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What Is Learning?

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Abstract

Learning appears to be a basic concept in educational science and psychology. In recent decades, the interest in learning has been growing in these disciplines. However, despite its conceptual prevalence, a closer look at the literature reveals the ambivalence of the learning concept. The main objective of this work is to contribute to the conceptual clarification of learning. Based on a scoping review of learning definitions stemming from the disciplines of educational science, philosophy and psychology a constructive analysis of the concept of learning was made to systematically analyze the term from an integrative perspective of behavioral sciences and humanities. The enriched understanding of learning gained in this study has interesting implications for learning research and practice of education: Promoting knowledge acquisition by reasoning should be at the core of education.

Keywords

Learning, Behavior, Knowledge, Conceptual Analysis, Constructive Analysis, Definition, Learning Theory, Cognitivism, Behaviorism, Constructivism, Reasoning

1. Introduction

Research on learning has been of interest for a considerable period, ranging from the last quarter of the 19th century with the early studies on learning and memory conducted by German psychologist Ebbinghaus (1885), until the recent contributions of the Dutch educational scientist Biesta (2018: p. 245) on the *learnification* of educational language[1]. Learning is a phenomenon that is influenced by a complex interplay of factors such as physiological, environmental, cognitive, emotional, motivational, and social factors (Domsch, 2014).

As noted by the American psychologist Lachman (1997), and referred to by

[1]The "learnification" of educational discourse makes it difficult to ask crucial educational questions.

the Belgian psychologists De Hower & Moors (2013), most textbook definitions of learning describe learning as a change in behavior resulting from experience or practice. Thus, according to these types of functional definitions, learning is an effect of experience on behavior (De Hower & Moors, 2013). One of the most influential definitions of this type was developed by the American psychologists Hilgard & Bower (1975: p. 17). "*L*earning refers to the relatively permanent change in a subject's behavior to a given situation brought about by his (or her) repeated experiences in that situation, provided that the behavior change cannot be explained on the basis of native response tendencies, maturation, or temporary states of the subject (e.g., fatigue, drugs, etc.)". Guy Lefrancois (Lefrancois, 1986), a Canadian learning researcher, defined learning as "all behavioral changes that come about as a result of experience. Such changes include not only the acquisition of new information, but also changes in behavior whose causes are unknown" (Lefrancois, 1986: p. 3). In this definition, "…changes (are) excluded that arise due to maturation processes (genetically predetermined changes), artificial chemical changes such as, e.g., consequences of drug consumption or temporary changes, e.g., due to fatigue" (Lefrancois, 1986: pp. 3f.).

In a recent response to Domjan (2010)'s and Lachman (1997)'s view that a functional definition of learning is over-inclusive, De Hower & Moors (2013: p. 9) define learning "as *changes in the behavior of an organism that are the result of regularities in the environment of that organism*" (italics in original—K.S.). Like these definitions, Kolb & Whishaw (2014) define learning as a relatively permanent change due to experience, and Mazur (2013: p. 6) "as a process of change that occurs as a result of an individual's experience". In a similar direction is the definition by Rescorla (1988: p. 329): He states that learning "…is a process by which an organism benefits from experience so that its future behaviour is better adapted to its environment". In opposition to this normative definition, Hall (2003) defines the change caused by the process in a neutral manner: Learning is a process "by which an animal (human or non-human) interacts with its environment and becomes changed by this experience so that its subsequent behaviour is modified" (Hall, 2003: p. 837).

Definitions that besides the change in behavior also characterize behavioral potential are presented by American psychologist Zimbardo (1992), and Anderson (1995), for example: Zimbardo defines learning "as a process…, that leads to relatively stable changes in behavior or in behavioral potential and builds on experience (Zimbardo, 1992: p. 227)." Anderson (1995)'s definition reads as follows; "something is learning if and only if it is a 'process by which relatively permanent changes occur in behavioral potential as a result of experience'" (Anderson, 1995: pp. 4f.).

As a reaction to criticism of these functional definitions, the American psychologist Domjan (2010) defines learning as "an enduring change in the *mechanisms* of behavior involving specific stimuli and/or responses that results

from prior experience with similar stimuli and responses" (p. 27). In line with this view of learning, which includes underlying behavioral mechanisms, Lachman (1997: p. 479) understands learning as "the process by which a relatively stable modification in stimuli-response relations develops as a consequence of functional environmental interaction via the senses".

From the systems perspective, Langley & Simon (1981: p. 367) define learning as "any process that modifies a system so as to improve, more or less irreversibly, its subsequent performance of the same task or of tasks drawn from the same population". The system referred to is an individual's information processing system (Langley & Simon, 1981).

Following Meyer-Drawe (2003), who takes a phenomenological perspective on learning, learning cannot be initiated by an intentional act. "Rather it proves to be like a kind of awakening. To begin to see something in a different light is an occurrence in which one is involved in the sense that it happens to or befalls her (Meyer-Drawe, 2003: p. 505)."

