The Art of Education or the Science of Education?

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Abstract

This paper focuses upon the possibility and limitation of an Educational Neuroscience (ENS) or Mind-Brain Education (MBE) in a general way. Both approaches seem to nurture the hope that educational efforts in general could be provided with a scientific foundation. By means of the explanatory bracket as provided by Bourdieu's concept of the field and Luhmann's system-theory, we provide a conceptual argument to the effect that it appears impossible to achieve such a reductive agenda. Hence, we argue that education remains a 'verstehen-based' art and can therefore not be captured by an exclusively natural-scientific approach as envisaged by ENS or MBE.

Keywords

Educational Neuroscience, Mind-Brain Education, Bourdieu, Luhmann, System-theory

Introduction

This paper emerged out of an interdisciplinary cooperation between the three authors, from work presented at the BESA conference in 2015. Author 2 was researching the Educational Neuroscience (ENS) / Mind-Brain Education (MBE) agenda from an educational perspective for a PhD in Education. Author 1 was finalising his PhD thesis, providing a philosophical assessment regarding the limitations of current psychological attempts to account for the mind, while our third collaborator (author 3), a lecturer in Mental Health, had previously researched and published about Weber's concept of '*verstehen*', i.e. the notion of an interpretative understanding.

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In this respect our paper draws on three different academic writing-backgrounds with their respective tacit codes of how to provide the argumentative narrative sufficient for an academic paper. We are aware of the fact that our multidisciplinary approach is, as Lea and Street (1998) argued, not without problems, as one decontextualized academic writing style, to be applied to a multitude of academic disciplines, does simply not exist (Russell, 1999). In that respect we expect that our multidisciplinary writing-'cross-over' may raise objections in the form of an attempted border-maintenance. Hence, that considerations regarding discrete academic-organisational boundaries (Carlile, 2002) may lead to objections with the way in which we try to put our argument forward, a way that may not always adhere to the established standards in educational studies. However, we like to think that our diverse academic backgrounds may nevertheless provide an interesting perspective on the discussion around ENS or MBE. We focus upon the debate concerning the implications of an educational approach as informed by ENS or MBE with a general perspective. Hence, we will neither focus upon any specific aspect of teaching nor upon a specific age group, our emphasis is rather one concerning the *a priori* possibility and/or the potential limitations of such an agenda.

The ENS/MBE proposal has initiated a considerable and still on-going academic dispute. The protagonists of the ENS/MBE agenda appear to argue around two main issues, whereby the exact focus is not always made explicit.

1) First, there seems to be an attempt to accomplish a physicalist-determinate reduction of educational efforts to biological structures and processes on a neurological level (Ansari et al. 2011). However, such a reduction to the causally determined biological level would equally link educational efforts and effects to this stratum in a causal fashion (Feldges, 2013). As such a reductive aim is founded upon the natural-scientific paradigm, such an agenda could arguably make educational efforts casually predictable.

2) Secondly, and hand in hand with this former issue, there is a stream of thought that aims to play such a biological foundation, which has not been successfully established yet, as a trump-card in an inter-academic 'turf-war' (Perkins, 2009), whereby either:

    a. the academic discipline of education would gain its own physicalist foundation as an independent educational science, or alternatively

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b. being soaked up in the presumed 'mother-discipline' of psychology in the form of an educational cognitive-neuroscience.

We remain critical about the possibility to achieve any of these aims and thus develop a conceptual argument to reveal the inherent limitations of the ENS/MBE agenda in terms of all of these objectives. This is probably where a word of caution is needed for those not quite used to the practice of these conceptual arguments. Our aim is to play clearly defined concepts against each other in an attempt to see if they can match or not and to draw out the implications of such a pairing for the question under consideration. This is done without providing empirical evidence, but rather with a strong reliance on established literature. However, before actually developing our argument, we provide a brief overview regarding the structure we wish to follow.

