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1. Introduction

It is a recurring scientific question how education and related cognitive and social concepts like learning or knowledge can be defined: year after year numerous discourses, conferences and conversations take place about this topic. One notion has crept into the Germanophone discourse that seems to have always been around and captivates in its own particular manner, namely “Aneignung”.¹ Aneignung describes a *subject’s independent and active involvement with the material and symbolic culture, which is spatially mediated* (Deinet, 2009b; Deinet, Reis, Reutlinger, & Winkler, 2018). Further, Aneignung is understood as *an essential process in human development* (Deinet, 2009b).² Very generally, Aneignung means to open up, access and grasp but also to change, re-function and transform the spatial and social environment (Reutlinger & Deinet, 2004: 7; Deinet & Reutlinger, 2014; Benze & Kutz, 2017).

Since the early 2000s, the term Aneignung has gained popularity in various discourses. On the one hand, Aneignung has gained attention within certain disciplines like social youth work, educational sciences or social and special pedagogy. In these contexts, Aneignung is discussed alongside with learning or educating and so far has often offered an alternative perspective with a focus on human-environment relations (Deinet & Reutlinger, 2020). On the other hand, it has popped up in political educational debates or within city planning publications. For example, in 2001 the Bundesjugendkuratorium, a committee of the German federal government concerned with children and youth issues, published a pamphlet arguing in favour of understanding education as a process of self-formation through Aneignung rather than a catalogue of accumulated knowledge: “Bildung ist zu verstehen als (...) Aneignung von Selbstbildungsmöglichkeiten” (Bundesjugendkuratorium, 2001: 4).³ By introducing the concept ‘Aneignung’, formal educational institutions like

¹ This thesis will use the German word “Aneignung”, because no appropriate English translation exists.

² „Aneignung als eigentätige Auseinandersetzung mit der Umwelt und wesentlicher menschlicher Entwicklungsprozess“ (Deinet, 2009b: 21).

³ “Education is to be understood as (...) appropriation of self-education opportunities” (Bundesjugendkuratorium, 2001: 4; translation by author). Note: Throughout this thesis, original German quotes will be used in-text and translated by the author in the footnotes.

nurseries, kindergartens or schools are confronted with, as the Bundesjugendkuratorium claims and favors, an extended concept of education – integrating most different procedures of “Aneignung von Welt”, i.e., Aneignung of the world. In 2005, the German Federal Government published the twelfth report on children and youth in which they also define education as Aneignung of the world (BMFSFJ, 2005).

Further, Aneignung as self-directed, active involvement with the environment also appears in discourses of urban planning and landscape architecture, where it is used e.g. to observe, evaluate and plan uses of open spaces (Hauck, Hennecke, & Körner, 2017). For example, educational landscapes as a strategy for urban and neighborhood development aim at enabling and creating spaces for Aneignung, among other things (Bollweg & Otto, 2017; Coelen, Heinrich, & Million, 2016; Reutlinger, 2008).

These incidences portray Aneignung as an attractive, alternative notion for Bildung, so that it get adopted by various contexts from urban planning and social work to formal education. Furthermore it seems, that a lot is expected of the idea of Aneignung, even with a flavor of revolutionizing the understanding of education across various domains. However, in comparison to this emphasized interest in Aneignung, only little profound knowledge and research regarding a concept and theory of Aneignung is available.

The most elaborated conceptual framework of Aneignung is presented by Ulrich Deinet’s “Aneignung als Bildungskonzept der Sozialpädagogik” (2004) at the Faculty of Social Sciences and Cultural Studies of the University of Applied Science in Düsseldorf. Deinet’s concept of Aneignung focuses on children and youth and is particularly directed at and resonating within the context of special and social pedagogy (Deinet et al. 2021; Hoffmann, 2005; Oehme, 2010). Outside of this disciplinary bubble, few references can be found to the concept – which seems unfortunate, given the high explanatory potential of Deinet’s phenomenon of Aneignung as an educational concept, for all uses mentioned above and others. Nevertheless, even Deinet’s concept lacks a clear theoretical definition and conception of Aneignung: it does not explain what exactly happens during Aneignung, how the self-directed and active involvement comes about and why it is a central developmental mechanism. In other words,

it is well understood how Aneignung is enabled, but it is not so well understood what Aneignung is as a psychological process of a subject that is embedded in an environment.

1.1. Goal of this thesis

It follows, that the general goal of this thesis is to develop and strengthen the theoretical foundation of Deinet's concept of Aneignung. This will be done with the help of the enactivist approach to cognition. The enactive approach proposes that cognition emerges in the interactional domain between a cognitive, living agent such as a human and the environment as a process of sense-making through action (Thompson & Stapleton, 2009). The enactive argumentation is based on some key concepts like autonomy, operational closure, identity, sense-making and embodied action amongst others. These concepts offer a new and alternative perspective to Aneignung and in particular to subject-related psychological processes of Aneignung. Thus, the more specific goal of this thesis is to integrate enactive concepts into Deinet's concept of Aneignung and by doing so formulating propositions for an enactive approach to the theoretical foundations of Aneignung. If Aneignung continues to be used as a central concept in education, social work, urban planning and others, a strong theoretical foundation is indispensable. Achieving this with the help of the enactive approach to cognition seems like a perfect match. Nevertheless, it should be emphasized that it is not the goal of this thesis to provide a new, complete and comprehensive theoretical foundation, rather this work is the first step towards an enactive approach to Aneignung.

1.2. Research Questions

To reach these goals, this thesis has following research questions:

- 1) How is Aneignung currently defined according to Deinet's concept?
- 2) What is the explanatory value of Deinet's concept of Aneignung?
- 3) How can the enactivist approach to cognition support in developing a theoretical foundation of Aneignung?
 - a. What can Aneignung learn from the enactivist approach to cognition?

b. How can enactive concepts characterize Aneignung?

These more general research questions led the development of the work, from exploring the concept of Aneignung in detail in chapter 2 and understanding the key concepts of the enactive approach to cognition in chapter 3. However, through the course of the work following central research question emerged:

How can enactive concepts characterize Aneignung as an individual's self-directed involvement with the environment and how and why has this engagement a developmental effect on the individual?

Therefore, this concretized research question will be focused on in order to integrate the enactive concepts into Aneignung in chapter 4.

1.3. Methods

To answer the research questions and develop a theoretical foundation of Aneignung in this thesis, a literature review on Aneignung and the enactive approach was used. For Aneignung, the thesis focuses on germanophone literature, using Aneignung and aneignen as keywords for scholarly databases. The enactive approach to cognition was explored by choosing specific literature along the original key ideas of enactivism.

Further an enactive approach to Aneignung was developed by conceptually integrating enactive ideas to the concept of Aneignung.

1.4. Structure of Thesis

The thesis is structured as follows: Chapter 2 offers an *introduction to the notion Aneignung* and the concept developed by Ulrich Deinet, focusing on the empirical background, its historical roots and key ideas. It is shown how the concept is derived from Marxist dialectic materialism through Vygotski's process of internalization and Leontev's endeavours to develop a cultural historical activity theory. Further empirical and theoretical references will be presented that led to Ulrich Deinet's sharpening of Aneignung, which is characterized through five dimensions and then further developed into "Raumaneignung". Looking at these various steps will allow to reflect on the

explanatory value of the presented concept in the final section of the first chapter.

Chapter three is devoted to presenting the *enactive approach to cognition*. A short overview of the scientific context will show, how the classical research paradigms – cognitivism, connectionism and dynamic embodied cognition – made way for the development of the enactive approach within cognitive science. In addition, the concept's core ideas autonomy, subsuming autopoiesis, operational closure, identity and emergence, and sense-making, subsuming structural coupling, cognition, embodiment and action will be explored. Then an illustration of the cell as an autopoietic system will show how the enactive approach is applied in living systems. The chapter closes with some key conclusion from the enactive approach to cognition.

The fourth chapter turns to *combining Aneignung and enactivism*, aiming to find out what Aneignung can learn from the enactive approach and to develop a characterization of Aneignung based on a conceptual integration. It will be shown that there is an explanatory overlap between Aneignung and the enactive approach, which allows for an enactive perspective on the process of Aneignung. This understanding leads to the development of an enactive perspective to the process of Aneignung through integrating enactive concepts. This characterization of the process offers the basis for discussing further specifications of Aneignung and how Aneignung is distinct from other types of activities from an enactive perspective. Throughout this chapter eight propositions will be developed that characterize the process of Aneignung and suggest features of Aneignung from an enactive view.

Finally, the fifth chapter focuses on conclusions and provides an outlook to future research on the topic of Aneignung at the backdrop of the enactive approach to cognition.

2. Aneignung

This thesis is concerned with developing the concept of Aneignung. The notion Aneignung has various meanings and is used in different contexts in the German language: In the German civil code, Aneignung is used as a legal term for the rightful appropriation of abandoned artefacts (Bürgerliches Gesetzbuch §§ 958pp). In colloquial language however, the term is more often used to refer to wrongful possession of an object. It also refers to making foreign content and skills one's own, particularly mental capacities, expertise, habits, opinions or the like (Keiler, 1988).

In academic discourses, the term 'Aneignung'/ 'aneignen' is used first and foremost in social sciences, particularly within all subbranches of pedagogy. There, Aneignung is compared and contrasted with 'learning' and 'Bildung' (education) as well as 'conveying knowledge' (Sauerbrey, 2017). Further, Sociology, Geography and Urban Planning have made use of Aneignung, mostly with a spatial embedding: Aneignung can refer to the use, the construction, the action, the production, the perception and remembering of space (Kogler, 2021; Löw, 2001). Cultural Studies have introduced Aneignung as a creative, subversive and even emancipatory practice of domesticating contents (Lingenberg, 2015). All these different usages and meanings suggest that there *is not one common, or interdisciplinary consensual understanding of Aneignung* neither in colloquial language nor across various disciplines:

“Eine gemeinsame, Disziplinen übergreifende oder interdisziplinäre Geschichtsschreibung des Aneignungsbegriffs als Fachbegriff, auf die übereinstimmend Bezug genommen wird, lässt sich in den verschiedenen fachlichen Diskursen nicht erkennen“ (Hüllemann, Reutlinger & Deinet, 2019: 382).⁴

The English-speaking discourse is equally vague regarding a clear conception of Aneignung, which is translated sometimes as appropriation, other times as assimilation or acquisition.

⁴ “A common, cross-disciplinary or interdisciplinary historiography of the concept of Aneignung as a specialized term, to which reference is made in agreement, cannot be discerned in the various specialized discourses” (Hüllemann, Reutlinger & Deinet, 2019: 382; translation by author).

Therefore, the discourse lacks clear concepts and notions, concise definitions, and demarcations. Ulrich Deinet's conception of Aneignung, situated within social and special pedagogy for children and youth stands out as the most referenced idea on the topic. The professor at the Faculty of Social Sciences and Cultural Studies at the University of Applied Sciences in Düsseldorf has dedicated most of his research endeavours and publications to date to that topic and established a profound, rich body of research that is frequently developed further.⁵ Not only does he explicate the roots of his understanding but he also engages in the application, dissemination and diversification of the concept - using cross-disciplinary, phenomenon oriented and applied theories (e.g. May, 2004). *To further develop the popular, yet unclear, notion of Aneignung this thesis takes Deinet's work as a starting point.*

In this chapter, Ulrich Deinet's concept of Aneignung will be introduced: A literature review of Deinet's most important publications was performed to trace the history of the concept's formation and its key themes. Firstly, Deinet's research motivation and method will be explained – showing the concept to be practically grounded, but equipped with rather weak theoretical foundations. In the next step, the different theoretical influences from Marx, over Leontjew to Holzkamp are explored. Then Deinet's initial concept of Aneignung will be elaborated, as well as its development into 'Raumaneignung' (Aneignung of space). In the next step, some current examples of how it is used will be presented. Finally, an evaluation of the concept's explanatory value will pave the way for a development of the concept with the help of the enactive approach to cognition.

2.1. History of the development of the concept of Aneignung

As explored in the introduction, the term 'Aneignung' has various meanings. So, how come Ulrich Deinet chose this particular notion and what were the circumstances that led him to develop a concept? What experience was guiding him throughout the development and what makes the concept useful? This subchapter aims to answer these questions with background information for Ulrich Deinet's Aneignung.

⁵ Cf. www.sozialraum.de for a collection and overview of publications

2.1.1. Aneignung as a new impulse

Ulrich Deinet's development of the concept of Aneignung is based on his many years of experience as an employee in a youth club⁶ and as a specialist advisor for open youth work at the Westphalia-Lippe Youth Welfare Office in Münster (Deinet, 1992). During this time, he realized that there were hardly any concepts, that were theoretically suitable and useful as well as practically applicable for the open work with children and adolescents.⁷ This gap coincided with Deinet's experiences in the youth club that led him to suggest a theory of practice, which culminated in his dissertation entitled "The Concept of 'Aneignung' in the Youth Center. New impulses for open children and youth work." (Deinet, 1992). The dissertation chose the notion of Aneignung as it was coined by the cultural historical school and especially Leontjew's work on developing a Marxist based psychology as a theoretical frame of reference. In consequence, Deinet starts off his dissertation with defining Aneignung as *the self-directed engagement of children, young people as well as adults with material and symbolic culture that is spatially mediated* (Deinet, 2014a). Further, Aneignung is seen as *embodying the most important ontogenetic principle of development of individual humans*: It should reproduce the historically formed quality and abilities of the human species in the qualities and abilities of the individual (Deinet, 1992: 28).

Deinet claims that the youth club can be a starting point for various processes of Aneignung, but that it requires an adjusted concept of Aneignung suitable to this context. To achieve this, he transfers Leontiew's concept of Aneignung to the concrete social conditions of the age group of interest (children and youth), while drawing on Holzkamp's application of Leontiew's theory in his 'Critical Psychology' (Holzkamp & Schurig, 1973):

"Ich stütze mich bei der Übertragung des Aneignungskonzept von Leontjew auf die konkreten gesellschaftlichen Verhältnisse der uns

⁶ In Germany, youth clubs (in German: „Jugendhaus“ or „Kinder- und Jugendfreizeiteinrichtungen“) are facilities that offer low-threshold (i.e. no entry fees, no memberships, no limited participation etc.) services to children and youth.

⁷ Open work is characterized by the pedagogical principle of voluntariness, in which participants (e.g. children and adolescents) can withdraw from the facility at any time. Thus, open educational work offers an antithesis to formal educational institutions such as schools or kindergardens and is also not bound to memberships (Deinet et al., 2021).

interessierenden Altersstufe der Kinder und jüngeren Jugendlichen auf die von Holzkamp in seiner „Kritischen Psychologie“ vorgenommene Anwendung der Theorie Leontjews“ (Deinet, 1992: 39).⁸

In addition, socio-ecological approaches such as Martha Muchow's "Lebensweltanalyse" and Zeiher's "Inselmodell", which explore socio-spatial behavior of children and youth, influenced Deinet's development of Aneignung (Deinet, 1992: 44, 50). Based on these theoretical frameworks, he determined operational *dimensions of Aneignung* before empirically evaluating and further developing them regarding their applicability to the youth club. This was done with the help of interviews with youth workers, observations, and analysis of situations. As a result, five dimensions of Aneignung were defined which elaborate how Aneignung takes place and with which effect. These dimensions became the cornerstone for many of his further publications (e.g. Deinet, 2018; Deinet & Reutlinger, 2020; Hüllemann, Deinet et al., 2019), and were further developed and complemented in his consequent work, yielding today's 5 dimensions: (1) Aneignung as an *extension of motor skills*; (2) Aneignung as *expansion of the action space*; (3) Aneignung as the *repurposing/conversion and change of situations, existing arrangements and spaces*; (5) Aneignung as *creative achievement and self-directed activity (Eigentätigkeit)*; 4) Aneignung as the *linking of spaces* (Deinet, 2014c). They will be explored in detail in section 2.4.

2.1.2. Development of the concept

Looking at the development of the concept, it needs to be emphasized that Deinet's experiences as a youth worker in youth clubs specified the paradigmatic direction for the development of his concept of Aneignung: they were the guiding content that made the phenomenon of Aneignung so appealing as a concept. The empirical research is ultimately the most convincing part of Deinet's work because it anchors the developed dimensions into practical experiences. In contrast, Deinet's concept of Aneignung has *weak theoretical foundations*: This thesis performed a literature review examining

⁸ "In transferring Leontyev's concept of appropriation to the concrete social conditions of the age group of children and younger adolescents that interests us, I rely on Holzkamp's application of Leontyev's theory in his "Critical Psychology" (Deinet, 1992: 39, translation by author).

the theoretical references mentioned above (Marx, Leontiew, Holzkamp, Muchow), which showed that the theoretical derivation is incoherent. In a personal conversation, Professor Deinet described his work in this regard as eclectic.⁹ Also, the references to Marx, Leontjew and Holzkamp and their interrelatedness are criticized and questioned (Keiler, 1988). Winkler elicited that the origin of the concept of Aneignung is "dubious" and "has not been deconstructed so far" (Winkler, 2018: 177). Thus, although Deinet's concept is often received as a recognition and further development of Leontiew's cultural-historical activity theory (e.g., Deinet, 2016; Kogler, 2021), this thesis suggests there is no real common thread in its theoretical foundation.

Therefore, it seems necessary to *readjust the theoretical foundations* of Deinet's concept of Aneignung. This can be done either by clarifying the references by reviewing the theoretical basis with the help of extensive and thorough original reading of Vygotsky, Leontiev and Holzkamp. Suitable starting points for such literature work would be: Held (1993), Holzkamp (2006), Holzkamp & Schurig (1973), Leontjew (1982) Leontjew (1973). However, the present work follows an alternative path, namely that of complementing and elaborating Deinet's work on Aneignung with *the help of the enactivist approach to cognition*.

For that endeavor, the original theoretical references to Marx, Leontiew, Holzkamp and Muchow nevertheless play an important role: They feature underlying assumptions and ideas about Aneignung that, even if eclectically elaborated, offer starting points for further development with the enactive approach to cognition, or point directly to that concept. These points of intersections will be highlighted throughout the presentation of the central theoretical building blocks for Deinet's Aneignung.

The following sections will follow the empirical (2.2.) and theoretical (2.3.) construction of the concept. Section 2.4. discusses the concept of Aneignung in the form of its five dimensions and its development into Raumaneignung, i.e. spatial Aneignung. Then an overview of the fields of application of the concept is given (2.5.). Finally, the chapter reflects on the explanatory strength of the concept of Aneignung (2.6.).

⁹ The author and Professor Ulrich Deinet had a zoom conversation about his work on 06.08.2021, which the author is very grateful for.

2.2. Empirical foundation of Deinet's concept of Aneignung

This chapter presents the empirical background to Deinet's development of the concept of Aneignung. Since Deinet's dissertation was the starting point for his further work on Aneignung, it gives valuable insight into the practical embedding of the concept, which will be shown below.

Deinet's reference to practice and empirical data is twofold: on the one hand the leading research questions were initiated through his experience, on the other hand he worked with iterative loops moving between empirical analysis of interviews and theoretical conceptual development to produce the dimensions of Aneignung. Both steps of the empirical work will be shortly presented here.

