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“The challenge is probably just to understand what it is...”

Constructing sustainable development as a wicked problem in an educational context.

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Abstract

Title	“The challenge is probably just to understand what it is...” Constructing sustainable development as a wicked problem in an educational context.
Authors	Tess Andrén & Rebecka Stubb
Supervisor	Johan Alvehus
Purpose	The purpose of this research is to investigate in which ways sustainable development in Swedish schools is constructed as a wicked problem.
Research Question	How is sustainable development constructed as a wicked problem in Swedish educational contexts?
Methodology	A qualitative study approach was implemented where 20 semi-structured interviews were used for data collection. The data analysis followed the process of sorting, reduction, and argumentation in order to identify common themes.
Results	The results of this study shows how sustainable development is constructed as a wicked problem in education due to several problems. UNESCO, the vague definition of sustainable development, and the flexibility within the Swedish curriculum are all contributing to how it is constructed as a wicked problem in education. Nevertheless, the results show that while the construction of sustainable development as a wicked problem creates challenges due to its complexity, it also brings opportunities of freedom and flexibility.

Keywords	Wicked problems, Education for Sustainable Development, Sustainable Development, Governance, Teachers
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1. Introduction

Wicked problems are social policy problems that are difficult to pin down due to their complexity. They lack definitive formulations, involve multiple stakeholders on different social levels with conflicting values and beliefs and concern interconnected systems that are difficult to grasp (Rittel & Webber, 1973). Sustainable development complies with many of the attributes of wicked problems due to its complex nature, while it also is considered to be an important part of all education in Sweden (Läroplan för grundskolan, förskoleklassen och fritidshemmet [Lgr22], 2022). Taking this into consideration, picture yourself as a teacher, standing in a classroom full of students. How do you start explaining such a problem? What do you include, what do you exclude, and how do you make something that even researchers struggle to define comprehensible for your students? This case is not unusual but represents the reality for the majority of Swedish teachers and is summarized in following quotation:

“The challenge is probably just to understand what it is. There are so many things you need to be aware of before understanding the complexity of it all.”

Sustainable development has been incorporated into governing documents on all levels of the Swedish educational system since 2004, when UNESCO’s educational sector created Education for Sustainable Development (ESD). As opposed to the traditional subject-based learning in Swedish schools, ESD requires a new way of teaching where a holistic approach is emphasized. Ecological, social and economic dimensions of sustainable development are thus expected to be equally included in education rather than studied as three different parts (SOU 2004:104; UNESCO, 2023). However, teachers in Sweden have been reported to express multiple challenges related to conveying the holistic perspective that is advocated for (Skolinspektionen, 2023).

Education for Sustainable Development was intended to set a new standard for how sustainable development should be integrated in an educational context, and thus provide a new framework regarding sustainability (SOU: 2004:104). The United Nations Educational, Scientific and Cultural Organization (UNESCO) is an important driver for educational policy agendas, striving to implement principles, values, and practices of sustainable development into all educational areas globally. Through international efforts by UNESCO to steer governing documents and guidelines, ESD has become an integral part of Swedish curricula

and syllabi (Borrmann & Nickel, 2017; SOU 2004:104). Nonetheless, it has also brought new challenges to the table. Researchers have pointed out that the holistic approach creates obstacles for teachers due to its complexity, leading to teachers simplifying the issue of sustainable development by limiting the scope to only entailing the environmental dimension (Baena-Morales et al., 2022; Borg & Gericke, 2021). Furthermore, research has highlighted how ESD emphasizes what education ought to be and how it should be done, which in turn influences the space in which teachers are allowed to operate (Holfelder, 2019).

The introduction of Education for Sustainable Development in schools has been characterized by numerous discussions and research, pointing to issues regarding implementation as well as the challenges it has presented. Researchers not only discuss the complexity of sustainable development in itself, but also the fact that it is embedded in a diversity of values resulting in a concept with multiple interpretations and meanings. Moreover, sustainable development is declared to be a wicked problem, further complicating the issue (Borg et al., 2012; Borg & Gericke, 2021; Hasslöf & Malmberg., 2015; Sinakou et al., 2019; Weinberg et al., 2020). While the Swedish National Agency for Education confirms that the meaning of sustainable development is subject to continuous discussion, the Swedish curriculum refers to the term as a complex subject (Skolverket, 2022). Thus, while previous research clearly demonstrates that teachers are experiencing challenges regarding how to use and manage the concept, sustainable development is still considered to be a crucial objective within Swedish education (Gyberg et al., 2020; Hasslöf & Malmberg, 2015; Sund, 2015; Weinberg et al., 2020). Furthermore, there is a lack of research regarding sustainable development in schools and its linkage to wicked problems. More research needs to be done in order to understand how sustainable development is constructed as a wicked problem within education in schools. Therefore, while departing from the view that sustainable development is a wicked problem, this study will further contribute with new understanding regarding how it is constructed as a wicked problem in education.

1.1 Problematization

Complex issues, involvement of multiple stakeholders, and conflicting norms, beliefs and values are common denominators of wicked problems. Originally coined by Rittel and Webber (1973), wicked problems describe social policy problems that lack definitive formulations, stand without simple or traditional solutions, and where causes are numerous, undefined and often globalized. Previous research has concluded sustainable development to be added to the list of wicked problems, due to it complying with many of the attributes of such problems (Blok et al., 2015; Earle & Leyva-de la Hiz, 2021; Wright & Monsour, 2020). While the existence of a wicked problem can be explained in several ways where the explanation determines the nature of the problem, the same can be said about sustainable development because of its vague definition. Wicked problems are interconnected systems that are difficult to pin down, which additionally makes the process inherently complicated. Likewise, issues regarding sustainability involve complex systems without simple solutions, where numerous stakeholders offer different solutions to common desirable goals. The issue of sustainable development is looked upon differently due to its complexity and involvement of numerous stakeholders, thus making it wicked in nature (Bengtsson & Östman, 2013; Dentoni & Bitzer, 2014; Head, 2022; Kanon & Andersson, 2023; Rittel & Webber, 1973).

Although previous research have demonstrated that teachers on different educational levels find it challenging to teach about sustainable development due to different reasons (Baena-Morales et al., 2022; Gyberg et al., 2020; Hasslöf & Malmberg, 2015; Sund, 2015; Weinberg et al., 2020), there seems to be insufficient research regarding its linkage to wicked problems. Studies related to how sustainable development has been framed as complex and difficult to comprehend by teachers is unsatisfactory. Concurrently, research confirm that teachers are a critical force, playing important roles when encouraging and shaping children's understanding of the world, simultaneously as they agree that the theme of sustainable development brings challenges due to its wicked nature (Borg and Gericke, 2021; Crawford, Luke & van Pelt, 2015; Khalid Malik et al., 2022). Furthermore, professional landscapes in public sectors are explained as environments filled with challenges where wicked problems are inevitable, leading to situations where the tools to tackle these complex problems are inadequate (Kanon & Andersson, 2023).

Thus, previous research agrees that sustainable development is a wicked problem (Earle & Leyva-de la Hiz, 2020; Dentoni & Bitzer, 2014; Lehtonen et al., 2018). Therefore, this study departs from the fact that the wickedness of sustainable development also is reflected in an educational context. However, research does not establish how the wicked problem of sustainable development is constructed in education. Due to this fact, the aim of this research is to investigate in which ways sustainable development in Swedish schools is constructed as a wicked problem. Considering the aim of this study, the following research question has been formulated:

- *How is sustainable development constructed as a wicked problem in Swedish educational contexts?*

1.2 Disposition

Following the introduction chapter, the second chapter is constructed in two parts, presenting the theoretical background and theoretical framework of the study. Aiming to provide an overview of underlying forces that impact how sustainable development is constructed in educational contexts, Education för Sustainable Development, governance, the ambiguous concept of sustainable development and the Swedish curriculum are explained and elaborated on. Following that, wicked problems are introduced to familiarize the reader with the concept. Wicked problems are discussed and described according to its characteristics and concludingly used as a theoretical framework in order to relate the empirical material to a theoretical foundation to be able to answer the study's research question. The third chapter begins by describing the methodology of the study. To accurately answer the research question, a qualitative approach and abductive reasoning is called for which are here described in more detail. Following that is a thorough presentation of the research process including the data collection and the data analysis. This part is organized to appear like the process in which the data collection took place to give the reader an idea of the proceeding study. Selection of sample, choice of method, and the way in which the data is analyzed are described and benefits and drawbacks are here being accounted for.

Thereafter, the thesis moves onto the results and analysis deriving from the empirical results. Here, the empirical material is presented to provide perceptions and personal experiences

from the participants, related to how sustainable development is constructed as a wicked problem in educational contexts. During the data analysis process, four main categories were discovered and further elaborated. *Problems in defining sustainable development*, *Unclear frameworks creates confusion*, *Subject-based education enhances the wickedness*, and *Flexibility within sustainable development* are explained in further detail to accustom the reader with the study's empirical results. Analysis of the themes are carried out as they are presented. The fifth chapter consists of the discussion of the study's findings, aiming to sum up the study through more comprehensive elaborations on the findings of the study. Concluding, the sixth chapter presents the conclusions of the study, practical implications and suggestions for future research.

2. Theory

The following chapter presents the theoretical background which the study is built on. The chapter deals with the background of Education for Sustainable Development, governance, the Swedish curriculum, and the ambiguity of sustainable development. By the end of the chapter, wicked problems are introduced and presented as a theoretical framework.

2.1 The Background of ESD

Education for Sustainable Development is developed by the United Nations' leading agency UNESCO, having its roots in the two distinct areas of education and sustainable development. It is based on the principles and values underlying the concept of sustainable development, which ensures the wellbeing of the five pillars (environment, economy, social, peace, and partnership) (Agbedahin, 2018). Among the main targets of ESD is to address environmental, social, and economic issues in a holistic way to contain climate change before it reaches disastrous levels (UNESCO, 2023). As such, it requires the systematic integration and inclusion of crucial sustainable development issues and concepts to be implemented in all levels and forms of teaching and learning. ESD is described as a dynamic term that embodies a new kind of education, seeking to empower people of all ages to contribute to creating a sustainable future (Agbedahin, 2018). A holistic way of teaching is advocated for, where focus lies on the interrelationship and interdependence of environmental, social, and economic dimensions (Borg & Gericke, 2021).

2.2 UNESCO and Governance

UNESCO is an important driver and agenda setter for educational policy agendas like Education for Sustainable Development. It strives to implement principles, values, and practices of sustainable development into all educational areas throughout the world (Borrmann & Nickel, 2017; SOU 2004:104; von Seggern & Singer-Brodowski, 2020). Similarly, the terminologies and frameworks being synonymous to 'the way' of responding to environmental, social, and economic challenges are thus originating from a global perspective, answering to international goals and solutions. Hence, UNESCO and ESD are seen as key enablers of sustainable development and an integral element of quality education (Agbedahin, 2018).