At first (I.) we locate, in a rather general way, the ENS/MBE agenda in relation to psychological efforts trying to account for the mind or mental states. We do this in two steps, first by discussing the relevant literature surrounding the emergence and the aims of cognitive psychology. This provides a clear view on the problem of the attempted reduction of mental states to a biological basis. Our second step assesses the question whether neuroscientific and educational efforts could be blended together successfully. The next section (II.) provides an assessment of the educational setting by utilising Bourdieu's (1993) concept of the *field*. By conceptualising education thus as an effort that takes place within a *field*, we assess (III.) the implications of this in relation to a system-theoretical framework as developed by Luhmann (1984). As this discussion leaves the educational effort as quite different to scientific-psychological attempts we utilise the subsequent section (IV.) to briefly unpack some relevant issues regarding the differentiation between the sciences and the arts. The overall discussion warrants us to conclude (V.) that education does not lend itself to be reduced to a mere biological level of description and that education can thus neither be an educational science itself, nor be absorbed by a presumed 'mother-discipline' of scientific psychology.

I. Educational Neuroscience and Mind-Brain-Education

Both ENS and MBE imply a close proximity between investigative psychology and educational efforts. Therefore, we use this section to briefly develop the relationship between psychology and education. Quite different from many current attempts (e.g.: Schrag, 2013; Cuthbert, 2015 or Kraft, 2012), arguing for the (partial) impossibility of the ENS/MBE agenda, we develop the problematic relationship between neuroscience

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and education by following the historic emergence of cognitive psychology. This line of enquiry is motivated by the assumption that if cognitive psychology cannot be reduced into a neuroscientific account, then it appears equally impossible to achieve such a neuroscientific reduction for educational efforts.

Historically the emerging field of education was closely related to psychology (Kaminiski, 2011). Both disciplines concern themselves with:

1. Mental events as they unfold individually within someone's mind and
2. Overcoming the problem of gaining access to these mental states that are supposed to be private and privileged, i.e., accessible only to the one who is undergoing these (Feldges, 2014).

Following from these shared problems the close proximity between psychology and education seems to be only natural. Therefore, it is important to briefly outline the difficulties that lead to the currently dominant cognitive-psychological paradigm (Wallace, 2007). Psychology struggled for a long time with the question of how to investigate the mind. The academic debate (*Methodenstreit*) that erupted in Germany near the end of the 19th century focused explicitly on this problem. As a result of this debate psychology preferred the scientific method with a clear commitment to what Lange (1905) called a psychology without a soul (*Psychologie ohne Seele*). That is a scientific, psychological investigation, purified of all mystical connotations (Sommer, 1985: 72). This was supposed to facilitate for a scientific-psychological pursuit, striving to match observable physical facts with mental events. This aim is probably most prominently epitomised by Watson's (1913) behaviourist manifesto. Watson's behaviourism refused to accept the existence of a mind or mental states as both remain un-available to empirical verification. Instead of this the behaviourist focused exclusively upon observable physical states in the form of behaviour. This is not the place to develop the well-established shortfalls of the behaviourist approach to account for the mind. Here it must suffice to point out that the behaviourist approach with its sole focus upon physical states failed to provide an acceptable solution for the psychological problem of trying to account for mental states and with for the mind (cf.: Beckermann, 1999).

In the light of these problems a new approach in psychology, i.e., cognitive psychology, developed between the 1950s and 1970s. This approach tried to resolve two key problems:

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1. First it wanted to break with the behaviourist equation whereby mental states ***are*** nothing but physical states, and

2. Secondly it aimed to sort the problem of gaining access to these mental states.

In an attempt to achieve this, cognitive psychology proposed hypothetical, cognitive states and structures for mental events. This hypothetical nature of states and structures can for example be seen in Attkinson and Shiffrin's (1968) commonly known Multi-Modal Model of Memory. This model proposes a short- and a long-term structure necessary for memory, while being aware of the fact that it remains difficult to compartmentalise or locate these short-term memory (STM) or long-term memory (LTM) structures in the brain.

Nevertheless, while cognitive psychology solved the first problem of behaviourism by allowing for the existence of mental, cognitive states that initiate or direct behaviour the second, the access-problem still remained. To solve this second problem, cognitive psychology makes inferences about these states based upon an empirical assessment of what these states are supposed to bring about, i.e., by their function. To explain that it is best to use Attkinson and Shiffrin (1968) Multi-Modal Model of Memory once again. The function of LTM structure is to store information. This storage-capacity, or function, can be empirically established via experiments testing memory-recall. This storing/retrieving function allows the cognitive psychologist to make inferences about the needed cognitive structures and processes that need to be in place to bring about this particular achievement. The crux is that these inferences are possible without the necessity to actually observe, i.e., to empirically establish and localise the relevant cognitive processes within the brain (Wallace, 2007).

