



A Conceptual Analysis of the Funds of Knowledge and Identity Approach from an Eco-functional Perspective

Leonard Nigrini¹ · Moisés Esteban-Guitart²

Received: 24 January 2023 / Revised: 8 May 2023 / Accepted: 5 July 2023
© The Author(s) 2023

Abstract

The article situates the Funds of Knowledge (FoK) approach and the Funds of Identity (FoI) theory in the context of the eco-functional perspective. It proposes to understand the “funds” as external factors of extra-cerebral organizations, as both refer to products of historically accumulated social labor. Furthermore, the article lays out that similar to the dynamic features of external factors in developing functional psychic organizations, funds of knowledge and identity have to be considered specific to a social and developmental context. It is found that Vygotsky’s concept of *perezhivanie* and Holzkamp’s concept of *position-specificity* may provide a valid framework for realization of this dynamic understanding of FoK and FoI.

Keywords Funds of Knowledge · Funds of Identity · Eco-functional perspective · External brain · Extra-cerebral organization · Extra-cerebral connections · Vygotsky · Holzkamp

Introduction

This article aims to relate the “**Funds of Knowledge**” (FoK) approach and its development, “**Funds of Identity**” (FoI), with the eco-function perspective, especially the concept of the “external brain” or “third hemisphere” as introduced by del Rio (2002). FoK/FoI and the eco-functional approach are genetically connected since they share a common methodological base and origin. Both theories are based on Vygotsky’s conception of an cultural-historical psychology (cf. del Río & Álvarez, 2017; Esteban-Guitart & Moll, 2014) which coincides with both of them relying on a historical-dialectical methodology. These genetical and methodological similarities between FoK/FoI and the eco-functional approach justify the supposition of their principal theoretical compatibility. However, FoK and FoI are already recognized to be reliable in theory and praxis. This recognition is shown by different positive outcomes being delivered due to the application of the FoK approaches, such as improving relationships between school and family, contextualizing learning, or valuing knowledge, practices and voices of under-represented families, among others (Esteban-Guitart, 2021; Llopart

✉ Leonard Nigrini
leonardnigrini@gmail.com

¹ Girona, Spain

² University of Girona, Girona, Spain

et al., 2018; Machancoses, 2021; Machancoses et al., 2022; Volman & 't Gilde, 2021; Whyte & Karabon, 2016). Despite the undisputed validity of the FoK and FoI approach, there have also emerged some critics towards the approaches that in our opinion can be contextualized and even resolved by an inclusion of features of the eco-functional approach to FoK and FoI. These critics include the concern that both FoK and FoI express ahistorical traits due to a lack of the representation of developmental dynamics in certain aspects of their empirical application and theoretical accounts (cf. Esteban-Guitart, 2021). Before contesting to the question of the validity of these critics toward FoK and FoI and the possible solutions offered by the eco-functional approach, both theories will be introduced.

The Funds of Knowledge and Identity Approach

Funds of Knowledge

The basic assumption of FoK is that all families possess due to sociocultural accumulation strengths, skills and knowledge regardless of their origin, diversity, and varied circumstances (González et al., 2006; Hogg, 2011; Llopart & Esteban-Guitart, 2018; Moll, 2019; Moll et al., 1992). Based on this premise, FoK advertise to make those resources, located in the families (with a focus on under-represented students), visible and to use them to support school education (Moll, 2019). In other words, the approach serves to recognize and legitimize those resources that any family possess by creatively incorporating them into pedagogical practice (Moll et al., 1992). FoK is commonly used in the context of educational psychology, especially when working with younger children. An exemplary account of FoK methodology can be found in Williams et al. (2020) investigation about the promotion of mathematic understanding due to the use of resources of three different Hispanic families. In their study, the researchers visited the home of three Hispanic students and conducted interviews with their families to find out how they support the students learning efforts in mathematics. Apart from identifying bilingualism and, e.g., the variety of textbooks existing in the homes of the students as resources for learning, the researchers also described daily practices in the family as potential resources to support mathematical understanding such as calculations applied within the activities of shopping or cooking (necessary to comply with the budget of the family). Furthermore, Williams et al. formulate indications, how the detected FoK could be transferred to the school context such as “connect content and process skills to mathematical activities already occurring in the home” (Williams et al., 2020, p. 22).

On the conceptual level, it is important to recognize the notion of FoK that Moll et al. (1992, p. 133) describe as: “historically accumulated and culturally-developed bodies of knowledge and skills essential for household or individual functioning and well-being,” because this quote shows that the concept of FoK is based on a historical-dialectical understanding. The resources that are available in the particular households are not considered characteristics of individual persons or families, but as the developmental products of socio-cultural history. Therefore, FoK have to be understood as result of historically accumulated social labor, which function in both, objectified and non-objectified modes, as carriers of social knowledge. Products of social labor FoK include the aspect of being *made for a particular use* (Gemacht-sein-zu), which describes the fact that their creation due to social labor serves a particular objective within the context of societal reproduction. The meaning of labor products is therefore constituted due to their objective within the societal

