Motivation and Experience versus Cognitive Psychological Explanation

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ABSTRACT

The idea to utilise cognitive neuroscientific research for educational purposes is known as Mind-Brain Education or Educational Neuroscience. Despite some calls for an uncritical endorsement of such an agenda, a growing number of educational scholars argue that it must remain impossible to translate neurological descriptions into mental or educationally relevant descriptions. This paper takes these well-established arguments further by not only focusing upon these different levels of description but going beyond this issue to assess the theoretical foundations of cognitive science as a functional theory of the mind. With relevance to education it is argued that because of its functional character a cognitive-psychological approach to education suffers from an inherent blind spot regarding the actor's feelings and motivations. The paper concludes with the claim that, because of this experiential poverty, any cognitive neuroscientific approach must face severe limitations when utilised for educational purposes.

1. Introduction

The Brain-Turn, as a current move in parts of the educational landscape, aims to utilise insight gained from neuroscientific or, to be more precise, from cognitive-neuroscientific, psychological research (Oxford Cognitive Neuroscience Education Forum, 2011) for pedagogical purposes. This sort of envisaged utilisation can manifest itself on – at least – two different levels. On one level it could be seen as serving the aim to enhance the learning-success of those being subjected to a pedagogy developed along the Mind-Brain Education (MBE) or Educational Neuroscience (ENS) agenda. This would be a pragmatic move, trying to incorporate from cognitive neuroscience what is supposed to work in education. However, on a second level it is possible to sense an intended or tacit reductive agenda as one finds it in the natural sciences. This reductive aim, if fully endorsed, appears to entail the possibility to reduce pedagogical

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instruction to a causal fixture whereby a specified stimulus will yield an invariable, and thus predictable, behavioural and/or cognitive result in the so instructed learner (Ansari et al., 2011). In that respect the second level of the Brain-Turn would yield normative influences, altering the existing borders of the established academic disciplines of education and psychology (Feldges et al., 2017). Although both levels may still sound promising it has to be kept in mind, that especially the second level undermines the academic discipline of education as such. Should such a theory-reduction be possible, and that is far from clear, the academic discipline of education could be soaked up by a scientifically motivated and more fundamental, underlying psychology. The first, the pragmatic level however comes with the danger of eroding education from the inside, turning it into something of a generic skill that could be perceived as the mere ability to present the right stimuli at the right time to evoke the aspired learning along a predictive, causal nexus. However, the argument I present here will reveal theoretical limitations that cast doubt upon the reach of such pedagogies, regardless upon which of these levels the ultimate aim of the protagonists of an MBE/ENS agenda lies.

I will thus argue for a specific limitation of the cognitive-neuroscientific agenda for educational purposes. This has been done a number of times, mostly with a focus upon the discussion that surrounds the incompatibility of the various levels of neuronal, cognitive and educational descriptions of learning (e.g.: Kraft, 2012; Schrag, 2013; Cuthbert, 2015 or, rather recently Feldges et al., 2017). This line of argument usually engages with the fact that neuroscientific descriptions are just that, hence that it is not possible to translate neuroscientific descriptions of learning-relevant neuronal processes into cognitive (Schröter, 2011) or, even more so, educational descriptions of the relevant processes as these occur upon these respective levels (Anderson & Reid, 2009). Arguably, nothing new can be gained from following this well-established argumentative path yet again.

However, there seems to be a side to the Brain-Turn that has not yet been fully developed in its implications regarding the suggested neurocognitive and educational pairing. This is the side of the experience of learning. By moving back to the theoretical foundations of cognitive psychology I will reveal cognitive psychology as a functional theory of mind. Cognitive psychology thus works with the hypothetical construct of mental (cognitive) states that serve a certain function and all this without the necessity of any ontological commitment towards the supposedly underlying biological stratum. The question as to

whether a neuroscientific underpinning could eventually provide such an ontological basis is still debated (Geyer, 2004), but quite often answered in the negative (Schröter, 2011). This is the area where the main-thrust of the argument for the impossibility for a neurocognitive pedagogy in the form of MBE/ENS appears to be located.