However, eventually the scientific quest would nevertheless require the hypothetical, functional-cognitive states to be matched with corresponding physical states necessary to carry out the relevant cognitive function. Hence, cognitive psychology would still have to formulate the relevant bridge-laws that would link the cognitive mental states to the biological substrate (Kim, 2006). This is where the recent development of cognitive neuroscience appears to promise a solution as prominently voiced by Singer (2004). Following this cognitive-neuroscientific assumption, the idea is that the cognitive conceptualisation of mental states can be linked with fine-grained assessments of physical, bio-chemical processes on the neuronal level to match the mind with the brain.

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So far we have drafted an overview of the various psychological attempts to promote a scientific, empirical account of the mind, trying to overcome the access-problem. In doing so we have yet left the historic development of the academic discipline of education out of focus, but both disciplines show striking historic similarities. Most educationalists would, prefer rational explanations, as the early psychologists did, while rejecting mystical accounts regarding their students' mind, thus refusing to blame the gods or demons to be responsible for their students' achievements or failings. The same holds for the behaviourist approach. This psychological conceptualisation turned out to be insufficient and it appears equally insufficient for educational purposes. Although behaviourism may still be helpful for specific educational purposes, it appears uncontested that 'deep learning' as an individual transformation and active constitution of knowledge (Fry et al., 2003: 10) requires a constructive alignment (Briggs, 1999) along the lines of an individually achieved sense-making processes (Luhmann, 1984). This however clearly exceeds the behaviouristic explanatory reach, which rejected the notion of those mental states altogether. Hence, education still remains rather close to the psychological struggle of how to account for the functional processes that are supposed to be involved in the acquisition and retention of information, otherwise known as learning. Nevertheless and although there are many more aspects to the running of education and psychology comparatively along each other, that is not our current concern. We merely wanted to highlight the specific problems that are shared by both disciplines to gain a perspective from which we could assess the potential effectiveness of the ENS/MBE agenda. We thus wish to continue by evaluating the potential reach of the ENS/MBE proposal in relation to the problems as we discussed them so far.

This is not the place to discuss the mounting pressure and the need for accountability faced by the educational profession. However, it seems self-evident that increasing public spending on educational services requires a sound justification for these expenses. It seems safe to assume that this is one of the reasons why an educational pursuit into the cognitive neuroscientific direction can yield attraction. If such a scientific basis would be available, education could work along established causal relationships whereby a stimulus (teaching) evokes the relevant individual (cognitive-neuroscientific) mental states that are supposed to result in the individual's ability to display that learning has taken place. Such an agenda would render educational success predictable and education-costs justifiable. A closer look at the ENS/MBE agenda reveals that it is indeed following the cognitive-neuroscientific pathway, and with that the reductive direction that psychology has taken. The Oxford Cognitive

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Neuroscience Educational Forum (2011) thus takes the ENS-agenda as a means to establish an education-relevant link between biological, neuronal states and the hypothetical mental, i.e., cognitive states and that is the reductive agenda we mentioned in the introduction. However, as to whether this would be possible is still a matter of an on-going debate in relation to the actual aim of such a link (Samuels, 2009) or in relation to its practical reach (Schrag, 2013).

Nevertheless, and closer to our current concerns, pursuing this psychological-scientific agenda binds education's chance of succeeding with educational-neuroscientific approaches very closely to the potential success of the psychological pursuit. Hence, any form of ENS/MBE proposing a link between educational-relevant, cognitive psychology and an underlying neuronal basis is invariably dependent on the successful accomplishment of the psychological reductive agenda. To put it the other way round, if psychology cannot reduce cognition to the biological basis, then the chances to achieve something along these lines for educational purposes are equally doomed.