context of reproduction (cf. Holzkamp, 1985, p. 292). Esteban-Guitart and Moll (2014) seem to share the same understanding of FoK, saying that “funds of knowledge do not exist solely within the mind of the individual, but rather they are distributed among persons, artifacts, activities, and settings” (p. 36). While the meanings themselves have a societal origin and are created due to social labor, the appropriation of the (symbolic) meanings by the individual subjects living in the society forms the other part of the process. FoK relate especially to the appropriation of historical products of social labor. In focusing on ethnic minoritized groups, FoK correctly consider the fact that different individuals occupy different places within the process of the cultural-historical development. This signifies that each particular individual disposes of a certain sector of social knowledge, which forms the base of what can be appropriated by this individual. This feature of the FoK approach resembles in a (although in a less explicit way) Holzkamp’s ideas about the specific characters of an individual’s position (Lage- und Positionsspezifisch; Holzkamp, 1985, p. 358f.). According to those ideas, societal meanings individual perception depends on a person’s position within the social context—his role within the (re-) productive process—and how each subject experiences this specific position (based on his former experiences and development). Depending on one’s position within the societal context of reproduction, the meanings of social relations, especially in their objectified form as products of labor, differ following the relation of a person’s function versus an object’s function in social reproduction. These differences are hereby mediated by the meaning of the products of labor (FoK) for individual reproduction (Holzkamp, 1985, p. 359f.). For example, a carpenter understands the function of a slicer in the process of the production of furniture in a more complete way than let us say an astrophysicist (who might perceive it as some kind of paperweight). From his position in the context of societal reproduction, the function of the slicer is significant for the former but not necessarily for the latter. However, the different understandings of a product of labor’s meaning result from the individual’s organization of survival. While an astrophysicist is not paid to fabricate furniture, the carpenter will not sell much commodities if he does not know how to use the slicer and therefore will not make a sufficient income to satisfy his organic needs of for survival.

Some Difficulties with the Funds of Knowledge Approach

As mentioned before, the use of FoK for school education is associated with several positive effects on the educational outcome itself and furthermore on the integration of school and everyday life of the students. Nonetheless, some points of criticism have been uncovered throughout the history of the FoK approach. One point that turned out to influence significantly the further development of FoK was that the predominant focus of the analysis on the practices of adult family members could lead to too little attention being paid to the experiences and knowledge of the children themselves (Esteban-Guitart et al., 2021). Consequently, “researchers have taken into account other contexts of life and activity beyond the home and family, such as the peer group, as sources of funds of knowledge” (Esteban-Guitart et al., 2021, p. 4), as evidently also children create their own social worlds, which may be independent of adults’ social life (Moll, 2005). In other words; children and their adult families are not necessarily (even very rarely) situated at the same position within the socio-historical context. It has to be considered that society and individuals are not only related within the context of appropriation, but also due to the transformative effects of labor onto the organization of the society. Therefore, children do not face the same societal contexts as their parents during their own childhood and at the same time they find themselves at a different ontogenetic

place as their parents in the current societal context. The family practices investigated by FoK can be useful in order to obtain insight, which forms of knowledge and skills are available in certain families and therefore can be appropriated. Nonetheless, it has to be noted that the meaning (developmental and functional) incorporated by these family resources can definitely differ between children and adults. Furthermore, it is evident that mentioned resources/FoK, which were described as products of accumulated social labor, also exist outside of the family context. Another fact is that, especially in a modern collaboratively organized society, many functions of education are distributed between social institutions outside of the family, such as kindergartens, schools, sport clubs, Internet, and friends. Considering that children encounter certain resources/funds as well outside of the family, it is the next logical step to include those contexts into the analysis.

Funds of Identity

The outdated narrowness of FoK to focus only on the family context causes Esteban-Guitart and Moll to formulate a development of the concept that they name “Funds of Identity” (FoI), first mentioned by Saubich and Esteban-Guitart (2011). According to them:

We use the term funds of identity to refer to the historically accumulated, culturally developed, and socially distributed resources that are essential for a person’s self-definition, self-expression, and self-understanding. Funds of knowledge—bodies of knowledge and skills that are essential for the well-being of an entire household—become funds of identity when people actively use them to define themselves. (Esteban-Guitart & Moll, 2014, p. 31)

Regarding their objective, FoI resemble the aim of FoK to enhance the educational experience of learner, usually students, by connecting the learning with individual resources. Esteban-Guitart and Moll (2014) describe in their article an example of the realization of a FoI analysis. As a method to grasp central identity artifacts they ask the students to draw a self-portrait including things from their life. Later they interpret the features of these drawings in relation to their indications of identity artifacts. In this way they are able to identify various artifacts, e.g., social institutions like church or geographical locations (the student’s community) as important identity artifacts. Very similar to FoK, FoI can be used to enhance learning experience, which could for example translate to a more interest-based curriculum.

By definition, FoI, which are situated in various parts of the everyday life of the learner, cover a broader section of funds than FoK. Besides the more ample conception of FoI, they also refer to a different issue than FoK, namely to such resources which are of highlighted significance for one’s self-understanding, self-definition, and self-expression (Esteban-Guitart & Moll, 2014). In this context, Vygotsky’s concept of “perezhivanie” is introduced as one fundament of FoI.

[P]erezhivanie, [...] is usually translated as ‘emotional experience’, ‘lived experience’ or simply as ‘experience’ (...) According to Van der Veer and Valsiner (1994), the term perezhivanie ‘serves to express the idea that one and the same objective situation may be interpreted, perceived, experienced or lived through by different children in different ways’ (p. 354). (Esteban-Guitart & Moll, 2014, p. 33)

Similar to the formation of knowledge in FoK, the constitution of identity in FoI is mediated by the appropriation of certain social meanings and cultural artefacts. Nonetheless, FoI differ in their expressed focus on those appropriations that are related to the

development of an individual (position-specific) meaning structure (cf. Holzkamp, 1985, p. 375) in contrast to FoK's focus on the appropriation of families' knowledge and skills.