In his dissertation Deinet depicts scenes in the youth club (e.g. various encounters with a young girl named Rosa) that led him to the perspective, that youth club facilities do not offer anything to the age group of older children and younger youth (approx. 7-15 years); moreover employees of the youth lack tools and concepts to meaningfully integrate this group of visitors.

He contrasts this phenomenon with other surprising observations in which offerings by the youth center were exceptionally well accepted by a wide variety of participants of all age groups as they were very engaged and active. For example, a Christmas party with special staging (candles, Christmas tree, etc.) and a festive atmosphere initiated a change in behavior of the participants: Instead of hectic, chaotic and competitive behavior, children and youth played along well. Other examples include a paper recycling collection in the local neighbourhood and an art project for the design of wall murals in the youth club. These scenes are introduced to understand what kind of experiences children look for at the youth club, and what the facilities could offer in consequence. Deinet suggests that the *behavior of the participants can be best described with the notion Aneignung*, which can offer a basis for a practice theory. Thus, his central research question is: how and where do processes of Aneignung take place in the youth center, and how can the youth center enable them?

After presenting the theoretical frame of reference for Aneignung, Deinet embeds his understanding of Aneignung into empirical explorations. He

interweaves 30 interviews of employees of the open youth work with the development of the dimensions of Aneignung. In these interviews, employees were asked to reconstruct everyday situations in the youth club, which were then analysed by Deinet with the help of his theoretical references of Aneignung. In this way, Deinet examines how Aneignung takes places in the youth club, and simultaneously evaluates the use of Aneignung for the analysis of situations, as well as more generally for the observation, understanding and choice of offerings within a youth club. As a result, the dimensions of Aneignung were developed by incorporating everyday experiences of employees. Therefore, the concept originates in practice, and is embedded in it.

2.3. Theoretical foundation of Deinet's concept of Aneignung

This chapter focuses on the theoretical concepts that Deinet refers to and uses in his development of Aneignung. Firstly (1), an outline of the *cultural historical psychology*, as the main school of thought and originator of Aneignung, is given. Then their ideas of (2) *materialistic-dialectical unity between human and environment*, (3) *objectification*, (4) *interiorization* are introduced. Next, (5) Holzkamp's *embedding of object meaning in spatial conditions* is elaborated. Finally, the socio-ecological models of (6) *Muchow* (life space analysis) and (7) *Zeihner* (island model) are presented.

2.3.1. The cultural-historical school

The cultural-historical school of psychology was founded with Lev Vygotskij's (1896-1934) work in Moscow, which was dedicated to child and developmental psychology from an interdisciplinary perspective between philosophy, pedagogy and psychology. Influenced by the October Socialist Revolution, Vygotskij sought to define a new, Marxist-oriented psychology with a foundation of materialist, dialectical, and historical philosophy (Deinet, 2014c). Instead of an introspective psychology, he hypothesized that *human psychological functions are mediated by tools*. As these tools are products of social, historical, and cultural circumstances, these conditions must always be analyzed for a thorough psychological understanding. Compared to the socio-political analysis of Marx & Engels, on which Vygotskij relied both

methodologically and theoretically, he wanted to focus on the individual psyche, which he claimed to develop *in a dialectical unity with the socio-historical becoming of society*. „Grundsätzlich verbergen sich hinter allen höheren psychischen Funktionen und ihren Beziehungen (...), genetisch gesehen, gesellschaftliche Beziehungen, das heißt reale Beziehungen zwischen Menschen“ (Vygotskij, 1992: 236).¹⁰ Accordingly, Vygotskij saw the *origin of all mental functions in real relationships between people*, representing the current *state of socio-historical, cultural circumstances*.

Today, Vygotskij's first steps into a new psychological paradigm are often regarded as "first generation activity theory" (Engeström, 1987). Vygotskij's student A.N. Leontiew (1903-1979) and Aleksandr Luria took up these thoughts and further tried to understand to what extent *human development is related to external circumstances* and how this relation looks like (ibid.). For Leontiew, *human activity*, as self-acting engagement with the environment, became the *central analytic category of psychological development*. Moreover, human activity as Aneignung was understood as the most important ontogenetic developmental principle. Leontiew's conceptualization of the relationship between the representational world and activity or consciousness is described as follows:

„Durch gesellschaftlich geprägte Tätigkeit des Menschen erfolgt der Umsatz der angetroffenen, wiederum gesellschaftlich verfassten gegenständlichen Welt in Bewusstsein (Widerspiegelung). Da sich die Tätigkeit durch diesen aktiven Kontakt den Eigenschaften eines Gegenstandes ‚notwendigerweise‘ mehr und mehr unterordnet, wird sie – und mit ihr das Bewusstsein – durch diesen verändert, ‚bereichert‘. Will man die Entwicklung des Psychischen angemessen erfahren, so muss dieser Umsatz, also auch und gerade die konkrete Tätigkeit daher selbst zum Forschungsgegenstand gemacht werden“ (Ennenbach, 1991: 103/4 in Zybowski, 2013: 147).¹¹

¹⁰ “Behind all higher mental functions and their relations (...), genetically speaking, there are hidden social relations, that is, real relations between people” (Vygotskij, 1992: 236; translation by author).

¹¹ “Through socially shaped activity of the human being the turnover of the encountered, likewise socially constituted representational world into consciousness (reflection) takes place. Since the activity 'necessarily' subordinates itself more and more to the qualities of an object through this active contact, it - and with it the consciousness - is changed, 'enriched' by it. If one wants to experience the development of the psychic adequately, this turnover, thus also and especially the concrete activity itself, must therefore be made the object of research” (Ennenbach, 1991: 103/4 in Zybowski, 2013: 147, translation by author).

Here, activity is seen as socially shaped, i.e., only to some extent as independent. Through activity, the world with its social structures is internalized, and even more than that: it is reflected through consciousness.

Deinet often refers to Leontiew as the founder of the classical concept of Aneignung, and then points out that it was the great merit of Klaus Holzkamp to follow the ideas with his critical psychology in the 70s and 80s (Deinet, 2014: 4). Holzkamp and his collaborators initiated a re-foundation of subject-oriented psychology based on materialistic Marxism. For example, they conceived of learning as “the enlargement of experience and action by the learning subjects themselves” (Holzkamp, 1994: 1) rather than the result of externally imposed learning conditions. After critical psychology was marginalized from the mid-1990s onwards, many of his approaches have been forgotten, as Deinet laments (Deinet, 2014). Many publications concerning the German concept of Aneignung, its debated origin and derivation from Marx come largely from Holzkamp and his fellows (see for an overview Keiler, 1983 & 2013).

In the English-speaking realm, Leontjew’s work has become known as "cultural historical activity theory" (CHAT), or second-generation activity theory and continues to be discussed with the International Society for Cultural-historical Activity Research (ISCAR). Supporters of CHAT praise the non-dichotomous nature of the approach, which allows, for example, to recognize the self as an intersubjective construct and thus the ontological unity of interindividual and intraindividual processes as mutually dependent processes. Yrjö Engeström, director of the Center for Research on Activity, Development and Learning (CRADLE) in Helsinki, Finland, is probably the most known developer of CHAT. Engeström proposed a use of CHAT under the term "Expansive Learning" (2014) for the analysis and monitoring of organizations, communities, and work contexts.

This brief outline of the cultural-historical school and the development of the activity theory and its successors already illustrate the challenges of a translation or collaboration between the English and German scientific communities: It seems that different scientific paths and understandings have

developed from Vygotski's original thoughts, culminating in the English CHAT and the German concept of Aneignung. Similarly, Deinet's publications discuss Engeström's work, but there is no active exchange or joint advancement between the two concepts (Deinet et al., 2018; Deinet & Reutlinger, 2014).

Another evident challenge in working with the notion of Aneignung is the attribution of the various theories and ideas included in Deinet's work to the original authors. As noted above, various voices criticize and debate these attributions and authorships, as well as their conceptual relations. To circumvent these discussions, the approach of this thesis is to follow Deinet's own logic of attributions.

Thus, the following sections describe concepts that need to be explicated as essential pillars for Deinet's concept of Aneignung, following his reference and use of the cultural historical school of thought.

2.3.2. Materialistic-dialectical unity

An important aspect of Deinet's theoretical considerations is the assumption of a materialistic-dialectical unity between environment and humans, which was also decisive for Vygotskij and Leontjew. The paradigm of dialectical materialism assumes that *humans and nature are not separable from each other, but rather deeply entangled and continuously influence each other's development*. This assumption manifests itself in that human activity intertwines with the natural conditions of the environment, within which the activity takes place. As a human becomes practically active in the environment with tools, she/he changes this environment, which then again demands a different form of activity from the human. Thus, a human person intervenes in nature through his/her own work, which in turn influences humans through its changed form. Human and nature are linked in a dialectical unity. This idea *offers a central link to Varela's enactivist approach to cognition*, where cognitive living beings and environments are understood to be structurally coupled and thus inseparable. This will be further discussed throughout the enactive perspective on Aneignung (3.3.)

As part of the idea of a dialectical unity, the process of objectification is of particular interest for Deinet, as it introduces the process of appropriation, i.e., Aneignung, as its counterpart.

2.3.3. Objectification and Appropriation (Aneignung)

The knowledge, skills and abilities with which humans are active in this dialectical process are objectified in their tools (note that while Vygotskij focused mainly on human communication, i.e. symbols and signs, Leontjew focused on tools). That is, a hammer manifests all the skills that humans have built up in their social and cultural history, i.e. in the dialectical relationship with the environment, until the development of the hammer. The need to develop a hammer to perform an activity came from the conditions of nature, which in turn was changed by humans. Therefore, the process of objectification explains the engraving of humans' skills and knowledge into the environment of objects such as tools. In this context, the notion of Aneignung was introduced to describe the *opposing process on the individual's side of objectification*: The skills objectified in the changed circumstances of life are appropriated or 'angeignet' through practically independent, active involvement with that environment. „(Der Aneignungsprozess) reproduziert die historisch gebildeten Eigenschaften und Fähigkeiten der menschlichen Art in den Eigenschaften und Fähigkeiten des Individuums" (Leontjew, 1972: 286).¹²

Deinet concludes that the world offers itself to a child (or any human individual being) as a *world equipped with social objects that embody human capacities formed in the course of social-historical practice* (Deinet, 1992). This environment *invites the child to realize Aneignung* with these objects as well as their capacities: The child must perform on these things a practical and cognitive activity adequate to (though of course not identical with) the human activity embodied in them (Leontjew 1973: 281). This resonates with Gibson's understanding of affordances (Gibson, 1986), which play an important role within the 4E cognitivist perspective on cognition as a characteristic of the interaction between a cognitive system and its relative environment. This will be further elaborated in the discussion of this research (cf. 4.3.3).

¹² "(The process of appropriation) reproduces the historically formed properties and capacities of the human species in the properties and capacities of the individual" (Leontjew, 1972: 286; translation by author).

2.3.4. Interiorization

Another essential pillar is Vygotskij's concept of *interiorization*, which explicates the understanding of cognitive activity for Aneignung at that time in more detail:

Interiorization describes the process of Aneignung taking place first on an external level, that of social objects or communication, and then on an internal one - that of internal, mental processes or higher psychological functions (cf. Keiler, 1983). Thus, Aneignung involves a *transition by which processes that take place externally with material objects are transformed into inner processes*:

“Interiorisierung ist der Übergang durch den die ihrer Form nach äußeren Prozesse, die sich mit äußeren, stofflichen Gegenständen vollziehen, in Prozesse verwandelt werden, die auf der geistigen Ebene, auf der Ebene des Bewusstseins verlaufen. Dabei werden sie einer spezifischen Transformation unterzogen: Sie werden verallgemeinert, verbalisiert, verkürzt, und vor allem werden sie zu einer Weiterentwicklung fähig, die über die Möglichkeiten der äußeren Tätigkeit hinausgeht“ (Leontjew, 1982: 95).¹³

It is not clearly defined by Leontjew, how the external activity is interiorized, but Deinet suggests that they are transformed to inner, mental images – in a generalized, verbalized and abbreviated form (Deinet, 2014: 15). Thus interiorization builds a bridge between some sensorimotor activity and the mental realm and offers an insight into how the process of Aneignung might work, which will be analyzed in 4.2.

2.3.5. Aneignung is embedded in spatial circumstances

Deinet makes the fundamental assumption that the process of Aneignung is embedded in spatial circumstances, which is partially explained by the processes of objectification and interiorization.

¹³ "Interiorization is the transition through which the processes that are external in form, which take place with external, material objects, are transformed into processes that take place on the mental plane, on the plane of consciousness. In the process, they undergo a specific transformation: they become generalized, verbalized, abbreviated, and above all, they qualify for a further development that goes beyond the possibilities of external activity" (Leontjew, 1982: 95; translation by author).

Holzkamp criticized that Leontjew's understanding of Aneignung lacks the consideration that the experience that is being appropriated is an experience belonging to or rooted in a particular society and its specific structures: "Bei der Darstellung des Aneignungsvorgangs selbst wird aber dem Umstand, dass die anzueignende gesellschaftliche Erfahrung die einer bestimmt strukturierten, konkreten Gesellschaft ist, außer acht gelassen" (Holzkamp, 1973: 199). Further, Holzkamp postulated that these conditions and structures of a society are primarily mediated spatially:

„Die Leontjewsche Gegenstandsbedeutung im Aneignungsprozess ist für Kinder und jüngere Jugendliche quasi eingebettet in den "Raum" unserer Gesellschaft, in die konkreten, durch die Strukturen der Gesellschaft geschaffenen, räumlichen Gegebenheiten“ (Deinet, 1992: 40).¹⁴

With the thesis that the category of space and its structures also reflect the structures of society, Deinet lays the foundation for his further socio-spatial remarks on the concept of Aneignung – which will be explicated in the development of the concept of Aneignung (1.4.2).

2.3.6. Martha Muchow's life space analysis

The so far presented pillars of Deinet's work with Aneignung can all be attributed to the cultural-historical school of thought. In addition to that, Deinet referred to other research areas regarding children's activities and behaviour of Aneignung, such as Martha Muchow's studies about the life space of the big city child. In the 1920s, Muchow used qualitative methods (questionnaires, observations, mapping) to illustrate and interpret places, streets, activities, and objects and their subjective meaning for individual children in the city. Thus, Muchow was among the first to empirically observe the city *as a socio-spatial context for growing up* by locating the child as a social actor (Fegter & Andresen, 2019). This was useful to Deinet, when exploring the where and how of processes of Aneignung as well as what hinders or enables them (Deinet, 2018).

¹⁴ For children and younger adolescents, Leontjew's object meaning in the process of Aneignung is embedded in the "space" of our society, in the concrete spatial conditions created by the structures of society" (Deinet, 1992: 40; translation by author).

2.3.7. Zeiher's island model

Similarly, Zeiher used empirical methods to observe children and their urban environments and came to the prominent "island" thesis. It postulates that children make only very selective spatial experiences as they do no (longer) know the areas between their educational and recreational institutions and home, and are dependent on adults to bridge the distances between these "islands" (Fegter & Andresen, 2019). This thesis influenced Deinet's argument that there are fewer spaces where Aneignung can take place in the city.

2.4. The five dimensions of Aneignung and Raumaneignung

Motivated by his work experiences, Deinet explored the notion of Aneignung to enable new perspectives as well as opportunities of observations and activities for children and youth work. Through an examination of theoretical readings on the concept of appropriation, historical references, and finally through its interweaving with experiences from the youth center, Deinet conceptualizes the process of Aneignung as a *central developmental mechanism of children, adolescents, and adults*.¹⁵ Here, Aneignung is understood as an *individual's autonomous involvement with the material and symbolic culture in the environment*.

Since Deinet roots his dissertation in his practical experiences, he aims to make the concept of Aneignung usable and fruitful for the practice and thus establishes "eine Praxistheorie, d.h. ein anwendungsorientiertes theoretisches Konzept, welches in der Lage ist pädagogisches Handeln empirisch zu strukturieren" (Deinet, 1992: 126).¹⁶ Therefore, he operationalized his understanding into a first set of 5 dimensions of Aneignung, which can be used as observable categories:

1. Extension of motor skills
2. Extension of the space of action

¹⁵ „Grundlage der Arbeit ist die Annahme, dass die Aneignung ihrer Lebenswelt als zentrale Entwicklungsaufgabe für Kinder und jüngere Jugendliche auftritt“ (Deinet, 1992: 126; translation by author).

¹⁶ "a practice theory, i.e., an application-oriented theoretical concept that is capable of empirically structuring pedagogical action" (Deinet, 1992: 126; translation by author).

3. Change of existing arrangements
4. Creative achievement and individual autonomous activities
5. Extension of skills based on previous situations

Deinet suggests that the dimensions can help children and youth workers to better understand, question and rethink their work and their own role for the recipients: How are processes of Aneignung possible in the youth center? Does the youth center provide opportunities along the dimensions? To what extent can participants expand their sphere of action? How can situations be created that make this possible? Which motor skills can be expanded and how? Are there possibilities to use the previously acquired skills again and to build up an own activity on it? Which arrangements are offered, and can they be extended by the participants?

The dimensions of Aneignung proved themselves as a fruitful structure to observe and analyse behavior of Aneignung, as many researchers picked them up. As a consequence, the dimensions of Aneignung have changed with its use and development. The latest state as per Deinet's publications (2018), comprises following five dimensions: (1) Aneignung as extension of motor skills, (2) Aneignung as expansion of space of action, (3) Aneignung as repurposing/conversion and change of situations, existing arrangements and spaces, (4) creative achievement and self-directed activity (*Eigentätigkeit*), (5) Aneignung as Spacing and linking of spaces.

This development shows a focus towards refining the conceptualization of space, reflected by dimension (3) and (5), which led Deinet to rename Aneignung into *Raumaneignung*, i.e. spatial Aneignung. The following section will present the recent version of dimensions, followed by an elaboration of the development into *Raumaneignung*.

2.4.1. Five dimensions of Aneignung

- (1) *Aneignung as extension of motor skills*: The underlying question of this dimension is, whether it is possible for children and youth to access and appropriate (aneignen) the symbolic and objective culture that has

manifested itself in spaces through socio-historical processes¹⁷. Indicators of successful object-related Aneignung are the extension of motor skills, further use, and testing of the new skills in other situations: The practice and repetition of newly acquired skills.

(2) *Aneignung as expansion of the space of action*: The space of action is at first only spatially the place where children and adolescents carry out their actions and the possibilities for activities that lie therein. Since the objects and spaces designed and created by people reflect the meanings and skills of society through the materialistic-dialectical development, possibilities of Aneignung depend on the environment made up of these spaces and objects. By expanding a space of action, e.g., accessing new rooms, new streets, new houses, the process of Aneignung is indicated by a development of the child or adolescent. Indicators of this dimension of Aneignung are the repeated and independent use of such spaces after the expansion of the space of action has taken place. The space for action that children can access determines opportunities of Aneignung through its spatial structure and the inherent possibilities for experiences that it offers and does not offer (Deinet, 1992). “Die Aneignung menschlicher Erfahrungsmöglichkeiten umschließt, (...) zugleich die Aneignung der Ausgeschlossenheit von bestimmten Möglichkeiten menschlicher Erfahrung“ (Holzkamp & Schurig, 1973: XLIX)¹⁸.