But, as I already mentioned, there is a second strand. In order to trace the hypothetical cognitive states that are at the core of current scientific psychology mental states are conceptualised via their functional utility to bring about the observed result. It is exactly this notion of functional states that leads to a critical point when one attempts the incorporation of individualised experience into such a functional framework. Individual experience thus appears to be a blind spot within the theoretical framework of cognitive science (Feldges, 2013), one that – due to the different levels of descriptions I mentioned earlier – cannot be remedied by recourse to the underlying neuronal structure in the form of a neurocognitive account. For this article I thus aim to explore the educational implications of this experiential blind spot of cognitive psychology. This will lead me to conclude that too strong a commitment to the neurocognitive agenda for educational purposes appears to be built upon a promise that neither cognitive science, nor cognitive neuroscience could keep because of their theoretical underpinnings.

2. Neuroscience, Cognitive Neuroscience and Education

Although it is not at all my aim to develop the problematic pairing on cognitive neuroscience and education here, it is nevertheless necessary to provide a simplified account of the cognitive psychological methods that are supposed to establish and justify psychological knowledge claims. As it will become apparent, this is needed because the notion of the experiential blind spot, mentioned above, is a direct product of the theoretical underpinnings of the scientific discipline of psychology and its methods. For the sake of a clearer exposition I will take three successive steps to develop the educational implications of a) cognitive science, b) cognitive neuroscience, and finally, c) education and cognitive neuroscience.

2.1 Cognitive Science

Knowledge, and psychological knowledge is no exception here, is justified belief. Hence, we claim to know something, if we can provide sufficient evidence to support our belief that something is the case. In order to provide such a

sufficient justification for what is deemed to be known the methods for knowledge-production are of key-importance. When one thus harbours the suspicion that the explanatory reach of cognitive psychology may be limited in any shape or form it is imperative to go back to the methods. This recourse to the methods used to establish the sought after evidence allows the recognition of what these methods were designed for and if they are up to the job. Already in 1953 Ludwig Wittgenstein (1953) claimed that Psychology engages in a conjuring trick by making us forget about its underlying assumptions and thus performing a slight of hand. Wittgenstein's exact charge must not interest us here, but especially his mentioning of the underlying assumptions is what needs further clarification.

Cognitive psychology is a discipline that models itself along the natural-scientific method. Large samples of participants are recruited and organised in, at least, two groups (experimental group and control group). These groups are put into controlled and therefore equal environments (Coolican, 2004) while the experimental group is subjected to the change of only one specific (the independent) variable (Wundt, 1913). This so induced change should yield a difference in the resulting behaviour (the dependent variable) of the experimental group, while the control group would show no change in the dependent variable. It is this difference in the dependent variable between the two groups that is then statistically assessed and, when sufficiently significant, it is taken to indicate a causal relationship between the independent and the dependent variable (Howitt & Cramer, 2008).

For example, Atkinson & Shiffrin (1968) assessed human memory, i.e., the capacity to learn and retrieve previously learned contents by presenting lists of random words to their participants. When compared with the control-group the total number of recalled words rose with increasing time allocated to the experimental group before the recall-task was performed. Hence, Atkinson & Shiffrin could claim that the incorporation of new knowledge (otherwise known as learning) needs time and that the allocation of this time stands in a causal relationship with the result (more time – more recall, less time – less recall). These results allowed Atkinson & Shiffrin to make inferences about the structure of human memory that is divided into short-term memory (STM) and long-term memory (LTM). The LTM is presumably able to hold stored information lifelong, while the STM is less than a secure storage, depending on stress and other disturbing influences. We do not need to bother us all too much with this specific piece of research, but the point I wish to make is that the

experimental setting and the empirically established differences between the two groups allowed the experimenters to make inferences about hypothetical, cognitive structures that must necessarily be place to make sense of these experimental results. Due to the potentially instable character of STM contents and the stable, retrievable character of LTM contents we know about these two hypothetical structures and the necessary flux of information from one to the other. And we know that although no one has ever observed these structures directly or the passing of information between them. The so revealed cognitive structures may be located at specific and distinct brain-locations, but they may equally be spread across various brain-regions. Nevertheless, the question regarding the location of these cognitive structures is not at the forefront of cognitive psychology's concerns, which, in its initial form, has made no clear-cut ontological commitment (Feldges, 2013). However, such an ontological commitment is made by cognitive neuroscience, and that is what I turn my attention to in the next section.