In contrast to this view, the American philosopher of education Steiner (1988) characterizes learning by consciousness and intentionality. Unintended learning is a phenomenon in the physical and biological senses. If there is no consciousness, learning is not a phenomenon in the human sense. Learning is defined as the process of intentional change in a psychic state (Steiner, 1988).

Mezirow (2000: p. 5) who was a Professor of adult and continuing education understands learning from a constructivist perspective "as the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience as a guide to future action."

Based on our initial presentation of learning definitions, it becomes clear that the different definitions of learning are characterized by controversy, ambiguity, and contradiction (Barron et al., 2015; Schaller, 2012): For example, learning is understood as "learning as change in behavior", "learning as change in behavior or behavioral potential", "learning as change in the behavioral mechanisms", "learning as change in the processing of information", "learning as system change", "learning as construction", "learning as a phenomenon" and "learning as action".

One result of the many different learning definitions is that quite a few authors criticize the concept's ambivalence (Meyer-Drawe, 2003). For example, Meyer-Drawe (2003: p. 505) objects that the word learning is widely used, but lacks a clear-cut meaning. Schaller (2012: p. 26) also regards the concept of learning as a theory-dependent construct, and Barron et al. (2015) as discipline-dependent.

The concept's ambiguity is not only problematic from a scientific perspective, but also from the perspective of educational practice as it makes scientific communication and evaluation of learning difficult. Despite more than 50 years of intensive research in the field of learning, only a few studies offer conceptual analyses on the topic (Barron et al., 2015; Cason, 1937; De Hower

& Moors, 2013; Nedenskov Petersen, et al., 2016). However, as far as I know, there are no scoping reviews that offer concept analyses of the term's many scientific uses.

With this study, I want to contribute to the research of defining the concept of learning by systematically analyzing the term from an integrative perspective of behavioral sciences and humanities. Following McClellan (1982: p. 92) "the concept of 'learning' employed by psychology has been of limited utility in advancing the applied science of education". The purpose of the present study is to increase our understanding of learning. The research goal is to determine what the concept of learning means.

2. Method

A scoping review is conducted in order to analyze the definitions of learning. As part of the scoping review, the *Constructive Analysis* (Kosterec, 2016: p. 222) is employed to clarify the concept of learning. By means of *Constructive Analysis*, I postulate a new relation stating that "some already known relation holds among previously unrelated parts of the language" (Kosterec, 2016: p. 222).

To conduct the scoping review, I used databases of the disciplines of educational science and the related sciences of psychology and philosophy. I selected the ERIC (https://eric.ed.gov), PubPsych https://pubpsych.de/), FID (Philosophie https://philportal.de/), PhilPapers (https://philpapers.org) and EBSCO host Library (www.ebescohost.com). For the EBSCO host library, I chose the databases education, philosophy/religion, and psychology and sociology.

According to Kosterec (2016: p. 223), *Constructive Analysis* consists of the following sub-processes:

- Specifying the initial conceptual background CB;
- Formulating the conceptual problem P;
- Stating the new conceptual relation R;
- Formulating tests T of the conceptual relation R within CB;
- Elaborating the new relation R by tests T respecting CB;
- If the relation R succeeds in tests, declaring it a part of CB.

Regarding the literature search, first, I specified the search in ERIC, PubPsych, FID, PhilPapers and EBSCO host by setting the following search criteria: Search within the title or the subject and find the search English terms "definition of learning" or "concept of learning" in peer-reviewed literature. Second, I excluded from the results of the literature search: 1) duplicates; 2) articles with reference to specific forms of learning, such as for example workplace learning; 3) articles that after reading the abstracts of the representative papers did not include information about a higher-level concept of learning and the "differentia specifica" or any other information about a definition of learning. In ERIC, publications are listed since 2005. For PubPsych, I entered "all these words", for EBSCO host, I entered by using advanced search "word" and "word" in the title, for FID, I selected in "title" and for PhilPapers, I entered the specific

terms. Third, also articles or books that are listed in the bibliography of the identified books resp. articles and that included any information about a definition of learning in the title were included. The search and exclusion processes were conducted in November 2023 with these inclusion/exclusion criteria (see Table 1).

The identified research material was published during the period from 1937 until 2022. The selected studies are mainly characterized by peer-reviewed journal articles published within the last 50 years.

3. Results

3.1. Specifying the Initial Conceptual Background (CB)

To specify the initial conceptual background CB a matrix is created (Nuopponen, 1998), including the higher-level concepts and the differentia specifica of learning in the definitions.

Table 1. Literature and search procedure with databases.