Referring explicitly to Vygotsky's concept of *perezhivanie*, FoI can be considered subjective position-specific meaning structures. In this context, position refers to an individual's position within the socio-historical development. Therefore, position-specificity describes the same relation between subject and environment as *perezhivanie*. This relation is characterized by its dynamical character which it obtains due to changes occurring in the environment in that a person is situated and on the other hand due to the person itself also undergoing changes (Cong-Lem, 2022). *Perezhivanie* or position-specificity expresses how the subject actually experiences the environment based on the fraction of it that it faces. This fraction depends on the subject's position in the socio-historical development, which includes "four discernible components of a *perezhivanie*: (1) the environmental factor, (2) personal characteristics, (3) refraction prism and (4) influence" (Cong-Lem, 2022, p. 6). The term influence refers hereby to the importance particular aspects of the environment have for the subject, which depends on the role that a subject fulfills in a specific context of societal reproduction (as mainly those aspects are relevant to an individual, which are necessary for the completion of his tasks within the context of social mediated survival). The societal context itself is hereby a product of historical development itself. "Environmental and personal characteristics are the first two major components of a *perezhivanie* [...], and they exist in unity" (Cong-Lem, 2022, p. 7). Environment and person are related due to appropriation of the environment and at the same time due to material activity, changing the same environment, by the subject. This relation is an active and developing process, which means that individual history and individual development form to some extent a foundation of the *perezhivanie/position*. "[The] refraction prism or functioning mechanism [is what] ultimately determines the influence of the environment. (...) Vygotsky emphasized the need to explore the degree to which a person understands and makes sense of the experienced even" (Cong-Lem, 2022, p. 8). The way in which an individual experiences and understands aspects of its environment, its subjective meaning structure, is based on previous *perezhivanie*. As mentioned earlier, FoI correspond to the subjective meaning structures/refraction prism. The way of forming subjective senses due to the refraction prism can be understood as part of the practical experience or respectively the lived experience that makes up *perezhivanie*. As mentioned earlier, the way that position-specific meaning structures emerge is not determined by the objective social circumstances in which a person is situated but rather by subjective experiences that derive from these conditions. However, individuals usually do not reflect consciously about their role within the reproduction of the societal nexus and which meaning structures they have to capture as a result. Instead, it is due to their lived experience, their daily practice of satisfying needs that they obtain the meaning structures corresponding to their social position. These meaning structures include not only forms to comprehend social relations in their objectified form but also an understanding of the role that they play themselves in a broader cooperative context. Esteban-Guitart comes to essentially the same conclusion regarding the way in which a subject's objective living conditions are turned into subjective meaning structures. According to him, the internalization of social meanings has to be conceived as an active and mediated process finishes with a dynamic system (of subjective meaning structures; Esteban-Guitart, 2021, p. 8).

Researchers like Verhoeven et al. (2021) have adapted these basic insights to come up with a new conceptual framework for investigating adolescents' school engagement which implements the mediation of the development of position-specific meaning structures due to individual living practice and experience.

Having in mind this particular relation of FoI and perezhivanie, different notions of FoI and FoK, apart from width of funds that they cover, become evident. Yet FoK and FoI are not opposing concepts. Instead, they occur side by side/interlaced within the process of appropriation. “In this sense, the funds of knowledge and identity are intertwined: individuals appropriate/develop new knowledge and skills (FoK) and at the same time come to understand and project themselves accordingly (FoI)” (Esteban-Guitart et al., 2021, p. 9).

The Eco-functional Perspective

The center of Vygotsky’s eco-functional approach forms the assumption that humans create external organs for new specific activities. This idea is based on considerations of Ukhtomsky, leading Vygotsky to the belief that “the human being organ-izes its environment by turning it into an extension of the organism itself, into an organ, by placing functional operators in it” (del Río & Álvarez, 2017, p. 65). The eco-functional approach constitutes in a certain manner a counter-concept to Vygotsky’s own Law of double formation. While the latter supposes complete internalization of social relations found in the outside world into interior psychic functions, the eco-functional perspective considers the possibility that new organs, new higher cognitive functions, can include both external and internal connections—not just as part of a transition from external to internal organization but rather as part of a mature functional organization (del Río & Álvarez, 2017, p.65).

Furthermore, Vygotsky’s eco-functional approach relates the organism and its environment dialectically in order to produce a materialistic explanation of biological/psychological functions. Thereby, organism and environment are considered part of each other. The organism reflects characteristics of the environment (at human stage this relation goes in both directions), as they are of formative importance during their development. A fundamental principle is that functional development precedes organic development, meaning that functionality for specific behaviors exists before organisms adopt them due to the means of organization. Like most of the organisms, humans represent their environment within their biological characteristics. At the same time, they are changing the environment actively and therefore create new functions. That is why environment needs to be re-represented in humans, in order to organize these human-made functions of the environment. Vygotsky’s proposition to understand this re-representation is based on the concept of extra-cerebral organizations (cf. del Río & Álvarez, 2016).