This is where a problem emerges, as the use-value of psychological, neurocognitive approaches is subject to an on-going debate (e.g.: Bennett et al., 2007; Geyer, 2004). In a rather recent assessment Schröter (2011) claims that cognitive neuroscience may inform us about the activity of certain neurons or neuronal clusters within the brain. However, and that is the crux of Schröter's account, these physical events cannot and do not equal cognitive processes. As this is important for our purposes we need to unpack this in more detail. The cognitive approach makes claims about hypothetical states identified by their function, and as we discussed earlier, it does so with no regard for their actual physical realisation. Hence, trying to match these cognitive states to physical states leads invariably to the fact that cognitive-neuroscience is making claims not longer warranted by its own underlying assumptions regarding the nature of these cognitive states (Schröter, 2011). That constitutes a serious blow to the cognitive-neuroscientific agenda and with that to the closely associated ENS/MBE agenda. Indeed, Schröter's concerns are also prevalent within the relevant educational literature. Here this problem of the different (neuronal and cognitive) levels of description is clearly recognised, as is the inherent incompatibility of these levels (e.g.: Anderson and Reid, 2009; Rose, 2009; Silva, 2007). It is this incompatibility that leaves any attempt to reduce mental (cognitive) states to neuroscientific, assessable biological states as problematic (Chalmers, 1995), if not impossible. With this incompatibility between the cognitive and the neuronal level of description it remains currently impossible to reduce educational efforts to the neuronal level. Hence, the

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first, i.e., the reductive aim of the ENS/MBE agenda as developed in the introduction has already shown to be misguided.

It is nevertheless possible to leave this specific problem of trying to provide a universal bridge-law between the physical and the mental out of focus. One could instead settle for empirically substantiated statistical probabilities regarding the co-occurrence of physical processes and mental states. Wundt (1913), the founding father of experimental psychology, did exactly this and cognitive psychology regards this to be a well-established solution to the problem ever since (Howitt & Cramer, 2008). That may be considered as still being good enough, or at least as good as it gets, for psychological purposes trying to provide a general account of the mind (Wallace, 2007). But it remains questionable if such an achievement would satisfy the needs of an educational application. Education is not, as psychology does, striving to account for the mind in a general way, but trying to evoke future mental states (learning) in relation to educational efforts. In that respect one has to bear in mind, that psychology's probability-based account appears to be much less than MBE/ENS seemed to promise. This is, amongst other reasons, owed to the fact that any actual pedagogy that could be developed upon these ENS-established probabilities could only ever make sense if one is willing accept two underlying assumptions:

1. The first is the assumption that stimuli are projected into the perceiving individual and are thus available as a more or less correct mirror image for that individual's inner perception. This is known in the literature as a Cartesian-representationalist assumption (Burwood et al., 2007).

2. The second assumption is owed to the controlled setting in which cognitive psychology carries out its experiments. Laboratory experiments work on the notion that all potentially influencing variables are controlled. Within experiments the experimenter alters only one variable to establish a statistical significant difference between assessed groups being either exposed to this altered or non-altered variable. It is thus possible to link the experimental manipulation of this one specified variable to the empirically assessed resulting differences. The so established causal link between one clearly specified stimulus and the resulting behaviour allows for inferences about the necessary cognitive processes that we discussed already earlier (Coolican, 2004).

However, the first assumption is not at all uncontested (cf.: Wiesing, 2009), while the second one may work well in clearly controlled experimental circumstances. Nevertheless, the actual, educational situation is arguably much more diverse than

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psychological laboratory settings as described above. To develop this more clearly we must turn our attention to the educational setting and assess the implications of what we have established so far.

II. The Educational Setting

In the previous section we suggested that adhering to the cognitive-neuroscientific pursuit would almost invariably require an equal commitment to two underlying assumptions. While we discuss the representationalist assumption within the next section, we here focus upon psychology's need for controlled experimental settings. That is that if ENS/MBE were to work in actual educational practice, one would have to accept this need for clearly controlled settings with one clearly specified stimulus in relation to which specified cognitive and/or behavioural responses, otherwise known as learning, are supposed to emerge.