2.2. Neuroscience and Cognitive Neuroscience

Neuroscience is the empirical, natural-scientific engagement with the physics, chemistry, biology and the psychologically relevant implications of neurons, neuron-clusters and neuronal systems (Bears et al. 2001). Neuroscience is thus about a specific sort of cell tissue, namely nerve-cells. Cognitive neuroscience is a focused attempt to identify relevant neuronal activity in relation to specific stimuli in an attempt to align these activities with known cognitive processes and structures, whereby the ultimate goal appears to be, at least for some, to reduce mental activity to the underlying neural activity (Singer 2004). This is where the discussion about the different level of description finds its location (Schröter, 2011). This discussion addresses the question as to whether it is possible to describe mental events in purely neuronal terms, e.g.: if a description of Atkinson & Schiffrin's learning and memory-retrieval could ever be a complete one if only told on the level of neurons without recourse to the mental or psychological level. Without wanting to dive all too deep into this problem of the various levels of description, I will nevertheless have to come back to this issue in the following section.

2.3 Education and Cognitive Neuroscience

When it comes to the MBE/ENS agenda it is apparent that the aspired match between scientific psychology and education is one that focuses on cognitive neuroscience as I developed it in the previous sub-section (Oxford Cognitive Neuroscience Education Forum, 2011). Hence, that education, following these agendas, is supposed to profit from the empirical findings of a science that aims to locate cognitive functions within the biological substrate of the nervous system. But such a plan comes with the difficulty of how to match neuronal with mental descriptions. This is a problem that has not yet been sufficiently solved for the pairing of cognitive psychology and neuroscience (Schröter, 2001). Hence, any suggested pairing of cognitive neuroscience and education does not solve the problem of the underlying pairing of cognitive psychology and neuroscience, but merely carries it along. As outlined in the introduction, this problem is still prevalent and it is not clear at all how an alteration of the investigative focus from mental processes and structures in general (cognitive psychology) towards structures and processes that are exclusively educationally relevant would ever be able to offer a solution to the underlying problem of how to fix the neuronal level of description with that of the mental (cognitive or education-cognitive) level. Hence, MBE and ENS propose the utilisation of cognitive-neuroscience while remaining probably a bit too uncritical about the fundamental problems that cognitive-neuroscience itself is still struggling with. Nevertheless, and slightly distinct from this well established line of argument, there is a second aspect and that is what I wish to focus upon in the next section.

3. Function or Feeling?

Within this section I will focus upon one of the problems that cognitive psychological attempts face when trying to account for psychologically relevant aspect of human life. I thus move away from

1) the ENS/MBE agenda (cognitive-neuroscience as applied to education)

and

2) from the agenda of cognitive-neuroscience.

This move frees me to place my focus exclusively upon a specific aspect of cognitive psychology, namely the functional character of cognitive psychology.

It is my claim that exactly this functional character of cognitive psychology poses a severe limitation to any ENS/MBE informed pedagogy that could be built upon and/or be shaped by a predominantly cognitive-psychological foundation. I will develop my claim in a number of steps: first by unpacking the issue of a functional account a bit more in detail, followed by a disclaimer, providing clarification about a necessary limitation to any critical engagement with psychology. I will then place experience-based accounts against functional, cognitive-psychological ones to be able to finally discuss the issue of causality.

3.1 Functional Account of the Mind

Before it is possible to explore the limits of cognitive psychological attempts, it is probably best to stop for a moment and contemplate that humans live in a world of reasons (Gilbert & Lennon, 2005). Humans assess situations from their unique, individual point of view to apply their own emotional and mental capacities to decide upon appropriate action, safeguarding their survival, well-being, replication and even enjoyment (Gehlen, 1950). As Scheler (1928) argues, this reason-guided ability to act wilfully, rather than merely reacting to environmental demands, is what is to be considered as essentially human. However, this human ability to plan and perform actions instead of re-acting entails that any so planned action results from a complex and individual mental conglomerate. This mental mix of contributing factors entails, amongst others, past experiences, current situational assessments, underlying motives and external demands in relation to an individual future horizon of what one wants to achieve. Hence, action is the execution of an individually devised strategy, and acting is thus not to be mixed up with re-acting, which is the display of a causally fixed behavioural sequence in relation to a stimulus as for example a knee-jerk reflex.