The Dialectical Nature of Extra-cerebral Organizations

del Río (2002) explains his thoughts about extra-cerebral organization in the following words:

[H]uman beings use the environment as a ‘third hemisphere’ of the brain. (...) This ‘third hemisphere’, which extends the two hemispheres of the internal brain and reconnects them in a new way, situates human beings in a virtual space in which their internal directing mechanisms for acting in the natural environment are reorganized into cultural mechanisms. (p. 243)

Due to the appropriation of the cultural environment, the reorganization of psychological functions emerges at a higher level. Toomela concurs with the conception of del Río,

stating that higher psychic functions emerge on the base of extra-cerebral connections that their origin lies in the socio-cultural environment rather than within the individual (Toomela, 2014, p. 324). Luria as well formulates a related statement, referring to:

L. S. Vygotsky [, who speaks] of that role played by ‘extra-cerebral connection’ in the localization of functions connected with specifically human areas of the brain, these extra-cerebral connections, built up in the activity of man, in the use of instruments and external signs, and so important in the formation of higher psychological functions. (Luria, 1965, p. 390)

It stands out that the eco-functional/cultural-historical approach to neuropsychology advocates a dynamic conception of the functional organization of the brain, especially of higher cognitive functions. Accordingly, the formation of higher cognitive functions is not to be thought of as a mechanistic process, but as the dialectical rising of natural to cultural/mediated psychic processes (cf. Toomela, 2014). “[T]he subject and its functioning, the organism and what it does, maintain a dialectical relationship: the organized activity generates a structure and literally the activity organ-izes itself” (del Río & Álvarez, 2016, p. 3). The dialectical character of the functional organization of higher psychic functions implies that the emergence of a higher form of organization is accompanied by a redefinition of the functional role of the old organization. Thereby the older form of organization is contained within the new one, but obtains a new quality in relation to the functional whole. “Furthermore, brain reorganization in the course of the development is not only continuous hierarchical synthesis. Often the lower-level structures must be disorganized for the new structures to become possible” (Toomela, 2014, p. 344).

Functional Role of Extra-cerebral Organizations

The development of new forms of organization of higher cognitive functions is mediated by so-called extra-cerebral links/connections (cf. Kotik-Friedgut & Ardila, 2014; Toomela, 2014). External factors form functional connections together with the inner hemispheres of the brain. They represent functional systems composed of the internal (initially innate) nervous organization and the external. Thereby, it needs to be mentioned that these external factors are of a cultural nature; they are developed within the social history as products of social labor/activity. The extra-cerebral organizations serve a particular objective, meaning that they realize a certain psychic function. “[T]he human organism creates new external organs for new specific activities” (del Río & Álvarez, 2017, p. 65).

For example, in little children, the spoken language functions as an extra-cerebral link and serves the external regulation of the child’s behavior. Learning to speak themselves, children start to regulate their own behavior mediated by language resulting eventually into the internalization of the executive function (cf. Luria, 1965, p. 390).

At the same time as realizing certain psychic functions, the extra-cerebral connections also form new connections within the inner hemispheres. “[T]he role of external factors (stimulus-mediators, symbols) in establishing functional connections between various brain systems is, in principle, universal” (Kotik-Friedgut & Ardila, 2014, p. 378). Particular functional/extra-cerebral systems serve neither just the development of the brain nor reflect functions of a specific external factor. Furthermore, it is not likely that the development that the extra-cerebral connections underlie is headed towards one definite final organic state. Instead it is assumed that the higher cognitive functions as such are organized as a dynamic system in a continuously state of a dialectical rising through contradictions. “[S]ocially shared and instrumentally

situated functional distribution is not only formative, evolutionary and provisional, but is maintained for much of the functional system (and with designs that vary according to age, person and culture) throughout the lifespan” (del Río & Álvarez, 2017, p. 67).

Specific Characters of the External Factors

In addition, the role of the external factors within the context of the organization of functional systems has to be understood as dynamic by nature. del Río and Álvarez (2017) state:

new type of activity is expressed as a new function that produces a new organ, although emphasizing the crucial fact that this organ does not have to be totally inside the body, and that the new higher function may be an innovative combination of external connections and internal connections. (p. 66)

Side by side with the upward development of the psychic organization, the functional role of external factors changes. As already mentioned, external factors usually represent human-made products of social labor. As such, they carry a certain function/meaning within the context of the social reproduction. Because the individual survival at human level is mediated by social labor, it is virtually a biological imperative for the subjects to appropriate the meaning of the products of labor, at least up to a level, that they can realize their function within the societal context of reproduction. del Río describes the said in these words:

that which is naturally visible is not of necessity conscious, for it is assured by the pre-equipment of the natural psyche; it is that which is naturally invisible, and requires cultural mediations to make it visible, that is strange and indigestible for the natural psyche, and therefore produces consciousness. (2002, p. 238)

The necessity for an emergence of conscious confrontation with the environment is caused by the fact that the environment that humans come upon is not natural, but one that carries societal meaning structures. While animals have developed psychic forms of organization during the biological evolution that allow them to adapt to the natural environment (to “represent” it), the cultural-historical development of the humans’ has formed environments, whose meaning structures are no longer evident from their natural characters, in a temporal period that does not permit evolutionary adaption. Meaning that the “natural” psychic organization of the human necessarily has to be extended (“re-represented”) in order to match the complexity of the organizational structure of the societal environment. The appropriation of social meanings, which are part of the human environment, represents a necessity for the individual’s development in order for them to contribute—mediated by the social labor—to the societal reproduction and therefore their own survival.