Research regarding ESD has studied the role that governance plays in the transfer within the education system for sustainability. International organizations such as UNESCO are the leading actors of innovations in education, heavily involved in goal formulation and agenda-setting in programs like ESD. However, they stand absent from the implementation of such education programs on the ground. There is thus a clear distinction between the organization who develops the concept and the actors at national levels who are responsible for their implementation. While actors from formal education, such as schools, could be expected to be the most influential when implementing innovations such as ESD, such actors have noticeably less influential and central roles than international, governmental actors (Goritz et al., 2019; Kolleck, Jörgens & Well, 2017).

Research further explains the discrepancy between the actors and the organizations who developed ESD, and the actors who implement it at the national level. According to UNESCO's steering documents, Education for Sustainable Development has to be integrated in all curricula of formal education. Further, UNESCO refers to themselves as a leader and advocator of ESD and provides guidance and standards meant to be implemented on national levels (UNESCO, 2017). However, research expresses how governance engagement in ESD applies a top-down approach, where the connection to teaching practice is vague due to its lack of participation between teachers in formulating its concept and goal setting (Borrman & Nickel, 2017; Sinakou et al., 2019; Stevenson, 2006). Hence, responses to international ESD mandates have not conformed to straightforward adoption and implementation models in subnational education policy and curricula (Aikens & McKenzie, 2021). By not having any clearly defined regulatory prescriptions, and while still being promoted by international organizations without any sanctioning power, ESD struggles to find its place within curriculum in many countries. Likewise, ESD persists as an important concept within global policy, while lacking consensus regarding how it ought to be used in schools (Charif, 2022; Goritz et al, 2019).

Furthermore, when not taking into consideration the lack of participation of teachers when formulating the programmes goals and implementation, it leads to its content being rather vague. Therefore, there is a need for better linkage between actors operating at different levels of government that are involved in sustainability innovations. The vagueness of the concepts of ESD is leaving the actors implementing it a lot of room to use it. Thus, educational innovations cannot be implemented effectively when only taking the international

organization into consideration, it also needs to be accepted by the actors implementing it for it to actively be put into practice (Goritz et al., 2019; Kolleck, Jörgens & Well, 2017).

Through international efforts by UNESCO to steer governing documents and guidelines, Education for Sustainable Development has become an integral part of Swedish curricula and syllabi. However, even though ESD has been enabled in policy documents in Sweden, international commitments have a tendency to emphasize the mainstream of ESD but give little to non attention to the local contexts in curricula and policy (Aikens & McKenzie, 2021). As opposed to the traditional subject-based learning in Swedish schools where each subject is studied separately, ESD is advocating for a new way of teaching. The programme highlights the necessity of a more holistic way of teaching where all three dimensions of sustainability, environmental, social, economic, are equally included and integrated while also focusing on their interrelationship (Borg et al., 2014; Sinakou et al., 2019). Nonetheless, examinations made by the Swedish school inspection have shown that different schools work with various components of ESD separately. On the one hand, the components are indeed supported in the governing documents, but on the other hand, the overall perspective that holds the various components together is missing. ESD has highlighted the holistic approach to be of central importance, however Swedish schools lack the cohesive perspective which is important for both content and forms of teaching. The examinations also show that it is common that there is a lack of common understanding at the school of what sustainable development is and how the school should work with it. Further, there are signs that teachers need more knowledge about learning for sustainable development (Skolinspektionen, 2023).

2.3 The Ambiguity of Sustainable Development

The most recurring definition of sustainable development derives from the Brundtland definition of sustainable development, presented over 35 years ago by the Brundtland report, “Our common future” (Brundtland, 1987). It is from this definition sustainable development has gained political currency and widespread acceptance (Harlow et al., 2011; Manteaw, 2020; UNESCO, 2018). Though, the definition has brought complexities and challenges, including on-going debates about how to either define or achieve it in practice (Blum et al., 2013). Several researchers argue that the exact meaning of the Brundtland definition is ambiguous, leading to multiple interpretations and a wide applicability of the concept to different sustainability issues (Banerjee, 2003; Barkemeyer, Holt, Preuss & Tsang, 2014;

Redclift, 2005; Tuominen, 2021). Further, it is an abstract term that while being used frequently, is difficult to understand due to its complexity (Agbedahin, 2018).

Education for Sustainable Development has emerged from framings in international discussions to shape how knowledge and learning should be applied to address contemporary complex problems, and it is built upon the Brundtland definition. Whereas many countries and institutions have embraced the ideals of ESD, it has evolved into becoming the mainstream educational discourse in regard to sustainable development. Hence, ESD is today accepted as the novel education tradition and is muting any other competing voices (Manteaw, 2020). Given that the definition of sustainable development has been considered ambiguous and vague, leading to multiple interpretations (Banerjee, 2007; Bengtsson & Östman, 2013; Redclift, 2005), questions then arise how such imbalances play out in the course of ESD (Goritz et al., 2019; Stevenson, 2006). The ambiguous aspects of sustainable development thus allows different countries to fill ESD with their own policy priorities, which further increase the nebulosity of its content. Consequently, despite being the mainstream educational discourse in regard to sustainable development, it is inconclusive in regard to having specific policy directions. It thus allows contesting demands such as social justice, economic growth, and environmental protection to all be represented in the progress towards a common desirable goal. Concurrently, the content of ESD can mean something different depending on what perspective you take (Bengtsson & Östman, 2013; Goritz et al., 2019). Likewise, as with the evolutionary definition of sustainable development, ESD is under continuous change, contributing even more to challenges for teachers to adhere to and put into practice (Sinakou et al., 2019).

The definition of sustainable development used in the curriculum for compulsory schools and governments in Sweden derives from the Brundtland report (Skolverket, 2022). The fact that the definition is vague and open for interpretation further adds to the complexity of the issue. Further, the Swedish National Agency for Education concludes that the meaning of the term is subject to continuous discussion and will presumably never receive a definitive and specific definition (Skolverket, 2022).

2.4 Development of the Swedish Curriculum

The Swedish education system has gone through excessive changes during the last two decades. Whereas the national government was once in charge over education, decentralization and deregulation has distributed responsibilities in different ways. Municipalities are today primarily responsible for compulsory and upper secondary schools. Curricula, syllabi and assessment and control systems exist at national level, however, the amount of detail and precision has changed over time. Teachers today have more flexibility in planning their lectures, whereas the official guidelines do not offer any specific assessment methods. Overall, teachers interpret the curriculum and enact the goals in ways they themselves see fit. Further, while the Swedish curriculum enables flexibility for teacher's interpretations instead of describing what should be taught in detail, teachers rarely have to adapt their instructions based on the decisions of the government (Bümen & Holmqvist, 2022).

2.5 Wicked Problems

Wicked problems, originally coined by Rittel and Webber in 1973, describes social policy problems as destined to fail due to their very nature. Originally deriving from public policy planning, the concept of wickedness has since been applied in various fields where sustainable development is one of them (Blok et al., 2015; Earle & Leyva-de la Hiz, 2021; Wright & Monsour, 2020). The problems are 'wicked' because they cannot be definitely described, nor can they be solved in the sense of specific and objective answers. While problems in the natural sciences can be described as 'benign' as a result of their mostly definable and solvable character, wicked problems lack such clarifying traits. To distinguish wicked problems, Rittel and Webber (1973) have specified ten different characteristics which have come to be widely accepted as the standard of wickedness, as shown in Table 1. Even though several decades have passed since the article by Rittel and Webber (1973) was published, it still holds its relevance when applied to contemporary problems. Recent studies commonly refer to wicked problems (Blok et al., 2015; Dentoni & Bitzer, 2014; Earle & Leyva-de la Hiz, 2021; Head, 2019; Kanon & Andersson, 2023; Wright & Monsour, 2020) and use them to explain current world issues, pointing to Rittel and Webber (1973) still holding their weight as significant actors.

1. "There is no definitive formulation of a wicked problem"
2. "Wicked problems have no stopping rule"
3. "Solutions to wicked problems are not true-or-false, but good-or-bad"
4. "There is no immediate and no ultimate test of a solution to a wicked problem"
5. "Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly"
6. "Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan"
7. "Every wicked problem is essentially unique"
8. "Every wicked problem can be considered to be a symptom of another problem"
9. "The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution"
10. "The planner has no right to be wrong"

Table 1 (Rittel & Webber, 1973; characteristics of wicked problems)

Inherently, wicked problems are public problems that are difficult to pin down due to their complexity. They are badly formulated, involve multiple stakeholders on different social levels with conflicting values and beliefs and concern interconnected systems that are difficult to grasp (Earle & Leyva-de la Hiz, 2021; Wright & Monsour, 2020). Furthermore when it comes to wicked problems, rules and regulations are insufficient due to the fact that the preferred outcomes are unclear and therefore future impacts cannot always be foreseen because of the complexity and uncertainty it brings (Blok et al., 2015). Uncertainties that arise from wicked problems can be caused by knowledge gaps, conflicts and value differences. These uncertainties exacerbate the tensions inherent in addressing wicked problems (Head, 2019). Climate change, poverty, and international terrorism have in earlier research been labeled as wicked problems, as they concern complex systems on different social levels where cause and effect relations are unknown (Blok et al., 2015; Dentoni & Bitzer, 2014).

Adding to this, multiple researchers have concluded the field of sustainability to be added to the list of wicked problems (Blok et al., 2015; Earle & Leyva-de la Hiz, 2021; Wright & Monsour, 2020). Issues regarding sustainability also concern complex systems without simple solutions. In fact, it is not even possible to propose a definite solution without an actual problem description. Within the case of sustainability a specific definition does not exist whereas the most frequently used - the Brundtland definition - is too vague and thus open for different interpretations (Blok et al., 2015; Tuominen, 2021). Additionally, wicked problems have come to take a prominent place in debates regarding sustainability and are argued to be so complex that there is no agreement on how to neither define or solve it (Dentoni & Bitzer, 2014) Consequently, wicked problems permeate all levels of society and the public sector is not an exception. Though, previous research has argued that the public sector lacks the necessary tools to tackle the complexity that make up wicked problems (Kanon & Andersson, 2023; Rittel & Webber, 1973). Thus, one of the challenges regarding wicked problems is for institutions to design and deliver successful interventions. Therefore the wicked problem perspectives have emphasized the role of stakeholders values, perceptions and interests in explaining how issues are priorities and solutions deliberated (Head, 2019).