When we put the need to specify a certain stimulus (teaching) in relation to a specific response (i.e., learning), supposed to casually follow in relation to educational practice we need a broader approach. Habermas (1973) perceived education as a state's attempt to colonise its human resources more effectively. In order to attain efficiency a multitude of learners/students benefit from the instruction of one educationalist in schools or universities. Luhmann (2002) points out that this approach is a sensible one to safeguard a cost-effective provision. However, away from the considerations regarding efficiency, one has to be aware that such institutionalised settings also change the dynamics of the teacher - student interaction and relationship. According to Bourdieu (1985; 1993) such a classroom setting constitutes a dynamic *field* of social interaction between a) educator and students, b) between the students themselves. Bourdieu's field thus provides a relational web in which social positions are negotiated in a constant dynamic. To make things more complex, away from the actors present, these negotiations are further influenced by individual, motivational conglomerates, in which current affiliations (friendship), baseline-expectations (family, class) and personal goals (qualification, career) converge to create an interface at which psychological processes emerge and change. These psychological processes are thus initiated and driven by a number of contributing factors, originating and/or reaching well beyond the actual classroom, transcending the physical setting, but nevertheless captured by Bourdieu's concept of the relational field. It is evident that such a field and the interrelatedness of various subject-internal and external processes can not match the cognitive psychological requirement to establish probabilities in relation to clearly identified and controlled stimuli, as the very notion of

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Bourdieu's filed does not cater for such a stimulus segregation. However, we want to take this a bit further.

One is thus left with a field of explicit and tacit occurrences, unfolding simultaneously with other occurrences. This leaves the individual as being surrounded by a multitude of causally-relevant and/or irrelevant co-occurrences, transforming any unfolding classroom-interaction action, into one that is guided, as Bourdieu (1985) argues, by quick and mostly un-planned *ad-hoc micro-strategies*. The classroom thus becomes a field in which stimuli cannot be specified sufficiently enough to attempt a causal relation with the anticipated learning-outcome. This notion of the *field* in which no clear-cut *right* or *wrong* decisions appear to be possible provides thus a background against which some actions appear to be more appropriate while others appear more inappropriate in relation to the fluid nature of this constantly changing setting.

The application of Bourdieu's *field* to the classroom already implies two difficulties.

1. The first one is constituted by the problem for the educator, as the teaching-methods specialist, to decide which method to apply to a specific educational setting with its unique and fluid dynamics to secure the sought after knowledge-transfer. This is a setting that is fundamentally different from the one that is artificially controlled and kept stable by the cognitive-psychological experimenter. Doubts about the specific applicability of cognitive psychological findings are thus warranted, due to the setting-specific diminished ecological validity of these psychological claims.
2. The second problem emerges in relation to the educator's attempt to assess the efficiency of the teaching efforts, i.e., what kind of assessment would suffice to establish that the aspired-for knowledge transfer has actually taken place. Once again, this is fundamentally different from the psychological design, whereby a selected outcome indicator is linked to a specified stimulus to make inferences regarding underlying cognitive processes. It is, in educational practice, not possible to do this and that limits the value of the classroom application of psychological findings.

As bleak as that may sound, we do not contest at all that cognitive psychology provides ample opportunity to be incorporated into everyday teaching practice. The Multi Modal Memory Model with its proposed structure of a short-term and a long-term memory store, but also neuroscientific research, as for example Steinberg's (2008) research about adolescent risk-taking are prime examples, highlighting how psychology can inform educational practice. Hence, an educational-neurocognitive focus could

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provide a better understanding of the structures and processes as they are supposed to work with in a student's brain. But, as the fact that an educator's education contains psychological modules clearly shows, there seems to be no question about the fact that education already utilises psychological knowledge and has done so in the past without the need of an explicit neuroscientific education agenda. This leaves MBE/ENS in a strange position. The MBE/ENS agenda may contribute positively to education but doing so without being able to guide the work and conduct of the educator (Schrag, 2013), but probably rather by enabling a reflective perspective for the educator, allowing, for example, for an assessment of work-related stress, professionalism and the student relationship (Sneyders et al., 2016). Nevertheless, there was one more issue when it came to an attempt to utilise a reductive MBE/ENS agenda for practical educational purposes and that is what we need to turn our attention to next.