(3) *Aneignung as the repurposing/conversion and change of situations, existing arrangements, and spaces*: This dimension refers to conquering the variety of uses of existing activity offerings and spaces. For example, a railing can be used not only as a demarcation and ordering element, but also as a slide or climbing opportunity, as an element of play for group games, or the like. In this dimension, most literally users make the spaces their own and rededicate their original functions and meanings (Deinet, 2018).

¹⁷ “Ist es möglich, dass sich Heranwachsende die gegenständliche und symbolische Kultur, die sich im historisch-gesellschaftlichen Prozess in Räumen manifestiert hat, erschließen und aneignen können?“ (Deinet, 2018: 151; translation by author).

¹⁸ “The Aneignung of human possibilities of experience includes, (...) at the same time the Aneignung of the exclusion of certain possibilities of human experience” (Holzkamp & Schurig, 1973: XLIX; translation by author).

Indicators for this dimension of Aneignung are the individual structural features of a situation and how they change in the use of children and adolescents.

- (4) Aneignung as *creative achievement and self-directed activity (Eigentätigkeit)*: Self-directed activity is seen as the *most intensive form of Aneignung of experience* (Rolff, 1985). Self-directed activities refer to the kind of activities where planning and execution are carried out by the same person: the opposite to the alienation that is often experienced in specialized work contexts. Deinet elaborates that the extent to which Aneignung can take place as an independent and self-directed activity depends essentially on the external conditions and possibilities of the activity of Aneignung.
- (5) Aneignung as *linking of spaces*: This dimension of Aneignung considers spaces not only in a material, local sense but also as symbolic, medial, and social. It is based on the observation that adolescents grow up in an islanded world of various spaces, in which they reside simultaneously. They establish connections between different spaces, such as between the physical space, the more distant places and social spaces with which they can communicate at any time (via cell phone or PC) as well as virtual spaces on the Internet, which can sometimes also be understood as social spaces. Therefore, Aneignung can take the form of forming new spaces by overlapping and linking these various spaces; a blended version of Aneignung that becomes more and more important.

2.4.2. Development into Raumaneignung (spatial Aneignung)

As discussed, Aneignung went through a variety of changes, however the most significant development is the elaboration into “Raumaneignung”. The conception of Aneignung initially focused on the physical-material environment, its artifacts, and the built representational world. However, Deinet and Reutlinger reflected that recent phenomena, such as the decreasing importance of everyday objects and their utility value, the movement into virtual and less tangible spaces, the islanding of life spaces that challenges the expansions of experiences and the immediacy of everyday life, contest the original activity- and object-oriented conception of Aneignung (Deinet, 2009a;

Reutlinger, 2002, 2019). Further, Martina Löw, known for her spatial sociology, criticized that the concept of Aneignung works with the idea of space existing beyond human action, a space that can be actively appropriated. “Raum wird also weder prozesshaft noch als zu konstituierend gedacht, sondern vorausgesetzt, dann aber die Eigenaktivität betont“ (Löw, 2001: 249).¹⁹ Löw pledges to overcome the separation between individual and space, and suggests that spaces are created through the interaction of living beings and social goods: “Raum ist eine relationale (An-)Ordnung von Lebewesen und sozialen Gütern an Orten” (Löw, 2001: 271).²⁰ In consequence, Deinet endeavored to *update the notion of Aneignung on the basis of an expanded understanding of space*. Raumaneignung conceives of the spatial environment as a social world constituted by humans under certain historical conditions in social processes where Aneignung takes place similar to how it works with artefacts:

“Mit diesem Zugang verstehen wir die räumliche Umwelt nicht nur physisch-materiell über Artefakte und die gebaute gegenständliche Welt, sondern vielmehr als eine vom Menschen unter bestimmten historischen Bedingungen in gesellschaftlichen Prozessen konstituierte soziale Welt, die sich ein Kind oder Jugendlicher genauso aneignen muss, wie die konkreten Gegenstände“ (Deinet & Reutlinger, 2014: 12).²¹

According to Deinet, Aneignung still means the independent, active involvement of the individual with his/her environment, but can now be used to describe how adolescents create their own and connect different spaces – with reference to the dimensions of Aneignung (Deinet, 2009a).

With the notion of Raumaneignung, i.e., spatial Aneignung, Deinet & Reutlinger intend to connect classical activity theory, cultural-historical school of psychology, socio-ecological approaches (e.g. Muchow and Zeiher), and spatial sociological approaches, such as Löw (2001). In their opinion Raumaneignung

¹⁹ “Space is thus thought of as neither processual nor to be constituted, but presupposed - the concept then emphasizes self-directed activity” (Löw, 2001: 249; translation by author).

²⁰ “Space is the relational arrangement and order between living beings and social goods in places” (Löw, 2001: 271; translation by author).

²¹ “With this approach we understand the spatial environment not only physically-materially via artifacts and the built representational world, but rather as a social world constituted by people under certain historical conditions in social processes, which a child or adolescent has to appropriate just as much as the concrete objects” (Deinet & Reutlinger, 2014: 12; translation by author).

can shed light on how subjective processes of human-environmental interaction take place from an activity-oriented perspective.²²

It is not clear to what extent the concept of Aneignung agrees with and adopts Löw's suggestion to overcome the separation between individual and space. However, it is a significant question for the further development of the concept of Aneignung, and as this theme is much discussed in the enactive approach to cognition, it will be picked up in the analysis of the process of Aneignung, in particular in 3.2.2.

It is important to note for the purpose of this thesis, that *through using and combining theories of various disciplinary backgrounds*, (Raum-) Aneignung has been developed as an *interdisciplinary phenomenon* – and engaging a *conceptual integration of enactive ideas* into the concept Aneignung *further enriches an interdisciplinary perspective on Aneignung*.

2.5. Fields of Applications

The previous sections elaborated on the core theoretical and empirical themes of the concept of Aneignung and how it developed further into Raumaneignung. With these developments new discourses and thematic fields opened up for the authors, but also for users and other audiences. Since this thesis aims at this point, to understand the possibilities and potentials of Aneignung as an applicable “practice”-concept, the three main publications by Deinet and Reutlinger that collected contributions of a diverse range of authors, will be presented in this subchapter.

(1) *"Aneignung" als Bildungskonzept der Sozialpädagogik: Beiträge zur Pädagogik des Kindes und Jugendalters in Zeiten entgrenzter Lernorte (2004)*.

The anthology examines to what extent Aneignung as an educational concept is suitable for social pedagogy in order to open the perspective of school and

²² “Raumaneignung vermag – so unsere Meinung – Aufschluss geben, wie aus einer handlungsorientierten Perspektive (d.h. relationalen Raumvorstellung) subjektive Prozesse der Mensch-Umwelt-Auseinandersetzungen in der menschlichen Entwicklung stattfinden (vgl. Deinet/Reutlinger 2004)“ (Deinet & Reutlinger, 2014: 11; translation by author).

institutional education for informal everyday education. Everyday education would thus take place in or in the context of different physical as well as non-physical spaces that are appropriated (angeeignet) by children and young people, but also adults. Aneignung is understood here primarily as subjective, active shaping and changing of spaces and territories (Deinet et al., 2004: 7). During these activities of Aneignung, social meanings embedded in spaces are decoded and spaces are reinterpreted - whereby spaces or territories are also understood as (individual) educational opportunities. The reinterpretation and alteration of existing spaces also create new spaces - a process described as "Spacing". In these processes of Aneignung, it is central that the acting individual constitutes spaces against the background of his or her biographical coping tasks and of meanings that he or she ascribes to the physical-material and social world. Aneignung means Aneignung of the lifeworld, whereby Aneignung is conceived as a pattern for the formation of the subject in social space. Conversely, social spaces are also always educational spaces that condition Aneignung possibilities and processes.

Thus, in addition to a theoretical conceptual discussion of the concept of Aneignung, the contributions to the anthology deal with different "spaces" for Aneignung: Wolfgang Schroer, for example, considers the concept of Aneignung in the context of the development of an unbounded labor society. Karl August Chassé examines to what extent and how poverty of children (also e.g., in relation to opening and closing of social spaces with an analysis of the patterns of Aneignung processes of children) is informative for opportunity fairness. Maria Icking examines the relationship between Aneignung and competencies "to shape occupational and employment biographies" (ibid: 14). And Schön and von Seggern discuss the planning of open spaces and public space based on experimental research results on Aneignung opportunities as guidelines for a youthful city.

(2) The second volume was published in 2014: *"Tätigkeit, Aneignung, Bildung. Positionierung zwischen Virtualität und Gegenständlichkeit."* 10 years after the first anthology, the editors Reutlinger and Deinet examine the relationship between social changes and subject in relation to the process of Aneignung. Specifically, they are concerned with a dissolution of boundaries between work and life - i.e., the dissolution and blurring of boundaries or contours and the

spaces associated with them – which is triggered and contributed to, among other things, by the everydayness of virtual spaces (Deinet & Reutlinger, 2014: 18). This breaking up and changing of traditional structures and spaces also affects appropriation structures and processes, which are discussed in the anthology. Schoolyards (Derecik, 2014), sports and exercise spaces (Fritsche, Kessl, & Reutlinger, 2014), city districts (Rahn, Reutlinger, & Fritsche, 2014), shopping mall and McDonalds (Deinet, 2014b) provide physical-spatial starting points for the contributions. Virtuality confronts Aneignung with the challenge of proving useful for new types of spaces, such as media-spaces like Facebook. It is shown that combining Aneignung with an expanded concept of space enables the analysis and consideration of changing educational spaces and educational processes for children and adolescents.

(3) With “*Potentiale des Aneignungskonzepts*” (2018), Reutlinger and Deinet, together with Reis and Winkler, invited contributions on the potential of the concept of Aneignung in the context of work and organization. To what extent can Aneignung help to understand organizational learning and change or in the development of knowledge management? In particular, the idea of "Expansive Learning" by Yrjö Engeström is discussed intensively, but without direct reference to Aneignung. Furthermore, the anthology covers research about how Aneignung can succeed in childhood, or in the connection of formal and informal spaces, e.g., by opening schools into the urban space.

The presented anthologies show that Aneignung is discussed and used in a wide range of disciplines and contributes to a discourse about all kinds of (in)formal educational spaces. Not only did the editors repeatedly motivate contributions that analyze contemporary challenges with the concept of Aneignung. But Aneignung as a cross-disciplinary theme can now also be considered as a phenomenon in itself without a link to education - Aneignung rather represents a practice "given with human existence" (Winkler, 2018: 203).

2.6. Reflections on the explanatory value of Aneignung

Following the literature review, this chapter summarizes and reflects the findings with regards to the first research questions.

2.6.1. How is Aneignung defined?

Aneignung has been defined as a *human's independent or self-directed and active involvement with the material and spatial environment*, which mediates socio-historically formed properties and skills; as such, Aneignung is seen as an *essential process in human development*. This characterization of Aneignung will be taken from now on *as the working definition for this thesis*. Plainly said: Aneignung is a type of human developmental behavior that is inseparably linked with the spatial environment. The five dimensions of Aneignung classify types of activities of Aneignung.

2.6.2. What does the concept of Aneignung explain?

The concept of Aneignung is concerned with the relationship between human living beings and their environment, assuming a materialistic-dialectical unity. Aneignung explains *how human developmental processes are linked to the socio-cultural composition of the environment*. It does so by structuring Aneignung into five dimensions²³ and analyzing where and how they take place in the environment. For this purpose, environment is conceived as a social space that is formed by human beings through social processes and practices under ever-changing historical conditions that become “engraved” into the space, i.e., they leave traces and change the space. This understanding of space includes physical-material artefacts, the built concrete world and the relational arrangement between human beings and artefacts at various places, like school, public spaces, consumption and strolling spaces as well as organizations and work contexts, offline as well as online.

The *central category of explanation is an individual's activity of Aneignung*, which has a developmental effect on the individual.

²³ Aneignung as: 1) Extension of motoric skills; 2) extension of space of action; 3) repurposing/conversion and change of situations, existing arrangements and spaces; 4) creative achievement and self-directed activity (Eigentätigkeit); 5) linking of spaces.

Therefore, the analysis of Aneignung offers a theory to empirically explore people and places and their relation to their developmental potential by asking the following questions (For ease of reading, Aneignung will be replaced in the following questions by “developmental behavior”):

- What are types of Aneignungsverhalten (behaviour of Aneignung), how do they take place and where?
- Where does person Y practice this developmental behaviour?
- How does person Y practice this developmental behavior?
- How does this developmental behavior show itself, and what are its indicators?
- Which places enable or disable the developmental behavior?
- How, where and by whom can this behaviour be enabled?

These questions show that the concept is well suited for practice-oriented work, such as any type of youth work, social work or education: it looks at concrete situations and their participants to evaluate whether and how Aneignung takes place. As a consequence, structures can be continuously improved to enable more Aneignung, following Deinet’s statement: „Aneignung braucht Anregung; und diese kann auch in einer abwechslungsreichen, ansprechenden räumlichen Struktur bestehen, in Materialien, Gegenständen, medialen Angeboten, die zur Selbsttätigkeit einladen“ (Deinet et al., 2018: 146)²⁴.

The questions also emphasize the trend of exploring the concept of Aneignung with regard to spatial aspects, most obviously with its development into Raumaneignung. That is sensible, considering that Aneignung is becoming a more prominent term also in the studies of spatial and urban planning. It further resonates with the “spatial turn”, which describes the renewed attention to the spatial organization of the social, mainly within cultural and social sciences (Döring & Thielmann, 2009). Thus, if Aneignung is understood as the interaction between self-directed, active involvement of people and the

²⁴ "Aneignung needs stimulation; and this can also exist in a varied, appealing spatial structure, in materials, objects, media offerings that invite self-activity" (Deinet et al., 2018: 146; translation by author).

environment, research has given clear and multi-faceted insights on the environment: we know a lot about the whole schmeer and embeddings of Aneignung. However, it has become clear that *we do not know a lot about the characterization of Aneignung as self-directed, active involvement* of people.

2.6.3. Improving the explanatory value of Aneignung

To improve the concept of Aneignung, it seems essential to explore the notion of self-directed active involvement and development, which is the first part of the working definition of Aneignung. The *psychological process of the subject has remained ambiguous* so far. However, it provides the concept with a particular twist: It assumes that a human living being has an inner drive to act, which qualifies the actions into developmental behavior.²⁵ This idea hints to some kind of independence of the human being, yet, this is not further defined. Therefore the central question, that has emerged through the dismantling of Deinet's work on Aneignung, is: *How can Aneignung be characterized as an individual's self-directed involvement with the environment and how and why has this engagement a developmental effect on the individual?*

The theories and concepts available for the theoretical foundation of Aneignung do not offer an explicit answer to this question. This gap is a symptom of a more general problem that the concept of Aneignung developed into: While the concepts originally chosen (cf. 2.3) did already not make for a strong theoretical edifice, by now the discussion has shifted so much towards space that work on the theoretical foundation is being disregarded. An indication of this are the latest publications, in which the same theoretical concept explanations and definitions are reproduced word for word. The classical set consists of the concepts mentioned in 2.3, with only slight variations here and there: materialistic-dialectical unity, objectification, interiorization, Martha Muchow's and Zeiher's work and Martina Löw's work on space. Therefore, a

²⁵ This feature distinguishes the concept of Aneignung from other works that deal with the connection between action, world and development. Sociologist Silke Steets, for example, applies Peter L. Berger's and Thomas Luckmann's social constructivists 'sociology of knowledge' (which works with the Marxist leaned processes of objectivation and internalization (resp. interiorization), as well as Aneignung) to architecture. Her explanations place the origin of action into the social construction of the world only (and also don't explicate what internalization brings about) (Steets, 2015, cf. ch. 5).

general readjustment of the theoretical foundation with a focus on the individual-psychological side of the process is required to improve the explanatory strength of the concept of Aneignung.

2.6.4. Contribution of this thesis

An obvious possibility to perform this readjustment and develop an answer to the presented central question would be to return to the original literature of the cultural-historical school of thought. This thesis however suggests taking a step forward, instead of turning back, and to connect the concept of Aneignung in its unique theoretically-patchy form with another, newer paradigm of thought: the enactive approach to cognition. The enactive approach to cognition, or short enactivism, is an alternative to more traditional views within Cognitive Science. For the theoretical framework of enactivism, concepts like *autonomy* and *sense-making* are crucial to understanding the *entanglement between mind and environment*. This thesis proposes that insights of enactivism can *significantly contribute* to a further development of the concept of Aneignung, *strengthen its theoretical foundation* and elaborate a *suitable explanation and characterization for the individual's self-directed involvement with the environment*.

3. Enactivism

Taking the next step in this thesis towards an enactive approach of Aneignung requires a definition of enactivism and its concepts. Therefore this chapter will give an introduction to the enactive approach to cognition.

Enactivism, known as well by the ‘enactive approach’, ‘enaction’ or ‘enactment’, is a scientific paradigm within cognitive science and belongs to the so called 4E-approaches, referring to the idea that mental processes are *embodied*, *embedded*, *enacted*, and *extended* (Newen, De Bruin, & and Gallagher, 2018; Thompson, 2007). In very general terms, this means that cognitive processes

- are *embodied*, in the sense that they are partly constituted by bodily processes;
- are *embedded*, meaning that they depend on processes in the environment;
- are *enacted*, so that they are constituted by the ways the organism and the world actively interact with each other;
- are *extended*, thus they are not located solely in the organism’s brain or head but rather extend into its environment.

While the four ideas agree in opposing the more classical conceptions of cognitive science, which posit that cognitive processes are almost exclusively carried out by brain processes, they do differ in their particular views (Newen et al., 2018; Rowlands, 2010).

In a nutshell, the enactive approach, initially developed by Francisco Varela, Evan Thompson and Eleanor Rosch, proposes that the “*human mind emerges from self-organizing processes that tightly interconnect the brain, body and environment at multiple levels*” (Thompson, 2007: 37; emphasis by author). For this purpose, cognitive living beings are characterized as *autonomous systems* (Varela, Thompson, & Rosch, 1991). Autonomous systems are defined as self-referential and operationally closed networks of mutually enabling processes, which require interactions with the environment for their continuous self-organization (Varela, 1997; Arandia & Di Paolo, 2021). For ensuring its continuation, the system is considered to be capable of adaptively regulating its relationship and its operations (interactions) with the environment, which is defined as *sense-making* (Thompson, 2007; Varela, Thompson, & Rosch, 1991).

Within this approach, *meaning comes from the relational process of creating significance between system and world*, which is based on the history of interactions between them. In consequence, *cognition is understood as the enactment of a world of significance*, and enacting means that a cognitive living being brings forth a world (of meaning) through sense-making processes (Varela, Rosch, & Thompson, 2016).

This chapter will first (3.1.) situate the enactive approach in the scientific discourse led within Cognitive Science and hence shows how three main cognitive research paradigms (cognitivism, connectionism & dynamical systems approaches) enabled the development of the enactive approach (Thompson, 2007). This helps to position the enactive approach within cognitive science. After that, in section 3.2., the roots of the enactive approach are briefly considered with remarks on Buddhist philosophy, Western phenomenology and cognitive science. Then its key tenets will be explored (3.3.): *autopoiesis*, *autonomy*, which includes *operational closure*, *identity generation & emergence*, and *sense-making*, subsuming *structural coupling*, and *cognition as sense-making*. The exploration of the key enactive concepts results in illustrating these concepts on the basis of the cell, in 3.3.3. The last section in this chapter (3.4.) draws conclusions from the enactive approach to cognition for the purpose of this thesis.