2.6 Using Wicked Problems to Understand Sustainable Development

The majority of literature on wicked problems tends to use the standard characteristics of wicked problems originally coined by Rittel and Webber (1973), and so is also the case for this study. Acknowledging that sustainable development in education is a wicked problem, this study aims to investigate how it is constructed in such ways. Therefore, the characteristics proposed by Rittel and Webber (1973) are used as a theoretical framework (see Table 2) to define how wicked problems are identified, to further be able to explain how they are constructed in education. Following table is used to describe and conceptualize each characteristic in order to understand their scope. Thus, a problem is wicked if several characteristics (or most of them) are present:

<p>1. No definitive formulation</p>	<p>Wicked problems lack definitive formulations due to the fact that multiple stakeholders are involved, all with their own ideas of how to understand the problem and how it should be solved. The information needed to understand the problem depends on one's idea on how to solve it.</p>
<p>2. No stopping rule</p>	<p>There are no criteria that tell when a solution has been found. There may always be better solutions to a problem.</p>
<p>3. Answers are not true-or-false, but good-or-bad</p>	<p>Different groups have conflicting ideas of how to correctly tackle the issue. Their judgments are likely to differ according to personal interests and values.</p>
<p>4. No ultimate test of solutions</p>	<p>The test of a solution is under the control of the few people that are involved and interested in the problem. The full consequences cannot be appraised until all repercussions have completely run out.</p>
<p>5. Every solution to a wicked problem is a "one-shot operation"</p>	<p>There is no way to test if a solution is appropriate due to there being no opportunity to learn by trial and error. Every implemented solution is consequential because it leaves traces that cannot be undone.</p>
<p>6. No enumerable set of solutions or a well-described set of operations</p>	<p>There are no criteria to prove that all solutions to a wicked problem have been identified and considered. Normally, several potential solutions exist, and it is a matter of judgment which solution should be pursued and implemented.</p>
<p>7. Every wicked problem is essentially unique</p>	<p>Despite long lists of similarities between a current problem and a previous one, there always might be an additional distinguishing property that is of overriding importance. Dealing with wicked problems is not knowing too early which type of solution to apply.</p>
<p>8. Wicked problems can be considered to be a symptom of another problem</p>	<p>To solve a problem the issue first needs to be located, meaning first you need to find where in</p>

	the complex causal networks the trouble really lies. One should not try to cure symptoms: and therefore one should try to settle the problem on as high a level as possible.
9. The existence of the problem can be explained in numerous ways	The choice of explanation determines the nature of the problem's resolution. Each of these explanations offers a direction to tackle the problem. Further, there is no rule or procedure to determine the "correct" explanation or combination of them.
10. The planner have no right to be wrong	Planners are liable for the consequences of the actions they generate; the effects can matter a great deal to those people that are touched by those actions.

Table 2 (Rittel & Webber, 1973; characteristics of wicked problems explained)

The body of concepts surrounding wicked problems serves to draw attention to the complexity of social, natural, and political processes. Sustainable development is characterized by its complexity (Agbedahin, 2018; Blok et al., 2015), and its vague definition that opens up for multiple interpretations (Bengtsson & Östman, 2013; Tuominen, 2021), further strengthening the use of wicked problems in this study. Using the characteristics of wicked problems as a theoretical framework assists in making sense of how sustainable development is constructed as a wicked problem in education.

3. Methodology

When deciding on an appropriate methodology and methods of data collection the object under study is the determining factor. Research that requires a qualitative approach pursue the questions of how and why, in order to explore and understand individual and social processes that have led to the current situation of the studied object (Flick, 2018). Thus, the aim of qualitative research is to gain a deeper understanding of the situation being studied (Bryman, 2018). In order to understand how sustainable development is constructed as a wicked problem in educational contexts, a qualitative study approach was called for due to its focus on understanding how people perceive and construct their world. One of the benefits of qualitative research lies in its ability to explain patterns and processes of human behavior, and is of specific relevance to the study of social relations in the context in which they are created (Flick, 2018).

Qualitative research enables a deeper understanding of phenomena and context. As such, this study adopts an interpretative viewpoint as an epistemological stand, and is thereby interested in meanings and nuances. The study opens up for a multiplicity of social perspectives and thus promotes a deeper understanding of how reality is constructed (Bryman, 2018; Flick, 2018; Rennstam & Wästerfors, 2015). As the research studies construction of realities, the ontological stance in this research aspires to critically determine the different meanings generated by the participants who partake. Constructivism is an ontological point of view, where social phenomena and meanings are accomplished through interaction, meaning that external realities are interpreted by individuals. Correspondingly, constructivism takes the stance that individuals in a social phenomena construct their own social realities (Fay, 1996). A qualitative approach thus takes into account the different viewpoints and practices due to different subjective perspectives and social backgrounds related to them. From this viewpoint, the researcher's communication with the field and its participants is an explicit part, where the knowledge of the reality is co-created by the researcher and the people who partake (Flick, 2018). Thus, by following a constructivist-interpretive approach, this research will allow teachers to communicate their own subjective perspectives, experiences and viewpoints regarding education of sustainable development in school.

Adding to the above, this research adopts an abductive reasoning where the collection of data is influenced by theory but highlights the worldviews of the participants when generating

new insights. By adopting an abductive approach, the study's theoretical account is grounded in the worldview of the participant. The abductive approach facilitates means of inferring new theory or development of existing theory. Further, it implies that the process when analyzing data is not linear, but rather iterative (Kovacs & Spens, 2005). Therefore, empirical data and theory in this study is subjected to continuous interpretation and comparison, moving from broadly descriptive empirical patterns towards a theoretically informed analysis. Hence, using an abductive approach enables this study to combine the theoretical framework as a guideline to develop understanding of the studied phenomena, with new knowledge gathered through the empirical data. As such, the qualitative approach invites abductive reasoning as it allows the ongoing reflection deriving from interpretations of the subject and contemporary theoretical understanding. Therefore, the process involves a continuous reflective dialogue between the researcher, the empirical data, and theory (Kovacs & Spens, 2005).

3.1 Data Collection

For the purpose of this study, participants were selected through the principle of *purposive sampling*. Participants were sampled through purposive and snowball sampling strategies, with the intention of strategically selecting participants to fit the purpose of the study. Further, this research focuses on a non-probability form of sampling. To be able to accurately answer the research question, participants that have experience in teaching about sustainable development in educational contexts must be selected in order to gain deeper understanding of the specific issue (Bryman, 2018; Flick, 2018).

When collecting the sample, the researcher must know what criteria are relevant when deciding on the inclusion or exclusion of participants (Bryman, 2018). This study takes its departure in a Swedish context. No distinction is made about the size of the school, socio-economic factors, or location. An initial decision was made to only include compulsory schools and upper secondary schools since the style of education is more similar, as opposed to universities where courses may be devoted to specific themes or fields. The second criteria considers the selected teachers, where only teachers that are qualified to teach in science studies, including biology, physics, and chemistry, and/or social study subjects in which geography, history, religion, and civics are included. Sustainable development is permeating both subjects but in different ways, making it a logical choice as opposed to investigating teachers who teach for instance mathematics or modern languages where sustainability is not

as frequently mentioned. Further, since the issue of sustainable development is a recurrent theme throughout the curriculum starting from the first year, teachers of all grades were invited to partake. The sample includes teachers from elementary school up to upper secondary school.

Though, the first criteria regarding what schools are selected was later adjusted when three additional teachers working at a folk high school were invited to participate. The teachers were all currently teaching either science studies or social study subjects, as well as having taught said subjects in compulsory schools prior to that. Considering that this study aims to investigate sustainable development as a wicked problem in educational contexts, this was regarded as an opportunity to bring an additional perspective. Students attending folk high schools aim to graduate with the grades they did not reach during compulsory school, hence they are expected to be knowledgeable of the goals set in the curriculum for compulsory school when graduating. Therefore, the first criteria was modified to further include teachers not only working at compulsory or upper secondary schools but to also consist of teachers working at a folk high school.

Adding to the above, initial emails were sent to teachers who complied with the described criteria. After getting in contact, an additional email was sent containing brief information about the interviews and what topics were meant to be covered. This to give the teachers a chance to get a grasp of the theme and decide if they wanted to participate or not. After confirming to partake, all participants received the same information related to main themes to be covered during the interviews and ethical considerations. As for sample size, this study built upon 20 interviews lasting for around 45 minutes.

3.2 Choice of Method

To uncover in what ways sustainable development in education is constructed as a wicked problem, teachers' perspectives and statements are requested. Hence, data was collected through qualitative interviews, where the *semi-structured interview* was selected due to it providing more in-depth knowledge and understanding. Further, the semi-structured interview provides flexibility to change wordings or sequence of questions as well as possibilities to probe responses for eventual elaboration or clarification or even ask additional questions (Bryman, 2018; Galletta, 2013; Mongar, 2022). This style of conducting interviews is composed of themes or topics to be covered and incorporates both open-ended and

theory-driven questions, creating space for the interviewee to narrate their experiences while still being tied to the research topic (Bryman, 2018). Even though the participants have been selected on similar groups and belong to a fairly homogenous group, their responses differ from each other. Therefore, the researcher's ability to support the participant's narrative is crucial and the semi-structured interview is a fitting way to follow up on such information (Galletta, 2013; May, 2011). As this research aims to enable new understandings and viewpoints, an interview approach that allows for probing and follow-up questions are key.

Whether a semi-structured interview is successful or not primarily depends on the interviewer, however, a well-executed interview guide can be of great help during the process. The interview guide can prior to the actual interview help steer what material can be collected (Galletta, 2013), however, all interviews were adapted to each interviewee to capture and follow up on important and interesting points of view. For the purpose of this study, the interview guide (see appendix 1) is based on the knowledge that was acquired through the theoretical chapter. When preparing questions, consideration is put on what is necessary to know to answer the study's research question, and several techniques are used to formulate relevant interview questions. The interview guide consists to a large extent of open-ended questions, including how sustainable development can be defined, how it is implemented in education, how it should be implemented, and what opportunities as well as challenges can be related to teaching about sustainable development. Open-ended questions allow the interviewee to answer more spontaneously and freely, resulting in in-depth data (Bryman, 2018; Galletta, 2013). Some close-ended questions are included and in some cases followed up by open-ended questions. Further, while the interview guide was used as base for all interviews, the direction in which the interviews went varied to some extent depending on the interviewee. Due to the flexible character of semi-structured interviews, focus could be directed on the answers provided by the interviewee whereas follow-up and probing questions revolved around either what the researchers or the individual participant found interesting.

The interviews were carried out digitally, mainly because there was a great distance between the researchers and the participants, but also due to time constraints and limited resources. Although, to not completely miss out on other important aspects within qualitative interviews such as body language and face expressions, all interviews were carried out with webcams. All interviews were recorded in Quicktime and transcribed by hand per the interviewees'

agreements. The transcript heavily aids in the data analysis as the researchers have the full material in script and can be reminded of specific important aspects. The interviews were carried out in Swedish to enable smoother conversations and to ensure that the participants could communicate without experiencing any barriers. All quotations are thus translated from Swedish to English. In total, 20 interviews were carried out. Due to the flexible character of the semi-structured interview where additional follow-up questions based on the replies by the participants are involved, the duration of the interviews varied. Approximately, each interview lasted in general for 45 minutes, resulting in 136 pages of transcribed material.

3.3 Data Analysis

To be able analyze the collected data, the analysis process follows the three-step approach regarding analyzing qualitative empirical data proposed by Rennstam & Wästerfors (2015). Through the processes of (1) sorting; (2) reduction; and (3) argumentation, it was possible to find common themes regarding the creation of sustainable development as a wicked problem. Following parts of the analysis process are divided according to the three-steps to display the process of each step.