The Upward Organization of Extra-cerebral Systems as Substrate of Appropriation

The appropriation departs from the present state of cognitive organization of the learner. Within the process of appropriation, with the internalization of extra-cerebral connections, emerges an upward development of the functional systems. Therefore, a new confrontation with the environment and new subjective meanings of the appropriated surge as well. Following a steady re- and upwards organization, the functional cognitive organization approaches functionally a level of complete appropriation of societal meaning structures. In different words:

[E]very object or phenomenon is a complex hierarchical organization of elements into a qualitatively higher level whole. Every component of such a system has a specific role in the organization of a whole. To understand how the whole functions, it is necessary to describe its components and relations between those components. If some components of a system are not identified, then the whole cannot be fully understood. The specific roles of identified components cannot be understood. (Toomela, 2000, p. 359)

The dialectic manner of the appropriation process implies that different external factors can represent different functional roles within different levels of cognitive organization. Therefore, it is necessary to study environment from the perspective of each individual learner in regard to his developing (extra-cerebral) organization of psychic functions. This can be understood as a function of his lived experience/perezhivanie (cf. Toomela, 2000).

Phylogenetic Implications on the Analysis of Higher Cognitive Functions

We want to add some further comments about the previous notes. In order to highlight the socially mediated character of the human way of life and of the higher cognitive functions, we mentioned a distinction between natural and cultural-historical forms of functional psychic organization. To be precise, the cultural-historical development has to be considered a part of the natural development (even though following new laws in development). It is reasonable to “consider the organism like a part of the environment and the environment like a part of the organism. (...) [As] the evolution is determined by the adaptation of the organism to the environment” (del Rio & Álvarez, 2016, p. 3). The psychic organization at human level is based on a long phylogenetic development. “Psychological functions are not by their origin functions of the brain but functions that emerge in the individual environment unity. All organisms are born with a biologically determined basic structure. This structure changes in the interaction with the environment” (Toomela, 2014, p. 334f.). To understand the phylogenetic development of structures is to the same extent significant for the functionality of the whole psychic system as the external and cultural factors. Internal and external hemispheres form together the substrate of the dynamic psychic organization. In order to comprehend this organization, the single stages of its development must be understood as well. Therefore, also the “natural” basis of the development of higher cognitive functions should be considered. Instead of being two separable categories, socio-cultural development and phylogenetic development are parts of a “genetic contradiction” that forms the higher cognitive functions (Vygotskii et al., 2007, p. 66). During its hominization, the human brain has developed a “huge capacity, to store information about various facts and rules whose nature is not known in advance, but acquired by learning through personal experience or derived from culture,” which forms the basis for the emergence of higher cognitive functions. Nonetheless, also these new developmental products relate to “[t]he ‘old’ subcortical structures [that] are preloaded with hardwired information representing the ‘wisdom of the phylum’” (Kotik-Friedgut & Ardila, 2014, p. 381). Therefore, the evolutionary development of the brain should be analyzed together with the ontogenetic development of higher cognitive functions. “[T]he natural line is also a line of development. Therefore it should be revealed how brain organization changes in the course of the development” (Toomela, 2014, p. 336). There are already a couple of investigations done in the context of a dialectical analysis of the phylogenetic development of psychic organization. Particularly Leont’ev (1973) and Schurig’s (1975) works deserve to be highlighted.

The Active Role of the Subject

We want to comment further on the issues of the appropriation of socio-historical products and their meaning within the context of societal reproduction. First, we want to highlight that the said appropriation is not an unidirectional process, but forms a dialectical unit together with the process of objectification. Due to their social labor, the individuals become in fact carriers of the society, which they change and develop (cf. Toomela, 2014, p. 325).

Given previously, the analysis of the development of higher cognitive functions has to take into account that the role of the learner in this process is not a passive and consuming one, but rather active. “[O]rganisms do not create new cortical formations — neurogenesis would not occur — unless actual voluntary action occurs and the entire organism is involved in that activity” (del Río & Álvarez, 2017, p. 74). In the end, it is the activity realized by the individuals, which carries the process of socially mediated survival. This premise cannot be treated as abrogated in certain stages of the ontogenetic development (e.g., in children or elderly), if we agree to understand the development as a dynamic process (which of course does not say, that there cannot be differences within the development). Therefore, the activity resulting from different psychic organizations within the life span of an individual always serves both objectives, to the upward development of the system and to the realization of specific human activity (according to the current level of development).

The Character of the Products of Accumulated Labor

Furthermore, we want to point out that socio-historical products do not necessarily have to become objectified. Even though within the social history there have been objectifications for the most socio-historical products (tools, symbols, writings, etc.) for example, early linguistic products that did not develop objectifications must be considered socio-historical products as well. The same goes for other “behavioral” developments.

The arts, play, religion, animism, rituals (including those of scientists and academics), myths and life’s narratives, self-analysis and criticism and social gossip—these are made for distancing not our ideas, but rather our intentions and feelings. The consideration of behavior as a lesser problem than knowledge, or reducible to it, has led to undervaluing the analysis of the processes of construction (and distancing) of the higher directive functions. (del Río, 2002, p. 258)

In fact, it is more accurate to conceptualize the external factors of extra-cerebral organizations in the more ample way of social relations like it is done by Veresov (2010). Products of labor represent within this perspective a partial but very important group of (objectivized) social relations. The insight that it is the objectivized form of social relations which plays an important role apart from their immediate appearances is confirmed by del Río and Álvarez (2011).