Process	Terms	Databases/search engine	Matches
Step 1			
Search 1: Specific terms	- *definition of learning* - *concept of learning*	EBSCO Host Library databases	- *definition of learning* (N = 255) - *concept of learning* (N = 2.843)
Search 2: Specific terms	- *definition of learning* - *concept of learning*	ERIC	- *definition of learning* (N = 337) - *concept of learning* (N = 1.065)
Search 3: Specific terms	- *definition of learning* - *concept of learning*	PubPsych	- *definition of learning* (N = 33) - *concept of learning* (N = 176)
Search 4: Specific terms	- *definition of learning* - *concept of learning*	FID	- *definition of learning* (N = 7) - *concept of learning* (N = 12)
Search 5: Specific terms	- *definition of learning* - *concept of learning*	PhilPapers	- *definition of learning* (N = 0) - *concept of learning* (N = 73)
Step 2			
Search excluding - exact duplicates - specific forms of learnings - lack of higher-level concept of learning - lack of differentia specifica - lack of any information about a definition of learning			Total: N = 28
Step 3			
Search 6: Specific terms	- *definition of learning* - *concept of learning*	Bibliography of identified texts	- *definition of learning* (N = 1) - *concept of learning* (N = 1)

According to sentences that might be spoken, written or thought by an English-speaking entity McClellan (1982: p. 87) identified five possible "completion instances":

- B learns "that"…"sentence" ("propositional knowledge")
- B learns "how to"…"verb phrase" ("skills")
- B learns "to" … "verb phrase" ("habits, attitudes")
- B learns "a"/"the" …. "name" ("information, memory storage")
- B learns "where, why, whether, who, how, when etc." "noun clause or phrase" ("reducible to one or more of the above by further specification") (McClellan, 1982: p. 87).

"The concept…is the set of all completion instances of L. (Learning—K.S.). A completion instance is a sentence formed by providing suitable referring expressions for 'B', grammatically tensed, mooded, voiced forms of 'learn', and suitable fillers for '_____X' (McClellan, 1982: p. 87)."

There are different types of learning objects, such as propositional knowledge, skills, habits, attitudes, and memory storage: The learning of habits and attitudes involves tendencies, while the learning of skills, procedures, and truth involves capacities (Brown, 1972: p. 23), I can conclude that "learning to" presupposes "learning how to" (McClellan, 1982) that presupposes "learning that" or "learning a/the" what on the other hand corresponds with the curriculum category of propositional knowledge or stored information.

Table 2 shows the higher-level concepts and the respective characteristics of the studied definitions.

3.2. Formulating the Conceptual Problem P

The overview of the categories of definitions confirms that there is no consensus on the nature of the higher-level concept and the components of the word "learning". Although I can find some identical higher-order concepts, a range of different higher-order concepts and characteristic features characterizes the current state of research. The literature review also reveals that not all authors define the differentia specifica. Apart from the incompatible senses of learning, some higher-order concepts have relations of logical super- and subordination to one another. For example, this is true for "change" and "enduring change". Moreover, in some definitions, the causes of learning are mentioned. In terms of the causes of learning, different causes are included. The analysis shows that the concept of learning is ambivalent.

Below I *analyze* the existence of the respective conceptual relations in implicit conceptual theory. The first two sections group together higher-level concepts that understand learning as *process vs.* learning as *product*. The three remaining sections discuss the function and the causes as constituents of a definition of learning and the gaps of the definitions.

Analysis of the present literature reveals that the term "learning" is predominantly used to describe learning as a process or as a product.

Table 2. Synthesis of generic or higher-level concepts and differentia specifica of learning derived from studies in educational science, philosophy and psychology.

Authors/Year	Higher-level concept	Characteristics
	Psychology	
	Learning as establishment/strengthening of neural connections	
Cason (1937)	etablishment or strengthening of	"neural connections between stimulating processes and responding processes as a result of accompanying or immediately preceding psychological acts"
	Learning as change in behavior	
Kellogg (1938)	change	*"in activity"*
Kellogg & Britt (1939)	persisting change or modification	of behavior "which results from the activity of the organisms itself and which tends to adapt the organism to its environment"
Hilgard & Bower (1975)	relatively permanent change	"…in a subject's behavior to a given situation brought about by his (or her) repeated experiences in that situation, provided that the behavior change cannot be explained on the basis of native response tendencies, maturation, or temporary states of the subject (e.g., fatigue, drugs, etc.)"
Rescorla (1988)	process	"…by which an organism benefits from experience so that its future behaviour is better adapted to its environment"
Lefrancois (1986)	change	"in behavior resulting from experience"
Hall (2003)	process	"in which an animal (human or non-human) interacts with its environment and becomes changed by this experience so that its subsequent behaviour is modified"
De Hower & Moors (2013)	changes	"in the behavior of an organism resulting from regularities in the environment of that organism"
Kolb & Whishaw (2014)	relatively permanent change	"in behavior resulting from experience"
Mazur (2013)	process	"of change that occurs as a result of an individual's experience"
	Learning as change in behavior or behavioral potential	
Zimbardo (1992)	stable change	"in behavior or behavioral potential resulting from experience"
Anderson (1995)	process	"…by which relatively permanent changes occur in behavioral potential as a result of experience"
	Learning as change in behavioral mechanisms	
Lachman (1997)	process	"…by which a relatively stable modification in stimuli–response relations is developed as a consequence of functional environmental interaction via the senses
Domjan (2010)	enduring change	"in the mechanisms of behavior involving specific stimuli and/or responses resulting from prior experience with similar stimuli and responses"
	Learning as change in the processing of information	
Good & Brophy (1990)	active process	"…involving the acquisition or reorganization of the cognitive structures through which humans process and store information"