The first step, according to Rennstam and Wästerfors (2015) is the *sorting* of the material. Initially, the material was read through several times by both authors as for them to get familiarized with the material. To be able to begin the sorting process, the author needs to get familiar with the material to understand it. The transcribed material was read through multiple times by both authors to be able to further discuss it. This enabled both authors to describe their interpretation of the material, resulting in different points of views regarding the findings. This initial sorting process was open and spontaneous, as to not miss out on any possible viewpoints. However, as qualitative material is characterized by a certain disorder (Rennstam & Wästerfors, 2015), the sorting process helped to organize and achieve a better understanding of the 136 pages of transcribed material. Furthermore, the sorting process led to the creation of main themes, which indicated directions in the material. By focusing on recurrent words and framings by the interviewees, five main themes were identified. For example, several interviewees used the concept of flexibility when describing sustainable development, thus the main theme of flexibility was created. Following the creation of all main themes, bullet points were created in order to grasp all perspectives related to the themes. Every perspective and explanation that could be connected to the main themes, were

described using bullet points. These perspectives were chosen due to the wordings used in relation to the main themes.

After having identified the five main themes and its bullet points, the material was read through one more time to investigate if more information could be found and related to the main themes in order to see if they could be explained in even more detail. This allowed for an openness during the sorting process, and goes in line with what Rennstam and Wästerfors (2015) argues about re-sorting being a way of obtaining in-depth understanding and finding new themes. The sorting approach suited the study's abductive method, as the empirical material could be revised during the working process. When applying an abductive approach, pre-understandings of theory are combined with new knowledge that is generated through the empirical findings of this study (Bryman, 2018). Hence, findings of this study will progressively proceed to create an understanding of the phenomena through an exchange between empirical findings and theory.

During the second step of the analytical process, the material was *reduced* in order to create clarity in the material and highlight the most representative parts (Rennstam & Wästerfors, 2015). When going through the sorted material, two main themes were consciously excluded due to not suiting the purpose and aim for this study. Since the study is focusing on how sustainable development is constructed as a wicked problem in educational contexts, the main themes relating to student's perspectives and pedagogical approaches were removed.

Further, the bullet points related to each main theme were used as guides and provided directions within the main themes. For instance, when going through the bullet points it became evident that there were two distinct perspectives related to the main theme of flexibility. Due to both perspectives being considered as important insights, the theme was divided into two separate themes. This gave an opportunity to display flexibility from two distinct perspectives, each contributing to answering the study's research question. Likewise, two themes showed similarities in their bullet points as corresponding words and framings were brought up. By themselves they were considered to be too narrow, however, when combining them they provided more sense. Therefore, the decision of combining them into one theme was made. All choices regarding the reduction process were based on conscious and attentive impressions of the material and what was fitting for the study's aim.

Thus, the initial main themes were reworked in order to best reflect the intended purpose and research question. Alvehus (2023) describes how this part of the analysis is strongly affected by what questions the study aims to answer. Therefore, during this process theoretical interests have influenced and steered the reduction process in choosing what is seen relevant for the study (Rennstam & Wästerfors, 2015). On one hand, wicked problems constitute the study's theoretical framework and the material has thus been looked upon from a certain point of view. On the other hand, close attention has been directed to the interviewees' statements resulting in the four main themes: *Problems in defining sustainable development*, *Unclear frameworks create confusion*, *Subject-based education enhances the wickedness*, and *Flexibility within sustainable development*.

The last step in the analysis process is the *argumentation* for the thesis, with the use of support from the empirical material (Rennstam & Wästerfors, 2015). The abductive approach is beneficial when deciding on and arguing for the selected themes. In order to not miss out on important aspects during the sorting and reduction processes, theory and empirical material were combined in a symbiosis, meaning they both contributed with important aspects. In other words, by sorting and reducing the material, all choices are argued for in accordance to their relevance. Even though the theoretical framework was a guiding aspect in constructing the themes, the perspectives of the interviewees were always kept in mind which further shaped the outcome and understanding of the context. As such, the selected theory did not overrule the empirical results when finding the most occurring and essential material that represents the phenomena under study. Hence, the use of data is emphasized whereas the empirical material ending up in the analysis chapter is supported with a strong argumentation in accordance to its relevance.

3.4 Research Quality

For the research to be accepted as trustworthy and to secure research quality it is of importance to demonstrate that data analysis has been conducted in detail to enable the reader to determine whether the process is credible. Regarding the quality of a study, there are several criteria that can be used to estimate the value. To ensure research quality for the purpose of this study, the criteria of trustworthiness and authenticity has been selected (Bryman, 2018). Nowell, Norris, White and Moules (2017) clarifies that trustworthiness consists of four sub-criteria: *credibility*, *transferability*, *dependability*, and *confirmability*. Further, Yardley (2000) proposes four sub-criteria for authenticity: *sensitivity to context*,

commitment and rigor, transparency and coherence, and impact and importance, which are accounted for.

This study aims to investigate the social realities of the interviewees, hence credibility is important to achieve trustworthiness as the social reality can be interpreted in several different ways. Member checkings were continuously being done during the interviews, in order to ensure that replies were interpreted correctly. For instance, participants were sometimes asked to confirm whether the researchers had understood the meaning of their statements. Likewise, in some cases information was followed up through email to ensure that information had been interpreted correctly in the event of eventual ambiguities. When conducting qualitative studies, the concept of transferability is difficult to achieve due to it having unique aspects and since social realities are constantly changing (Bryman, 2018). Instead, this study aims to provide the reader with large amounts of empirical material of the understanding and nuances of the challenges of working with broad and complex issues like sustainable development. Thus, the reader can make their own judgments regarding the study's transferability.

When it comes to dependability it is crucial that the research process is accurately described (Nowell et al., 2017). To ensure trustworthiness of the research process, detailed descriptions and arguments of both benefits and drawbacks relating to the chosen method and methodology are accounted for. Lastly, confirmability is related to the notion that the researchers demonstrate how interpretations and conclusions have been reached. According to Bryman (2018), confirmability concerns the objectivity of the study. While realizing that absolute objectivity is not possible to reach, it should be evident that the researchers have not let any personal values or theoretical biases influence the findings of the study. To achieve and ensure confirmability the researchers own perceptions of the material has been brought up and discussed during the writing processes in order to minimize subjective opinions. Furthermore, peer-reviews have been conducted focusing on critically viewing the study as well as inspecting if results and conclusions can be drawn departing from the empirical data.

In regard to authenticity, the sensitivity to context criteria was applied through showing consideration both for theoretical positions and empirical data. As the empirical material consists of the participants' thoughts and experiences, which could be perceived as sensitive, both the interviewees and their schools are made anonymous. The second criteria as proposed

by Yardley (2000), is explained as having an interest in the area, the necessary skills, and a thorough data collection and analysis. Both authors are very interested in the investigated subject, simultaneously as the research process included preparations of research in the subject to gain necessary understanding knowledge. The third criteria are transparency and coherence, where research methods are clearly specified and a reflexive standpoint is taken. This is achieved by following clear research methods, as described in the methods chapter. Lastly, Yardley (2000) describes how impact and importance emphasize that the conducted research needs to have a significance on either theory or on the object under study. Throughout the work of this thesis, the aim has always been to achieve a theoretical contribution, accomplishing the last criteria.

3.5 Ethical Considerations

When conducting research, ethical considerations need to be considered as they relate to the integrity of this research (Bryman, 2018). To ensure no ethical transgressions were made, this study takes into account the four ethical principles proposed by Vetenskapsrådet (2002). The principles are based on information requirements, consent requirements, requirement of confidentiality, and utilization requirements. The first principle of information is exercised as the interviewees are informed of the purpose of this study, what themes can be expected to be discussed, that participation is voluntary and they can choose to withdraw at any time without giving any reason to do so. Having acquired this information, the participant can make an informed choice on whether they want to participate or not. Further, all participants were given opportunities to ask questions before agreeing to partake. For the second principle about consent requirements, the participants need to agree orally or verbally about their decision to partake in the study. The interviews are recorded for transcription, which participants were both informed about through email and asked again before the interview started to confirm their consent. The requirement of confidentiality is exercised as the only ones having access to the empirical material are the researchers of this study. The collected data is presented as such that it is not possible to identify either teacher or school. Thus, unauthorized people are not able to access or find out any details of the participants. Lastly, the principle of utilization requires that the collected data is used exclusively for the purpose of this study (Vetenskapsrådet, 2002).

4. Empirical Findings and Analysis

The following chapter presents the empirical material and analysis of the study, structured according to the four main themes identified from the results of the interviews. The themes are further analyzed with previous research and literature to expand the field of research. Analysis of the themes are carried out as they are presented.

4.1 Problems in Defining Sustainable Development

When analyzing the empirical material it is evident that there is no common definition of sustainable development among the participating teachers. Likewise, Blum et al., (2013) conclude that the definition of sustainable development is framed by complexity, challenges, and on-going debates related to how it should be defined. Out of the 20 interviews that were conducted none of the teachers described the concept in the same way, although sometimes in similar terms. Following table illustrates the discrepancy between the teachers' descriptions of sustainable development by presenting eight examples deriving from the empirical material.

“In some way it’s about how we should keep our standard of living as much as possible at the same time as we need to think about future generations. We shouldn’t waste as much of the resources that exist... ecological resources... the environmental aspect.”
“Sustainability is very similar to the Sustainable Development Goals. That type of definition, both social, economical, cultural, and environmental. The four pillars, all are equally important.”
“The way I speak about sustainable development is that you have to divide it. It should be sustainable for the future, but also leave room for progression. But, this can be different for different people in different parts of the world.”
“Sustainable development is really everything we do and consume and that we must go plus or minus zero towards nature and our environment”.
“That is a good question... you can talk about the UN's global climate goals and the circular economy and you can talk about it on an individual level or if you want you can look at it from the investment banks. Everything is connected in one way or another”.
“It's really the basis of the driving force we have in modern society, regardless of whether we're talking about economics, or social development. It's the central building blocks, when they're not really there then society also stops. Whatever we actually discuss, sustainable development comes into play. And it doesn't matter if it's micro or macro level”.
“Well, the way I talk about sustainable development, it's just that you divide it. It must be

sustainable for the future, but there also needs to be room for development. But there are different conditions for people in different parts of the world. I usually talk in terms of us being able to live sustainably in the West and make more ecological and environmental decisions that cost more, while countries that have difficulty with food for the day do not have that opportunity. So just this that development is not the same for everyone, and where some can live more sustainably than others”.

“Yes, so when you talk about sustainable development, you usually focus only on environmental aspects. And I don't want to do that, but I see sustainable development as something that needs to permeate the entire business and society, so that both people and the environment can feel good and develop in a positive direction”.