To highlight the importance of this difference I once more want to go back to Atkinson & Shiffrin's classical study on the cognitive structure of memory. The crux of this piece of research was the recognition of the structured organisation of human memory whereby one cognitive structure (short-term memory or SMT) needs to hold a limited number of items for a certain amount of time to be able to secure a transfer into the other cognitive structure (long-term memory or LTM). In order to reveal the cognitive-structural difference between STM and LTM the study presented the participants with lists of random words to minimise potential effects of memorising techniques like stringing a number of these words into meaningful sequences. Participants were asked to

recall as many of the memorised words as they could in relation to various alterations of the experimental condition (disruption, disturbances, length of time for memorising). The number of words the participants could memorise was the outcome-measure (dependent variable), allowing a statistical calculation of the effects of these controlled alterations as they manifested themselves between the results of the experimental group and the control group.

This all sounds rather straight-forward and most certainly very important for pedagogical purposes. In order to assess what the learners have been expected to learn, they are often encouraged to show that learning has taken place by being exposed to a variety of tasks allowing them to display their ability to memorise (and connect) key-aspects of what was expected of them to be learned (Pokorny, 2016). Hence, education makes use of psychological research, as evidenced by pedagogical techniques such as metered repetition of core-aspects, session closure and the visual presentation of key-points. However, when Atkinson & Shiffrin sat out to do their research they were not primarily interested in the design of an effective pedagogy, their aim was to reveal the cognitive structure of human memory. To research this with an established and presumably equal base-line in all participants they utilised the extent of the averaged memorising ability of their groups in relation to previously acquired neutral items to be memorised. To phrase it slightly different: to assess the effectiveness of the human function to memorise in relation to various environmental demands under otherwise controlled circumstances Atkinson & Shiffrin had to expose their participants to do some prior learning in the form of a list of random words. Hence, although this learning-aspect is highly valuable to education, it did not gain prominence in the intended assessment of the memorising-function of the human brain, which subsequently allowed for the formulation of a theory of a structured cognitive lay-out of human memory. The learning-aspect of Atkinson & Shiffrin's experiments was a mere but necessary pre-cursor to get the study going. To safeguard unified conditions, this actual learning-aspect was controlled, that is, harmonised in such a way that potential individual differences were minimised by a controlled group-composition and by the chosen, presumably meaningless string of words. Controlled in such a way Atkinson & Shiffrin did not need to bother themselves all too much with this harmonised prior learning aspect of their project and could thus focus solemnly upon the memorising-function and its structural limits.

This is now where an important aspect of cognitive psychology reveals itself. In order to capture a specific aspect of human mental life, a specific function of

the human mind, the researching psychologist has to carve this specific aspect out of the multitude of other, constantly and simultaneously on-going, mental events and states. But as there is no way to assess these psychological states directly (see for more detail: Feldges et al., 2017), psychologists utilise the construct of cognitive processes and structures unified by a specific purpose that is supposed to be served. And the effectiveness of serving this purpose remains assessable via certain behavioural displays, as in Atkinson & Shiffrin's case the recalled number of items indicated the effectiveness and limitation of various cognitive states that were assumed to contribute to the function of human memory. Hence, in order to get an investigation going, cognitive psychology does isolate specific mental aspects, supposed to achieve a specific outcome. Or, a bit more pointed, cognitive psychology assesses functional states and the structure of these in relation to a design-immanent purpose.

3.2 Disclaimer

Every kind of scientific investigation starts with a clear definition of what is to be investigated so that a suitable decision can be made to employ the appropriate investigative method. If the investigation is supposed to focus on the mind things get inherently complicated. This is due to the nature of what is to be investigated, i.e., mental states and processes. There are claims that it would be possible to reduce mental events directly to the underlying physical events and that an exhaustive assessment of the biological stratum upon which these physical events unfold would provide a sufficient basis to capture the mental events as well (see for example: Singer, 2004). Others maintain that the crux of these mental states is that they are individualised, that they offer a unique experiential access to the world as experienced from the point of view of the one undergoing these states (see for example: Maturana & Varela, 1972). Endorsing this second option entails – to a varied degree – a position whereby these mental states would be private, i.e., individualised, and privileged and thus only and exclusively accessible to the one undergoing these states (Wittgenstein, 1953). But if science is understood to be a form of knowledge acquisition whereby appropriate method is used to purposefully collect empirical evidence to corroborate, substantiate or falsify theory, the provision of this empirical evidence becomes a critical issue. If mental states are indeed individualised episodes, empirical evidence can only be obtained from the experiencing subject. But as there is no guarantee that – for example – my pain matches exactly the pain of someone else (Feldges, 2014), the empirical basis for any