Continued

Omrod (2012)	long-term change	"in mental representations or associations as a result of experience"
Toulmin (1971)	coming	To know
	Learning as system change	
Langley & Simon (1981)	process	"…that modifies a system so as to improve, more or less irreversibly, its subsequent performance of the same task or of tasks drawn from the same population"
Barron et al. (2015)	structured updating	"of system properties based on the processing of new information"
	Learning as change in view	
Osborne (1985)	change	"in world-view"
	Learning as an increase	
Washburne (1936)	increase	"through experience, of problem-solving ability"
	Educational science	
	Learning as constructing	
Mezirow (2000)	process	"of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience as a guide to future action"
	Learning as a process	
Harel & Koichu (2010)	continuum	"of disequilibrum-equilibrum phases manifested by: 1) intellectual and psychological needs that instigate or result from these phases and 2) ways of understanding or ways of thinking that are ultilized and newly constructed during these phases"
	Philosophy	
	Learning as action	
Steiner (1988)	process	"of an intentional change in the psychical state"
	Learning as a process	
Brown (1972)	rule-guided process	of acquiring something "its character is… determined by the results characteristic of it"
	Learning as activity	
Fleming (1980)	activity	"with its attempts and successes and failures"
	Learning as development	
Luntley (2005)	development	of insight
	Learning as knowledge acquisition	
White (1972)	acquisition of knowledge	"by the application of one's present conceptual equipment"
	Interdisciplinary	
	Learning as a process	
Jablonka & Ginsburg (2022)	process	"leading to an experience-dependent behavioral response of a system"
Olteanu (2022)	becoming	conscious

According to Langley & Simon (1981), Steiner (1988), Rescorla (1988), Good & Brophy (1990), Anderson (1995), Lachman (1997), Hall (2003), Mazur (2013), Barron et al. (2015) and Jablonka & Ginsburg (2022) the concept of learning refers to a *process*. Following Langley & Simon (1981) learning is a "process that modifies a system", while Good & Brophy (1990) understand learning as an active process "involving the acquisition of knowledge" or as a rule-guided process (Brown, 1972). For Mazur (2013) learning is a process of change, while Anderson (1995) specifies the process as change in the behavioral potential. This view is similar to Hall (2003)'s perspective who states that the process of change lies in the behavior. Steiner (1988) specifies a process with "intentional change of a psychic state", while Lachman (1997) qualifies the process as a relatively stable modification in stimulus–response relations that develops because of functional environmental interaction via the senses. Regarding the psychic state, the concept of the psyche comprises personality traits. These, however, are not easily changeable. For Rescorla (1988) learning is a process "by which an organism benefits from experience". Barron et al. (2015: p. 406) offer an integrative perspective on learning as a process to reconcile most of the definitions of learning by reference to a common theoretical framework: Their definition of learning is as follows: learning is "… a structured updating of system properties based on the processing of new information" (Barron et al., 2015: p. 406).

Mezirow (2000) characterizes the process as an interpretation. Following McClellan (1982: p. 102), learning "refers always and only to changing from one state to another". "At the behavioral level, it refers to the successive approximations that may intervene between B's not knowing ___ X and B's acquiring that knowledge… At the neurophysiological level, 'learning' refers to the biochemical processes that fix the path running from stimuli to response (McClellan, 1982: p. 102)."

For Brown (1972) the process of learning is rule-guided. If the process of learning results in knowledge, Brown (1972: p. 24) asks the philosophical question "whether there are any kinds of factor causally necessary to learning which are derivable from the character of this result". In terms of the propositional knowledge, information, skills, habits and attitudes to be learned there must be a rule "by which its behaviour is guided" (Brown, 1972: p. 27). In the case of propositional knowledge, the information and skills "the rule by which its behaviour is guided must be a right rule" (Brown, 1972: p. 27), as it is "internal to the operation itself" (Brown, 1972: p. 27) or must be a "rule by reference" (Brown, 1972: p. 33). In case of a habit, the rule is an external one. However, in "both kind of cases an individual must be affected by some rule" (Brown, 1972: p. 31). If the process is not rule-guided such as in the case of acquiring the habit of blushing I am not inclined to say "that blushing is a *learnt* habit" (Brown, 1972: p. 38).

DiClemente (2015) describes the course of the intentional change as "it is filled with starts and stops, progression and regression, slips, lapses, relapse and, more importantly, recycling" (p. 1225). Learning in the sense of a change is not a

singular event, but it is complex, dynamic, multi-dimensional and non-linear like much of the human behavior (DiClemente, 2015). As the change is not a singular event, there might be events within the learning process or sequences such as "unproductive redoing which seemed a more fruitless endless cycle of change attempts likely caused by unmet needs, complicating problems…or significant impairment of basic self-control or self-regulatory processes" (DiClemente, 2015: p. 1225).