Table 3. Definitions of Sustainable Development

One of the characteristics of wicked problems is that there are no definitive formulations due to many actors being involved with their own interpretations on how to solve the issue (Rittel & Webber, 1973). Likewise, when the teachers were asked to define and explain sustainable development, it became evident that there were no universal definitions that the teachers used or referred to. Although the participating teachers all explained the concept in various ways, some topics were mentioned multiple times throughout all interviews. The UN Sustainable Development Goals were mentioned by eight teachers, and the majority of the teachers described the three dimensions of social, economical, and environmental sustainability as important factors to be aware of. However, there was no consensus on which dimensions were most critical or where the focus should be directed on. In addition, none of the teachers referred to the Brundtland definition, even though it is the one that is used within both Education for Sustainable Development and the Swedish curriculum (Manteaw, 2020). The reason behind the variation of explanations of sustainable development can be related to the fact that wicked problems can be explained in numerous ways and where the explanation determines the nature of the resolution (Earle & Leyva-de la Hiz, 2021; Rittel & Webber, 1973; Wright & Monsour, 2020) It is clear that all teachers describe various perspectives and in that description it is also evident that what parts they chose to bring up display what they consider to be most essential. While some teachers highlighted the environmental aspects, others excluded this perspective and emphasized the social or the economic aspects.

That the participating teachers had a tendency to describe sustainable development in various ways and digress into numerous topics, goes hand in hand with what Skolinspektionen (2023) reports about the lack of a common understanding of what sustainable development is. When asked during the interviews, a few of the teachers seemed to struggle when trying to define

the concept in simple terms. Rather, they discussed other dilemmas that could be related to the issue of sustainable development which concludingly led to them not even being able to actually answer the question. Some of them mentioned how to integrate it in education, others spoke about student perspectives and how to involve and engage the children, while others discussed unsustainable practices rather than sustainable ones. Whilst some teachers seemed to be surprised by the question and needed some time to contemplate...:

That is a good question... but sustainable development is that we should live as well as possible today and also in the future. But then, what 'as well as possible' is, there are probably different interpretations.

...others replied with confidence when asked to define sustainable development:

How many hours do we have? Haha. It has a lot to do with the SDGs and Agenda 2030, those are what we depart from.

Wicked problems can be explained in different ways due to different groups having various interests and values, where the explanations are not true-or-false but rather good-or-bad (Rittel & Webber, 1973). Even though the replies by the participating teachers lack congruence, the results show that all teachers have their own way of describing sustainable development whereas they all chose to accentuate different things. This further strengthens the fact that wicked problems are so complex that there is no agreement on how to define or solve the problem (Dentoni & Bitzer, 2014). In accordance with this, the teachers were asked if there could be a problem when teachers define the concept differently and emphasize diverse aspects. The following quotations further illustrate that different teachers have various interests and values and that those interests may impact what sustainable development becomes:

I would probably say that all teachers teach differently, and it can be relatively similar or very far apart. It is really up to the teacher's interpretation of the assignment, to a large extent anyway.

And maybe for better or for worse that you have to constantly agree, where do we draw the line for what is okay? And not everyone thinks the same, because we are different. But I think that the discussion makes you move closer. It's not about four teachers having an

absolute consensus on what sustainable development is, but that we at least move towards each other and that the extremes of opinions that differ are grinded down. Because you come across different opinions and teachers' interest impacts what is being taught.

Moreover, the teachers were asked if their work place provided any directives in regard to how they should define or refer to sustainable development, where only one teacher had pronounced directives. It is thus evident that it is up to each teacher to interpret sustainable development in their own way, which also can explain why every teacher had their own idea and interpretation of its meaning. When asked, most of the participating teachers would though prefer to have at least some guidelines to fall back to as it would contribute to a more coherent picture of sustainable development among the profession. One teacher expressed that they had discussed implementation of directives related to sustainable development in the school policy to showcase its importance. Currently, most teachers agree that the curriculum does not offer any help in defining the concept. Similarly, because of the top-down governance in ESD, its connection to teaching practices is vague due to teachers not being sufficiently involved in framing the concept of sustainable development (Borrman & Nikel, 2017; Sinakou et al., 2019; Stevenson, 2006). Furthermore, all teachers expressed that they did not have any directives or guidance regarding how to implement sustainable development in education. Instead, the teachers expressed that while they know that it is crucial that sustainable development is implemented and permeate all subjects, how it should be done is rather vague as the quotations below displays:

As long as there are no clear directives on how we should think, I don't think it will catch on that widely. More information and also some governance is needed on how the schools should handle it.

I feel like it's a bit of unknown territory if you say so. There are still no clear guidelines as to how this concept should be defined or what it contains in more concrete terms.

Both quotations highlight similar viewpoints of the problems of not having any clear guidelines to adhere to. Since there are no universal definitions or frameworks to refer to, teachers have illustrated the difficulties that arise which further illustrate how sustainable development becomes constructed as wicked in education due to it complying with several characteristics.

4.2 Unclear Frameworks Create Confusion

Due to the fact that teachers are using various definitions to explain sustainable development, it is evident that there are no universal guidelines for them to refer to. All teachers were asked if they had received any skills training or additional education related to sustainable development within their profession, and everyone with the exception of three said no. However, almost all said that it was needed and that they would be happy to partake. Simultaneously, Skolinspektionen (2023) describes that teachers need more knowledge about learning for sustainable development which is confirmed by the participating teachers. However, one of the teachers believed that any additional education was not necessary, but the educational material related to sustainable development for all teachers needed to be more coherent. Further, the lack of guidelines on implementation is described by many of the teachers as contributing to challenges related to what to include and what to exclude during the lectures. For instance, some teachers pointed to unclear ‘requirements’ regarding to what extent education should be characterized by sustainable development. All participating teachers have expressed that the way in which sustainable development is mentioned in the curriculum is too unclear and vague to be able to make judgments about its implementation. The quote below further illustrates how the vagueness is perceived by teachers:

I think the curriculum is pretty vague. It's too unclear for people to grasp and comprehend because there's too little information regarding what to actually teach and implement in education.

The curriculum, according to the teachers, highlights the importance of sustainable development as a theme that should permeate the entire school and all levels of education, but it does not explain in concrete terms how this should be done in regard to knowledge which contributes to the confusion. Many point to the complexity of sustainable development in the curriculum, its insufficient explanations, as well as the difficulties to know what to select in what grades and what level to depart from. Since sustainable development is a wicked problem, it correlates with the characteristics of there being no well-described set of operations (Rittel & Webber, 1973), and where the preferred outcome can be viewed as unclear and thus contribute to complexity and uncertainty (Blok et al., 2015). That there are no well-described set of operations and that the teachers explain the complexity of what to select can thus be seen to bring uncertainties that contribute to the tension in addressing wicked problems (Head, 2019). Likewise, the teachers express how there are no explanations regarding how

sustainable development should be implemented in education. This lack of concrete examples further illustrates how sustainable development is constructed as wicked due to it creating challenges for teachers to apply in education. The teachers also bring forward the issue of differences between different teachers in regard to what levels are chosen as starting points which is further related to the matter of judgment which solution should be implemented (Rittel & Webber, 1973), and how the preferred outcome is not clear (Blok et al., 2015). This issue is summarized by one of the teachers who express the difficulties to interpret what the students are expected to know in sustainable development, and hence the diverse interpretations it brings:

It goes without saying that if you give an entire teaching staff or professional staff free hands to both teach and problematize and choose, the end results will vary.

Further, the quote illustrates how the end results will vary when giving teachers free hands to problematize and choose what way to go. Rittel and Webber (1973) express how planners are liable for the consequences of the actions they generate where the effects matter to the people who are touched. Many teachers argue how it is their responsibility to provide their students with enough knowledge to act sustainably in the future, as shown in following quote:

Our mission is to raise awareness and educate our students so that they both become ambassadors and can make right decisions both for themselves and for their surroundings, today and in the future.

Therefore, the majority of the teachers express the need of clearer frameworks in order to know how much and what should be included in the education to provide their students with enough knowledge and awareness. Likewise, the participating teachers also state that the curriculum does not highlight what to exclude and where to draw the line. The teachers repeatedly state that a lot of responsibility is put on them in regard to knowing what to include within the concept, while still not having any additional education related to sustainable development. This goes hand in hand with earlier research that says that ESD struggles to find its place in curriculum, and therefore there is lack of consensus on how it ought to be used in schools (Charif, 2022; Goritz et al, 2019). That the curriculum does not offer any explanations of the concept, is further described by the following quotes:

I think, if you depart from the curriculum itself, sustainable development is barely mentioned.

... in the curriculum, no, it is not enough. It assumes I know what it is to be able to talk about it. If I were to come here as a completely new teacher, the curriculum doesn't give me enough to stand on. It doesn't provide enough explanation. And that leaves room for a lot of interpretation for individual teachers.

In relation to this, all teachers were asked if they had somewhere to turn and/or ask for help if they felt uncertain in how to implement and conceptualize sustainable development for their students. Here, all teachers said that their work places did not provide any further assistance. Instead the teachers search on the internet or discuss with other colleagues to gain more knowledge and find consensus on how to use the concept. However, some of the teachers have experienced problems at their workplace when trying to agree upon a definition to use, due to opinions being scattered. The following quotes illustrate that due to the lack of directives on how to define sustainable development, the discussion among teachers determines how it comes to be defined:

If I was working at a huge school with lots of geography teachers, it would have been one of those things that we would have to find a consensus around. We would have to sit down and decide, how do we interpret this and what do we emphasize?

We usually come up with good answers once we start discussing among each other, I think. My colleagues are very competent, so I'm lucky there. We have a lot of discussions both in our roles as teachers but also outside those roles and we usually come up with good ideas. It would've been a lot worse if I had colleagues that weren't interested in sustainable development at all. Then I wouldn't be so sure what to do.

Wicked problems have been described as being badly formulated issues that are difficult to grasp (Earle & Leyva-de la Hiz, 2021; Rittel & Webber, 1973; Wright & Monsour, 2020). All teachers describe different ways in which sustainable development is being implemented in education. The diverse replies regarding teaching methods also confirm what Rittel and Webber (1973) conclude about wicked problems having as many explanations as there are actors involved. Further, it can also be related to the difficulties that the teachers express about not being able to demonstrate the holistic approach of sustainable development. The

teachers said that teachers within social study subjects tend to focus on the social and economic dimension of sustainable development, while teachers within the natural sciences put most attention on the environmental dimension. The teachers explain this issue as having to do with each teacher in each subject has their own role and own perspective regarding sustainable development, summarized in the following quotation:

It's easy to raise it a little bit in each subject, but then the students don't get the whole picture. It's really difficult to get all the pieces together and create a large puzzle.

In order to create an unified image and thus accomplish the holistic approach, the teachers describe that it needs to be sync between all teachers. Though, the fact that the teachers express that there are no universal guidelines or frameworks makes it difficult for them as individual teachers to provide a holistic approach, and sustainable development is instead mentioned separately in each subject. The majority of the teachers argue that without clear guidelines, the responsibility falls on the teachers to decide what and what not to include. The participating teachers thus discuss the risk that sustainable development becomes too fragmented where the holistic dimension diminishes. This can further be linked to the fact that responses to ESD have not confirmed a straightforward implementation in education curricula (Aikens & McKenzie, 2021). Thus, the following quote raises the struggle of achieving the holistic picture when there are no frameworks that provides instructions on how to do so:

Now, it falls on fifteen subjects to build sustainable glasses for the students, and those glasses won't be very good, you know what I mean?