knowledge claim is invariably limited to an insufficient small sample of that one experiencing individual only. Such a limited evidence-basis would thus be in danger of being riddled with mere idiosyncrasies. To avoid this problem psychology has established a method that utilises larger samples and statistical techniques to assess certain states and processes as they are supposed to happen in a similar fashion within a larger group of participants. Nevertheless, the states and processes are still not directly observable and are thus captured by what these various states are supposed to bring about, i.e., by their function.

At this stage an example may help. Feistinger (1957) investigated a concept known as cognitive dissonance. This is an obvious gap between what one thinks one is going to do and what, when faced with the actual situation, one is actually doing, which quite often stands in a direct opposition to what one thought one would be doing. The behavioural effects of this cognitive dissonance are quite easily observed in the form of any kind of actual behavioural deviance from the previously formed and communicated plan. However, the actual inner tension of the individual that experiences such a cognitive dissonance, i.e., the uncomfortable realisation that one's cognitive processing prior to an imagined situation and the actual action within this situation is, due to the private and privileged status of mental states, not assessable to an empirical assessment. Cognitive dissonance, as a psychological phenomenon is thus defined as a function that brings about an assessable difference between initial plans and actually displayed behaviour. It thus becomes possible to collect cognitive-psychological evidence to investigate what sort of influences yield a causal impact on the extent of this function. And this without having to focus at all upon the experiential dimension, i.e., the motivation to alter behaviour in relation to earlier plans, as it manifests itself within the individual participant.

This functional description is thus what allows the generalised capture of an individual conglomerate of mental states and to define these as sufficient and necessary to pursue a certain goal. But, and that is the crux here, any so defined function is a mere heuristic device, a design-guided description from outside the experiencing individual. Hence, the function is defined by someone other than by the one who is actually pursuing a certain goal. In Atkinson & Shiffrin's experiments this becomes rather clear, complete groups are exposed to experimental settings, whereby the motivating force behind their displayed actions to learn lists of random word remains nothing but a presumption of the experiment-designing psychologists. They have to assume that an equally composed group of individuals will share a similar motivational drive to learn

and recall, but the extent of individual motivation is of no further concern. Hence, when it comes to cognitive psychology, as a functional theory of mind, one has to bear in mind that individual human action, as I developed it above, remains only assessable in so far as the experimenting psychologist's design-assumptions in relation to the participants' motives provide for a good general match with each and every individual's actual motives.

It is of course possible to interject here, that this is probably as good as it gets. After all, if one would not be willing to accept this assumed motivational bracket that makes possible the formulation of functions, well ... what else could be done? In that respect it is probably best to clarify that I am not saying that, for the sake of cognitive psychology and the undoubted usefulness it has to enlighten us about a great number of aspects of the human mind, these underlying assumptions of the cognitive, functional states are a bad or wrong move to make. What I am saying is that, although these cognitive-functional states are undoubtedly useful, they nevertheless come with limitations. And if one is willing to nolens volens embrace the undoubted usefulness while accepting the inherent limitations, one should at least know explicitly what these limitations are. And that is, for my purposes here, the inherent investigative blind spot of cognitive psychology concerning the actual experience of the individuals partaking in experiments and an investigative starting-point that takes the experimenter's assumption of the participants' motivation as a given, while the actual individual motivation remains out of reach.

3.3 Feelings and Experiences

Until now I have engaged with cognitive psychology as a functional theory of the mind and while doing so I outlined the individual-experiential blindness of such an approach. What is now left for me to do is to bring these theoretical considerations a bit closer to the field of education.