3.1. Contextualizing the enactive approach within Cognitive Science

The endeavor of studying the human mind and cognition, its mechanisms and principles and mental behavior lies at the center of cognitive science (Dupuy, 2001) – coined in the late twentieth century as an interdisciplinary research program trying to integrate perspectives of many different disciplines, such as psychology, neuroscience, linguistics, artificial intelligence, philosophy and computer science (Thompson, 2007; Bermudez, 2017). Each discipline offers different perspectives and research questions to phenomena connected to the mind, such as problem-solving, memory, language, behavior and perception (cf. for an overview: Friedenbergs & Silvermann, 2016). Cognitive scientists wanted

to make use of various concepts, techniques and models to provide a detailed *interdisciplinary account of what the mind is* and how its structures and processes work in living cognition (Bermudez, 2017). In addition, the vision of building cognitive and intelligent artifacts is another driving factor for understanding human cognition.

Broadly, three main streams of research can be identified to have shaped cognitive science since the 1950ies, namely *cognitivism*, *connectionism* and post-cognitivist approaches characterized by a *dynamic view of cognition* (Calvo & Gomila (eds.), 2009). These streams gave a paradigmatic context to the development of the enactive approach to cognition (Thompson, 2007; Frankish & Ramsey, 2012).

3.1.1. Cognitivism

Cognitivism builds on an image of the mind as a computer – a machine processing, producing, transforming and manipulating information as symbols, which represent patterns and properties of a cognizer's environment (Newell, Shaw, & Simon, 1958).

Thus, research focuses on the mind modeled as an information processing 'machine' in the form of a physical symbol system, that mediates between input and output through a feedback loop (Bermudez, 2017). For example, Miller (1956) explored how, how much and which information gets into the 'machine' and proposed that human senses are channels for information to machine that are limited in capacity. Broadbent complementary researched how information is selected in the auditory information channel, suggesting that the selection of information is solely due to psychological characteristics of a signal and whether the selected information has previously satisfied the goal in the mechanism (Bermudez, 2017; Broadbent, 1958). In this context, *cognition is defined as information-processing* or in other words as a computation, an operation carried out on the representing, symbolic elements in the mind (Bermudez, 2017; Thompson, 2007). A key notion of cognitivism is 'representation', i.e. elements standing for something with certain qualities out there in the world (Villalobos & Dewhurst, 2017). These symbol manipulation operations are considered to take place in a central cognitive module located in the brain, separated from senses and actions (ibid: 6). In this understanding, cognitive

science and its various sub-disciplines are engaged with the study of information-processing mechanisms and their algorithms, such as physical symbol systems, the quality and nature of representation and of their cognitive processes (Thompson, 2007; Varela et al., 1991).

3.1.2. Connectionism

Like cognitivism, connectionism explores information-processing mechanisms. However, connectionists use a network approach to understand cognitive processes (Friedenberg & Silvermann, 2016). Connectionist research was driven by explorations of the neurological structure of the brain (Hebb, 1949; McCulloch & Pitts, 1943), which led to modelling the brain as artificial neural networks (Friedenberg & Silvermann, 2016). Artificial neural networks simulate the activity of actual brain neurons during the performance of tasks, like perception, action, problem-solving etc. (Friedenberg & Silvermann, 2016). Artificial neural networks are built of nodes, representing neurons, and links, representing the connections between the neurons (Bermudez, 2017). Nodes have an ‘activation value’, that specifies whether a node fires depending on the input it gets, and links have ‘weights’, indicating the strength of the connection. Together, activation values and weights specify the network’s output value, depending on the input. Thus, artificial neural networks involve the parallel distributed processing of information as the whole network’s pattern represent information instead of a symbol as in the cognitivist’ model of a physical symbol system (Rumelhart, McClelland, & PDP Research Group, 1986). Artificial neural networks can have multiple layers, also hidden layers, i.e. neither layers of input nor output nodes, and various numbers of nodes at different layers, so that the activation pattern of the output nodes is a network’s first response. Multilayer networks can be trained with backpropagation learning algorithms, where the network is given feedback according to the desired output (Werbos, 1990).

Cognitivism and connectionism, subsumable under computationalism, both work with the theme that “cognition is a form of information processing” or computation (Bermudez, 2017: 401; Shapiro, 2007). Further, both views support *dualist views*, as they assume mind-world dualism, thus supposing an independent world out there that is represented through something like inner states, symbols or states of a network (Thompson, 2007). The mind is

understood to be *located in the head*. “The mind and the world were thus treated as separate and independent of each other, with the outside world mirrored by a representational model inside the head” (Thompson, 2007: 10). Further, computational approaches are mostly understood as solving pre-defined symbolic descriptions of problems that are inserted as an input to the program (Beer, 2000; Thompson, 2007).

3.1.3. Dynamical systems approach

The dynamical systems approach to the mind is seen as an alternative view within cognitive science that moves away from modelling cognition as information processing solely ‘in the head’ and on the basis of representations (Friedenberg & Silvermann, 2016). The core of a dynamical approach is to study cognition with the conceptual and mathematical tools of dynamical systems, so that cognitive systems are understood as *systems with states that change over time* (Port & van Gelder, 1995). The dynamical systems theorist Van Gelder (1995) defines a system as a set of interrelated aspects of the world and the state of a system at a specific time as the arrangement of these aspects at that time. The state space is made up by all the states that the system might be in over time, and the change in the overall state of the system is denoted as the behavior of the system. A sequence of a system’s states within the state space is the trajectory of a system. Thus, understanding the cognitive system or cognitive processes as a dynamical system means to study the aspects that make it up, the states of a cognitive system, how they change over real time etc. (Bermudez, 2017). This means, that from a dynamical perspective, “the cognitive system is not the brain, inner and encapsulated; rather it is the whole system comprised of nervous system, body and environment” that coevolve with each other over time (Port & van Gelder, 1995: 3). Further, in comparison to the computational approaches described above, the dynamical systems approach does not work with representations but rather with variables that change through the state space (Port & van Gelder, 1995). Thus, dynamical approaches include into the research about the mind, the environment of the cognitive living being and the way it is embedded, i.e. the *relation between environment and cognitive processes*.

Dynamical perspectives on cognitive processes are often connected with, or closely related to an embodied and situated viewpoint (Bermudez, 2017). Embodied cognition emphasizes the role of the body and its particular and distinct physical characteristics in the explanation of cognitive processes (Shapiro, 2007). In regard to cognition, Shapiro emphasizes three themes of embodiment research, namely conceptualization, replacement and constitution (Shapiro, 2019). Conceptualization addresses the importance of the body for understanding cognition, in that the way an organism develops and uses concepts to understand its world depends on the organism's properties. Replacement refers to the possibility of replacing representational and computational explanations in cognitive processes by a body being in interaction with its environment. Finally, embodied cognition research suggests that the world or the body do not merely play a causal role but rather they are a constituent of cognition (ibid: 5). The enactive approach, that will be used in this thesis, incorporates embodiment as embodied action, as we will see in the next sections.

Situated cognition views are centered around the idea that cognition is not the computation of information available in the environment, but rather cognition comes from the dynamic coupling, the interactions between an organism and its environment (Roth & Jornet, 2013). Thus, Clark and Wilson argue that the research field of situated cognition encompasses "many forms of cognitive extension" (Wilson & Clark, 2008: 56), which include embodied cognition embedded cognition, distributed cognition, even enactive cognition and others (Robbins & Aydede, 2008).

The presented paradigms, cognitivism, connectionism and (embodied/situated) dynamicism do not give a complete overview of cognitive scientific strands, but they provide the context in which the enactive approach emerged: "The enactive approach of Varela, Thompson, and Rosch (1991) aimed to build bridges between the embodied dynamicist accounts of the mind and phenomenological accounts of human subjectivity and experience" (Thompson, 2007: 13). Some key concerns of cognitive science are addressed by the three strands, such as the discussion of representations and their nature, subjectivity

and consciousness, as well as the mind-world dualism. They are also central to the discussion of the enactive approach to cognition in the following sections.

3.2. Roots of the enactive approach

The term “the enactive approach” was introduced in “The Embodied Mind: Cognitive Science and Human Experience” (TEM) published by Francisco Varela, Evan Thompson and Eleanor Rosch in 1991. It presents *cognition as enaction*, which refers to the “ongoing process of being structurally and dynamically coupled to the environment through sensorimotor activity (...) that brings forth an agent-dependent world of significance” (Thompson, 2017: p. 1). The enactive approach was further developed by Thompson (2007). Di Paolo (2010) as well as De Jaegher (2007) are conceived as working most closely with the original concept. Apart from these, many research domains have contributed, applied and discussed the theme of enactivism, furthering the development of branches and varieties of enacted cognition, such as ‘radical enactivism’ (c.f. Hutto & Myin, 2013, 2017) or ‘sensorimotor enactivism’ (O’Regan & Noë, 2001) – making it an own research endeavour to draw lines of difference and relatedness between the approaches (Kiverstein & Clark, 2009; Ward, Silverman, Villalobos, & Ward, 2017). Criticism has been raised that not all of the concepts and ideas labelled with enactivism or making use of the word ‘enactive’ have a common understanding of the core views on the mind, leading to wild mixtures and challenging the reformist potential of the approach (Di Paolo et al., 2010). Therefore, this thesis will *only work with the original texts* and its direct conceptual family as mentioned above, such as Maturana & Varela, 1980; Di Paolo & Thompson, 2014; Thompson, 2007; Varela, Thompson, et al., 1991.

The enactive approach constructs a multi-disciplinary web concerning the relation between human experience and the scientific inquiry of the mind, as the authors draw upon insights from artificial intelligence, traditional psychology, neuroscience and biology, and even religion and philosophy with the exploration of a major Buddhist tradition (Varela et al., 1991). *Three important sources* will be presented briefly:

1. One of the most important roots of the enactive approach to cognition goes back to the publication of “Autopoiesis and Cognition. The Realization of the Living” by Humberto Maturana and Francisco Varela in 1980 (1972 in Spanish). In the book, the authors explore the nature of the organization of living systems, by introducing the notion of *autopoiesis*; it refers to a specific self-referential, or self-fabricating form of system formation of a living system (ibid.). Along with autopoiesis, many central ideas such as *autonomy*, *unity*, or *structural coupling* of the later called enactive approach were introduced in this publication, entailing “Cognition of Biology” and “Autopoiesis: The Organization of the Living” (ibid).

2. The development of the enactive approach was also inspired by the *practice of mindfulness meditation*, borrowed from Buddhist philosophy. Varela, Thompson and Rosch were particularly interested in using meditation to access and explore subjective experience in a phenomenological manner, and its connection with ideas about the organization of cognition and living systems. “Mindfulness means that the mind is present in embodied everyday experience; mindfulness techniques are designed to lead the mind back from its theories and preoccupations, back from the abstract attitude, to the situation of one’s experience itself” (Varela, Thompson, et al., 1991: 22). Based on the conviction that human experience and science endeavours must explore and inform each other, they argue that cognitive science can be enlarged by including lived, human experience (Varela, Rosch, & Thompson, 2016).

3. A third important inspiration for “The Embodied Mind” is *Western phenomenology*, and in particular Merleau-Ponty’s philosophy of the lived body:

“We hold with Merleau-Ponty, (...), that we see our bodies both as physical structures and as lived, experiential structures – in short, as both “outer” and “inner”, biological and phenomenological. (...) We cannot understand this circulation [between the two sides] without a detailed investigation of its fundamental axis, namely, the embodiment of knowledge, cognition, and experience. For Merleau-Ponty, as for us, embodiment has this double sense: it encompasses both the body as a lived, experiential structure and the body as the context or milieu of cognitive mechanisms” (Varela et al., 2016: Ixi).

Among others, these sources informed and helped to formulate the enactive approach, which relies on the basic idea that “the living body is a self-producing and self-maintaining system that enacts or brings forth relevance, and that cognitive processes belong to the relational domain of the living body coupled to the environment” (Varela et al., 2016: xxv). Thus, the enactive approach to cognition explains *how the organization of living systems* such as human beings, *is characterized* by assuming the body as a system *encompassing the interaction between body and mind, body and environment, and environment and mind* (ibid.).

This explanatory potential of the enactive approach *bears an opportunity for the concept of Aneignung*, which aims to explain a theme situated at the threshold between all three interactions (body-mind-environment) too. To explore this, the following section covers the key tenets of the enactive approach to cognition.

3.3. Key concepts of the Enactive Approach

The enactive approach is based on some key concepts and responds to various fundamental questions of enaction: How is a cognitive living system organized, i.e. what are the “relations that must exist among the components of a system” (Maturana & Varela, 1987: 47); or: how must a system be organized in order to be cognitive (Thompson & Stapleton, 2009)?

This thesis identifies the following key ideas as defining the enactive approach (De Jaegher & Di Paolo, 2007): *autonomy* subsuming *autopoiesis*, *operational closure*, *identity*, *emergence* and *sense-making* subsuming *structural coupling*, *embodied action* and *enaction*. It takes the concept of *autonomy* as the point of departure, to answer the question of the characteristics of a cognitive living system: “According to the enactive approach, what makes living organisms cognitive beings is that they embody or realize a certain kind of autonomy” (Thompson & Stapleton, 2009: 24). This autonomy emerges based on the the idea of *autopoiesis* or *autopoietic structures*, i.e., the idea of a self-referential system or a circular organization that characterizes living systems as unities. Further, autonomous systems are *operationally closed* and *precarious*

and they actively generate their own *identity* by drawing distinctions between their own environment and themselves. The enactive approach speaks of an identity (or identities on various levels) that *emerges*. This emerging identity entails a certain *perspective* on the world surrounding the living cognitive organism, which evaluates the world according to the self-organization's needs and constraints. Here, *sense-making* takes place as the organism regulates its *structural coupling* with its environment. This brings forth a *world of significance* for the organism. In consequence, cognition is understood as *embodied action* through which a cognitive system *enacts* a world of significance.

The highlighted concepts support each other in their argumentation (Thompson & Stapleton, 2009). The following sections will explain them in turn: *autonomy* subsuming *autopoiesis*, *operational closure*, *identity*, *emergence* and *sense-making* subsuming *structural coupling*, *embodied action* and *enaction*.

3.3.1. Autonomy

The first central concept of the organization of cognitive living being is, that they are *autonomous* systems. Autonomy literally refers to the *capacity of being self-governed* or in other words, “a system is autonomous if it can specify its own laws, what is proper to it” (Maturana & Varela, 1987: 48). Systems are autonomous in such a way, that they are sustaining and constructing themselves as *self-organizing systems while or in interacting with their environments* (Froese & Di Paolo, 2011). This means that for an autonomous system being and doing are not separable processes, there is no separation between the product and the producer. It is therefore necessary that *autonomous systems are constituted by processes and their interactions* and not by static entities (Thompson, 2007). So how are these processes related and organized for the system to be autonomous? Which properties of organization are required? To further elaborate these questions and the concept of autonomy, the ideas of *autopoiesis*, *operational closure*, *identity* and *emergence* will be introduced.

Autopoiesis

Autonomy has to be understood as related and distinct to autopoiesis. The concept of autonomy is deeply intertwined with the idea of autopoiesis, which refers to a system's capacity of self-production. "What autopoiesis attempts to do, is to precisely, to draw explicitly, in as much detail as possible, what are the fundamental laws to allow autonomy to happen, to emerge?" (Reichle, 2004: 00:30).

The word autopoiesis comes from *autos* (self) and *poiesis* (creation, production) and was coined by Varela's colleague Humberto Maturana (Maturana & Varela, 1980). Autopoiesis is defined as follows:

"Autopoietic systems are organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produce the components which: (i) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and (ii) constitute it (the system) as a concrete unity in the space in which they (the components) exist by specifying that topological domain of its realization as such a network" (Maturana & Varela, 1980: 79).

Varela considers, autopoiesis to be a particular character of living organisms that enables the organism's autonomy; Autopoiesis is confined to a physical space while autonomy can be applied as a more general phenomenon in other spaces of interaction (Varela, 1981). Autopoietic systems realize their distinction through a topological boundary, such as cellular systems. More generally, autonomous systems can lack topological, material boundary defining its unity - such as the immune system or the nervous system (ibid.). In this way, *autopoiesis is a special case of autonomy*, while autonomy allows for a more general view of systems that are categorized by their organization. To clarify it should be noted, that autopoiesis itself is insufficient as a comprehensive theory of cognition and of life, and that the theory explored with the enactive approach goes beyond autopoiesis (Di Paolo, 2009).

Operational closure

Usually, three principles are introduced in characterizing the processes and their organization, constituting an autonomous system (Thompson, 2007; Thompson & Stapleton, 2009):

1. First, each process of an autonomous system has *at least one other process in this system that it depends on, relates to, or is conditioned by* (De Jaegher & Di Paolo, 2007). “The constituent processes recursively depend on each other for their generation and their realization of a network” (Thompson, 2007, p. 44).
2. Second, all of the processes together *give rise to the unity of the system in whichever domain they exist. And these processes are again determined by this system*. This means that not only the parts give rise to the whole (one-directional), but rather that the parts and the whole condition each other or rather mutually specify each other by being interdependent.
3. Finally, the processes *specify the possible relation of the system to its environment*, as they “determine a domain of possible interactions with the environment” (ibid.; Varela, 1979: 55). We will come back to the question of possible interactions with the environment later.

The described properties of the processes, the realization and construction, thus the self-organizational capacity of a system’s network of processes is called *operational closure*: An autonomous system is operationally closed insofar as it is specified by “a network of dynamic processes whose effects do not leave the network” (Maturana & Varela, 1987: 89). “What is common to all autonomous systems is that they are organizationally closed” (Varela, 1981: 15). Initially, Varela described autonomous systems as organizationally closed and then used both operational and organizational closure interchangeably. Thompson later drew a distinction (2007). For him, organizational closure “refers to the self-referential network of relations, that define the system as a unity”, and operational closure to the “re-entrant and recurrent dynamics of a system” (45). This thesis uses the term operational closure. Operational closure does not imply that the system is closed to the outside world, but rather it looks at the the relational quality of the interaction. Indeed, systems that are operationally closed, must also be thermodynamically open to the world due to a constant flow of energy and matter happens between the system and its surroundings (Thompson, 2007, Varela 1991). In Varela’s words:

“A system that has operational closure is one in which the results of its processes are those processes themselves. The notion of operational closure is thus a way of specifying classes of processes that, in their very operation, turn back upon themselves to form autonomous networks. Such networks do not fall into the class of systems defined by external mechanism of control (heteronomy) but rather into the class of systems defined by internal mechanisms of self-organization (autonomy). The key point is that such systems do not operate by representation. Instead of representing an independent world, they enact a world as a domain of distinctions that is inseparable from the structure embodied by the cognitive system” (Varela, 1979: 139).

How is a system then distinguishable as a unity from the surrounding? A unity, according to Maturana and Varela (1987), “is brought forth by an act of distinction” which “distinguishes what has been indicated as separate from its background” (40). For this act of distinction, a criterion of distinction is needed to specify its properties as a unity. This criterion is the organization of the system, and particularly for living beings the question of distinction reads: Is the system organized in such a way that it is autonomous, i.e., specifying its own laws (self-governing), coherent (constituting a unity) and self-determining in interaction with the environment (Thompson, 2007: 37)?

