly knit learning community with peers and experts in the field to work on real-world projects. Without a formal examination system, they measure learners' progress and provide feedback through various alternative methods, such as portfolios, learning exhibitions, peer reviews, and online dashboards.

A game board quest serves as a guide for learners to manage their own learning paces. A sprint is about six weeks, and each encompasses a quest around a specific theme. Upon completing the sprint challenge, the school organizes an exhibition where learners display their achievements and insights gained throughout the sprint. They also utilize online courses to master core subjects like reading, writing, and mathematics. Furthermore, preceding work sprints and project sessions, learners will get together with their guide before engaging in a new process or collaboration task so as to be inspired and equipped at the beginning of the day. In addition, a town hall is held every Friday afternoon, providing learners with an opportunity to address any problems or issues they have encountered throughout the week, and the opportunity to collaborate to find solutions. To ensure learners excel in SDL, parents were encouraged by the school to offer suggestions without providing direct assistance.

Data Collection

Data collection began in May 2023, with in-depth semi-structured interviews conducted online via Zoom Cloud Meeting (Zoom Video Communications Inc., 2021). A smartphone voice recorder served as a backup in case of technical issues. The in-depth interviews contained four consecutive sessions, each featuring around 8 to 11 main semi-structured questions, as follows: 1. The first interview focused on understanding the participant's experiences with SDL, exploring his SDL school routine and activities, and recent projects. For example, participants were asked, "How long have you been engaged in SDL?", "Can you share how you organize your SDL activities?"; 2. The second interview was conducted about two weeks later. This session delved into the participant's learning activities and processes, exploring how he learns, locates resources, and employs strategies. Questions included the following, "Can you explain the steps or process you go through when starting a new learning project?", "How do you decide what topics or subjects to explore?"; 3. The third interview, scheduled approximately three weeks after the second, focused on how internal and external structures shape the participant's behaviors. Questions included the following: "I noticed that you set objectives that align with your future goals. How did you determine that these are the things you want to pursue? "How do you identify which methods work best for you?"; 4. The fourth interview focused on how the participant evaluated his learning. For example, "How do you monitor your progress and evaluate your learning outcomes without formal assessments or grades?" (see Appendix 1 for more examples of the interview protocol for participants).

In addition to the major data sources collected from participants, informal interviews were conducted with the parents and facilitators to gather extra insights into historical external influences on SDL behavior. For example, parents were asked questions such as, "How did you first become interested in SDL for your child?", "Can you describe how you get involved? How do you support your child's learning?" (see Appendix 2 for more examples of an interview protocol for parents). The researcher also reviewed documentation related to the participant's learning journey, such as the game board quest checklist and personal reflection. This is done to triangulate the primary interview data and ensure the trustworthiness, validity, and reliability of the research study (Merriam, 2009). Moreover, communication with the participant and his parents was maintained through email or WhatsApp (WhatsApp Inc., 2020) to keep them updated on the research progress and clarify any questions. Table 1 summarizes the data collected from various sources, including interview duration and date of interview.

Table 1

Data Collected from a Variety of Sources

Data Collection	Data Source	Interview Length, minutes	Interview Date
Interview	Kai Wen	42	31.5.2023
		87	14.6.2023
		60	13.7.2023
		96	17.8.2023
	Kai Wen's father	80	09.6.2023
	Kai Wen's facilitator	150	24.6.2023
Documentation	Kai Wen		
WhatsApp	Kai Wen & father		
Researcher notes			
Total Interview Time with Participant		285 minutes	
Total Interview Time with Participant's parents and facilitator		230 minutes	

Data Analysis

This study utilized constant comparative analysis, which involved moving from micro-analysis to within-case analysis (Corbin and Strauss, 2008). In order to produce attributes and hypotheses regarding the general phenomenon being studied, this method involved continuously comparing data and codes (Glaser, 1965). The MAXQDA 2022 (VERBI Software, 2021) was used to analyze the data. Each subsequent interview was conducted only after completing the analysis of the previous one, allowing the researcher to develop new questions based on the data analysis (Charmaz, 2014). Based on this analytical procedure, the data was coded with open coding, followed by axial coding, and then selective coding.