Due to there being no frameworks, the teachers explain that it becomes their own responsibility to implement and collaborate with other teachers around the issue of sustainable development. Further, many teachers argue that when it is up to the responsibility of every teacher, it is difficult to know to which extent sustainable development is being implemented in the lectures. Thus, the teacher is argued to become the determining factor whereas individual interest and perspectives steer the outcome of the implementation of sustainable development. Therefore, many of the teachers express that more information and governance is required regarding how the schools should handle and implement sustainable

development. As shown in following quotations, there may be risks when giving each teacher full responsibility over what to include and what to leave out:

When things are declared as everyone's responsibility, it turns into no one's responsibility and when no one is responsible, it won't get done. Basically, it's the case of when everyone's responsibility becomes no one's responsibility.

The risk is that you feel content with the fact that you have brought up sustainable development, you have explained the concept. Perhaps you gave some concrete examples of what can be done, and then you have sort of checked it off the list. And then you can be satisfied, like 'I've done what I have to do, I've brought it up'. But maybe you haven't actively worked with it as much as you would've needed for it to stick with the students. It's up to the teacher to choose what we want to highlight, and therefore there's a risk that education won't be equal for all.

Due to the fact that so many teachers express the difficulty of providing a holistic view, as well as the challenges when giving every teacher the full responsibility of sustainable development, they were asked to discuss their perceptions on having sustainable development as its own subject. Even though both advantages and disadvantages were raised, the majority was positive to such a change. Benefits of being able to emphasize it more and devote more time to it were lifted, making it possible to ensure qualitative education through learning outcomes and teachers with the right competence. Sustainable development as its own subject is lifted as having the potential of removing the unclear frameworks that come with a lot of responsibility and having them replaced with an actual and specific syllabus. The following quote illustrates the advantages of having sustainable development as its own subject:

I think we would benefit from having it as its own subject. It would be a good and relevant way to merge different subjects and make the necessary connections. There's a risk of having it permeate all other subjects, because then I don't have to talk as much about it because I'm sure another teacher will. Then it relies on personal interest rather than actual requirements, leaving sustainable development up to chance.

As for now, what the teachers are expressing can strongly be connected to the characteristics of wicked problems, specifically that there are no well-described set of operations that can tell if certain solutions are right which instead results in several different potential solutions

(Rittel & Webber, 1973). This can further be connected to the fact that it can be challenging to deliver successful interventions, and where individual perceptions and interest steer how issues are prioritized and solutions deliberated (Head, 2019). The teachers explain that it is up to each teacher to do their part while relying on others to do the same, correlating to it being a matter of judgment which solution is implemented. However, they all agree that it could be easier to have a framework to lean against, which could explain why the majority would prefer to have sustainable development as an interdependent subject in school.

4.3 Subject-based Education Enhances the Wickedness

When asked about how they would prefer to teach about sustainable development, all teachers talked about doing it more practical and concrete, rather than theoretical. Having study visits, organizing field trips, collaborations with local businesses, projects or case studies that display sustainable development in a more holistic way, are examples that are brought up by the teachers. No one concluded that the current ways of teaching were appropriate for such complex issues. By only providing theoretical lectures during each specific subject, the teachers contend that students have problems understanding how things are connected, as exemplified in following quote:

We have been discussing emissions quite a lot, but it's only from a theoretical perspective. I think many students have a hard time both grasping it and relating it to other problems.

The participating teachers argue that because the field of sustainable development is so broad and complex, only getting theoretical perspectives in each subject is not enough to achieve the holistic dimension that is emphasized within ESD. Wicked problems are said to have no true or false answers, indicating that different groups have conflicting ideas of how to correctly tackle the issue (Dentoni & Blazer, 2014; Ritter & Webber, 1973). While UNESCO argues for ESD to be taught holistically, the Swedish educational context creates obstacles for this to be achieved. Likewise, the teachers argue that the holistic approach is challenging to carry out due to each teacher being too tied to their own subject. Teachers describe the challenges of trying to provide a holistic dimension while being tied to their own subject where other perspectives need to be brought forward. Being able to connect all the pieces to completely be able to comprehend and see the bigger picture instead of separate parts is not an easy task. The quotations below illustrate how the subject-based education leads to teachers being closely tied to their subjects and therefore enhances how sustainable

development is constructed as wicked when different actors have conflicting ideas over how education should be performed:

Most teachers are busy with their own subjects. So the challenge is to make sure that sustainable development is still being incorporated throughout education.

When you don't have enough knowledge of the other subjects, it can truly be difficult to achieve a holistic perspective and you may only focus on your own subject instead. So, the focus ends up on each and every subject instead of providing a holistic approach.

The problem according to the teachers is that the traditional subject-based learning in Swedish schools is difficult to reject. This has further been confirmed by Aikens and McKenzie (2021) who expresses how international commitments have a tendency to give little attention to the local contexts in curricula and policy when implementing international programs such as Education of Sustainable Development. Likewise, the majority of the teachers claim that the Swedish, traditional, subject-based school is not suitable when it comes to ESD. Wicked problems are characterized by not having any well-described set of operations, simultaneously as there is no way of testing if a chosen solution is suitable (Rittel & Webber, 1973), and issues surrounding sustainability have been referred to concern complex systems without simple solutions (Blok et al., 2015). Thus, it can be argued to be difficult to assess whether current ways of teaching are appropriate for the field of sustainable development. One teacher exemplifies the dilemma of being stuck in the traditional teachers table education where theoretical information is constantly thrown at the students, while wanting to conduct a more practical approach instead:

We are living in such a digitalized world where we can access so much information. Knowledge seems to never end and new information is constantly brought upon us. And I feel like Skolverket and the curriculum tries to keep up but today everyone has a cellphone and can easily search for information. That's why students need more practical education to be able to comprehend.

This is also brought forward by other teachers who argue that everything within education today is overpowered by the traditional view of Swedish schools, whereas theoretical aspects are always lifted. The teachers are all pushing for more practical education related to

sustainable development. Likewise, the characteristics of no stopping rule and no ultimate way of testing solutions further results in teachers not knowing whether current ways of teaching about sustainable development are the correct and most advantageous. Teachers also express that there is no possible way of testing if the ways of teaching are the right ones until the student is put to the test, which goes hand in hand with how wicked problems have no ultimate way of testing solutions (Rittel & Webber, 1973), and where the preferred outcomes are unclear (Blok et al., 2015), which is illustrated in the quote below:

There are so many things to be aware of before realizing how big sustainable development actually is. I think that is the challenge. My six-graders are working with it now and for the exam I intend to include a question like ‘what is sustainable development?’. And even though we have been working with it, I’m still not sure everyone will be able to answer that.

The quotation also points to the characteristic that every solution is a “one-shot operation”. Every operation that is implemented leads to a solution that is consequential and leaves traces that cannot be undone (Rittel & Webber, 1973), and can therefore be related to that wicked problems are complex systems where cause and effect relations are unknown (Blok et al., 2015; Dentoni & Bitzer, 2014). The teachers need to adhere to curricula, and even though it is being open for interpretation the traditional subject-based learning overpowers any new ideas. Some of the participating teachers say that they need to focus on other things which makes it impossible to incorporate sustainable development the way they would have wanted to. More and more weight is put on teachers to keep the class together, ensure passing grades, as well as more administrative aspects. That being said, many teachers still argue that the practical approach is the optimal way of making sense of sustainable development. Many teachers express the need of combining the theoretical dimensions with a practical approach, to give students a more encompassing view. The following two quotations illustrate that the traditional theoretical approach needs to be more connected to the practical perspective in order to tackle the complexity:

The disadvantage of the school is that you are enclosed in that world, and don’t always get outside of those walls. But there is too much theory in relation to practical experiences. So, working more practically around this. Then I think you’ll get the best results.

There is a need to combine the theoretical with the practical.

However, the practical aspects of education that the teachers suggest as the way forward is not possible to achieve due to different groups having different ideas on how to tackle the issue (Rittel & Weber, 1973), and where the voice of UNESCO holds the most weight (Borrmann & Nickel, 2017; SOU 2004:104; von Seggern & Singer-Brodowski, 2020). The teachers express that they want to do more in relation to sustainable development, but lack the means to accomplish it. This is further confirmed by Kanon and Andersson (2023) who describe how the public sector lacks the necessary tools to tackle the complexity of wicked problems.

That the participating teachers voice that they lack the means to accomplish Education of Sustainable Development is further related to what the teachers express about the limitedness of time. Even though all teachers raise the importance of incorporating more practical elements of sustainable development to achieve the holistic approach that is advocated for, the structure of current education practices makes this challenging. The time aspect is tightly coupled to the practical approach that the teachers advocate for. Every teacher that raises the need for more practical education when it comes to sustainable development also expresses that this is not possible due to time constraints. With more time, the teachers argue that it would be easier to grasp such a complex subject, due to them being able to implement more practical and concrete approaches in education. This goes hand in hand with what Rittel and Webber (1973) express about wicked problems being symptoms of other problems. In this case, sustainable development is the wicked problem, but it also becomes a symptom of there not being enough time to properly integrate it in schools. This can further be connected to when research expressed that the public sector lacks tools to tackle the complexity of wicked problems (Kanon & Andersson, 2012), but also that it can be a challenge to implement and deliver successful interventions (Head, 2019).

The teachers express how it takes time to break patterns, and especially to break the established and habitual patterns that make up traditional teaching. Due to the traditional subject-based school, a lot of time has to be devoted to each subject but also to other things. One participant express the difficulty of breaking patterns and involve the practical approach that may be needed:

It takes a lot of time to break the habitual pattern that you're accustomed to. You have your material, your lesson plans, your power-points, and what you want to emphasize. To actively make changes and rearrange your teaching to incorporate practical elements, that takes time.

Furthermore, many teachers highlight aspects such as administrative matters and ensuring that everyone graduates with passing grades, which ultimately creates obstacles in finding the time to devote to sustainable development. Thus, time aspects make it difficult for the teachers to accomplish the task of integrating the practical approach of sustainable development which according to the majority of the teachers would be the most beneficial. The construction of sustainable development as a wicked problem in educational contexts is hence increased due to the symptom of lack of time, as displayed in the quotation below:

Usually the time is against you. I would like to spend more time on sustainable development, but there's no way. You have so many other things to do.