Individual Position in the Context of Functional Extra-cerebral Organization

Our ultimate comment concerns the notion of the context of societal reproduction. So far, it has been laid out that societal reproduction and production of societal meanings and objectifications follow a particular development. Indeed, there is solely *one* cultural-historical development of human history. Nonetheless, each individual only faces a specific sector of it. “However, different mediators and means, or significantly different details within

them may and in fact do develop in different cultures” (Kotik-Friedgut & Ardila, 2014, p. 378). The individual development depends highly on the specific fraction of the environment that is faced. Therefore, the actual relation between subject and socio-cultural history has to be understood in the way of a “specific environment influence [on] the systemic-dynamic organization of higher psychological functions” (Kotik-Friedgut & Ardila, 2014, p. 379) rather than a universal law of nature that effects everybody equally.

Discussion: Funds of Knowledge and Identity in the Context of the Eco-Functional Approach

The previous analysis showed that funds of knowledge and identity as well as the eco-functional approach are based on an historical-dialectical foundation. Funds of knowledge were described as historically accumulated products of social labor. Therefore, they refer to the same thing as what we introduced as “external factors” in the context of the extra-cerebral organizations. They are situated in the “third hemisphere” and form together with the internal hemispheres of the brain the function structure of organization of higher cognitive processes. This conceptual similarity can in fact serve as a basis for a fertile combination of the two approaches. Furthermore, we have stressed that the learner does not face the whole of accumulated socio-historical developments, but a certain fraction. This premise is reflected in Holzkamp’s (1985, p. 358f.) idea of individual position, in the FoK approach’s focus on the specific position of ethnic minorities and in FoI within its fundamental concept of *perezhivanie*.

Particularly the development of FoK into FoI introduces a further advancement regarding to the recognition of individual position. Due to the more precise representation of individual position of the subjects, FoI enables a more exact analysis of those funds/external factors that form the individual basis of extra-cerebral connections and therefore of appropriation processes. Apart from that, FoI introduce further advancements, as it focusses funds, which learners “actively use [...] to define themselves” (Esteban-Guitart & Moll, 2014, p. 31) and therefore highlights the subjectivity of meaning structures. Furthermore, FoI stress the active role of the subjects in the process of their individual development. Nonetheless, the approach could gain even greater benefit from a more explicit reference to the active role of the subjects, not only within their individual history of appropriation, but also within the general societal process, particularly within the process of objectification and material activity. This is in accordance with the original base of FoI, *perezhivanie*, in which both are expressed (cf. Cong-Lem, 2022).

In the introduction, it was mentioned that FoK and FoI had been previously criticized for a lack of the representation of developmental dynamics and therefore a certain historicity. Following the comparison of FoK and FoI to the eco-functional approach, this critique can be confirmed in reference to particular characteristics of the theories. While it was appreciated that the approaches indicate a historical-dialectical concept for the character of the funds and that in particular FoI consider the individual position of the learner and his individual confrontation with the funds, applying the perspective of extra-cerebral organization also evokes one problematic indication. As being said previously, the functionality of the extra-cerebral organization is defined by its developmental context. For this reason, the role of external factors (=funds) has to be considered dynamical. The appropriation of the funds is a dialectical process. Within different developmental stages of the extra-cerebral

organization, they have different functional roles, meaning that funds also have different subjective meanings, depending on the previous development of extra-cerebral organization of higher cognitive functions. Therefore, “[e]nvironment should be studied not as it is, not in absolute terms, but in relation to a child. The same environment in absolute terms is absolutely different for a 1-, 3-, 7- and 12-year-old child. (Vygotsky, 1933–1934/1984, p. 383)” (Toomela, 2000, p. 361).

Apart from the necessity to relate the subjects within a social context, it is also necessary to relate the social context to the individual development of the learner. In particular, FoK can be considered problematic in this aspect. They have been criticized before of being too adult-centric (Esteban-Guitart, 2021). As a consequence, it is unclear which individual meaning of certain funds has for each learner and therefore which role they have in their concrete extra-cerebral organization. FoI as well are subject to this critique, even though to a lesser extent. FoI consider the individual meanings of the funds due to such methods as the identification and generation of individual narratives and the observation of subjectively meaningful objects (Esteban-Guitart, 2021). Nonetheless, it needs to be highlighted that this method only serves to obtain a temporary understanding of individual meaning that can change within the dynamic development of psychic organization. Esteban-Guitart formulates a similar statement about the problem: “the methods used in the approach [FoI], such as identity drawing, result in teachers obtaining only ‘snapshots’ which are, potentially, incapable of documenting, in any depth, those aspects of identity that are not fixed” (Esteban-Guitart, 2021, p. 6).

Following the problem of lacking an adequate representation of developmental dynamics, which we were able to confirm from a perspective of the eco-functional approach, we recommend that FoK and FoI should be reflected regarding this issue and its possible conceptual resolution. Especially FoK might have to adapt more references to the role of individual position but also FoI has to strengthen this position particularly in regard to the changing functional role of funds within the process of individual development. Therefore, as a concrete recommendation for FoI, we recommend to consider the use of longitudinal study settings since they are more appropriate to reflect developmental dynamics.