Coding Process

The coding process began with open coding, which involved breaking the data down line-by-line using in vivo and inductive coding in order to make sense of the information before further examination and

comparison (Merriam, 2009). Based on the quadripartite cycle of structuration, the following four broad analytic categories were identified: (a) "Internal Structures," (b) "External Structures," (c) "Active Agency," and (d) "Outcomes." Open codes were arranged into these categories. For example, "relying on peers" was arranged into "External structures." After the open coding, followed by axial coding, which involved grouping open codes with similar categories or themes into axial codes. For example, "Squads" and "Running Partners" were grouped in "Peers." Subsequently, selective coding was carried out, where selected axial categories fit under the same core categories. Meanwhile, some descriptors were grouped under one subcategory. For example, "More knowledgeable others," "Facilitator/teacher," "Peers," and "Parents" were grouped under "People" in the category (b).

Constant Comparison

The constant comparison method was employed throughout the entire analytical process, spinning around from micro-analysis to within-case analysis. Although this study has focused on a single participant, the within-case analysis has facilitated triangulation and a thorough understanding of the contextual variables that might affect the case (Merriam, 2009). The researcher began by comparing the open codes and making notes and memos for subsequent questions and analysis. This comparison method was used to identify patterns across different data sources (interviews, documents, parents, and facilitator's interviews). For example, when the participant described his initiative to enroll in a programming course, "*I just did it by myself*," this action was coded under "Active Agency" as it demonstrated deliberate decision-making in response to a particular circumstance during SDL. It had utilized a combination of predisposition skills and knowledge that the subject had brought into his learning process. This theme emerged in an interview and was further cross-checked against his online course document, where he documented his learning process. Thus, this triangulation within a single case helped validate how structured guides shaped the participant's SDL strategies. In this iterative process, new and previous codes are integrated through a dynamic interplay between induction and deduction (Bloomberg and Volpe, 2018; Charmaz, 2014; Merriam, 2009). Overall, the constant comparison process revealed that comparing line-by-line was inadequate, leading the researchers to reexamine the data sentence-by-sentence and paragraph-by-paragraph. Notably, inappropriate quotations and codes were replaced with more suitable ones. In the conclusive phase of selective coding, themes similar to those of the axial codes were combined to form core categories in order to answer the research questions.

FINDINGS

This study utilizes the quadripartite cycle of structuration as a theoretical foundation to analyze how the dynamic interaction between the internal and external structures of the participant shapes his SDL's strategies and processes. The findings reveal that structured support from the SDL school provided the necessary guidance and significantly shaped Kai Wen's SDL in the early stages. As his internal structures (including interest, motivation, and meta-cognitive skills) developed, he began to take ownership of his learning and engage more independently in his SDL journey.

The Influence of External Structures in SDL

Several external structures were identified in this study. These structures significantly shaped Kai Wen's SDL strategies and processes, including structured guides, people, and tools.

Structured Guides

The SDL school provides structured guides and resources tailored to facilitate learners' SDL. A gamification system tracks learners' progress, promoting self-discipline and motivating them to set and maintain their goals. On this game board, Kai Wen sets his learning objectives, challenges, and expected time frame completion for each sprint quest. Once the tasks were accomplished, he received digital badges for his achievements. For example, when Kai Wen chooses a coding quest, he creates a plan with milestones to accomplish his tasks on this game board. After completing the quest, Kai Wen will present his achievements and insights gained at the end of the sprint at an exhibition organized by the school.