The higher-level concepts that understand learning as a *product* are employed by numerous authors in the sense of change because of a process (Domjan, 2010; Edelmann, 2000; Hilgard & Bower, 1975; De Hower & Moors, 2013; Jablonka & Ginsburg, 2022; Kolb & Whishaw, 2014; Lefrancois, 1986; Omrod, 2012; Zimbardo, 1992). According to Weidenmann (1989), "*change* [seems to be …] the general explanandum of all learning theories" ((Weidenmann, 1989: p. 996) italics in original—K.S.). Change "can mean different things: New acquisition and elimination (in everyday language: learning and unlearning or forgetting), adaptation and maladjustment (such as phobias […]), continually becoming different and abrupt change (as in learning through insight)" (Weidenmann, 1989: p. 996). While (De Hower & Moors, 2013; Hilgard & Bower, 1975; Kolb & Whishaw, 2014; Lefrancois, 1986; Zimbardo, 1992) see change in the area of behavior, Domjan (2010) refers to change in the *mechanisms* of behavior, and Omrod (2012) refers to changes in the processed information. In early definitions, behavior has been characterized by the physical activities of an organism that are observable. Today, behavior is considered to include not just externally observable activities, but also experiential processes like feelings and thoughts. A change of the psychic state (Steiner, 1988), and the mechanisms (Domjan, 2010) are, in contrast, less often named.

Other higher-level concepts are an "increase" (Washburne, 1936), a "development" (Luntley, 2005), as "establishment and strengthening of neural connections" (Cason, 1937), change in activity (Kellogg, 1938), and a "continuum" (Harel & Koichu, 2010). Kellogg (1938) objected to the higher-level concept of establishing and strengthening neural connections that it is difficult to prove learning from the change of "neural connections".

The analysis of the present definitions of learning shows that an overarching *function* of learning is inherent in all the definitions examined here that understand learning as a process or an action. It can be seen from the studies that the function of learning is concerned with different objects of change. In most definitions, the function is the formation of associations, knowledge acquisition, and knowledge construction, change of behavior, behavioral potential or a change or acquisition of dispositions.

From the concept of knowledge I cannot derive any information "about the way in which knowledge is acquired" (Brown, 1972: p. 25). Interestingly, from a perspective of Chinese philosophy, the Buddhist concept of learning relies on knowing how to practice and admonishes the "indulgence in 'extensive knowledge'" (Wu, 2006: p. 501).

Depending on the epistemological view, in some definitions, the concept of learning is understood as the acquisition of knowledge (Good & Brophy, 1990), the process of "coming to know" (Toulmin, 1971: p. 33f.) or the process of becoming conscious (Olteanu, 2022), but in others, learning is defined as a change in view (Osborne, 1985) or as an interpretation (Mezirow, 2000). While the concept of acquisition designates a gain in information, the concept of construction of knowledge focuses on assembling knowledge. A change in mental representations or associations (Omrod, 2012) can be assigned to both the acquisition and the construction of knowledge.

Buchinger & Scott (2010) state that for Niklas Luhmann who modelled learning within the framework of social systems theory cognitions as expectations are disposed towards learning, and for Pask (1975), the processes of concept acquisition and conceptualization as internal and external dialogue are central to learning. As for the acquisition of dispositions, following Splitter (2010: p. 224), dispositions are the "triggers of our intentional and relatively stable behavior" under certain background conditions.

Besides the function that is part of most process definitions, the *causes* of learning are named in most of the product definitions. Among the causes referred to, experience predominates. Likewise, according to the educational psychologist Weidenmann (1989), experience is a key concept in definitions of learning. "*Experience* as a key concept shows that learning is bound to impressions, content, information and thereby to the environment and the processing of environmental perception. In principle, this does not exclude any psychological category of interaction with the environment. Learning bound to experience applies equally to cognitions, emotions, behavior (plans, regulation, and execution)" ((Weidenmann, 1989: p. 996) italics in original). "…whereas Anderson's definition reflects the very broad theoretical assumption that experience affects behavioral potential, future research may allow us to say more precisely which of our experiential psychological processes our research on learning should investigate" (Nedenskov Petersen et al., 2016: 34ff.).

With reference to the philosopher and pedagogue Bollnow (1974), the term experience refers to "… what a man had to suffer in the hazards of the journey and took home with him as a bitter memory" (Bollnow, 1974: p. 2). Experience is not an activity, "… but rather a suffering. Man is delivered in experience to what is coming at him. Experiences penetrate him. He cannot resist them" (Bollnow, 1974: p. 2). In answer to the question of what knowledge acquisition was, Hilgard & Bower (1975: p. 13) stated: "Typically, we suppose that the organism had some specific experience which caused or was in some way related to the change in its knowledge state". However, from a philosophical perspective experience is seen in a negative sense, as painful (Bollnow, 1974; Gadamer, 1960). Etymologically, according to Bollnow (1974), the word "experience" is associated not only with the spatial movement of travel but also with the word for "danger". "The experiences one has are always painful experiences. (…) There are no pleasant experiences. That would be a contradictio in adjecto"

(Bollnow, 1974: p. 20). In contrast, in learning research, in the sense of empiricism, experience is wrongly understood as a process "that we take up and process any data (or information)" (Bollnow, 1974: p. 20). "If one speaks of having an experience, one means that something did not go as one had expected (Bollnow, 1974: p. 20)."