Conclusion

Using the eco-functional perspective, the approaches of Funds of Knowledge and Funds of Identity can be situated within a neuropsychological context. It stands out clearly that FoK have a similar notion as the external factors. FoI match the term in some ways even better, as they highlight the fact that funds/external factors inhabit particular subjective meanings/functions in different individual structures of organization of higher cognitive functions.

Apart from these descriptive results, the analysis also resulted in the suggestion that particularly FoK should adopt a perspective more oriented towards an understanding of the funds as developing, dynamic, and individual meanings/functions. FoI on the other hand are recommended to adapt an approach that takes the development of individual psychic organization more into account. (Table 1).

Appendix. Glossary

Table 1 Glossary

<i>Term</i>	<i>Explication</i>
Eco-functional approach	Neuropsychological approach that understands the functional psychic organization as a combination of external and internal connections. External–social relations can become internalized as intra-cerebral connections; nonetheless, even mature functional organization can include external (extra-cerebral) connections
External brain	External brain refers to the concept, that specific factors outside of the human brain constitute important parts of the functional psychic organization
External factors	External factors are in general social relations. Often these social relations take the form of products of labor as they become objectified social relations. As such they serve a specific social purpose which is functionally reflected within their role in the psychic organization
Extra-cerebral connections	Extra-cerebral connections describe the links between the interior cerebral organization and the external factors of the “external brain.” Extra-cerebral connections serve a concrete functional purpose within a functional psychic organization but can also become the basis for the emergence of new connections within the brain, which is called “internalization”
Funds of Identity	FoI are as well the result of historically accumulated social labor but from the perspective of a particular individual. FoI can be understood as the way in which an individual experiences and understands aspects of its environment, similar to its subjective meaning structure
Funds of Knowledge	FoK have are the result of historically accumulated social labor, which function as carriers of social knowledge. Therefore, FoK can be used to support learning and education e.g. in the school context
Historical dialectics/ socio-cultural approach	The socio-cultural approach follows the methodology of historical dialectics. Historical dialectics (or sometimes dialectical materialism) are an ontological position that assumes the auto-motion of objects based on their inner contradiction. This relates to methodology in psychology insofar as phenomena are understood as (a) being in motion and therefore supposes a dynamical understanding of things and (b) containing within themselves the historical stages of their rising in contradiction and therefore have to be understood referring to their history

Author Contribution Leonard Nigrini presented the idea. Leonard Nigrini and Moisés Esteban-Guitart elaborated the theoretical approach of the paper. The theoretical analysis was performed by Leonard Nigrini. Leonard Nigrini wrote the manuscript in consultation with Moisés Esteban-Guitart.

Funding Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature. Second author (M. Esteban-Guitart) acknowledges the support of the project ref. PID2021-127143NB-I00 funded by MCIN/AEI/10.13039/501100011033FEDER, “A way of making Europe”, by the “European Union” and by Government of Catalonia, ICREA2021 award.

Availability of Data and Materials Not applicable.

Declarations

Ethics Approval and Consent to Participate Not applicable.

Consent for Publication Not applicable.

Competing interests The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Cong-Lem, N. (2022). The relation between environment and psychological development: Unpacking Vygotsky's influential concept of perezhivanie. *Human Arenas*. <https://doi.org/10.1007/s42087-022-00314-6>
- del Río, P. (2002). The external brain: Eco-cultural roots of distancing and mediation. *Culture & Psychology*, 8, 233–265.
- del Río, P., & Álvarez, A. (2011). La actividad como problema de desarrollo. Algunos potenciales educativos del eco-funcionalismo y la psicología histórico-cultural. *Cultura y Educación*, 23(4), 601–619. <https://doi.org/10.1174/113564011798392442>
- del Río, P., & Álvarez, A. (2016). Y el Verbo se hizo carne... Una aproximación eco-vygotskiana a la adquisición del lenguaje. *Papeles De Trabajo Sobre Cultura, Educación y Desarrollo Humano*, 12(1), 1–21.
- del Río, P., & Álvarez, A. (2017). Vygotsky and beyond: Horizons for the future of psychology / Vygotski y más allá: Horizontes para el futuro de la psicología. *Estudios De Psicología*, 38(1), 63–114. <https://doi.org/10.1080/02109395.2017.1281580>
- Esteban-Guitart, M. (2021). Advancing the funds of identity theory: A critical and unfinished dialogue. *Mind, Culture, and Activity*, 28(2), 169–179. <https://doi.org/10.1080/10749039.2021.1913751>
- Esteban-Guitart, M., Iglesias, E., Serra, J. M., & Subero, D. (2021). Community funds of knowledge and identity: A mesogenetic approach to education. *Anthropology & Education Quarterly*.
- Esteban-Guitart, M., & Moll, L. C. (2014). Funds of Identity: A new concept based on the Funds of Knowledge approach. *Culture & Psychology*, 20(1), 31–48. <https://doi.org/10.1177/1354067X13515934>
- González, N., Moll, L. C., & Amanti, C. (2006). *Funds of knowledge: Theorizing practices in households, communities, and classrooms*. Routledge.
- Hogg, L. (2011). Funds of Knowledge: An investigation of coherence within the literature. *Teaching and Teacher Education*, 27(3), 666–677. <https://doi.org/10.1016/j.tate.2010.11.005>
- Holzkamp, K. (1985). *Grundlegung der Psychologie* (Studienausg). Campus-Verl.
- Kotik-Friedgut, B., & Ardila, A. (2014). Cultural-historical theory and cultural neuropsychology today. En A. Yasnitsky, R. van der Veer, & M. Ferrari (Eds.), *The Cambridge Handbook of Cultural-Historical Psychology* (1.^a ed., pp. 378–400). Cambridge University Press. <https://doi.org/10.1017/CBO9781139028097.021>
- Leontjev, A. N. (1973). Probleme der Entwicklung des Psychischen. Athenäum-Fischer-Taschenbuch-Verlag.
- Llopart, M., & Esteban-Guitart, M. (2018). Funds of knowledge in 21st century societies: Inclusive educational practices for under-represented students. A literature review. *Journal of Curriculum Studies*, 50(2), 145–161. <https://doi.org/10.1080/00220272.2016.1247913>
- Llopart, M., Serra, J. M., & Esteban-Guitart, M. (2018). Teachers' perceptions of the benefits, limitations, and areas for improvement of the funds of knowledge approach. *A Qualitative Study*. *Teachers and Teaching*, 24(5), 571–583. <https://doi.org/10.1080/13540602.2018.1452729>
- Luria, A. R. (1965). L. S. Vygotsky and the problem of localization of functions. *Neuropsychologia*, 3.
- Machancoses, M. (2021). Impacto de la Aproximación Fondos de Conocimiento desde la Visión de las Docentes y las Familias. Un Estudio Cualitativo. *Revista Internacional de Educación para la Justicia Social*, 10(1), 55–68. <https://doi.org/10.15366/riejs2021.10.1.004>