III. System-theoretical Dynamics

The problem incurred by a multi-dimensional field as developed above brings us to our second pending issue, i.e., a widely shared assumption of mirror-like representational cognitive processes. We want to assess this problem by using a system-theoretical framework as developed by Luhmann (1984). Although this representational assumption has come under growing scrutiny (cf.: Zahavi, 2008), the basic idea is that presented stimuli are made available to the mind's eye as inner representations. We do not want to repeat the current, and critical debate in philosophy and psychology regarding this representational assumption here (cf.: Burwood et al., 2007). Nevertheless, as the fluid dynamics of the educational field alongside with its explicit and tacit individual pre-dispositions already indicated, a mirror-like, subject-internal representation of specified objects or matters of fact appears questionable. Luhmann (1984) offers a system-theoretical explanation of what happens in these dynamic fields whereby an individual does not simply represent external stimuli internally, but rather makes individual sense out of these. For Luhmann (1984: 111) this *sense* comes from a referential relation, formed by *one realised actuality* of the kind: I experience *this* together with all the other possible, but not actualised potentialities for which the environmental stimuli could have equally catered. Hence, *sense* is the relation of a currently individually actualised *description* with other possible, but not actualised ones. This is quite important for our current discussion. Luhmann's notion of *sense* leaves us with something that cannot exhaustively captured within actual cognitive processes only, but it is something that takes place within the field in which the sense-making actuality is individually achieved. But a

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dependence upon the potentialities offered by such a field leaves the process of individual sense-making as one that transcends mere cognitive or even neurocognitive processes. Hence, sorting taught contents into an individual sense-making frame to achieve learning is something that cannot be captured with recourse to neurocognitive processes and structures alone.

Accepting such a framework limits the reach of educational-neuroscientific explanations in relation to the individual acquisition of knowledge. But it also has implications on the practice of teaching. Luhmann's referential and sense-providing interaction-patterns as they manifest themselves within an unfolding dynamic of a Bourdieusian *field* require a continuous assessment by a skilled and experienced educator. In a situation in which there is, as we discussed earlier, no right or wrong action, but only more or less appropriate ones, the educator has to successfully '*read*' these *referential relations*. Exactly this need to be able to read these emergent dynamics within the educational field necessitates the educator's experience-based skill as it manifests itself along an interpretative approach as developed by Weber (2005). But Weber's interpretative understanding (*verstehen*) cannot be captured by a merely individual-focused, scientific assessment of cognitive/neuronal processes and structures. Interpretative understanding is dependent upon the intellectual and empathetic imagination as it emerges in the experienced educator in relation to the students' attempts to make sense out of the materials they are exposed to in relation to the multiple influences as they occur externally and internally within the educational field.

With these considerations we have moved way beyond the problems posed by the neuroscientific difficulty to bridge neuronal and cognitive levels of description as developed in section II. We have equally moved beyond the problem that the educational setting is fundamentally different from the setting in which psychological results are derived as we discussed in section III. The system-theoretical notion of individually constituted *sense* or *meaning* necessitates an interpretative-understanding approach to capture these individual achievements. With reference to the underlying, tacit assumptions of the MBE/ENS agenda as we outlined them in the introduction, the need for an interpretative understanding as developed here has massive implications. This holds for any project aiming to provide a scientific foundation for the academic discipline of education, as well as for any attempts of an assumed psychological 'mother-discipline' to absorb education, whereby the latter is reduced to be a mere neuroscientific-educational branch of the former. To develop

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this with greater clarity, we briefly need to consider the difference between scientific and artistic academic disciplines in our next and final section.

IV. Science or Art

Within this section we discuss the relation between the academic disciplines of psychology and education. We do this with recourse to the established division of academic labour. Hence, our current concerns about academia do not at all limit the reach of what we discuss to the actual provision of higher education only, we are concerned with the academic discipline of education as it informs all educational provision on all levels.

The carving up of academic disciplines to allow for focused teaching and learning is one that can be traced to the very beginnings of the University as an institutionalised, incorporated and goal-orientated setting to transfer knowledge from teachers to students. With two urban centres (Bologna and Paris) emerging around 1200, the university as an institution quickly spread across – and beyond – all of Europe (Weber, 2002). We must not bother ourselves all too much with the classical distinction, dividing the *Artes liberales* into the *Trivium* and the more 'calculating sciences' of the *Quadrivium*. What is important here is the increasing importance of the natural-sciences and their methods during the enlightenment, allowing for the explanation, prediction and utilisation of nature to an unprecedented extent (Cassirer, 2007). When leaving all this historical background aside we find, most prominently in the Anglo-American tradition, the academic pursuit as being broadly divided between the *Arts* and the *Sciences*. Hence, despite all the fine-grained differentiation of specialised academic disciplines, we find an over-arching division, whereby some disciplines are deemed to be strictly (natural-) scientific, while others are deemed to be arts. In relation to the aim to utilise the ENS/MBE agenda to either turn education into a science itself or to sort it under the overall 'mother-discipline' of scientific psychology it is important to see where education would sit in relation to this *science-art* division to then assess the feasibility of such attempts.