The school provided basic materials designed to be beginner-friendly. Kai Wen likened these materials to a "starter course," indicating the activities were accessible without prior knowledge: "You can step in to do this survival things, with zero knowledge about survival. It's not just this, a lot of the other things also, where you can start without having any knowledge" (Kai Wen, ID4, l.133). These resources serve as an introductory foundation, allowing learners like Kai Wen to build their knowledge and skills gradually. If learners are motivated to learn more deeply, they may need to explore additional resources independently. Despite the materials provided and accompanying instructions, learners have the flexibility to adjust to the challenge level. As Kai Wen described as follows:

> "There is no level. This is one thing we can do. If it's too easy, we can change. We can make a custom plan for ourselves, like we can change one or two challenges. Then, if it's too hard, we can also do the same thing." (Kai Wen, ID2, l.109)

The goal-setting and task challenges are determined by the learners to ensure that they can adjust the task challenge level accordingly.

The structured guides prompt Kai Wen to recognize the necessity of focusing on tasks and managing his workload effectively. This structure influences his decision to *prioritize tasks* based on their significance and allocate his time accordingly. He pointed out that: "You're given all the requirements and the work to do, then you start to feel like…we need to start prioritizing what's important first." (Kai Wen, ID4, l.3). This also led him to *choose task completion* prior to engaging in recreational activities. For Kai Wen, the process of completing his work prior to indulging in leisure activities gives a sense of fulfillment. He shared this insight: "So, like when you earn your leisure time by completing your work, it gives you a sense of fulfillment" (Kai Wen, ID4, l.13).

People

In the SDL school, guides served as facilitators, assisting learners through a questioning approach. Kai Wen emphasized the significance of these questions in prompting him to find answers himself: "It's part of the

skills of being a guide, is that you have to be able to craft questions where they (learners) can answer themselves best" (Kai Wen, ID4, l.237). Accordingly, the guides observe each learner's distinct abilities and employ the appropriate questioning techniques to help the learners reach their potential.

Kai Wen noted that while he could identify areas for improvement, the guides played a crucial role in assessing whether learners were maximizing their capabilities: "So, like the guide I mentioned, if you think this is enough, but the guide knows you can do a lot more, (he) questions(s) you…is this enough for you? Do you think this is all good? Why?" (Kai Wen, ID4, l.161). This reflective approach encourages learners to self-assess and evaluate their progress. When Kai Wen's guide was asked, "What kind of questions do you ask to lead them to their self-directed action," the guide emphasized that one always remind the learners to first check with their books, buddies, and brain prior to asking the guides for answers. He elaborated: "The idea is not me trying to answer the question but is to cultivate that process within that and among each other" (Kai Wen's guide, l.153). Hence, guides play a role in asking questions that help learners to discover themselves.

Structured guides offer guidelines to support structured peer interactions. Kai Wen was paired with a "running partner" and grouped into squads for collaborative activities, such as research and exchange of feedback. These structured interactions ensured purposeful collaboration, such as peer-reviewing and providing constructive feedback. In addition to structured guidance, the Internet was a great source of knowledge and a platform for learning new skills.

In addition to facilitators and peers, parental support in facilitating Kai Wen's SDL was also crucial. Kai Wen's father emphasized the need to trust the SDL processes. Kai Wen's parents adopted a supportive role, assisting their children in accessing relevant resources and sharing pertinent materials aligned with their interests. As shared in the following response, the parents provided suggestions without overly intervening in Kai Wen's decision-making processes:

> "We will find resources; that's the role we will play, and the rest is to support his knocking on the wall and all that when he faces challenges, that's to give the support. So, we don't get involved" (Kai Wen's father, l.35).

Tools

The Internet serves as a valuable repository of information and a platform for acquiring new skills; with search engines like Google, YouTube videos, Wikipedia, and chatbots such as ChatGPT providing convenient access to knowledge. For instance, when faced with an unfamiliar concept, Kai Wen confidently stated: "I just look it up online," elaborating that, "When we encounter a problem, we can fix it quite easily with just Google" (Kai Wem, ID1, l.95). Additionally, Kai Wen often turns to YouTube videos for learning purposes, such as for programming tutorials.

In exploring the external structures that may shape SDL, we have uncovered various conditions that play pivotal roles in Kai Wen's SDL. From structured guides and people to various tools and contextual activities, these elements contribute to shaping the learning experiences of Kai Wen when engaging in SDL and when using his own personal strategies.