Identity

The characterization as a unity gives rise to an *identity*, a global coherence of some kind, which is generated and sustained by the operationally closed dynamics of the system (Froese & Paolo, 2011).

As the organization and dynamics of various autonomous systems are different and with that also their interactions with their environment vary, different identities are produced with their own phenomena, problems, constraints, which in turn influence the activity and organization of the system. This identity is not substantially localized and it does not depend on the physical nature of the system’s components, but *emerges* through the operational closure of the autonomous system (Varela, 1997). In this way, autonomous systems are both producer and product. Their “activity is both the cause and effect of their own autonomous organization (...) This gives it an essential self-constituted identity because its own generative activity demarks what is to count as part of the system and what belongs to the environment” (Froese & Di Paolo, 2011: 6). The distinction as a unity or the distinction between “self” and “other” is a by-

product of the continuous self-production of the system and its history of distinctions (Di Paolo et al., 2010).

Emergence

It has been noted that the identity of an autonomous system *emerges* from its operational closure. Emergence is another key concept of the enactive approach and an important feature of autonomous systems and can be contrasted with reduction (Holland, 1997). Reduction describes that a whole complex system can be explained by understanding its constituting parts or subsystems and their interaction (Bermudez, 2017; Holland, 1997). In emergence, novel features have *emerged on the level of the system, that do not appear on the sub-level, where the subsystems or parts interact*. Searle suggests that these “novel” system features “have to be explained in terms of the causal interactions among the elements” (Searle, 1992). A prominent example of emergence in nature are ant colonies, as the behavior (coordination, learning, etc.) of ant colonies cannot be explained by the properties of isolated ants (Johnson, 2002). Within cognitive science some few examples of topics discussed as emergent processes or phenomena are language, developmental disorders, consciousness, and cognitive modules (McClelland, 2010). Thus, emergence is present across various domains and phenomena and at the heart of self-organization and cybernetic theories (Varela et al., 1991; von Foerster, 1984).

Emergence shows that it can be that a system’s global phenomenon or a type of global coherence emerges from local components, its constituent processes, as a collective pattern between them (Varela et al., 1991). For autonomous systems specifically, emergent processes involve influences between “local” and “global” dynamics in a reciprocal way, as described in Thompson’s following formal definition of emergence for complex system theory (Thompson, 2007: 418):

“Definition: A Network, N, of interrelated components exhibits an emergent process, E, with emergent properties P, if and only if:

- (1) E is a global process that instantiates P, and arises from the coupling of N’s components and the nonlinear dynamics, D, of their local interactions.
- (2) E and P have a global-to-local (“downward”) determinative influence on the dynamics D of the components of N.

And possibly:

- (3) E and P are not exhaustively determined by the intrinsic properties of the components of N, that is, they exhibit “relational holism”.

This definition suggests that three propositions must hold for a process to count as emergent, a process that emerges and has emergent properties: First, the parts (as in the network’s components and its relations) must give rise to the whole (global phenomenon). Second, the whole affects the parts regarding their dynamics. And finally, the two cannot be reduced to one another, as they are co-determined. They stand in a relation of circular causality to one another, they co-emerge. Often the first and the second proposition are denoted by “local-to-global determination” or “upward causation” and “global-to-local determination” or “downward causation” respectively. For the case of autonomous systems (and complex systems theory in general), Thompson introduced the notion of “*dynamic co-emergence*” to refer to this particular case of mutual specification (Thompson, 2007: 38; emphasis by author). In autonomous systems, local parts determine novel processes or patterns with their own characteristics, and global characteristics in turn specify, thus constraint or govern local components and their interactions. Co-emergent systems are systems where part and whole co-emerge, and they are dynamic because they (the whole and the parts) change over time in a “smooth and continuous” manner, the “processes are always ongoing with no clear starting or end points” (Thompson, 2007: 39 pp).

Conclusion

Autonomy, as described above, is a *property or generic type of organization*, and is based on the classic concept of autopoiesis. Autonomy tells us about the way the *organization’s constituent processes are operating and organizing under operational closure whilst being thermodynamically open*: they (1) recursively depend on each other in generating and sustaining a network, (2) make up the system as a unity and (3) they determine which kind of interactions with the respective environment are possible (Thompson, 2007). Further, according to the enactive approach, *autonomous systems exhibit dynamic co-emergence*, which specifies that neither the parts nor the whole exist independently of another. Dynamic co-emergence and its circular causality as

well as self-organization and *operational closure thus bring forth a system as a unity*, which is distinct from the environment insofar as the system can separate what are its parts and what are not its parts, thus for it to ensure autonomy. An *identity co-emerges*, generated by the system's activity and interaction with the environment. For a better understanding of this demarcation between environment and system as well as their interactions, the next section will discuss *sense-making* as an aspect of how autonomous systems relate to their environment and how the processes "determine a domain of possible interactions with the environment" (Thompson, 2007: 44).

3.3.2. Sense-Making

Autonomy is a central concept within the enactive approach to cognition. Systems are autonomous if their constitutive processes and their co-emergent whole are organized under operational closure, as described above.

In this way, living cognitive beings as *autonomous systems are continuously engaged in a process of constituting an identity*. Varela proposed that the "emergent identity gives, logically and mechanistically, the point of reference for a domain of interactions" (Varela, 1997: 73). This means that the constituent processes also determine how and under which conditions interactions with the environment are possible for the system. But how do interactions happen and how is this suggested entanglement between environment and system characterized?

Structural Coupling

In general, recurrent interactions between an autonomous system, which is constituted by its processes as a unity, and the respective environment consist of *reciprocal perturbations*. Perturbations are external triggers to a system, i.e. independent of the system's ongoing activity, that unbalance the system (Varela, 1997). Consequently, "mutual congruent structural changes" take place in both and lead to *structural coupling* (Maturana & Varela, 1987: 75). "We speak of structural coupling, whenever there is a history of recurrent interactions leading to the structural congruence between two or more systems" (ibid.). During this reciprocal coupling, the autonomous system continuously defines what it is as a unity and through that demarcates what it is not, i.e. what belongs to its surrounding environment (Varela, 1997). Varela notes this

relationship to be *dialectical*, in the sense that the environment of the system “is defined in the same movement that gave rise to its identity and that only exists in that mutual definition” (ibid.: 97). So how does a system decide about the process of its coupling and under which aspects?

As an autonomous system, the *recursive processes constitute the system as a unity and at the same time constrains this system’s possibilities*, i.e. the processes have to facilitate the ongoing self-organization of the system and protect its integrity and lineage. What does that mean? The system has an *interest to survive in the world*, and thus “any action undertaken by the system is permitted as long as it does not violate the constraint of having to maintain the integrity of the system and/ or its lineage” (Varela et. al, 1991: 205). If the system is in any ways interrupted in its autonomy and therefore not able to self-produce or self-construct itself, the unity is given up and the system’s demarcation diffuses (Thompson, 2007).

It follows that the structural coupling of a system are driven by the need to maintain itself, which in turn limits the possibilities of structural coupling (Varela, 1997).

Cognition as sense-making

Therefore, an autonomous system *actively regulates its interactions with the world and determines a domain of possible interactions*. To make these processes clearer, it makes sense to revisit the conceptualization of a system’s co-emergent identity: Autonomous systems produce and sustain an identity as they are operationally closed. This identity dynamically co-emerges with the processes that constitute the system over time, and it entails the domain of interactions. The domain arises from the identity of a system establishing a *perspective* from which the interactions with the world are evaluated: some interactions endanger the system’s autonomy, some other support for continuing the autonomy of the system. “An autonomous system produces and sustains its own identity in *precarious conditions* and thereby establishes a perspective from which interactions with the world acquire a normative status” (Thompson & Stapleton, 2009: 25).

Thus, in interactions with the world, *meaning* is brought forth as the system’s identity *engages in constituting a world of significance for itself* and thus is making sense of it. In turn, this activity of *sense-making* regulates the system’s

structural coupling and thereby conserves its autonomy. Therefore, *interaction as coupling with the world is a condition of existence for autonomous systems as well as it transforms the system and not only informs it*. Sense-making is at the core of the enactive approach and can be seen as the “interactional and relational side of autonomy” (ibid.). In the enactive approach, *cognition* is introduced to describe specifically this sense-making, i.e. *creation and appreciation of meaning*. “Cognition is sense-making in interaction: the regulation of coupling with respect to norms established by the self-constituted identity that gives rise to such regulation in order to conserve itself” (Di Paolo, 2009: 19).

This sense-making activity leads to a differentiation between world and environment: As the identity exhibits salience, meaning and value to the world it interacts with, the world is transformed into an environment, an “Umwelt” in the sense of Uexküll (Uexküll & Kriszat, 1970). In other words, a world becomes a respective environment for an autonomous living system through their dialectical relationship (F. Varela, 1997). Thus, the system *enacts* an environment of meaning for itself, it brings forth a world by its structural coupling (Varela, Rosch & Thompson, 1991: 205).

Consequently, meaning is not found ‘out there’ in world, but it emerges and is continuously produced by the sense-making activity of an autonomous system - “Meaning is an aspect of the relational domain established between the two. It depends on the specific mode of co-determination that each autonomous system realizes with its environment, and accordingly different modes of structural coupling will give rise to different meanings” (Froese & Paolo, 2011: 7). In other words: Cognition is the *enactment* of world.

Embodiment and Action

Two final and related aspects must be further elaborated on to gain an understanding of the enactive approach’s core ideas of autonomy and sense-making: Cognition as embodied and action and how they relate to each other, i.e. the understanding of action and embodiment for sense-making of autonomous systems, which are living beings.

As autonomous systems interact with their environment through structural coupling making use of sensory capacities and motor capacities, they perceive

and act. For lived cognition, “sensory and motor processes, perception and action, are fundamentally inseparable” (Varela et al., 2016, p. 173). This means that the system encounters a world, which is its ‘Umwelt’ in the sense that it is enacted in relation to its own activity, since the system is continuously engaged in self-sustaining its autonomy through sense-making. As a result of the system’s action the environment continuously changes and so does the perception of it. Thus, *perception and action are actually co-evolving structures*, resulting in action that is perceptually guided and perception that is guided by action.

Now, perception and action further depend on the way the system is equipped regarding its sensory and motor capacities. This addresses the notion of *embodiment*, which emphasizes the following two points in ‘The Embodied Mind’ (1991): “First, that cognition depends upon the kinds of experience that come from having a body with sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context” (Varela et al., 1991: 172 pp).

In the enactive approach to cognition, embodiment means that the process of sense-making involves a whole animate system of body and mind where “the body is the ultimate source of significance” (Di Paolo et al., 2010: 42). Therefore, body and mind are deeply entangled. The mind is inherent throughout the autonomous system’s coupling with the world, where continuously self-distinction is practiced. There are many layers of these entangled body-mind systems which are autonomous and engaged in self-constitution and self-organization, *various identities at different layers emerge* (ibid.). Thus, the way in which the autonomous system is *embodied* determines how the system dialectically couples with the world according to its needs and constraints. Finally, this means that cognition and cognitive phenomena such as knowledge, memory or language depend on being in a body that is inseparable from the world (Varela et al., 1991).

Conclusion

In conclusion, this section has explored the notion of sense-making in the enactive approach to cognition. It showed how autonomous systems relate and

interact with the world through structural coupling, characterized by embodied perceptually guided action, and how meaning and sense arises through this coupling, transforming the world into an environment. Here, the notion ‘cognition’ is understood as a deeply relational embodied action through which a cognitive system enacts a world of significance (Thompson, 2007: 13; Varela et al. 1991: 205 pp).

3.3.3. Illustration of enactive concepts with the living cell

In order to illustrate the principles of the enactive approach for a living system, this section will apply the ideas to the example of the living cell. The enactive approach shows how living beings are characterized and organized through autonomy and sense-making – and by that enact a world. Examples for autonomous systems are “single cells, microbial communities, nervous systems, immune systems, multicellular organisms, ecosystems” (Thompson, 2007: 46), and others. All these systems employ autonomy in that they are “sources of their own activity, [and] specifying their own domains of interaction” (ibid.). What does this mean in detail for the often-used example of the living cell?

A living cell is made up of chemical processes and their ongoing dynamical interactions which make up the metabolism or metabolic network of the cell. These processes or metabolic reactions recursively depend on each other. “This cell metabolism produces components which make up the network of transformations that produced them” (Maturana & Varela, 1987: 44). Thus, the cell sustains and produces itself by chemical transformations. But, interestingly, some parts of the components form a semipermeable membrane, which becomes a limit or a boundary to the network of transformations. With this membrane, a barrier is introduced to the free diffusion between inside and outside, between the cell and the environment – but it allows for an exchange of energy and matter. Therefore, the membrane participates in the network of transformations and at the same time is constituted by the cell’s metabolic processes. “Metabolic processes within the cell construct these boundaries, but the metabolic processes themselves are made possible by those very boundaries” (Thomas, 2007: 46). The membrane has the function of allowing the dynamics of the cell to continue living, since without it the metabolism “would disintegrate in a molecular mess that would spread out all over and

would not constitute a discrete unity such as a cell” (ibid.: 46). For a living cell, its metabolism constitutes a unity that actually manifests itself in a spatial arrangement as the membrane. Thompson summarizes the constitution of a cell as an autonomous system as follows:

“Thus the cell embodies a circular process of self-generation: thanks to its metabolic network, it continually replaces the components that are being destroyed, including the membrane, and thus continually re-creates the difference between itself and everything else” (Thompson, 2007: 99).

Figure 1 illustrates the circularity of this phenomenon of unity: Neither the boundary of the cell nor the dynamics of it have been there first: The integrity of the processes that make the whole possible is in turn the enabling feature for distinguishing it.

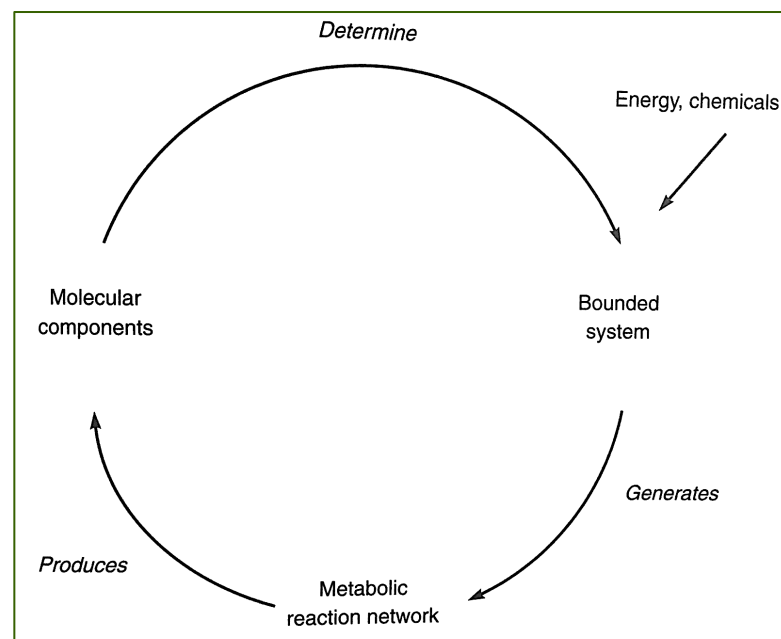


Figure 1: Unity of Dynamics and Boundaries for an autopoietic organization, (Thompson, 2007: 45).

With the capacity of forming the membrane the cell actually organizes itself as an autopoietic, spatially bounded system.

The specific metabolic dynamics, i.e. the recursively dependent processes that constitute the cell as a unity that is defined by its membrane, also determine the domain of possible interactions for the cell. For example, in an interaction with a molecule, the cell’s perspective on this molecule that depends on the way the cell is organized. The network of metabolic processes determines the way, how

this molecule is perceived, and the changes that the interactions with the molecule bring about depend on the cell's organization, which depends again on the history or changes the cell has been through. The cell is structurally coupled with its environment. Therefore, the domain of possible interactions, i.e., interactions that do not lead to a dispersion of the cell, are determined by their organization, i.e., the characteristics of relations between the metabolic processes and how they are embodied, i.e., their specific physical structures. As an autopoietic system the cell brings forth a unity with the help of a semipermeable membrane which distinguishes between selfhood and otherness, between identity and environment; in this case, a "bodily self" emerges due to organizational closure that regulates interactions with the environment.

The presented example of the autonomous systems, the cell, offers a perspective into the realization of this type of organization. There are other types of autonomy realized by other systems such as the nervous system, various multicellular organisms, ecosystems etc. All of these autonomous systems bring forth a unity, some kind of self-hood. Thus, in a living body, the unities of many autonomous systems intersect and couple.

As we will see in the next chapter of this thesis, it is interesting that processes that take place in very simple living organisms, like the cell, actually can also be found on a larger scale in processes of Aneignung.

3.4. Conclusions from the Enactive Approach to Cognition

This chapter has described the enactive approach to cognition as an alternative view to the traditional and functional perspectives on mind. The approach forms itself around the core ideas of *autonomy* and *sense-making* and its sub-ideas. Living organisms, such as the cell, the nervous system or any animal are conceptualized as autonomous systems, which constitute their system's unities with operational closure. In consequence, identities arise, determining what is relevant or not to the system or what might endanger it. Based on this generation of meaning, interactions with the world are regulated by the system. As they are structurally coupled, the interactions mutually transform the system

and the environment. Thus, through the history of structural coupling the system enacts a world of significance, which is the system's environment. The core of cognition is this embodied action of sense-making. In the following, three conclusions can be derived that are important for the exploration of Aneignung from an enactive perspective.

3.4.1. Enactivism rejects mind-world dualism

The demonstrated autonomy perspective on systems supposes that the mind neither responds solely to external environmental states nor does it only satisfy internal needs, but rather, *mind and world dynamically co-emerge in structural coupling*. Therefore, the world cannot be separated from the organism that lives in it, as it stands in relation to its dynamics and organizations and vice versa. This conclusion challenges the assumption of traditional cognitive science that the world is independent or separated from the cognizing agent. Conceiving the relation between the two as one of “mutual-specification or dependent coorigination” (Varela et al., 1991: 150) has far reaching consequences in the analysis of cognitive phenomena: On the basis of the enactive approach to cognition, scientific research can move towards an understanding of a *deep relationality* of mind, world, and body. This relationality implies that cognition in fact has *no specific location*. Rather, cognition as sense-making “belongs to the relational domain, established between the two” (Froese & Paolo, 2011: 7), i.e., between the environment and the agent.

It is important to understand that this relationality addresses all aspects of the enactive approach, including the formation of an identity through structural coupling. As the autonomous system is structurally coupled to its environment, it tries to make sense in an embedded and embodied manner and not independent of the cultural or biological environment. Individuation, i.e., the formation of a self or a unity is thus a product of the relational aspect of the enactive approach.

3.4.2. Active engagements in interactions

Another important aspect of the enactive approach is the recognition of dynamical processes and the activity of autonomous systems as driving factors: Information is not just picked up or even processed by an observer in the

enactive approach, but rather meaning and knowledge are *actively* being generated through the relational domain. In being active and participating in structural coupling with the environment and then making sense of the perturbations for itself, a world is brought forth by the system while it also co-produces itself. An autonomous system's self-determination requires activity instead of passive response. Therefore, the whole framework of enactivism is inherently relational and dynamical as well as activity-based. "An organism dynamically produces and maintains its own organization as an invariant through change, and thereby also brings forth its own domain of interaction" (Thompson, 2007:50).