In his book "learning through experience", the British psychoanalyst Wilfred Bion (1992) argues that thinking occurs due to the absence of objects: Bion explains: If there is no object such as the maternal breast, it can only be the absent breast and the consequently felt hunger that causes the thought "no breast". In this fundamental case, for example, learning occurs through emotionally experiencing the absence of an object.

In a few definitions, functional environmental interaction regularities are also named as causes or, as in the case of Lachman (1997), functional environmental interaction, because experience is not regarded as a sufficient cause for change. In a similar way, I can argue, following Bollnow (1974)'s definition of experience, that suffering is not the only trigger for change. According to Italia (2017), learning occurs for epistemic and non-epistemic reasons.

The analysis of definitions shows that it is not a trivial aspect to find the higher-level concept of learning and its specific differences (Hilgard & Bower, 1975). For theoretical concepts, it holds that depending on the theoretical perspective, the theoretical presuppositions of the definition differ. A closer look at the literature reveals a number of *gaps* in the presented definitions:

Some of the definitions relating to learning (Barron et al., 2015; Langley & Simon, 1981; Steiner, 1988; Lachman, 1997) are vague because it is unclear what I should understand by *more or less irreversibly*, *structured updating*, *relative*, *relatively stable*, *psyche*, *open*, *new*, *equipment*, *and applying*. Rescorla (1988)'s process-related definition of learning is normative, as it does not imply any changes of behavior that manifest a decrease in adaption to its environment.

As causes are implied in most of the product definitions, the concept of learning as a product is above all a concept of effect (Brezinka, 1990). The definitions that imply a "change" refer to products, because the behavior or mechanisms of behavior have already changed. Also for a specific form of learning, such as implicit learning, Frensch & Rünger (2003: p. 14) summarize that implicit learning "is defined in terms of its product rather than the properties of the learning process".

Regarding the experience as a predominant cause of learning in the presented product definitions, I can state that (1) the concept of experience is misunderstood as experience is always a disappointed expectation (Bollnow, 1974), and (2) these definitions are tautological as to learn a lesson from the repeated disappointments is inherently linked to the definition of experience (Bollnow, 1974).

Regarding the qualities of some higher-order concepts, I can state that in some cases change is employed generally, while in other definitions it is specified, either, for example, with "enduring" or "stable". In Mazur (2013)'s definition, it is not clear what the change is about. Langley & Simon (1981) relate

learning to the performance of tasks. The concept of *mechanism* is vague because it is unclear which mechanisms are meant by the definition.

3.3. Stating the New Conceptual Relation R

To state a new conceptual relation of learning, the analysis is based on the logical conceptual systems of Educational Science. For defining the concept of learning, it is important that the concepts included in the definitions must be more elementary than the definiendum.

"Psychological verbs (are) characterized by the fact that the third person of the present is to be verified by observation, the first person not (Wittgenstein, 1991: p. 160). Following Boyum (2013: p. 497) the concept of learning does not typically function as a psychological verb, in Wittgenstein's sense. Following the *Constructive Analysis*, the new relation R is postulated" (Kosterec, 2016: p. 222).

(R) Learning is defined as the acquisition of knowledge by reasoning.

3.4. Formulating Tests T of the Conceptual Relation R within CB

To validate the proposed definition three tests are made:

- The linguistic usage for the proposed definition is analyzed.
- Analysis is made of whether the higher-level concept and the *differentia specifica* are substantively unambiguous.
- Analysis is made of whether: 1) the higher-level concepts are logically related to other concepts on the same level and 2) the concepts on the level of the *differentia specifica* are really coordinated and are thought to be coordinated.

3.5. Elaborating the Relation R by Tests T Respecting CB

Linguistic usage is examined for the proposed definition. Referring to natural language usage, the concept of learning is a verb. The following examples underline this mode of usage: "B learns 'that'… 'sentence' ('propositional knowledge'), B learns 'how to' … 'verb phrase' ('skills'), B learns 'to'… 'verb phrase' ('habits, attitudes'), B learns 'a'/'the'… 'name' ('information, memory storage'), B learns 'where, why, whether, who, how, when etc.' 'noun clause or phrase' ('reducible to one or more of the above by further specification')" (McClellan, 1982: p. 87). The linguistic usage of learning shows that this concept is a product concept. Thus, the identified relation that learning is *a process* is not compatible with the central linguistic usage.

Following the central linguistic usage, I can specify the typical usage of learning as a change in behavior as a knowledge acquisition. The higher-level concept of "knowledge acquisition" is derived from the Latin verb "*acquisitio*(*n*-)". The action verb "*to acquire*" represents a *process of doing something to make something happen or* to gain by effort. The acquisition of knowledge is the result of the process of acquiring knowledge. Based on the etymology, the word "knowledge" was derived from *the Middle English word* "*knoulechen*", *which meant* "*find out about*" *or* "*recognize*, *understand*, *come to recognize*". This meaning

corresponds with the etymologically derived basic meaning of learning which is "*I know*" or "*I have tracked down*".