It is probably safe to assume that every educational practitioner will have experienced that the actual classroom setting is different from the psychologist's controlled laboratory. The classroom provides the interface for the interaction of the teacher with the learners, but also for the learners amongst each other. Bourdieu (1985; 1993) conceives the classroom as a dynamic field of interaction in which social positions are negotiated within a relational web. The extent of this web reaches far beyond the physical setting of the classroom, it entails individual histories in terms of friendships and animosities, the expectations of family and class, personal goals in terms of later careers and of

course, wider social implications in the form of educational ideologies that provide the framework within which educational instruction is to be provided. This far-reaching relational web manifests itself within the classroom as a multitude of past and current influences in relation to an anticipated future horizon, and impacts on unfolding interaction (Feldges et al., 2017). Bourdieu's notion of a dynamic field of interaction thus provides the means to understand the classroom as a motivational seedbed for the individual learner to either engage with education, i.e., to become an active agent as outlined above or to remain ambivalent or even dismissive towards it.

From this picture it appears to be evident that educational reality is totally different from the controlled setting of the psychology research laboratory that would allow for the presumption of an underlying and equal motivational force to assess observable outcomes in relation to presented stimuli in order to warrant inferences about causality. But here it could be objected that this was never what cognitive-educational psychology intended. However, as much as that is admittedly true, the problem is still on the table. Even if research and the evidence-backed formulation of causal claims is left to the laboratory-based psychologist, one is still left with the question of having to make a decision under what sort of educational circumstances these psychological research-finding appear to be suitable to guide actual educational practice. As I discussed above, all that psychology tells us are probabilities for future behaviour within more or less equal circumstances under the assumption of a shared motivational drive will take provided stimuli as a reason to act individually. But if such a presumed motivational bracket, allowing the formulation of a function, becomes too wide, this function-founding bracket of the motivational presumption equally becomes meaningless.

Alternatively, it is possible to argued that learners, finding themselves in artificially created, psychological research settings, bring with them their years of past experiences regarding this motivational interrelated web of the real classroom. Hence, these learners would thus, so the underlying assumption of this objection, take their existing/non-existing motivation to learn with them into this artificial research environment and perform as if they were in a real class-room. This attempt to secure the ecological validity of subsequent claims is not without problems. Such a motivation-orientated similarity assumption would not only have to assume – as psychology does – that there is a motivation to learn. It would also have to assume that this motivation is similar to the one that individually emerges within the fluid field of class-room interaction

alongside with all its situated internal and external contributing factors. And that appears to be the point where this specific objection runs into problems. Whereas psychology conceptualises motivation to act as a given and uses it as a starting point to define the function of learning, the similarity assumption would contaminate the controlled experimental setting with a broad range of individual motivational differences. Allowing for such an individual motivational habitus would pull the carpet from under the feet of what cognitive-psychological experiments are supposed to be and render their results as questionable. Hence, the similarity assumption cannot cater for the needed controlled environment that enables psychological science to establish a causal link between stimulus and result in the form of a functional relation.

Evidently the classroom as described above does not cater for the definition of a unified function of learning whereby new contents are acquired via the transfer of experiences into memory-items that can be re-arranged and recalled. Defining such a function would necessitate the presumption that all learners in the classroom actually want to learn, but that is not always the case. Hence, the assumption of an action-guiding, motivational drive that affects some learners sufficiently to become active agents of their learning, works for some, but unfortunately not for all. The function, based upon a presumed motivation to learn, become blurred because some learners simply do not wish to learn or remain ambiguous. And this remains a problem even when trying to assume some sort of equality between the psychological research setting and the real classroom and its own dynamics.

Although I spoke mostly about motivation so far, the issue is broader as it is actually about the learner's affectedness, i.e., their individual experience of certain aspects of the classroom setting that makes the perceive some thing as desirable, while others are to be avoided. There is a huge discussion about these experiential influences upon an individual's cognitive economy, with some arguing for a split between a mere functional (part of the) mind and a phenomenological one (see: Chalmers, 1996). For current purposes it is not necessary to assess this still on-going discussion in too much detail but there is one point that is of key-importance. Based upon the concept of a functional theory of mind, as used for cognitive psychological purposes, one finds a provided stimulus that is supposed to cause an action, whereby the contributing functional states are supposed to be the necessary and sufficient cause for the observed action. Hence, when Atkinson & Shiffrin asked their participants to

recall previously learned items, the functional states, transferring contents from STM to LTM were in themselves a sufficient cause that impacted on the participants' performance. Even more so, without these functional states nothing would have happened.