- Machancoses, M., Siqués, C., & Esteban-Guitart, M. (2022). La participación de las familias en el contexto escolar: Un estudio cualitativo. *Psicoperspectivas. Individuo y Sociedad*, 21(1). <https://doi.org/10.5027/psicoperspectivas-Vol21-Issue1-fulltext-2285>
- Moll, L. C. (2005). Reflections and possibilities. In N. Gonzá´lez, L. Moll, & C. Amanti (Eds.), *Funds of knowledge: Theorizing practices in households, communities, and classrooms* (pp. 275–288). Mahwah, NJ: Lawrence Erlbaum Associates.
- Moll, L. C. (2019). Elaborating funds of knowledge: Community-oriented practices in international contexts. *Literacy Research: Theory, Method, and Practice*, 68(1), 130–138. <https://doi.org/10.1177/2381336919870805>
- Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory into Practice*, 31(2), 132–141. <https://doi.org/10.1080/00405849209543534>
- Saubich, X., & Guitart, M. E. (2011). Bringing funds of family knowledge to school. The living Morocco project. *REMIE: Multidisciplinary Journal of Educational Research*, 1(1), 79–103.
- Schurig, V. (1975). *Naturgeschichte des Psychischen*. Campus Verlag.
- Toomela, A. (2000). Activity theory is a dead end for cultural-historical psychology. *Culture & Psychology*, 6(3), 353–364.
- Toomela, A. (2014). There can be no cultural-historical psychology without neuropsychology. And vice versa. En A. Yasnitsky, R. van der Veer, & M. Ferrari (Eds.), *The Cambridge Handbook of Cultural-Historical Psychology* (1.^a ed., pp. 315–349). Cambridge University Press. <https://doi.org/10.1017/CBO9781139028097.019>
- Van der Veer, R., & Valsiner, J. (1994). *The Vygotsky reader*. Oxford, UK: Blackwell.
- Veresov, N. (2010). *Forgotten methodology: Vygotsky’s case*. In *Methodological thinking in psychology: 60 years gone astray?* (pp. 267–295). Information Age Publishing.
- Verhoeven, M., Polman, J. L., Zijlstra, B. J. H., & Volman, M. (2021). Creating space for agency: A conceptual framework to understand and study adolescents’ school engagement from a Funds of Identity perspective. *Mind, Culture, and Activity*, 28(2), 125–137. <https://doi.org/10.1080/10749039.2021.1908363>
- Volman, M., & ‘t Gilde, J. (2021). The effects of using students’ funds of knowledge on educational outcomes in the social and personal domain. *Learning, Culture and Social Interaction*, 28, 100472. <https://doi.org/10.1016/j.lcsi.2020.100472>
- Vygotsky, L. S. (1984). Krizis semi let. In D. B. El’konin (Ed.), *L.S. Vygotsky. Sobranije sochinenii: Tom 4. Detskaja psikhologija* (pp. 376–385). Moscow: Pedagogika. (Original work presented as a lecture in 1933–1934).
- Vygotskii, L. S., Luria, A. R., del Río, P., & Álvarez, A. (2007). *El Instrumento y el signo en el desarrollo del niño*. Fundación Infancia y Aprendizaje.
- Whyte, K. L., & Karabon, A. (2016). Transforming teacher–family relationships: Shifting roles and perceptions of home visits through the Funds of Knowledge approach. *Early Years*, 36(2), 207–221. <https://doi.org/10.1080/09575146.2016.1139546>
- Williams, J. J., Tunks, J., Gonzalez-Carriedo, R., Faulkenberry, E., & Middlemiss, W. (2020). Supporting mathematics understanding through funds of knowledge. *Urban Education*, 55(3), 476–502. <https://doi.org/10.1177/0042085916654523>

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.