3.4.3. Experience is central to the enactment of a world

As elaborated before, the authors of the enactive approach aim at developing a cognitive science that integrates and offers place for subjective experience. But what does experience actually mean and how is it generated? Experience in the enactive approach is found in the distinction between world and environment: As the living cognitive organism establishes a perspective on the world through its autonomy, it turns it into an environment, where the organism evaluates the meaning of its surrounding and its parts. In other words: "organisms cast a web of significance of the world" (De Jaegher, 2021: 854). Some interactions in the system's surrounding are experienced as meeting needs, others as challenging constraints and threats or even some are experienced as irrelevant – out of the specific perspective that this living organism has developed through its action of sense-making along the history of structural coupling. Experience refers to these historically *evolved patterns of evaluations* of interactions with the environment. More specifically experience can then be referred to as rules and norms, according to which interactions are evaluated. Thus, experience is a *transformative process* and an aspect of embodied action, that influences the continuity of the autonomous system insofar as it becomes incorporated in the identity, which influences the regulations or interactions.

Autonomy, sense-making, relationality, and experience are some aspects of the enactive approach to cognition that provide an alternative perspective and new tools to develop a better understanding of the concept of Aneignung, which we turn to now in the coming chapter.

4. Enactivism and Aneignung

This chapter aims at integrating the enactivist approach to cognition and the concept of Aneignung to answer the final research questions: What can Aneignung learn from the enactivist approach to cognition and how can enactive concepts characterize Aneignung? The chapter is structured as follows: The first section (4.1.) will provide an overview of the research questions and the respective findings so far. This leads to a concretization of the open research questions regarding the process of Aneignung and a short elaboration of how this chapter will use a conceptual integration to address them.

The second section (4.2.) develops an enactive perspective to the process of Aneignung by *integrating* enactive concepts. We will look at four aspects of the process of Aneignung in detail and develop *propositions* for an enactive approach to cognition. The four aspects characterizing the process are: the *self-directed engagement* of the individual and its *developmental nature*, the notion of *activity* and the *presence of the body* throughout the process. The findings, i.e. the proposed enactive characterization of the process of Aneignung, are summarized in 4.2.6.

In 4.3., the discussion first reflects on this enactive characterization and then goes on to explore what makes Aneignung distinct from other activities, or in other terms: Is every activity Aneignung? On the basis of Deinet's empirical work, four possibly important features will be discussed by drawing upon a wider research connected to the enactive approach to cognition. These include (1) the *degree of autonomy* exhibited throughout an activity of Aneignung, which will be investigated with the help of De Jaegher's ideas on *social cognition* and participatory sense-making; (2) the way *Aneignung can be enabled* and is embedded in a world, where Gibson's concept of *affordances* will help to develop a better idea; (3) how activities of Aneignung can be made distinct from other activities by the fact that they *leave traces* in the environment, which will be considered in the context of structural coupling; and (4) that Aneignung is characterized through entailing *novelty* for the individual engaged in Aneignung, which finds its place in sense-making of the autonomous system. A summary concludes this discussion.

4.1. Overview

To understand at which point of the thesis we have arrived right now, it is useful to look again at the research questions, presented in chapter 1 and review respective answers:

- 1) How is Aneignung currently defined according to Deinet's concept?
- 2) What is the explanatory value of Deinet's concept of Aneignung?
- 3) How can the enactivist approach to cognition support in developing a theoretical foundation of Aneignung?
 - a. What can Aneignung learn from the enactivist approach to cognition?
 - b. How can enactive concepts characterize Aneignung?

So far, we have the following definition of Aneignung, presented in chapter 2: Aneignung is the *self-directed engagement with the individual's environment*, and has a *developmental effect on or is of developmental character for the individual*.

We have seen, that Aneignung can take place in many different environments and that the research tends to exploring these environments of Aneignung regarding their existing/ enabling qualities for Aneignung and how Aneignung takes place there and for whom. As shown in 2.4., this research is (most often) formulated in a practice-near manner, looking at places such as malls, schools, public places etc., and the way that Aneignung shows itself there. The dimensions of Aneignung summarize these concrete, practical activities in 5 groups: extension of motor skills, expansion of space of action, conversion/ repurposing/ altering of existing arrangements, creative achievement or self-directed activity, linking of spaces (cf. 2.4.).

Thus regarding research question 2, the concept can explain well how, i.e., through which type of activities, and where Aneignung takes place and furthermore, how these places need to be adapted to provide improved conditions for Aneignung. However, the theoretical framework given within Deinet's development of the concept of Aneignung cannot sufficiently explain the psychological process of the subject during Aneignung. This was on the one hand shown by the superficial way that the theoretical references are used: For

example, it assumes a dialectic relationship between individual and world without clarifying what the individual is and what the world is. On the other hand, it was analyzed in the reflections on the concept of Aneignung (2.6.), that the concept does not explain *how the self-directed engagement is related to the individual*, and *how and why this engagement has a developmental effect* on the individual. The particular *process* of Aneignung is *not yet specified* and understood.

This important finding offers an interesting entry point for the development of theoretical foundations of Aneignung. Therefore a concretized guiding research question can be formulated at this point: *How can enactive concepts characterize Aneignung as an individual's self-directed involvement with the environment and how and why has this engagement a developmental effect on the individual?*

Naturally, this concretized research question needs to be addressed at the backdrop of the more general research questions, namely how can the enactivist approach to cognition, support in developing a theoretical foundation of Aneignung, what can Aneignung learn from enactivism and how can enactive concepts characterize Aneignung.

For this purpose, the enactive approach to cognition has been introduced in chapter three, where we have learned first and foremost that cognitive living beings are autonomous systems, which continuously engage in processes of self-constitution on various levels and as a result give rise to emergent identities that regulate their system's interactions with the world in regard to the viability of the system. Moreover, the enactive approach views cognition as embodied sense-making.

It is very interesting to explore now, how an enactive perspective can support in developing a theoretical foundation of Aneignung and in particular how enactive concepts can help understand the process of Aneignung, that has remained very vague so far. In the next sections we will do that by *integrating* enactive concepts in elaborating aspects of Aneignung. For that, theoretical and empirical foundations of Aneignung (cf. 2.2. & 2.3.) will be used to inform about

the process of Aneignung when combining it with the ideas of the enactive approach. Through this, it will be explored how the enactive framework fits to the initial foundations of Aneignung and also what an adoption of an enactive theory implies for the enactive approach. Finally, to approach a revised theoretical foundation for Aneignung the present theoretical references will be questioned, and where valuable or suitable, the enactive approach will guide and offer an alternative to the previous theoretical positions. This results in an *enactive characterization of the process of Aneignung*, which lays the basis for a further discussion aiming to specify Aneignung in more detail.

4.2. Conceptual integration: enactive perspective on the process of Aneignung

The conceptual integration will combine the two concepts with each other to answer the concretized research question. First a consideration of the concepts' *explanatory areas* will help to understand the differences and overlaps of the concepts (4.2.1.). Then, different key aspects of the process of Aneignung will be explored and developed by integrating enactive ideas, leading to some propositions that characterize the process of Aneignung in more detail: 4.2.2. focuses on the idea of Aneignung as an individual's self-directed involvement with the environment; 4.2.3. illuminates Aneignung as a human developmental mechanism; 4.2.4. looks at the notion of activity within the concept of Aneignung and 4.2.5. considers the relation between Aneignung and embodied action. Finally, 4.2.6. provides a summary for the elaborated enactive perspective on the process of Aneignung.

4.2.1 Enactivism and Aneignung - explanatory overlap

Aneignung and enactivism are situated in different scientific realms and explain different phenomenon. Nevertheless, the conspectus in 4.1. already indicated that there is an *explanatory overlap* regarding the particular *process* of Aneignung. What is meant with explanatory overlap, is that the enactive approach to cognition can help explain Aneignung, and in particular the process of Aneignung. An overview of the two concepts illustrates this overlap in figure 2 on the following page.

OVERLAP BETWEEN ANEIGNUNG AND ENACTIVISM

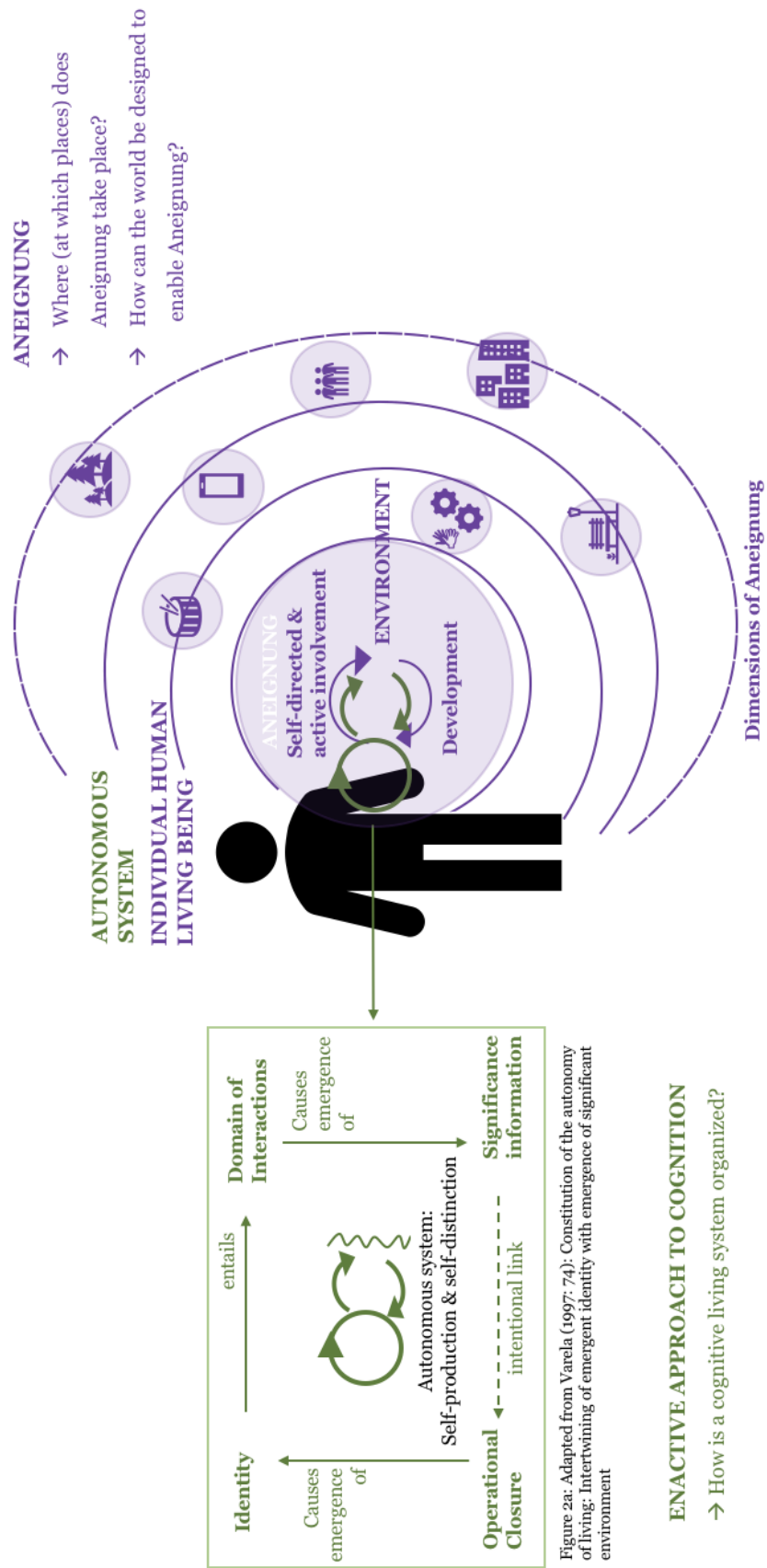


Figure 2a: Adapted from Varela (1997: 74): Constitution of the autonomy of living: Intertwining of emergent identity with emergence of significant environment

Figure 2: Overlap between Aneignung and enactivism

Aneignung, depicted in purple above, is a very particular notion, used mainly within social youth work and increasingly in other domains like educational sciences or city planning. It describes a specific behavior, that is characterized through self-directed active involvement with an environment and its developmental effect on the human (purple arrows at the center). We have seen, that concept of Aneignung characterizes five different themes of this active involvement with an environment, namely the five dimensions of Aneignung (illustrated by the half-circles on the right side to the individual). The key research interest of the community using Aneignung, is to describe *at which specific places* Aneignung takes place in its various dimensions and how places can be designed to enable Aneignung. These places of Aneignung include public spaces, urban structures, social situations, digital as well as analogue spaces, spaces for motorical skills and others (cf. symbols within dimensions in figure 2). Therefore, the explanatory focus, at this point of time, lies on the analysis of empirical, detailed work (cf. section 2.5.).

In contrast, the enactive approach to cognition, depicted in green above, explains the organization of cognitive living systems and *offers a comprehensive, closed theory system*, which is continuously developed further. Research projects of various disciplines use the key concepts of enactivism to explain a specific phenomenon. Central to the enactive approach is the idea of a living organism as a self-organized autonomous system, that is engaged in self-production and self-distinction as it couples with the environment or other autonomous systems based on its need to self-sustain; this is symbolized by the green circle with the arrows reaching out to the environment in the middle of figure 2a²⁶. Figure 3a illustrates this process of the constitution of autonomy for a living system in more detail: The operational closure of an autonomous system “causes emergence of” an identity, that provides a perspective on the environment and thus determines or “entails” a domain of interactions (Varela, 1997: 74). Through sense-making in interacting with the environment, significance or meaning is brought forth by the living autonomous system, which is linked to the operational closure of the system (revisit section 3.2. for explanation of concepts).

²⁶ The illustration of an autonomous system is inspired by De Jaegher (2015).

The *overlap* of the two concepts is right at the center of the image, where the process of Aneignung is at the moment characterized only through self-directed active involvement (*eigentätige Auseinandersetzung*) and its developmental effect on the individual. It is unclear how exactly this process is shaped, and how then individual and world are intertwined. The theoretical references of Deinet's concept to explain this process are the assumptions of a materialistic-dialectical unity and interiorization. Dialectical materialism assumes a reciprocal influence and deep entanglement between humans and nature. Interiorization describes that external processes are transitioned into internal mental images. Both references are not sufficient to explain how the process of Aneignung actually takes place, how it is related to the human individual and the world. But, as we have seen, the enactive approach offers an *explanatory perspective* on what happens at the limen between individual and world, and how both come about; the overlap exemplified with the green circle at the centre, that overlaps with the bright-purple colored phenomenon of Aneignung.

Based on this explanatory overlap, we can now start to develop an understanding of the process of Aneignung with the enactive approach to cognition in the next sections. To do so, the two main characteristics of the process will be treated separately. First, the individual's self-directed active involvement with the environment will be examined, followed by the feature of development. In addition to this section, the notion of activity, central to Aneignung will be observed from an enactive perspective. This leads to the final paragraph of this section on Aneignung and embodiment/ embodied action.

4.2.2 Aneignung as ,eigentätige Auseinandersetzung‘

Aneignung is defined in German as “eigentätige Auseinandersetzung mit der Umwelt”, and has so far been translated into self-directed and active involvement with the environment. Thus, Aneignung is first and foremost denoted to individual's involvement with the environment, and “eigentätig” explains what type of involvement that is. In relation to enactivism, it makes sense to have a look at the German original again: The prefix “Eigen-“ is

commonly adopted in English²⁷, literally translates to “self-“ and describes that it is “of oneself, as in self-made”²⁸. An individual’s “eigentätig(keit)” therefore means that the *activity is inherent or proper to the individual, it is self-made*. In other terms, this means that the planning and the carrying out of an activity are both directed by the same individual, instead of an external input directing the activity. It follows that Aneignung is characterized as an Auseinandersetzung, i.e. involvement, with the environment that is in some way made by the individual itself and it is expressed as an activity. How can the activity be ‘self-made’?

This idea resonates deeply with the enactivist idea of the ‘involvement’ of an autonomous system with its environment.²⁹ An autonomous system is ‘involved’ with its environment in such a way that it actively regulates its interactions with it – *to sustain and produce its own identity*. Remember that autonomy literally means the capacity of specifying one’s own laws as well as defining what is part of it and what is not part of it, along the principles of operational closure. The autonomous system acts in terms of its own autonomy, its own ‘interests’, needs and constraints. Consequently, the activity can be seen as “self-made” or “eigen” to the autonomous system, contrasting e.g. activity that is other-governed or heteronomous, or where the planning and the execution of the activity are separated. Thus, Eigentätigkeit can be understood in terms of the active regulations of an autonomous system when it interacts with the world. The activity of the individual living being is ‘eigen’ in the sense, that it is aiming at sustaining and constructing itself as a self-organizing system through its interactions. Therefore, the individual’s eigentätige Auseinandersetzung is guided by the way interactions with the environment facilitate or hinder *self-individuation*. In consequence, we can say now that when individuals engage in Aneignung, *they actively regulate their interactions with the environment to sustain and produce their own identity on some level of self-individuation*.

²⁷ Cf. https://en.wiktionary.org/wiki/Category:English_terms_prefixed_with_eigen- for an overview.

²⁸ Cf. <https://dictionary.cambridge.org/dictionary/dutch-english/eigen>

²⁹ Note, that the prefix “Eigen-“ is not new in the context of the enactive approach: Varela speaks of Eigenbehaviour to formalize organizational closure within an algebraic framework (Varela, 1981). In addition, Luhmann’s systems theory which was inspired by Varela’s work uses ‘Eigenlogik’ to describe autopoiesis for organizational or social systems (e.g. Luhmann, 2000).

Proposition 1: When individuals engage in Aneignung as “eigentätige Auseinandersetzung mit der Umwelt”, they actively regulate their interactions with the environment to sustain and produce their own identity on some level of self-individuation.

4.2.3 Aneignung as a human developmental mechanism

The second main characteristics of Aneignung is that it is *developmental*, that the activity of Aneignung is a central developmental mechanism of humans. Rolff describes that the activity of Aneignung generates consciousness and objects and symbols receive meaning and sense (Rolff, 1985 in Deinet, 2005).³⁰ What can be learned in this regard from the enactive approach to cognition?

For the moment, two perspectives of developmental character can be identified based on the elaborations made above on the enactive approach of cognition: Firstly, the interactions of an autonomous system with the world bring forth meaning and thus transform the world into an environment for the system. Throughout the interactions, a system’s identity is engaged in constituting a world of significance for itself, i.e., it engages in sense-making by evaluating and creating meaning. This creation and appreciation of meaning is relative to the identity in its relation with the environment, it is enacted. The process of sense-making points to development because *something novel and meaningful is created through the interactions* for the system. *The system could be understood as developing insofar as it actively generates meaning and knowledge through the relational domain.* From this perspective, Aneignung understood as the active regulation of interaction in terms of self-constitution is developmental activity because the perspective of the identity on the environment grows with increased meaning.