It is possible to critically object here: At the end of the day, a functional description as employed by cognitive psychology and the individual-motivational account that I have placed in opposition to this functional theory of mind appear to be nothing more than the discussion about the incompatibility of the various levels of description that I mentioned before. Indeed, on one side one finds the goal-orientated function, assessed by its outcome, on the other side an individual, experience-based motivational force that is supposed to guide individual action, hence two different ways to explain why an individual has behaved in the way she/he did. In that respect it really looks like this is all nothing more than the discussion about the incompatible levels of description, this time focusing on the cognitive and educational plane instead of the neuroscientific and cognitive/educational level. Instead of trying to counter such a critical remark I would like to emphasise that it is exactly these two levels of cognitive psychology and education that constitute the core of my concerns. But in order to utilise this tension to reveal the second issue that I mentioned in the introduction, I will have to unpack this additional dimension more clearly within the next section.

3.4 Causal Over-determination

If taking the experiential/affective poverty of cognitive psychological attempts as a systematic limitation of this approach then one could suggest to simply add the appropriate measure of this experiential dimension to the cognitive paradigm. But this is where things get complicated. As explained above, cognitive-functional states are supposed to be the sufficient and necessary cause of the observed results. This notion of the sufficient and necessary cause is what poses the problem in relation to the potential suggestion of merely adding some individual, experience-based motivational force to the picture. Sufficiently causal and necessary functional-cognitive states cannot be supplemented with an individual-experiential gloss. Any such attempt would lead to the fact that the observed results are causally over-determined (Beckermann, 1999), that the observed results could be reduced to either one, or the other, or even to both causes. These would be:

1. the functional states that cognitive psychology utilises to investigate the mind and additionally
2. an individual, experienced-based affectedness that fixes behaviour in a specific way.

Although such a solution may exert some attraction for educational purposes, it remains impossible for cognitive psychology. The logical coherence of the cognitive approach rests upon the causal purity of these states and that leaves no space for the incorporation of additional experiential aspects as they may manifest themselves individually in more complex settings as we find them within the educational field. From what I discussed earlier, it follows that cognitive psychology cannot give up on the exclusive causal conceptualisation of its functional states and has thus no place for individual experiences or motivational aspects.

4. Conclusion

My paper focused upon the MBE/ENS agenda and the problem of utilising scientific psychological results within educational practice. In a first step I developed the three levels, i.e. cognitive psychology, neuroscience and education. Instead of focusing upon the incompatibility of the various levels of description I suggested to merely focus upon the theoretical underpinnings of cognitive psychology as a functional theory of mind. By developing the implications of such a functional theory it became clear that cognitive psychology has to conceptualise the functional states that do the work to serve a purpose, as identified by the researching psychologist, as sufficient and necessary causes for resulting action. As successful as this research-paradigm has proven in the past, it fails to account for individual experience and motivation. The notion of causal over-determination, together with the exclusive causality of the functional states leaves cognitive psychology with a blind spot regarding the individual experiences that guide individually meaningful action. Due to its own theoretical foundations, cognitive psychology has no place for individual motivation as an additional force. If this constitutes indeed a conjuring trick, as Wittgenstein suspected, or whether it is more of a normally ignored reality of the cognitive psychological approach, open for everyone to see who is willing to engage with the theoretical assumptions of this approach, must not bother us too much here. We have had that closer look and we are now aware of this limitation of the cognitive paradigm.

But based upon my brief introduction of the educational field it became clear that any individual affectedness and subsequent inclination to learn is rooted within a rich web of relations. This web is either actively individually assessed or merely passively endured and yields its impact upon an individual willingness to engage with education or not. But trying to account for the motivational factors of such an interrelated field of interaction and the resulting individual conglomerate of cognitive, emotional and affective processes remains beyond the reach of cognitive psychology.

This has wider implications for the MBE/ENS agenda. Such approaches are based on the assumption that cognitive-neuroscience could positively impact upon pedagogical practice. But as cognitive psychology is supposed to supply the bracket according to which the processes of neuronal tissues and systems are captured any resulting educational utility of such a neuroscientific reduction could only manifest itself within the clear explanatory reach of cognitive psychology as I developed it here. But that might, due to its experiential poverty, just not be sufficient to capture educational reality.

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