It is thus necessary to develop this differentiation between the sciences and the arts a bit further. *Science*, following Nagel (1986) here, aims to provide an account of the world, one that does not depend upon a specific perspective or a particular observer. Hence, scientific methods gain empirical evidence, accessible to everyone, and scientists interpret this evidence along causal relations to formulate explanations with predictive power. The methodological purification, elevating observations above a particular perspective or an observer's subjectivity allows for the so established results

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to be tested and with that falsified, substantiated or corroborated by anyone employing the same method under the same circumstances. This is the domain of the natural sciences in the form of chemistry or physics. Crucial to the *sciences* is thus a strong ontological commitment regarding an ego-independently existing nature, one that can be assessed in an objective manner (Gadamer 1972: 226). This is, as we discussed in section I. the standard pursuit of scientific psychology with its reductive agenda, trying to link cognitive states to the underlying biological stratum.

The *Arts* however work, in the widest sense, with the vision of the world as it presents itself in a concrete form from an individualised observer's point of view. This is the domain of the creative arts, writing, and the humanities, i.e., disciplines where academic knowledge is derived from a systematic investigation of the individual comportment to certain aspects of an individual's environment. Following Gadamer (1972) here, this is the domain that concerns itself with emerging sense ***for*** the individual encountering these aspects, it is the domain that focuses upon individual understanding (*Verstehen*) of these aspects.

With these considerations one is thus left with an ontological motivated epistemology as employed by the *sciences* and an epistemology based upon an interpretative-understanding (i.e. Weber's *verstehen*) as utilised by the *arts*. The latter strives to reveal the modes and possibilities for the human ability to assign individual sense or meaning to encountered events and objects. Hence, following from our discussion throughout section III, it seems evident that the academic discipline of education displays a very close fit with a pursuit of obtaining academic knowledge as employed within the arts. This does not imply at all that any so derived knowledge could not or should not, wherever this is appropriate, be scientifically tested as well. However, and that is the crux, as the question that concerns education is one of how the students make sense of teaching, education reveals its belonging to the arts. Therefore it cannot be turned into a science itself or constitute a promising candidate to be subsumed under a scientific-psychological 'mother-discipline' without loosing what education is supposed to be about, without losing the question that education has set out to answer.

V. Conclusion

In this paper we have discussed the MBE/ENS agenda with recourse to our own, quite diverse academic backgrounds. However, while it is possible to assess the reach of such an agenda in terms of practical potentialities, we tried to assess the wider implications that this agenda could yield on the academic discipline of education.

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In relation to the reductive aim of the MBE/ENS proposal we followed the emergence of the discipline of psychology. This allowed us to highlight the fact that the underlying assumptions of the cognitive-scientific approach remain incompatible with the neuroscientific pursuit and that therefore cognitive states remain irreducible. As MBE and ENS are founded upon the cognitive-neuroscientific assumption both MBE and ENS share thus the same and fatal verdict, i.e., that the aspired reduction of education-relevant mental states to biological states is not possible.

In relation to attempts to provide a scientific foundation for education we discussed the standard methods of psychological knowledge acquisition as being fundamentally different from the educational setting. With reference to Bourdieu's concept of the *field* we established the limitations when trying to transfer experimental psychological results into the fluid dynamics of such a field. This, together with the earlier established irreducibility of mental states makes it unlikely that the academic discipline of education will be able to turn itself into an independent educational science.

We developed these aspects further and contextualised them with Luhmann's system-theory and the concept of emergent sense. It is here that it became apparent that this individual sense is something that, by necessity, transcends cognitive or neuroscientific descriptions, but emerges in referential relations of the educational *field*. The crux of our discussion was that this emergent sense necessitates an approach utilising an interpretative understanding.

Our final considerations assessed the academic division between the arts and the sciences. As education makes use of Weber's interpretative understanding it is firmly rooted within the arts. Hence, it cannot be soaked up by the 'mother-discipline' of psychology without losing what education is about.

In that respect we established the current and future independence of the academic discipline of education. Education does not require a scientific foundation to achieve its goal nor can it be downgraded to be a mere sub-discipline of an otherwise scientific pursuit of psychology.

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