From a logical point of view the product concept of learning is a concept of effect. Thus, the cause of learning is a constituent part of the definition. Reasoning is regarded as the explaining factor of learning. The word "*reason*" comes from Latin "*ratio*" which means "to reckon", "to think" and "to put together".

Etymological reconstruction produced the result that with the concept of learning I mean that the subject "has gone the way" of thinking or putting together of knowledge, resulting in changes of knowing or of having tracked down. If I search in any dictionary that reflects the common usage of language, a close relationship between learning and knowing becomes obvious (Hilgard & Bower, 1975). There is a logical linkage between "learning" and "coming to know" (McClellan, 1982) that holds in ordinary language.

In order to clarify the structure of the substantive conceptual system, I analyze whether the higher-level concept and the *differentia specifica* are substantively unambiguous. The higher-level concept of knowledge acquisition and the specifica differentia, by reasoning, are substantively unambiguous.

For a better understanding of knowledge refer to Mittelstraß (1996)'s definition, which states that knowledge is a "term for generally available orientations within the framework of everyday action and factual contexts (*everyday knowledge*—K.S.), in the narrower, philosophical and scientific sense in contrast to *opinion*…and *belief*…for knowledge based on reasons and subject to strict verification postulates, institutionalized within the framework of *science*" (Mittelstraß, 1996: p. 717f.). (Italics in original—K.S.).

Regarding the acquiring of knowledge, acquisition "refers basically to a *change* in possession; at one time, the organism did not 'possess' a given bit of knowledge; at a later time it did" ((Hilgard & Bower, 1975: p. 13) italics in original).

Walton (1990: p. 403) defines reasoning as "the making or granting of assumptions called premises (starting points) and the process of moving toward conclusions (end points) from these assumptions by means of warrants. A warrant is a rule or frame that allows the move from one point to the next point in the sequence of reasoning. The term 'warrant', used instead of the more familiar (but narrower) term 'rule', is appropriate because of the existence of frame-based, and other kinds of non-rule-based reasoning". According to Walton (1990: p. 402) "an inference links the premises to the conclusion, and it always has a direction proceeding from the premises to the conclusion". Valaris (2017), however, challenges the view that reasoning is essentially a matter of following rules. Consequently, reasoning is understood in the current study in the widest sense as the "process of drawing conclusions" (Leighton, 2004: p. 3; Angeles, 1981).

The gain of a given bit of knowledge refers to the novel conclusion that is the result of combining two isolated mental representations. Generally, following Broome (2002), reasoning is understood as a process that starts from an existing

mental state and concludes in a new state of mind.

In order to identify logical errors, I examined whether (1) higher-level concepts are logically related to other concepts on the same level and (2) concepts on the level of the *differentia specifica* thought to be coordinated actually are coordinated.

What is the common ground between the kinds of objects I can learn (White, 1972: p. 43)? The commonality is the knowledge (White, 1972: p. 43) "All uses of 'learning'…fundamentally imply the acquisition of knowledge" (White, 1972: p. 43). Acquisition of knowledge holds for learning in the sense of acquiring propositional knowledge, skills, habits, attitudes, and information as White (1972) demonstrates. "At the core of the concept learning must imply knowing (White, 1972: p. 48)."

The higher-level concept of knowledge acquisition as a product is sufficiently demarcated against the concept of the process of acquiring knowledge. In the natural and social sciences, the concept of "process" is defined as a "directed sequence of an event" (Carrier & Wimmer, 1995: p. 385). According to White (1972: p. 50) on the one hand, a process "can stand for a *procedure* that one follows in order to reach a certain result. (…) On the other…it refers simply to a connected series of events which terminates at some endpoint, whether or not anyone intends to bring this about". White (1972: p. 50f.) argues, "that the concept of a process may imply the concept of the result of that process even though the process may not be completed. But if learning is not necessarily intentional, it cannot be like this." Following White (1972: p. 51) learning "implies knowledge not as an intended but always as an actual achievement." For White (1972: p. 51) learning "is not a process but an achievement." He compares learning with winning in order to demonstrate that a person is not engaged in a process but has achieved something (White, 1972: p. 51). The achievement, here the knowledge acquisition, means "someone has come up to some mark" (White, 1972: p. 51). Besides the linguistic usage of "*X has learnt Y*", I can also say "*X is learning Y*". While in the first statement, the achievement character is obvious, in the second it relates to a connected series of achievements including future expectations (Fleming, 1980; White 1972).

I will argue that the concepts of knowledge by acquaintance and knowledge acquisition by reasoning that are actually coordinated by knowledge gain can be differentiated from each other. Relating to the philosopher Russell (1912) knowledge by acquaintance cannot be regarded as learning, as the occurrence does not lead the individual to form an inference about the knowledge to be acquired. Knowledge by acquaintance does not involve thought, intention, or judgment, or application of concepts. In line with this argumentation, White (1972: p. 53) demonstrates with an example that if I put a ladder away in the cellar of my house I know that it is there because I have put it there. In this case, I acquired knowledge that I did not previously possess. However, "it would be incorrect to say that I have just *learnt* that the ladder is there". Thus, I did not learn by acquainting myself with knowledge although I acquired knowledge. Moreover,

rote-"learning" cannot be regarded as learning (White, 1972).