Internal Structures for SDL

This section aims to understand the "internal" components influencing learners' SDL actions. These components, which comprise Kai Wen's internal structures, are adaptable and transferable, serving as a resource or set of guidelines in various settings. Furthermore, Kai Wen's affective elements, knowledge ability and agency, and cognitive and meta-cognitive skills develop a set of predispositions, including skills, knowledge, and belief toward his SDL strategies and processes. Collectively, these elements are interconnected, enhancing the SDL process through a self-reinforcing cycle that deepens Kai Wen's engagement and meta-cognitive strategies.

Curiosity and interest are examples of affective elements influencing Kai Wen's motivation and willingness to take charge of his learning. His intrinsic motivation led him to engage in activities actively, which came from a sincere interest. This innate drive fueled his commitment to exploring material deeply, seeking out additional resources, and persistence in facing challenges. Note that Kai Wen's interest in programming was sparked during a sprint where he developed an online game app, an experience he found both enjoyable and satisfying. This initial positive encounter spurred his desire to delve further into programming.

Kai Wen believed that SDL emphasizes learners' autonomy and responsibility for their own learning process. He remarked that he should decide what he wanted to learn, how he wanted to learn it, and at what pace. At the same time, he acknowledged that the structured guides provided by the SDL school empowered him to become a self-directed learner. Employing the SDL school's structured guides, Kai Wen's actions interacted with the external rules and internal willingness to justify his plans and ideas to his learning community. Moreover, cognitive and meta-cognitive strategies such as *reasoning, reflecting, making sense, self-monitoring, and self-regulation* were demonstrated by Kai Wen, enabling him to assess information critically, evaluate evidence, and make informed judgments. This will be further elaborated in the next section on how Kai Wen's internal structures began to take precedence over the influences of external structures.

Transitioning from External to Internal Structures

After presenting his self-designed game to his learning community, the positive feedback he received fueled his intrinsic motivation and desire to master the necessary skills in programming. His internal aspirations also pushed him to set future goals related to programming. However, Kai Wen confessed his lack of programming knowledge and experience while struggling with complexity. Determined to explore coding more deeply, he started the CS50 online programming course independently: "I just did it by myself" (Kai Wen, ID2, l.74). This was achieved by *setting his learning goals, arranging his CS50 program learning, using YouTube videos* to clarify complex concepts, *reviewing lecture notes, participating in activities proposed by the online program, using experts' comments to check for correctness*, and *dividing online lectures* to maintain focus and motivations.

Through persistent daily programming tasks, Kai Wen demonstrated his agency in shaping his learning trajectory. When asked about how he arranged his CS50 program learning and what factors led him to make those decisions, Kai Wen replied:

> "I guess being a self-learner, it's I get to do whatever I do, whatever I want to do, whenever I feel like doing it. And no one is there to judge me or accuse me of whatever" (Kai Wen, ID3, l.185).

Kai Wen applied various cognitive and meta-cognitive strategies to internalize external elements, such as *reasoning*, *integrating information*, *making sense*, and *monitoring*. Moreover, the SDL framework allows him to redefine success as a combination of self-set goals, personal satisfaction, and practical application of learned skills, in contrast to traditional academic benchmarks. He *assessed his progress through self-reflection,* asking: "What can I do next time to make this experience better?" (Kai Wen, ID4, l.67). When he became comfortable (internally) with his current workload, he recognized the need to *challenge himself* further.

Trusting his judgment, Kai Wen made his own decisions on which feedback to incorporate. He believed that while considering other's opinions was valuable, the ultimate responsibility lay solely with him as the outcome primarily affects him: "It's good to consider other people's opinions, but in the end, the decision is yours. Like whatever decisions you make, it will only affect you the most, right?" (Kai Wen, ID4, l.197).