Second, we know from the idea of structural coupling that system and environment *influence or structurally change each other*, without disintegrating the identity. From this perspective, *Aneignung is developmental*

³⁰ "Aneignung ist mithin eine Tätigkeit; sie ist immer aktiv in dem Sinne, als sie aus der Auseinandersetzung des Subjekts mit der materiellen und symbolischen Kultur entsteht. Die Umwelt wird vom Kinde nicht passiv rezipiert, sondern verarbeitet. Aus der Aneignungstätigkeit entsteht Bewusstsein und erhalten Gegenstände und Symbolisierungen ihren Sinn und ihre Bedeutung" (Rolff 1985: 171).

because the system is structurally transformed through its interactions with the environment. Maturana emphasizes: “If a living system enters into a cognitive interaction, its internal state is changed in a manner relevant to its maintenance, and it enters into a new interaction without loss of its identity” (Maturana & Varela, 1980: 13). In addition, the environment also changes during the interactions with the system – *coupling is dialogic* (Varela, 1997). Combining both views, Aneignung, as the (actively regulated) interaction between environment and system, has a developmental effect on the system because new meaning is generated through sense-making and because the interactions lead to (inner) structural changes in the system.

In general, this fits with the notion of development described above, i.e. objects receive meaning and sense from the activity. However it should be emphasized that the enactive approach really moves the generation of meaning and the source of structural changes into the *relational domain between environment and system*. This differs from Deinet’s conceptualization of Aneignung insofar as the references seem to take a more objectivist stance, where concepts like objectification describes that human’s skills and capacities are manifested in objects which need to be appropriated, thus creating a world that is filled with objects that have an objective meaning “inside of them”. Yet, for both concepts, activity is the main mediating category. Thus from the loosely defined theoretical foundation it can be assumed that Aneignung only loosely subscribed to objectivism. With the help of the enactive approach, the process of Aneignung can now be understood from a relational perspective, i.e. situating the development of the identity in the relation between environment and system. Thus, a second proposition can follow:

Proposition 2: Aneignung is development for the system because its interactions with the environment are (1) sense-making, which generates new meaning, and (2) structural coupling leads to structural changes of the system.

The two main characteristics of Aneignung, namely “eigentätigkeit” and development, have been analyzed from an enactive perspective. Figure 3 illustrates the overlaps between the characteristics of the process and the enactive approach.

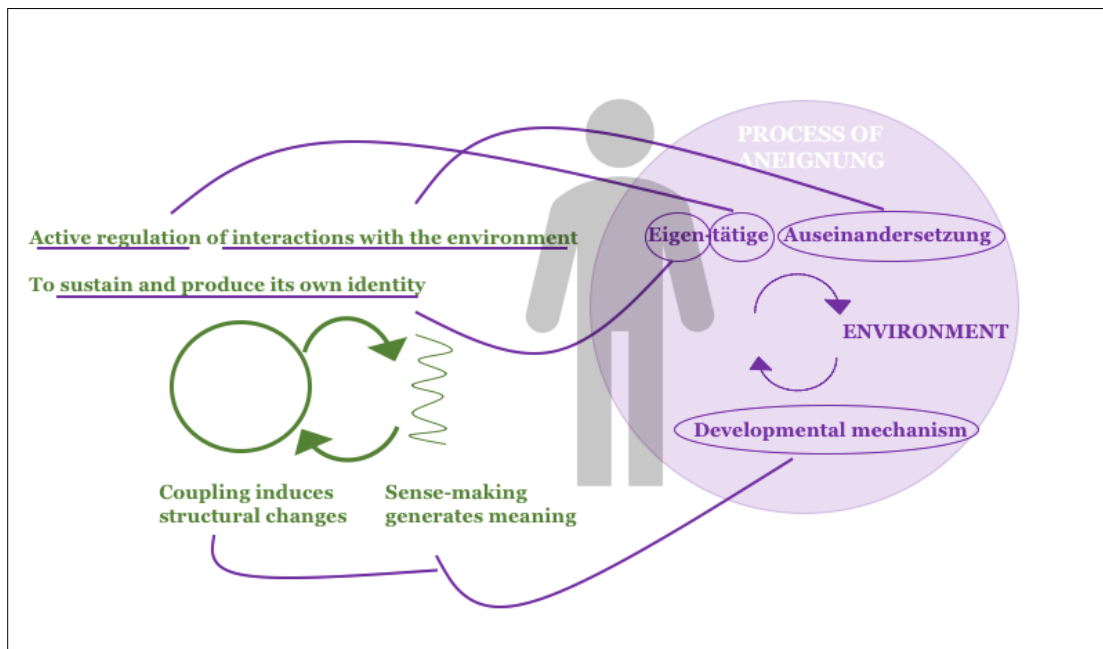


Figure 3: Characteristics of the process of Aneignung from an enactive view

From the enactive view, we have learned that in the process of Aneignung, individuals actually engage in the active regulations of their interactions with the environment driven by their interest in self-individuation. Aneignung can be “eigen” in so far, as the individual’s interactions with an environment are regulated in regard to its own viability. We have also learned that the process of Aneignung can be understood as a development mechanism because novel meaning is generated through sense-making and when environment and individual couple, the structures of the system’s are changed, i.e. developed.

4.2.4 Aneignung and Activity

The notion of activity is indispensable for the understanding of the process of Aneignung, and thus worth further examination. The concept of Aneignung is oriented towards the activity of an individual, as emphasized by the notion of ‘activity theory’ for related concepts originating from the cultural-historical school of thought (cf. section 2.3.1.). For Aneignung, activity is the way humans encounter their environment and through which they develop themselves. The empirical references show, that Deinet (like most research contributions) is

concerned with certain types of behaviour and observes the “quality” of activities in regard to their potential of Aneignung. In addition, the dimensions of Aneignung are presented as types of activity, such as the practice of newly acquired motor skills in other circumstances (cf. 2.4.1). Regarding theoretical references, Oehme (2004) formulates Leontjew’s view that to engage in Aneignung of some object in the environment, humans must perform some cognitive or practical activity. In turn, activity objectifies skills and capacities into the environment and thus makes them available for further Aneignung.³¹ Let’s revisit the understanding of activity in the enactive approach to see whether it is compatible with Aneignung in this regard, and further to understand how activity in Aneignung can be contextualized better. For enactivism, activity is the main driver, that allows for an autonomous system to maintain its identity: The organism is seen as an autonomous active agent that keeps defining itself as a unity through being active in an environment, that co-emerges from this action of self-distinction. Activity is the central source of self-individuation and cognition is sense-making in interaction that leads to the distinction of the self from the environment. Cognition is the *enaction* of a meaningful world, and cognition and activity cannot be separated. Thompson emphasizes this by saying that

“the organism’s “concern”, its “natural purpose”, is to keep on going, to continue living, to affirm and reaffirm itself in the face of imminent not-being. Incessant material turnover and exchange with the environment is both a reason for this concern and the only way to meet it” (Thompson, 2007: 153).

In both concepts, activity is what ‘relates’ the system or the individual to the world. However, in the case of Aneignung, activity has theoretically been

³¹ „Im Prinzip ist die gesamte menschliche Umwelt eine "Welt gesellschaftlicher Gegenstände" (1973: 281), die durch menschliche Tätigkeit geformt wurde. (...) Um diese spezifisch menschliche Qualität eines Gegenstandes zu begreifen, muss jeder Mensch an ihm "eine praktische oder kognitive Tätigkeit vollziehen", die bspw. der im Löffel "verkörperten menschlichen Tätigkeit *adäquat* (obwohl natürlich mit ihr nicht identisch) ist" (Leontjew 1973: 281; emphasis in original.)“ (Oehme, 2004: 209).

understood as some type of vehicle, through which the external world, nonetheless dialogically related to the individual, enters from an outside the internal realm of the individual. In addition, the concept makes a distinction between cognitive and practical activity. In empirical research of Aneignung, this distinction appears by evaluating what has been learned, or what type of development has been made by the individual as “a result” of some activity, but not inherently connected to it.

This conception can be revised and developed with the enactive approach, where activity is not bringing the outside world into the inside realm, but it is inherently *relational* – the ‘inside’, i.e., the system’s demarcation, and the ‘outside’, i.e., the environment to the system co-emerge from the sense-making activity of a system (Thompson, 2007). In addition, enactivism uses the notion action “to emphasize (...) that sensory and motor processes, perception and action, are fundamentally inseparable in lived cognition. Indeed, the two are not merely contingently linked in individuals; they have also evolved together” (Varela et al., 2016: 173). For the process of Aneignung this means that the notion of activity is situated in the relational domain – it relates the individual to the world in such a way that through the individual’s activity both are continuously brought forth for the individual. This can be compatible with the emphasis on activity for empirical research of Aneignung: In trying to understand an individual’s activity of Aneignung, the question from the enactive perspective is regarding the organization and process of self-individuation of a system. Hence, from an enactive perspective, activity is inherently relational and the enaction of a meaningful world and simultaneously the way how the system distincts itself from the environment again and again. Cognitive and practical activity are not made distinct here, because cognition is embodied or, in other words, sense-making is a bodily process and thus body and cognition are constitutive of each other. Two propositions for the concept of Aneignung can be derived from this:

Proposition 3: Activity as the central category for the concept of Aneignung is inherently relational.
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Proposition 4: Activity is not either cognitive or practical, but every activity is cognition.
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4.2.5 Aneignung and embodied action

Proposition 3 has described that the individual's identity and its environment co-emerge through the activity of the system. The enactive approach emphasizes that this activity is taking place in a body and with a body or in other words: that the way the identity and the environment are constituted depends on the ways of having a body with different sensorimotor capabilities and "that these individual sensorimotor capacities are embedded in a more encompassing biological, psychological and cultural context" (Varela et al., 2016: 173). In short, action is embodied and embedded. This implies for Aneignung the presence of the body as another central category of analysis: The process of Aneignung is *eigentätige Auseinandersetzung* with the world *with a body*: Everything experienced is experienced with a body and its ways and therefore research on Aneignung should consider the subjective experience of a body.

Proposition 5: Activities of Aneignung are always embodied.

4.2.6 Summary

This section has worked out an understanding of how the concept of Aneignung can be characterized with the enactive approach regarding the particular process of Aneignung. Both traits of the process of Aneignung, namely the "*eigentätige Auseinandersetzung mit der Umwelt*" as well as its developmental effect, have been explored resulting in four propositions. Therefore an initial answer to the concretized research question - *How can enactive concepts characterize Aneignung as an individual's self-directed involvement with the environment and how and why has this engagement a developmental effect on the individual?* - can be proposed in the following way:

From the perspective of the enactive approach to cognition, the characterization of Aneignung as an individual's self-directed involvement with the environment can be explained by starting with an understanding that the activity of the individual is an activity of an autonomous system. Therefore the individual's activity is "eigen" or self-directed in the sense that the guiding concern of the activity is the viability of the system at stake: The activity is the active regulation of the system's interactions with the world to ensure the continuous self-

production and self-distinction of the system. The domain of possible interactions is given by the perspective the emergent identity has on the world. This activity, i.e., the active regulation of the interactions with the world, can be framed as a development for the individual, because through interacting with the world, it makes sense of it and generates meaning – it constitutes an environment full of meaning for itself, and simultaneously redefines its own demarcations. This action is inherently developmental because it is directed to the continuation of life and brings with it a recurring unfolding of itself. A second interpretation of development was defined in the case of structural coupling: Structural coupling describes that a structural congruence has developed from recurrent interactions between a system and another system or its environment over time. The development of structural congruence implies structural changes of the system, thus a system develops in the sense that its inner structure evolves through the coupling with the environment. In addition, an enactive perspective on the notion of activity further developed the understanding of the process of Aneignung: Instead of seeing activity as the vehicle through which the external world is taken in by the individual, it was shown that a system's activity is actually inherently relational as it brings forth the world and the system through sense-making. Furthermore, from an enactive perspective, activity is embodied cognition.

4.3 Discussion

The above presented answer to the concretized research question characterizes the process of Aneignung with the help of the enactive approach to cognition. The proposed characterization of the process also offers a good base to start a discussion regarding the further development of an enactive theoretical foundation of Aneignung.

One key issue that arises from the upper characterization of the process of Aneignung is the question, *whether every activity is Aneignung*, or *what makes Aneignung special*, how is Aneignung distinct from other activity? These questions will be leading through discussion of four central themes of Aneignung that have not yet found their expression in the present enactive

characterization. The discussion offers possible specifications of these themes from an enactive perspective and therefore the four discussion points include: (1) Degrees of autonomy in Aneignung and social interactions, (2) the structuring of a world enabling Aneignung and affordances, (3) the individual's engraving into the environment and structural coupling, and (4) the aspect of novelty within the concept of Aneignung. The discussion is concluded with a summary.

4.3.1 Is every activity Aneignung?

The above examination of the category activity has already indicated an ambiguity of the process' characterization at this stage: For Deinet, not every activity is considered as Aneignung. However, the enactive characterization of the process of Aneignung does not specify if activity is Aneignung or not, because it tells us mostly how the process of Aneignung can be self-directed and of developmental nature. It provides an enactive perspective of what happens when Aneignung takes place, but this does not yet make it *distinct* from other activities.

To develop the present idea further and specify what is and what is not Aneignung in enactive terms, it is useful to turn to the empirical foundations of Deinet's work: Deinet observes that there are gradients in '*the quality*' of Aneignung in activities, mainly regarding the factor of 'eigen-ness', or, in enactive terms, of autonomy. This could mean, that the more autonomous the individual is in its activity, the higher the quality of Aneignung.

"Inwieweit Aneignung als Eigentätigkeit stattfinden kann, hängt wesentlich von den äußeren Bedingungen und Möglichkeiten der Aneignungstätigkeit ab. (...) Eigentätigkeit ist also die intensivste Form der Aneignung" (Deinet, 1992: 55).³² Two ideas can be taken away from this quote. Firstly, it can be proposed that *the degree of autonomy* in the involvement with the world, or how "much" autonomy is possible, specifies Aneignung. And second, the *structure of the world* that the individual encounters, and where its activities can take place, influences the possibilities of Aneignung. Two other themes, that have been

³² "The extent to which appropriation (Aneignung) can take place as an activity of one's own (Eigentätigkeit) depends essentially on the external conditions and possibilities of the activity of appropriation (Aneignung). Self-directed activity (Eigentätigkeit) is therefore the most intensive form of appropriation" (Deinet, 1992: 55; translation by author).

emphasized by Deinet, are that *Aneignung* often *changes the existing environment* and that activities of *Aneignung* are *novel* to the individual. The coming sections will discuss these four themes, that can further specify *Aneignung*.

4.3.2 Degrees of autonomy: Social interactions

In order to discuss the idea that degrees of autonomy in activities of *Aneignung* specify or partly determine whether *Aneignung* takes place, we turn to the enactive approach and find out what it has to offer to explain degrees of autonomy. For the present purpose, elaborations on *social cognition* by De Jaegher and Di Paolo will be referenced.

Following the enactive approach, the autonomy of an agent cannot be seen as separated from its environment, but rather the autonomous system maintains and constitutes its autonomy, i.e., its internal self-organization, in interaction with its environment or other social beings. To self-sustain, it regulates its interactions based on a perspective on the world. We have seen that the identity of an autonomous system gives the point of reference for a possible domain of interaction, and that possible interactions are interactions which will not lead to the diffusion of the system.

Research on social cognition and in particular the work of De Jaegher and Di Paolo and their notion of participatory sense-making (De Jaegher & Di Paolo, 2007) offer an interesting perspective on degrees of autonomy. The authors distinguish between agent-agent interactions and agent-environment interactions (Brancazio, 2020), and their definition of *social interactions* in relation to degrees of autonomy will be referenced here to develop this discussion:

“Social interaction: a mutually engaged co-regulated coupling between at least two autonomous agents, where (a) the co-regulation and the coupling mutually affect each other, and constitute a self-sustaining organization in the domain of relational dynamics, and (b) the autonomy of the agents involved is not destroyed, although its scope may be augmented or reduced” (originally in De Jaegher, et al. 2010: 442 & adapted in Gallagher, 2017: 134; emphasis in original).

In this quote, (b) states that within the domain of possible interactions, there can be interactions that increase and others that decrease the autonomy of the agents involved. Point (a) gives insight into the reason for these changes of the

involved agents: In social interactions there is a co-regulated coupling that allows for an emergence of a self-sustaining organization, i.e., an operational closure – thus the *interaction also has its own autonomy*. Di Paolo and de Jaegher call this *participatory sense-making* (De Jaegher & Di Paolo, 2007). The authors argue that this autonomy of the interaction can enable, moderate and constrain the individual sense-making processes (De Jaegher et al., 2010). Thus the autonomy of the individual is entwined with the autonomy of the social interaction:

“The autonomy of the individual depends on the autonomy of interaction – that is, to the extent that the individual can participate in the autonomy of interaction, there is the possibility of an increase or decrease of his or her autonomy. Individual autonomy varies, positively or negatively, in relation to the individuals positive or negative interactions” (Gallagher, 2017: 136).

From this we can propose that activities are more likely to be Aneignung, if the interaction *increases the individual's autonomy* or at least does not decrease it. For example, the autonomy dynamics of an interaction are also influenced by social categories such as role or power as well as the history of interactions between two individuals. The traditional role of the teacher in school is understood as someone superior to the pupil in regard to knowledge and power. As teacher and pupil couple, this distribution of roles decreases the autonomy of the pupil, and possibly impairing the possibility for self-directed Aneignung during the interaction. In contrast, the role of the teacher can be made explicit as someone that is equal to the pupil, with the “same amount of voice”, jointly embarking on the exploration of a problem, while their difference between formal “knowledge” is minor because the individual experience and knowledge of the pupil is equally respected. In this way, the interaction allows for greater autonomy of the pupil, while it actually does not impair the autonomy of the teacher.

An extensive analysis of degrees of autonomy in social interactions goes beyond the scope of this thesis. However the discussion has shown that, in the case of social interactions, the autonomy of the individual is dependent on the autonomy dynamics of the interaction and thus the potential of Aneignung is connected with the social interactions in which the activity takes place. Remember, that social interactions are themselves considered as “spaces” in the

concept of Aneignung, and thus create or disable opportunities for Aneignung. Analyzing these “spaces” as autonomous systems themselves can help to further explore these spaces and the relation between Aneignung, degree of autonomy and social interactions. A sixth proposition can be formulated on the basis of the discussion.

Proposition 6: The autonomy of social interactions influence the possibilities of Aneignung of the autonomous agents involved. The co-regulation of the agents modulates the individual’s autonomy.

4.3.3 The world enables Aneignung: Affordances

We have seen in chapter 2 that the main research body of Aneignung is dedicated to understanding how the world can be structured to enable Aneignung or what environments disable Aneignung: For example, spaces are analyzed regarding their quality and potential for the different dimensions of Aneignung (Deinet, 2014b). Thus, it seems that the way spaces are characterized plays an essential part in specifying whether an activity is Aneignung or not. Let’s try and integrate this general idea, namely that the world influences the possibilities of Aneignung, into the theoretical understanding of Aneignung from an enactive perspective.