Similarly, Popper (1991: p. 175) argues regarding the concepts of forming associations[2] in reflex theory and the related association theory, as are prevalent in behaviorism, that people and animals adapt through activity (Popper, 1991: p. 175f.). Thus, Popper (1991: p. 176) concludes: "I am of the opinion that organisms do not passively wait for the repetition of one or more events in order to imprint or impose regularities or regular connections on their memory. Rather, organisms quite actively try to impose suspected regularities (and thereby similarities) on the world". McClellan (1982) establishes that a learning claim stated in behaviorism also "depends on prior knowledge claims" (p. 101), for example, a creature came to the knowledge "to respond in just that fashion" (p. 101).

Alternatively, Brown (1972: p. 28) writes that "a rudimentary form of inductive reasoning seems to be involved". Even in the case of implicit learning which can be modelled by the mechanisms of picked up "statistical dependencies encountered in the environment" that "generate highly specific knowledge representations" (Frensch & Rünger, 2003: p. 17), it can be assumed that these knowledge representations are not an inevitable reaction to a stimulus, even if the individual is not (yet) aware of the learning process and result.

That the knowledge acquisition and the explaining factor of reasoning integrate cognitive and behavioristic perspectives in this definition was made clear not only through Popper's already presented ideas but also through the following reasoning of Hilgard & Bower (1975): They begin by explaining that behaviorism began from empiricism and is based on the premise that all knowledge is gained through experience via the senses.[3] In contrast, rationalism regards reason as the primary source of knowledge[4]. Rationalism goes back to cognitive psychology, whose forerunner from neo-behaviorism to cognitive learning theory was the American psychologist Tolman (1932). However, referring to epistemology and the question of how knowledge arises and the relationship between experience and the organization of the mind, Hilgard & Bower (1975: p. 23) conclude that the cleavages between behaviorist and cognitivist theories are found to be blurred. Even if, for example, different answers are given from the side of both representatives about what is learned, namely "cognitive structures" on the one and "habits" on the other side, "variable nonhabitual behavior would force us to admit cognitive structures as part, at least, of what is learned. But the stimulus-response psychologist is satisfied that he can deduce from the laws of habit formation the behavior that the cognitive theorist believes supports his interpretation" (p. 25).

Also for the habits, White (1972) could show that some cases of habit-learning

[2]"All behavioristic theories of learning are also associationistic" (Hilgard & Bower, 1975: p. 12).

[3]"Empiricism is the view that *experience* is the only source of knowledge. Special emphasis is given to sensory experience, although some allowance is made too for knowledge derived from intellectual reflections regarding relations among a number of experiences" (Hilgard & Bower, 1975: p. 3).

[4]"Rationalism is the general philosophical position that reason is the prime source of knowledge" (Hilgard & Bower, 1975: p. 7).

are forms of skill-learning, others are forms of procedure-learning and some are habit-learning as they represent the acquisition of known truths for morality. "There is no reason to think that there must be some habit-learning which is *not* the acquisition of knowledge" (White, 1972: p. 48).

Because the postulated relation R succeeded in the tests, it became part of the conceptual background.

4. Discussion and Conclusion

The logical conceptual systems of educational science, philosophy and psychology provide a basis from which I derived the new conceptual relation of learning: Learning is defined as the acquisition of knowledge by reasoning. The outcome of this conceptual analysis is to provide a framework for the higher-order concept and the *differentia specifica* of learning.

The higher-level concept of knowledge acquisition that denotes *a change* in possession of a given bit of knowledge is distinguished by its explaining factor of reasoning. Reasoning is understood in the widest sense of drawing conclusions. This result corresponds with the etymological reconstruction that produced the result that the concept of learning means that a subject has acquired knowledge and tracked it down by going a way of reasoning.

The results I have summarized have interesting implications for theories of learning from the perspective of educational science. First, as reasoning constitutes learning it is essential to promote the ability to reason to contribute to effective learning. Based on the dual-process theories an implicit and intuitive system of reasoning is distinguished from an explicit and rational system (Wilhelm, 2005). For promoting the ability to reason, the second system should be primarily addressed to enhance for example the awareness of the meta-information on reasoning. Therefore, there should be a major focus of research on reasoning. Second, promoting knowledge acquisition should be at the core of lifelong education.

Future-oriented research that investigates the dynamic patterns of reasoning may expand the knowledge base of learning. Jonker & Treur (2003) could show using the example of "reasoning by assumption" the dynamics of reasoning. For reasoning not only "content information" is important, but also "(meta-)information" on the reasoning state such as assumptions, observations, predictions and evaluations that have been made (Jonker & Treur, 2003). For example, while some reasoning patterns show a transition from a reasoning state without an assumption to a reasoning state with an assumption, others show a transition from a reasoning state with a prediction to a reasoning state with an observation (Jonker & Treur, 2003). It will be interesting to address in further research the analysis of these micro processes that lead to knowledge acquisition for others types of reasoning. A conceptual clarification of the concept of learning will enable us to develop a coherent research program based on an unambiguous and unified conceptual system.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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