Kai Wen embraced mistakes as valuable learning opportunities and would prepare him to navigate future challenges: "If you don't make mistakes, then you can't learn, and the what if it happens in the future then you can't do anything about it, or you don't know what to do." (Kai Wen, ID3, l. 127). Kai Wen also perceived his learning experiences as shaping his strategies. His reflection on the matter is an amazing revelation of his SDL maturity: "It just through experience, you know…So, maybe this time I did like two extra steps, and next time I learn from this, and then I just cancel those two extra steps" (Kai Wen, ID2, l.257).

Guided by the school's framework and the help of his learning community, Kai Wen started placing greater emphasis on his internal structures. His purposeful actions were driven by his interest, motivation, and a sense of satisfaction, while also incorporated mirroring strategies learned from the structured guides directing his own learning.

DISCUSSION

This study has examined the SDL processes of the participants in the SDL context through a quadripartite structuration lens. Throughout the investigation, it becomes evident that Kai Wen's SDL behaviors were shaped by both external and internal structures, highlighting the dual role in enabling and constraining his learning strategies.

The findings indicate that external structures served as a foundational framework for Kai Wen, who was learning to be self-directed. Structured guides provided a clear framework and step-by-step instructions to assist Kai Wen in navigating his educational journeys, from planning and analyzing problems to seeking solutions and presenting acquired knowledge. For instance, starting with simpler materials as a *starter course* without prior knowledge and increasing complexity had allowed Kai Wen to build his understanding. Notably, structured guides served as scaffolds, enabling learners like Kai Wen to break

down projects and learning tasks into manageable parts while gradually increasing complexity. This approach allowed Kai Wen to acquire new knowledge and skills even without prior knowledge, fostering research on the importance of prior knowledge in learning (Lapidow & Walker, 2022; Schauble, 1990; Schwaighofer et al., 2017). Moreover, by providing a framework that supports gradual understanding, structured guidance aligns with findings which have emphasized how instructional scaffolding structures facilitate learners toward the development of SDL (Balfour, 2016; Beckers et al., 2021).

The involvement of supportive individuals, particularly peers, facilitators, and parents, is another key enabling external structure that supports learners' SDL. This support was inherently adaptive and responsive, as it was tailored to the needs of Kai Wen. Accordingly, Kai Wen exercised his agency by actively *seeking out advice, exchanging constructive feedback, collaborating, interacting, and learning through mistakes* with these supportive networks. This, in turn, influenced his learning strategies and outcomes, reflecting the observation that learners who were willing to interact with and learn from others were more adept at posing good questions and integrating multiple perspectives (Wegerif, 2019). Recent studies have also suggested that reflection, peer assessment, and peer feedback contribute to developing critical thinking and increasing learners' engagement and responsibility in their learning process (Dutta et al., 2023; Swaran Singh et al., 2017; Vrieling-Teunter et al., 2022). Furthermore, facilitators act as catalysts who create conditions in which new knowledge is gained, and helping to foster thinking and problem-solving skills. In SDL, learners like Kai Wen require help to maintain focus and direction, as well as immediate feedback and introspective questioning to improve their knowledge and skills. This study agrees with Grow (1991) who has pointed out that self-direction is an ability to be learned and that teachers can support or hinder development.

In the context of SDL, tools are not only limited to physical instruments, but also include software, digital platforms, and online educational resources. These tools mediate learning by shaping how learners interact with the knowledge content (Hakkarainen & Seitamaa-Hakkarainen, 2022). For example, Kai Wen leveraged online courses to grasp foundational programming concepts by watching relevant videos and before diving into more complex coding tasks to solve his coding problems. This approach allows him to adjust his learning pace according to his immediate understanding and needs. However, mastering complex techniques that require precise execution and immediate corrective feedback underscores an adaptive learning model where digital, personal instruction and interaction complement each other. Note that merely inserting technology into an educational setting without a concerted effort to cultivate meaningful use is unlikely to result in significant educational transformation (Hakkarainen, 2003). In essence, this point underscores the necessity of designing learning environments that integrate technology and align these tools with clear instructional goals, and understanding learners' needs.