4.4 Flexibility within Sustainable Development

The characteristics of wicked problems tend to point to mostly negative connotations (Rittel & Webber, 1973), however, the results from the empirical data show a different angle where teachers express how the construction of sustainable development as a wicked problem also comes with advantages. Even though the empirical results have highlighted the uncertainties regarding specifically the unclear frameworks, other perspectives have also been brought forward. While sustainable development has been related to confusion, it also comes with the benefit of flexibility. Many of the teachers discuss sustainable development in itself as favorable to teach, especially due to its vague definition. By such, teachers express that it becomes easy to tie it to reality and adapt it to the different groups of students. The majority of the teachers highlight that even though some guidelines would be preferable, they enjoy having their hands free and structure their lectures in the way they prefer, which is displayed in following quotations:

I'm very free in how I want to work with this. That I have to work with it, that's crystal clear. But how I do it is not explained anywhere, I have a lot of freedom and can decide for myself.

I have a lot of freedom to carry out my lessons the way I want, and I consider what level suits the group best. There my hands are free, there is no one who directs or interferes in my lessons as long as I get results. Then no one will argue with me about what I do.

Some of the teachers describe that the new curriculum for 2022 is designed in a way that leaves more room for interpretation, correlating with earlier research about how teachers today have more flexibility in planning their lectures as well as being able to interpret the curriculum more freely (Bümen & Holmqvist, 2022). As expressed by the teachers, the quotes below displays how teachers are allowed to enact the curriculum in a less controlled way:

I was happy when I first read the curriculum for 2022. Because this one, as compared to the last one, is more open for both interpretation and freedom, I think.

I feel that even though sustainable development has been given a greater part in the new curriculum, it has also become more detached. For instance, LGR11 was designed in a more regulated way in terms of what to implement. Today it's more free, meaning that teachers can make their own teaching materials, and some use it digitally while others use physical books.

Therefore, as the quotes illustrate, teachers are able to construct their own lectures in ways they see most appropriate. Almost every teacher accentuates the benefits of being able to adjust the sustainable development education to different groups. The teachers have expressed that students today are knowledgeable and interested in sustainable development, simultaneously as they sometimes struggle to cope with the negative effects and future uncertainties. The teachers discuss challenges related to speaking about such heavy topics that may increase environmental anxiety, and therefore think it is beneficial that they can decide for themselves and the class in which direction to go. Hence, the teachers argue that the flexibility creates large opportunities for them as teachers to adjust sustainable development to the interests of different classes, but that it also comes with responsibility as shown in following quote:

It becomes a great responsibility for me, but also an opportunity where I can have two different classes that display two completely different interests relating to sustainability.

Here, I can twist my teaching to what they are interested in. But in free spaces, there is freedom for the better or for the worse.

Simultaneously, the teachers also claim that there is a risk with flexibility is that the teaching turns out to only revolve around what the teacher is interested in. If teachers are passionate about social study subjects, they may choose to only involve topics related to that and still argue for having taught about sustainability issues even though only having included one dimension. Likewise, wicked problems are characterized by having no well described set of operations as well as the existence of the problem can be explained in numerous ways (Rittel & Webber, 1973). The empirical data shows how different teachers choose to highlight certain aspects of sustainable development, due to the lack of specific frameworks. This further illustrates the role of individual values, perceptions and interests steer in how issues are prioritized and solutions deliberated (Head, 2019). Most evident is how the teachers describe how teachers within social study subjects discuss the social and economical dimensions and natural science teachers explain the ecological dimension. Regardless, the teachers highlight this as an opportunity to be able to choose themselves among material. Considering that the teachers' hands are described as free and no one interferes as long as sustainable development is being brought up during school, having no true or false answers in this context is seen as favorable, rather than a challenge. Likewise, previous research has described the Swedish curriculum as enabling the flexibility for teacher's interpretations while not providing any instructions based on governmental decisions (Bümen & Holmqvist, 2022). Following quotations emphasize how the teachers describe the opportunity of being able to choose among material:

It's laid out for what you think is most important about sustainable development, what should be taken into account and what you then select for your class. If it were in black and white, it would be very easy to say what is right or wrong, but it's not, there are endless options and perspectives to talk about. So then, discussion becomes the only way forward.

And I think when it comes to sustainable development, there are many options that make sense. Because sometimes you can think that it's too much, it's not possible, I don't have time. But here I think it's an advantage, that you can choose what you think suits you and your group. There is so much to choose from, so it's almost easiest to just try to find what you want to focus on.

That every wicked problem is described to have numerous explanations (Rittel & Webber, 1973), is shown when the participating teachers demonstrate that their personal interest most often steer their lessons, which ultimately leads them to focus on certain aspects of sustainable development. However, the teachers conclude that even though they may discuss different aspects during lectures it may necessarily not be negative, further correlating to what Rittel and Webber (1973) is saying about there being no way of determining the “correct” way of tackling the problem. The freedom of interpretation within the curriculum invites different perceptions and explanations that all relate to sustainable development in different ways, as demonstrated in following quotation:

I think that the curriculum is built in a good way where I can adapt it myself based on my class and the situation. I know that I have to give them the knowledge, but then it’s up to me as a teacher how much I choose to incorporate it.

In relation to the previous quote, teachers express how the freedom of interpretation within sustainable development allows them to adapt their teaching to contemporary world events. The teachers emphasize how the vague definition in the curriculum is a benefit where they have opportunities to relate education to current situations that happen in the world. As shown in the quotations below, teachers describe the freedom as helpful:

I devote a lot of time to adjusting my teaching to what is happening around the world. And if the curriculum were to tell me that I wasn’t allowed to do that, I would actually be very sad.

It is very free and open today. And I feel like it has to be that way because you need to be able to adapt the teaching after events and situations that occur globally as well.

Hence, the fact that wicked problems have no well-described set of operations makes teachers able to adjust to their own judgment due to the fact that several potential solutions exist (Head, 2019; Rittel & Webber, 1973). Further, since there is no agreement on how to neither define it or solve the issue (Dentoni & Bitzer, 2014), and where individual values,

perceptions and interest can steer how issues are prioritized and solutions deliberated can be seen as favorable circumstances in an educational context. Thus, the way in which sustainable development is constructed as a wicked problem gives teachers opportunities to be more in control through vague definitions and unclear frameworks, indicating that wickedness in an educational context is not always a problem.

5. Discussion

Wicked problems have been argued to be social policy problems that are difficult to grasp due to their complexity. Previous research has all agreed that sustainable development is a wicked problem. Hence, this study departs from the fact that the same wickedness is reflected in an educational context due to the lack of a definitive formulation, involvement of multiple stakeholders and no well-defined solutions (Blok et al., 2015; Earle & Leyva-de la Hiz, 2021; Rittel & Webber, 1973; Wright & Monsour, 2020). While teaching about sustainable development is considered to be an important part of all education (Lgr22, 2022), it also brings challenges in how to manage and comprehend the concept as a result of its wicked nature (Borg & Gericke, 2021; Crawford, Luke & van Pelt, 2015). So therefore, the question is how sustainable development is constructed as a wicked problem in Swedish educational contexts?

Throughout the empirical results it is manifested how and in what ways sustainable development is constructed as a wicked problem in education. To begin, the complexity surrounding the concept makes a universal definition a challenge to achieve, mainly due to many actors being involved with their own interpretations of the issue. The empirical results accentuate how the lack of a universal definition leads to each teacher explaining the concept based on their own values and ideas on what they consider to be most important. Furthermore, some teachers seemed to even struggle with describing it, further pointing to its complexity. Education for Sustainable Development is based on the Brundtland definition which in itself is a broad definition, open for multiple interpretations (Agbedahin, 2018; Manteaw, 2020; Tuominen, 2021). Thus, even though ESD derives from the most common definition of sustainable development, the Brundtland definition seems to be still too vague when the teachers do not have a common understanding of how it should be explained and interpreted. This fact can therefore indicate that the lack of a specific and universal definition is contributing to how sustainable development is constructed as a wicked problem in education. With wicked problems, it is not even possible to propose a definitive solution when there is no actual problem description (Blok et al., 2015). Adding to this, it can thus be discussed that whereas ESD is built upon a definition of sustainable development that in itself is wicked, it may be one determining factor to how it is constructed as a wicked problem when put into action in education.

The lack of a definitive definition seems to go hand in hand with the existence of no frameworks to adhere to. Rittel and Webber (1973) have described that the information needed to understand a problem depends upon one's idea on how to solve it. This goes hand in hand with other research that has argued that there is no agreement on how to either define or solve wicked problems due to their complexity (Dentoni & Bitzer, 2014). Thus, without a universal understanding of sustainable development, it can be discussed that it may cause challenges to find common frameworks regarding how it should be tackled. Hence, as a result of teachers having no frameworks to follow they may have to find solutions themselves to tackle the issue of defining and comprehending the concept. This fact emphasizes the role of how individual values, perceptions and interests might influence what is prioritized and what solutions will be applied (Head, 2019). However, finding their own solutions may not be an easy task considering almost none of the teachers had received any skills training related to sustainable development, and can therefore explain in what ways the public sector lacks necessary tools to tackle the complexity of wicked problems (Kanon & Andersson, 2023). By such, having no additional education regarding sustainable development as well as no framework that contains well-described operations can further be seen to impact how sustainable development is constructed as a wicked problem in education. The empirical results display how teachers seem to struggle to know what to include and exclude and from what level to depart from, while having no way of testing if their solutions to the problems are appropriate. As such, it seems that every solution becomes a one-shot operation (Rittel & Webber, 1973), where teachers encounter difficulties to even know if their way of teaching about sustainable development is most beneficial or if there may be better options. Further, the difficulties and uncertainties teachers experience in the implementation of sustainable development can be seen as an explanation to how outcomes are unclear and how future impacts cannot be anticipated because of the complexity (Blok et al., 2015).

Moreover, solutions to wicked problems are considered to be neither true or false, but rather good or bad (Rittel & Webber, 1973), and consequently stand without agreement on how to define or solve the problem (Dentoni & Bitzer, 2014). Therefore, how sustainable development is constructed as a wicked problem in education seems to be the result of different actors having various judgments of what they see as better or worse solutions. The empirical results indicate this when the teachers take different directions in regard to how they integrate sustainable development in education. This fact highlights that there are divergent ways to go as well as numerous explanations which offer different directions to

tackle the problem (Rittel & Webber, 1973), and can explain why the participating teachers emphasize various approaches as suitable solutions. This further highlights how individuals' values, perceptions and interests in a context of wicked problems have been seen as factors that can explain how some issues are prioritized and which solutions that are applied (Head, 2019). The variations of approaches seems to contribute to how it is constructed as a wicked problem, where it might be difficult for teachers to judge whether their chosen approach is optimal. Thus, without frameworks or well-described set of operations for teachers to follow, they cannot know if their teaching approach is good or bad whereas the full consequences cannot be appraised until the student is put to the test.

Furthermore, it can then be argued that the tools to tackle a wicked problem like sustainable development can be inadequate (Kanon & Andersson, 2023). The teachers have expressed an uncertainty in regard to how to implement and conceptualize the concept, whereas this creation of uncertainty can be another factor which relates to how sustainable development is constructed as a wicked problem in education. Uncertainties that arise from wicked problems can be due to knowledge gaps and value differences that exacerbate the tension in addressing the problem (Head, 2019). The empirical results show how teachers voice their responsibility to provide their students with enough knowledge, however, there is still no possibility to assess if this is the right way to go. This fact can therefore be seen to make it challenging for teachers whereas every solution they apply becomes consequential as there is no room for trial and error. Thus, the outcome can be discussed to be unclear and where future impacts cannot be foreseen due to the uncertainty and complexity wicked problems can bring (Head, 2019). This can thus be why clearer guidelines are described as tools that could diminish the uncertainty that is a result of how sustainable development is constructed as wicked.