The five dimensions of Aneignung describe the themes of activities considered as Aneignung: (1) extension of motor skills, (2) extension of the space of action, (3) repurposing and change of situations and existing arrangements, (4) creative achievement and self-directed activity, and finally (5) linking of spaces. These dimensions are not set in stone, but have developed and have been adapted over time. Research usually evaluates whether places (e.g. shopping malls, schools, streets, etc.) allow for activities of different dimensions to unfold, in order to understand the relation between the world and Aneignung (Deinet & Reutlinger, 2014). To enable Aneignung in the form of extension of motor skills, the world must offer *suitable spaces*: for example a wood-workshop cannot be a multiuse space but should be equipped with the corresponding materials and tools and attract inspirational people and their activities. Simply said, there must be the *possibility* for an extension of a motor skill. This resonates with the notion of *affordances* (Gibson, 1986) from ecological psychology that is increasingly used by enactivists (Brancazio, 2020):

“An affordance (...) is a resource that the environment offers any animal that has the capabilities to perceive and use it. As such, affordances are meaningful to animals: They provide opportunities for particular kinds of behavior. Thus affordances are properties of the environment but taken relative to an animal. (...) Affordances are relations between the abilities of organisms and features of the environment” (Chemero, 2003: 182 pp.).

The view of affordances states that the environment is structured with potentialities that are relative to an individual and connect to the individual's abilities. Examples are the drinkability of a glass with water or opportunities for socializing offered by a public space. For Aneignung as the extension of motor skills to take place, the environment must afford opportunities for engaging in motor skills at different levels of abilities, so that various affordance relations can develop. Affordances differ for the various dimensions of Aneignung. To allow for an extension of the space of action or the conversion of existing arrangements, the environment can be equipped with suitable affordances, like an allowance for open usage or the suspension of participatory limitations such as compulsion to buy. Understanding affordances as relations between the abilities of organisms and features in the environment means that they are subjective structures, and one helpful affordance to one person might be a disabling affordance to another person. Thus affordances can be understood as *indicators of the environment's potential for an individual's Aneignung*. Furthermore, from the empirical research it seems that an environment is enabling Aneignung, the more it allows for the individual to be autonomous: the creation of spaces, freedom and self-determination, distance from the routines and constraints of everyday life, allowing various behaviour (Deinet, 2014b; Deinet et al., 2018). Thus it can be proposed that for Aneignung to take place, the world must be equipped with features that afford the autonomy of the individual, which of course differs from person to person.

Proposition 7: Aneignung can be enabled by a world equipped with features that afford the autonomy of the individual.

4.3.4 Engraving into the environment

Another significant aspect of Aneignung is that it often changes the environment: The third dimension of Aneignung concentrates on Aneignung as the ‘repurposing’ or conversion of the environment and the fourth dimension explores Aneignung as creation or creative achievement of objects, meanings, spaces. Thus, an individual engaged in Aneignung leaves traces in the environment and develops it further regarding its material nature and characteristics and also regarding its meaning, e.g. in the way a particular space is talked about. So, what can be found from an enactive perspective regarding this aspect of Aneignung?

In fact, the enactive characterization of the process of Aneignung inherently includes this aspect, yet it has not been discussed so far. Proposition 1 suggested that when individuals engage in Aneignung they actually actively regulate their interactions with the environment to continue their process of self-individuation. From this understanding it follows that interactions between an individual and another individual or the world take place as structural coupling, where *both* experience internal structural changes. So, in *any case of structural coupling the environment is changed* through the activities of the individual and vice versa. Therefore, an enactive view sees activities of Aneignung as leaving traces or inducing changes in the environment during structural coupling – embodied action changes the environment.

In the case of Aneignung, the ‘degree’ of engraving into the environment is interesting. When individuals engage in Aneignung, they actively change and create new spaces, they convert existing arrangements, they structure the environment according to their own interest and perspective. This can be interpreted as an importance of experiencing self-efficacy in activities of Aneignung as individuals make spaces or artifacts ‘their own’. Another perspective on this specification of Aneignung, is that some dimensions of Aneignung point to the creation of artifacts: the fourth dimension describes activities of Aneignung as creative achievement. For example, this refers to the planning and realization, the creation of objects (e.g. a handmade chair, pottery work, etc.) or any other type of design work.

The relation between human cognition, their action and the environment, and in particular the material world, has been further explored in Lambros Malafouris’ “Material Engagement Theory” (MET), which is closely tied to the

enactive approach to cognition as it approaches the question “How do things shape the mind?” (Malafouris, 2013). At the first glance this resonates with Vygotskij’s initial ideas, that human psychological functions are mediated by tools through Aneignung (cf. 1.3.). While it exceeds the scope of this thesis, it surely would be worthwhile to study Aneignung along the lines of MET within the ‘project’ of an enactive approach to Aneignung.

Within the frame of this discussion, it can now be said, that activities of Aneignung *leave traces* in the environment. This aspect could be considered as an add-on to the second proposition too, where the process of Aneignung was argued to be developmental because of sense-making generating new meaning and structural coupling leading to structural changes of the system (and the environment).

4.3.5 The aspect of novelty

Finally, a last characterization of Aneignung that can further refine the process of Aneignung is the aspect of *novelty*. Most of the dimensions of Aneignung implicitly state that through activities of Aneignung something initially new to the individual becomes familiar: The first dimension (extension of motor skills) indicates that the individual acquires new motor skills. The second dimension is the extension of the space of action, whereby new rooms or unfamiliar places in the city are accessed. The third dimension (repurposing and conversion of existing arrangements and spaces) has an aspect of novelty in it, because through Aneignung of space, the individual discovers and develops new ways of using the space. The fourth dimension groups activities that are creative achievements, where the element of novelty also is encountered through the active creation of the individual. The fifth dimension speaks of activities that create new spaces by linking existing spaces, where spaces do not need to be physically locatable but are defined through the relational arrangements of things and people.

Thus, the aspect of subjective novelty is inherent to activities of Aneignung. This is interesting regarding the developmental aspect of Aneignung from an enactive perspective. The analysis formulated in the second proposition that Aneignung is development for the individual because its interactions with the environment generate new meaning and that structural coupling leads to

structural internal changes of the system. It could be argued now, that Aneignung are activities where the individual encounters something novel and unpredictable and thus it takes place when the autonomous system interacts with a novel environment rather than engages in a well-known interaction or if something novel emerges through interactions.

Proposition 8: Activities of Aneignung implicate an aspect of novelty for the individual.

4.3.6 Summary

The previous sections discussed options for specifying activities of Aneignung in contrast to other activities, and four more propositions were formulated. The first guiding idea was that activities are activities of Aneignung regarding their degree of autonomy. By looking at the nature of interactions, and more specifically social interactions, it has become clear that the autonomy of an individual can be modulated in social interactions due to the autonomy of the interaction itself. Therefore social interactions can hinder or enable the ‘Eigenness’ of an activity of Aneignung. In this case, only social interactions with increased autonomy for the individual of interest can be considered as Aneignung. The autonomy of the interaction and its effect on the autonomy of the individual specifies the activity of Aneignung further. The second guiding idea was that Aneignung cannot take place under all circumstances. Considering the various dimensions of Aneignung and their relation to the environment together with the notion of affordances has shown that for activities to be activities of Aneignung, the environment needs to be equipped with appropriate affordances. It seems that these affordances must again in turn enable the autonomy of the individual agent, rather than disabling it. Then, it was discussed how the enactive approach includes the theme that Aneignung is understood as the changing of the environment. Furthermore, the aspect of novelty was introduced as a key theme for Aneignung, specifying that activities of Aneignung could differ regarding their degree of novelty from other activities. In enactive terms this can be specified by focussing on interactions of an individual that are at first unfamiliar and unpredictable.

This discussion is not exhausting – rather it offers insight into possible themes for the further development of a theoretical foundation. It becomes clear that the enactive approach has much to offer with its elaborations on various phenomena, like social cognition and affordance as well as MET. These topics were now introduced to find out how activities of Aneignung can further be specified. However, the topics Aneignung & social cognition as well as Aneignung & affordance or Aneignung & MET deserve their own research, as much more can be explored for refining a theory of Aneignung.

5. Conclusion and outlook

5.1. Summary

This thesis started from the observation that the notion of Aneignung is a dominating and attractive term mainly within social pedagogy, youth work and education and increasingly also within other areas like urban planning. However, it was shown that the most widely used concept of Aneignung, which was introduced by Ulrich Deinet, needs further theoretical development. In particular, chapter 2 exposed, by exploring the empirical and theoretical references, that the current explanatory value of Aneignung and its research domain lies first and foremost in analyzing where Aneignung can take place, and how it can be enabled; while the understanding of the actual subject-related process of Aneignung remains vaguely defined as the self-directed and active involvement of a human individual with the environment, where Aneignung also is an essential developmental mechanism of humans. Organizing and reviewing the literature on Aneignung also demonstrated that the concept of Aneignung is weak in providing a general theoretical framework and understanding of the empirical observations.

Instead of tackling this theoretical gap by revisiting the original theoretical references of the cultural-historical school, this thesis embarked on an alternative path: It introduced the enactive approach to cognition (in chapter 3) as a theoretical framework, that can provide a novel perspective to the ongoing of Aneignung with its key concepts, such as autonomy and sense-making of cognitive living beings. Thus the main guiding research question of this thesis was “How can the enactive approach to cognition support in developing a theoretical foundation of Aneignung?”

The answer to this question was formulated throughout chapter four: First of all, it was shown that the enactive approach to cognition entails concepts such as autonomy and sense-making to explain how cognitive living beings are entangled with their surrounding world, which is the underlying theme of the process of Aneignung – this was titled the explanatory overlap between

Aneignung and enactivism (cf. figure 3). In consequence, it was possible to develop and address a concretized research question: “How can enactive concepts characterize Aneignung as an individual’s self-directed involvement with the environment and how and why has this engagement a developmental effect on the individual?”

The first main finding was, that the idea of Aneignung as ‘eigentätige Auseinandersetzung’ resonated with the core enactive theme of autonomy. Through integrating the idea of cognitive living beings as autonomous systems that engage in active regulation of interactions with the environment to self-sustain, it was shown that individual’s ‘eigentätige Auseinandersetzung’ is guided by the way interactions with the environment facilitate or hinder self-individuation.

The second main finding developed by incorporating structural coupling and sense-making to understand how Aneignung can be seen as a developmental mechanism of human (cognitive living) beings. Thus, Aneignung was on the one hand understood to have a development effect on the system in terms of structural coupling, where recurrent interactions between a system and environment induce (inner) structural changes in the system. On the other hand, in terms of conceptualizing interactions as sense-making, where new meaning is generated.

With these two findings, an enactive perspective to the key aspects of the process of Aneignung was presented (as illustrated in figure 4). Moreover, this enactive characterization opened the doors to explore further characteristics of Aneignung using enactive concepts and discuss aspects that make activities of Aneignung unique. As a result, six propositions (P) (in addition to the two main findings above) were formulated that characterize Aneignung from an enactive perspective:

P 1: When individuals engage in Aneignung as ‘eigentätige Auseinandersetzung mit der Umwelt’, they actively regulate their interactions with the environment to sustain and produce their own identity on some level of self-individuation.

P 2: Aneignung is development for the system because its interactions with the environment are (1) sense-making, which generates new meaning, and (2) structural coupling leads to structural changes of the system.

P 3: Activity as the central category for the concept of Aneignung is inherently relational.

P 4: Activity is not either cognitive or practical, but every activity is cognition.

P 5: Activities of Aneignung are always embodied.

P 6: The autonomy of social interactions influence the possibilities of Aneignung of the autonomous agents involved. The co-regulation of the agents modulates the individual's autonomy.

P 7: Aneignung can be enabled by a world equipped with features that afford the autonomy of the individual.

P 8: Activities of Aneignung implicate an aspect of novelty for the individual.

The propositions offer an exciting entry point to an enactive approach to Aneignung. Each proposition addresses a different aspect of Aneignung and contributes to the development of a more precise and comprehensive theoretical foundation of Aneignung. Working them out has been an explorative journey through research concerning Aneignung and its theoretical foundation with the help of enactive concepts.

5.2. Conclusions

Based on the propositions some general conclusions regarding the adoption of enactive concepts for the concept of Aneignung can be drawn:

First of all, the interpretation of the process of Aneignung in enactive terms made the notion of Aneignung at all *accessible* to a theoretical development with the enactive approach to cognition. As such it has been shown that combining the enactive approach to cognition and the concept of Aneignung offers a *fruitful ground* to develop theoretical foundations of Aneignung. In particular, enactive concepts can help to understand and formulate the dynamics of the process of Aneignung.

Second, the adoption of enactive terminology and conceptions enable a theoretical grasp of the phenomenon of Aneignung, that provides a basis to

discuss the dynamics of Aneignung *within* a bigger comprehensive and coherent framework and abstracts from the empirical cases. While this thesis focused on the key concepts of enactivism, it has become clear that there is a wide range of connected ideas within the enactive research domain, such as MET, participatory sense-making or affordances, that is useful for characterizing Aneignung.

Third, the enactive approach *clarifies and renews* some basic understanding underlying the concept of Aneignung. From an enactive perspective *individuals are understood as autonomous sense-maker* and Aneignung thus becomes an *activity of sense-making*, i.e. Aneignung is a process that is inherently part of a system's self-individuation. Understanding Aneignung in enactive terms implies to consider that activities of individuals are *meaningful* to them; therefore activities can give insight into the *identity mechanisms* of the individual autonomous system. This view offers the possibility to analyze behaviors of Aneignung in connection to the self-organization of the individual and thus asking (De Jaegher, 2015): Why does something mean something for someone? What is at stake for this individual in the action and situation?

Similarly this view emphasizes the subject-oriented character of Aneignung, meaning that the *subjective perspective* is crucial for understanding Aneignung better. This resonates with the approach of enactive research that emphasizes the importance of subjective experience for the understanding of cognitive phenomenon.

Furthermore, assuming that Aneignung is one of the key developmental mechanisms whilst acknowledging the autonomy of the system, means that the individual is the *agent* of its own development, engaged in self-directed and active Aneignung. This view can have far-reaching consequences for educational settings, because it requires to give the control over the learning process back to the individual instead of the teacher. Educating institutions, with all their spaces and people, can become enablers of Aneignung, creating again and again arenas for Aneignung.³³

³³ How this might look like is presented e.g. by Rebeca and Mauricio Wild's project "Pesta" in Ecuador: <https://vimeo.com/4211517> ; <https://www.susiladharma.de/projekte/schulbildung/todo-un-mundo/> or Summerhill School in England: compare e.g. <https://howsummerhillworks.com>

5.3. Outlook

This thesis is the first step in the development of the notion of Aneignung and its theoretical foundation with the help of the enactive approach to cognition. Many different steps can follow as the conclusions above have elaborated the potential of combining the two concepts. Each proposition itself invites for further in-depth research: For example, studies could be conducted on the aspect of embodiment for Aneignung, on degrees of freedom and Aneignung in the context of various social interactions or on the relation between affordances and Aneignung.

To further exploit the potential of the research on Aneignung and enactivism as a whole, it would be very worthwhile to initiate this research in the German language, because there is the biggest audience that would profit from the integration of the enactive approach to cognition into Aneignung.

Furthermore, while the present work is purely theoretical in nature, insofar as it works with text and theory, abstract and analytical, it was shown that a concept of enactive Aneignung is accessible to an empirical level and would benefit from an exchange with concrete living experience. Therefore further research should introduce empirical studies and even a phenomenological account of Aneignung could be introduced to support the theoretical foundations and include the subjective perspective in the process of Aneignung. This will be particularly interesting, as we have seen that Aneignung is a very context-dependent and person-dependent phenomenon as a process of sense-making for self-individuation: It depends on the environmental and interactional context whether Aneignung can take place, and it also depends on the agent, its embodiment and history of interactions whether certain situations enable Aneignung. The enactive approach to cognition and its connected research fields are definitely well equipped and, as we have seen, particularly suitable for this complexity of Aneignung as an educational revolutionizing term.

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Appendix

Abstract in English

In recent years, the term "Aneignung" (loosely defined as: appropriation) has been increasingly used by educators, social workers, and even urban planners as a substitute for education or learning in German-language discourse. Nevertheless, it is not always clear what is meant by it. The most frequently cited concept was developed by Ulrich Deinet and defines Aneignung as the self-acting engagement with the environment, whereby Aneignung is described as an essential human developmental mechanism. This master's thesis points out that this concept lacks a theoretical foundation, especially with regard to the concrete, subject-related process of Aneignung; and undertakes a renewal and development of this foundation with the help of the enactive approach to cognition, which can be traced back to Varela, Thompson & Rosch. For this, enactive key concepts such as autonomy and sense-making are introduced and integrated in the concept of Aneignung to explain properties of Aneignung. As a consequence, an enactive perspective on the process of Aneignung can be elaborated: Activities of Aneignung are now understood as activities of sense-making in which the individual is engaged as an autonomous system for self-sustaining. Through sense-making and structural couplings with the environment, Aneignung for the individual is also development. Other aspects of Aneignung are explored using enactive concepts and formulated into 8 propositions. An active approach to Aneignung proves to be extremely helpful in order to better fathom and theoretically strengthen the concept of Aneignung, so that it can be applied more soundly in the multifaceted contexts between pedagogy, urban planning and social work. This work offers many starting points for further research, both theoretical and empirical.

Abstract auf Deutsch

In den letzten Jahren wurde der Begriff "Aneignung" zunehmend von Pädagog:Innen, Sozialarbeiter:Innen und auch Stadtplaner:Innen als Ersatz für Bildung oder Lernen im deutschsprachigen Diskurs genutzt. Dennoch ist nicht immer klar, was damit gemeint wird. Das am meisten zitierte Konzept wurde erarbeitet von Ulrich Deinet und definiert Aneignung als die eigentätige Auseinandersetzung mit der Umwelt, wobei Aneignung als wesentlicher menschlicher Entwicklungsmechanismus beschrieben wird. Die vorliegende Masterthesis arbeitet heraus, dass es diesem Konzept an einer theoretischen Fundierung mangelt, insbesondere hinsichtlich des konkreten, auf das Subjekt bezogenen Prozess der Aneignung; und nimmt eine Erneuerung und Entwicklung dieser Fundierung mithilfe des Enaktivismus (enactive approach to cognition) vor, das auf Varela, Thompson & Rosch zurückzuführen ist. Hierfür werden enaktive Schlüsselkonzepte wie autonomy und sense-making

vorgestellt und durch eine Integration in das Konzept der Aneignung zur Erklärung von Eigenschaften von Aneignung benutzt. Als Folge kann eine enaktive Perspektive auf den Prozess der Aneignung erarbeitet werden: Aneignungstätigkeiten werden nun als Tätigkeiten von sense-making verstanden, in die das Individuum als autonomes System zur Selbsterhaltung engagiert ist. Durch sense-making und strukturellen Kupplungen mit seiner:ihrer Umwelt ist Aneignung für das Individuum auch Entwicklung. Weitere Aspekte von Aneignung werden mithilfe von enaktiver Konzepte erforscht und insgesamt acht Thesen formuliert. Ein enaktiver Ansatz zu Aneignung erweist sich als äußerst hilfreich um Aneignung besser zu ergründen und theoretisch zu stärken, sodass Aneignung in den vielseitigen Kontexten zwischen Pädagogik, Stadtplanung und Sozialer Arbeit fundierter genutzt werden kann. Diese Arbeit bietet viele Ansatzpunkte zu weiteren Forschungsvorhaben, theoretischer und auch empirischer Natur.