Overall, this study aligns with Gidden's (1984) view of structures as enabling and constraining effects on learners' activities. These structures shape learning activities and interactions, setting the conditions for engagement (Stones, 2005). At the same time, internal structures that comprise the learners' motivations, cognitive and meta-cognitive capacity, knowledge ability, and agency drive learners' behavior and decision-making in response to SDL challenges. This interplay highlights individuals' capacity to navigate, adapt, and exercise agency within social structures (Giddens, 1984). In addition, Kai Wen's experience has illustrated the interplay between structure and agency, demonstrating how social structures shape his

behavior while he actively assesses and adjusts his actions in response to his social context. His case reinforced the idea that structure and agency are interdependent (Giddens, 1984; Stone, 2005).

Stones (2005) suggested that individuals possess a set of predisposition skills and knowledge that shape their perception of and engagement with the world, and their ability to apply knowledge and skills in particular circumstances. This is reflected in Kai Wen's transition from relying on external guidance to SDL with confidence, driven by mirroring and internalizing what he has learned from the external structures. This study has revealed that Kai Wen's improvement in his autonomy and reflexivity can be attributed to the development of meta-cognition skills, which ultimately strengthened his internal structures. This aligns with the findings of Uus et al. (2022), who emphasized the significance of prior knowledge of learning strategies and meta-cognitive skills for a successful SDL.

Despite his initial interest in programming, Kai Wen recognized a gap in his knowledge and capabilities that could hinder his progress. Knowledge ability and agency are critical for an effective SDL. As learners deepen their understanding and broaden their knowledge bases, they gain confidence, boosting their capacity to exercise agency. This agency enables learners to make independent decisions and tailor their learning strategies according to their specific needs. Thus, this study has discovered that having affective elements alone was insufficient for an effective SDL; in order to successfully navigate their SDL processes, they also needed cognitive and meta-cognitive skills, along with a sense of knowledge ability and agency. However, even with structured guides and instructions, there is no guarantee of achieving deeper learning. This highlights the need to assess learners' genuine interest and motivation towards their learning, as intrinsic engagement is crucial in sustaining meaningful learning experiences. In essence, in a structured learning context, flexibility is needed to accommodate individual learner preferences and promote intrinsic engagement.

CONCLUSION

This study has demonstrated the dynamic interaction between the internal and external structures in SDL contexts. It has highlighted how the participant actively engages and manipulates these structures to foster his SDL processes. Through the quadripartite cycle of the structuration framework, this study as shown that Kai Wen's ability to navigate SDL was shaped by the interaction between his internal structures (prior knowledge, cognitive and metacognitive skills, affective elements) and external structures (structured guides, people, tools). Initially, the external structures only played a scaffolding role in providing guidance and shaping Kai Wen's learning approach. Consequently, he gained confidence in exercising his agency and taking ownership by making his own decisions by mirroring what he has learned from the external guides. At the same time, he recreated his structures through self-reflection and experiences. This reflects the iterative relationship between structure and agency.

The findings underscore that SDL is not merely a method of learning, but a complex interaction of motivations, capabilities, and environments that has evolved over time. Through the lens of Structuration Theory, this study theoretically extends our understanding of the interaction between structures and self-direction, and how learners actively engage with and reshape their structures. In particular, this study has outlined the critical roles of agency, knowledge ability, and the strategic use of resources in developing a

robust SDL practice. In asking how much support to offer learners, this study has shown that it is not about the volume but the type of guidance provided, such as asking reflective questions, probing each other, and providing strategy guidance to encourage learners to self-organize and manage their own learning.

To create effective SDL environments, educational designers and policymakers should integrate theoretical insights with practical applications in learning and instructional design. This includes designing flexible structures and guidance to accommodate individual learner preferences and foster intrinsic engagement, providing resources that promote community engagement and collaboration, and enhancing the learning experience for all the parties involved. One approach is to implement interest and skill-based matchmaking systems to assist learners in identifying their learning partners or groups with similar interests or complementary skills (Brennan, 2021). In line with this, educators can help learners develop SDL using structured guidance and reflective questioning to help learners develop greater agency and meta-cognitive skills, ultimately empowering them to take ownership of their learning journey. Educators can further support learners by forming a network of mentors and connecting learners with mentors who can help expand their knowledge and skills. Additionally, incorporating an immediate and constructive feedback system enhances the learning dialogue between learners and educators, ensuring timely support and reflection.