Another aspect that may contribute to how sustainable development is constructed as a wicked problem in education is the traditional subject-based learning in Swedish schools. The traditional way of learning seemingly does not favor the holistic approach that Education for Sustainable Development advocates for. Therefore, the discrepancy between the organization who developed ESD and the teachers who implement it at the national level (Goritz et al., 2019; Kolleck, Jörgens & Well, 2017) becomes evident. While UNESCO advocates for a holistic approach as the right way to integrate sustainable development in education (Borg & Gericke, 2021; UNESCO, 2017), teachers seem to struggle to carry out the holistic approach and instead find their own ways regarding its implementation based on personal preferences.

It can thus be discussed that personal interests and values may affect how to correctly tackle the issue. Hence, there are numerous ways of how a problem can be explained and different groups have conflicting ideas of how to correctly tackle the issue (Rittel & Webber, 1973), which further contributes to how sustainable development in education is constructed as a wicked problem. In this case, it seems that several distinct views of how ESD ought to be creates conflicting ideas on how to tackle the issue. The top-down approach of UNESCO can be argued to make the connection to teaching practices vague and is not always coherent in regard to what teachers would find appropriate to their local context. Therefore, in this case it is evident how the traditional school structure of Sweden makes it difficult to provide the holistic approach of ESD, clearly displaying two conflicting sides with differing judgements of how to tackle the issue.

How sustainable development is constructed as a wicked problem in education has created challenges in regard to uncertainties because of unclear frameworks, no definitive formulation and no ways of determining whether a solution is the right one. However, although sustainable development as a wicked problem seems to be associated with negative connotations, this study has shown that in an educational context this does not always have to be the case. By having no well described operations, numerous ways of explaining the problem, no true or false answers as well as no way of testing solutions, are aspects that describe how sustainable development in education is constructed as a wicked problem. However, in an educational context the same aspects can be seen as opportunities for freedom and flexibility rather than sources of confusion. How sustainable development is constructed as wicked can be argued to create space for teachers to adapt their approaches and lectures due to wicked problems having no way of determining the “correct” way of tackling the problem (Dentoni & Bitzer, 2014; Rittel & Webber, 1973). Therefore, the insufficient rules and regulations which on the one hand makes the preferred outcome unclear (Head, 2019), does on the other hand not always have to come with uncertainties. As such, the empirical results have emphasized how teachers express the benefits of being able to decide for themselves, due to the vagueness and there being no frameworks regarding implementation. Teachers also describe how the curriculum is open for interpretation and can thus be seen as a way in how sustainable development is constructed as wicked, when the problem can be explained in numerous ways (Rittel & Webber, 1973). This is described by the teachers when they express the advantages of having their hands free and no frameworks to comply with. Thus, how sustainable development is constructed as a wicked problem in education, can be

seen to give the teachers an opportunity to adapt their education according to personal interests and values, as well as to current situations and interests of the students. Additionally, this also highlights the way in which individuals' perceptions, interests and values can steer in a positive way, where issues are prioritized and solutions considered (Head, 2019).

Throughout the thesis, it seems to be evident that how sustainable development in education is constructed as a wicked problem can be described to derive from several problems. Wicked problems are symptoms of other problems, whereas these problems need to be located in order to know where the trouble really lies (Rittel & Webber, 1973). Hence, how sustainable development is constructed as a wicked problem in education can be argued to originate from other problems. Therefore, identifying where the trouble really lies in the complex interconnected systems that make up wicked problems (Rittel & Webber, 1973), can thus be argued to explain how sustainable development is constructed as a wicked problem in education. It has been argued that UNESCO is an important driver for Education for Sustainable Development. However, the top-down approach that is applied in governance engagement makes the connection to teaching practices vague (Borrman & Nikel, 2017; Sinakou et al., 2019; Stevenson, 2006), and can be an explanation of the problems that teachers experience when trying to implement the holistic approach. This also seems to explain why there is a lack of straightforward implementation in Swedish curriculum (Aikens & McKenzie, 2021). The governance of UNESCO can be described to be an influencing factor to how sustainable development is constructed in education, where the top-down approach and the lack of straightforward implementation in curriculum also can be argued to create uncertainties. Uncertainties within wicked problems are often due to conflicts and value differences which exacerbate the tension in addressing the problem (Head, 2019). In this case, it seems that there are value differences and conflicts in how to successfully integrate ESD, when the teachers express that they have problems in implementing ESD in the way it is ought to be.

Similarly, the fact that ESD derives from an ambiguous and vague definition of sustainable development that is open for multiple perceptions, can also be seen to have a major impact in how it is constructed as wicked in education. Furthermore, another factor that also seems to contribute to how it is constructed as a wicked problem derives from the Swedish curriculum and its flexible character which opens up for teacher's interpretations, but at the same time does not offer any specific implementation methods. As such, it can be argued that all these

factors are identified as problems within the interconnected systems that make up how sustainable development is constructed as a wicked problem in education. Thus, the governance of UNESCO, the vague definition that ESD derives from, as well as the flexibility within the Swedish curriculum seems to all contribute to how the characteristics of wicked problems are present, resulting in how sustainable development is constructed as wicked due to being a symptom of other problems.

6. Conclusion

This study intended to investigate how sustainable development is constructed as a wicked problem in a Swedish educational context, and several explanations have been identified. How sustainable development is constructed as wicked in education is a result of several problems, contributing in various ways to the complexity teachers experience when managing and implementing the concept. UNESCO, the vague definition of sustainable development and the flexibility within the Swedish curriculum are all problems that in turn make the process of how teaching about sustainable development becomes inherently complicated. However, the results of this study points to how sustainable development is constructed as a wicked problem in education, and how it can be seen in both positive and negative terms. In the same way as it creates uncertainty due to lack of a definitive formulation and clear frameworks, it also brings the opportunity for flexibility and adaptation. Thus, even though wicked problems involve complex systems without simple solutions and where numerous stakeholders offer conflicting solutions to common desirable goals, in an educational context this can also be seen as an advantage rather than a source of confusion. How sustainable development is constructed as a wicked problem in education therefore offers both benefits and drawbacks when managed by teachers.

Education for Sustainable Development was intended to set a new standard for how sustainable development should be integrated in education, but has brought new challenges to the table. The holistic approach that is advocated for may create obstacles for teachers to implement due to its complexity, however, this complexity also brings space for freedom and flexibility. Taking this into consideration, picture yourself as a teacher, standing in a classroom full of students. You are about to explain sustainable development, and your options are infinite because there are numerous explanations to the problem. You are able to construct the lecture in the way you see most appropriate, because there are no right or wrong answers. Your hands are free regarding what to include and what to exclude and it is up to you to select in which ways to go. Hence, in conclusion, it seems that even though sustainable development is constructed as a wicked problem in education due to several factors, this creation does not only bring uncertainty and difficulties, but can also ease the complexity and challenges that teachers express.

6.1 Practical Implications

The findings of this study has contributed to new insights regarding how sustainable development is constructed as a wicked problem in educational contexts, making it a challenge for teachers to comprehend the issue. Further, they have also shown how international policies have a tendency to not consider local contexts or involve actors on national levels before implementing programs such as Education for Sustainable Development, which further influences how it becomes constructed as a wicked problem. Thus, the study's findings can be helpful for actors that create Education for Sustainable Development, whereas international programs are not always easy to implement in local contexts where it needs to adhere to other factors such as national school systems. The framework composing ESD leads to how it becomes constructed as wicked, and while it can be perceived in both positive and negative terms, it inherently leads to challenges in regard to teaching. Thus, the study's findings can be helpful for future planning of international programs such as ESD, whereas it has shown that many factors need to be taken into consideration before deciding on integrating programs into all levels of education around the world. Further, it is of importance to engage local actors in the planning phase as they are the ones who will carry out the program once it is implemented.

6.2 Recommendations for Future Research

The findings of this study has illustrated how sustainable development is constructed as a wicked problem in education, leading to both uncertainties due to lack of definitive formulations and clear frameworks, but also to opportunities for flexibility and adaptation. While this study has taken departure from a Swedish context, it creates curiosity in regard to how this is outplayed in other countries. UNESCO strives to implement educational policy agendas into all educational areas globally, and therefore future research could bring additional insights in how sustainable development is constructed as a wicked problem in education in other countries. This study has displayed how the holistic approach may be difficult to implement in a Swedish traditional subject-based education, however, it may differ in countries with other educational systems.

For future discussion, while this research has contributed with the insights from the teachers' perspectives in regard to how sustainable development is constructed as a wicked problem, it further raises questions of how this is reflected from a student perspective. Hence, further discussion could contribute with additional aspects on how and if students are affected. This

research has illustrated that teachers sometimes struggle to comprehend and explain the concept, and therefore it becomes interesting to know how this wickedness is outplayed for the students. Does it become even more wicked for the students to understand when their teachers experience challenges in comprehending? Additionally, while this study has contributed with an overview of how sustainable development is constructed as a wicked problem in education, questions arise if this may be different when investigating more specific contexts. Thus, further discussions can contribute with further insights regarding if there are differences when looking among various grades or even subjects.

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Appendix 1. Interview Guide

Introductory questions:

1. How long have you been working as a teacher?
2. Which or what subjects are you teaching in?
3. How would you explain sustainable development?
4. When it comes to the definition of sustainable development at your school, are there any guidelines on how you should define it for the students? Are you directed to use a specific source or reference?

Specific questions:

1. The curriculum mentions concurrently that students should develop knowledge regarding how they can contribute to a sustainable development. Based on how sustainable development is described in the curriculum, do you think the concept is easy or difficult to interpret and understand?
2. Do you know if your school has any stated goals or directives on how you should work with sustainable development in education? If so, how are they made visible for you as a teacher?
3. How would you describe the ways in which you incorporate sustainable development into your lectures?
4. Do you think there is a “right” way of teaching, or do you think that there are different ways to tackle education of sustainable development?
5. How do you experience teaching about sustainable development? What are the possibilities/challenges?
6. Are there any aspects of sustainable development that you feel unsure about? What do you think causes this?
7. Do you experience that you are governed to teach about sustainable development in a specific way or it is up to you to decide what parts you include?

Concluding questions:

1. If you were given free hands, how would you like education of sustainable development to look like?
2. What are the challenges or obstacles to achieve such an education?

3. In your role as a teacher, have you taken part in any skills training related to sustainable development?
4. If there were to be any uncertainties regarding how to implement and conceptualize sustainable development for your students, is there any guidance for you to receive?
5. Anything more you want to add or elaborate on regarding sustainable development in education?