LIMITATION AND FUTURE STUDIES

This study presents a condensed version of the findings from a more comprehensive study, which has carried out a deeper dive into Kai Wen's case. The case reported here was selected for comparison with different informal educational settings as part of a multiple-case study approach in the original research. As a result, the criteria for selecting this case are context-specific and aligned with the requirements of the multiple-case study design used in the more extensive study.

This study provides a more nuanced understanding of how an individual navigates SDL through the interplay of structure and agency espoused in Structuration Theory. Based on the uniqueness of the case, the findings cannot be generalized to other different contexts. Hence, future research could replicate this study with multiple case studies across different learning environments to explore variations in how learners' internal structures interact with their external structures.

In addition, future research would benefit from conducting a longitudinal study to better examine the effects of SDL on lifelong learning. In sum, this study has essentially illuminated the dynamic interplay between the external and internal structures influencing learners' purposeful actions. The findings of this study has revealed more nuances about the interaction between the internal and external structures and how this could shape the SDL processes and strategies. In addition, these nuances have helped to identify a set of flexible structures and guidance for educators, curriculum designers, and policymakers, which they need to seriously consider when creating environments that balance learner autonomy with the necessary scaffolding to engage with and reshape external structures to fit the learner's evolving needs.

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APPENDIX 1

Example of Interview Questions for the Participant

Part 1: To understand learners' experiences

1. How long have you been SDL?
2. Have you attended any formal schools before? If yes, what schools did you attend, your age when you attended, and when you left, your grade level, and reasons to leave the school?
3. Did you or your family choose to SDL?
4. What does your normal day look like?
5. Can you share how you organize your SDL activities?
6. What will you do when you don't understand/ encounter difficulties?
7. How do you know that your learning was successful?
8. Are you learning/doing anything complex/challenging right now? Can you please share it with me?

Part 2: Focus on SDL strategies and processes

(Build on the scenario from the screening interview and information given from parents' interviews on how the participants describe their daily activities.)

1. What is the most complex/challenging thing that you have learned?
2. Can you explain the steps or process you go through when starting a new learning project?
3. What is the most difficult part of this project?
4. What are your learning goals for this project?
5. How do you set your goals?
6. How do you decide what topics or subjects to explore/learn?
7. What sources of information or learning materials do you use?
8. How do you verify you are learning the right things?

APPENDIX 2

Interview Protocol for Parents

Time of interview:
Date:
Interviewer:
Interviewee:

Describe the project and tell the interviewee about:

a) The purpose of the study,
b) The individuals and sources of data being collected,
c) What will be done with the data to protect the confidentiality of the interviewee,
d) How long the interview will take?
e) Confirm participant consent,
f) Answer participant queries about research (if any)

- How did you first become interested in unschooling/self-directed learning for your child?
- Can you describe how your child (the name of the participant) learns and the role self-direction plays in it? Have you noticed any changes in your child's motivation, independence, or curiosity since embracing SDL? If so, can you elaborate?
  Can you think of an example?
- Can you describe how you got involved? How do you support your child's learning?
- Did he/she ask for your help/guidance? How did you respond to it?
- What challenges have you encountered while supporting your child's SDL, and how have you addressed them?
- What specific strategies or resources have you found helpful in supporting your child's SDL?
- What will (your child) do when he/she doesn't understand/encounter difficulties? Can you explain the situation in detail?
- From your observation, has he ever made a series of bad decisions? How would he react to his bad decisions?
- Is he/she currently involved in complex learning? Can you describe/explain in detail what the complex learning (project) is about?
- How do you assess your child's progress and learning outcomes?
- Can you share any memories, experiences, or success stories related to your child's SDL that stand out to you?
- Is there anything else you would like to share or discuss about your experience with SDL?