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Conceptual Issues and Assessment of Implicit Theories

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Abstract

We reviewed fundamental conceptual issues and the state of research on the definition of and assessment of implicit theories. We grappled with the following controversies related to the construct: (a) Are entity theory and incremental theory opposite ends of the same continuum? (b) How can scholars use more sophisticated methodologies to classify individuals into either the entity or incremental theory? (c) Given shifting conceptions of what intelligence is, how can scholars refine the implicit theory of intelligence construct? Given these conceptual issues, we then addressed practical issues related to the assessment of implicit theories. We pointed to the need for more sophisticated methods such as implicit associations tests, and the use of virtual environments as more "stealthy" ways to assess the construct.

Keywords: implicit theories, mindset, assessment, measurement, definition

The first challenge for this topical issue of the Zeitschrift für Psychologie arose as we contemplated the appropriate term for our topic. Should the construct be called Implicit theories, the way Dweck and Leggett (1988) first introduced the term in their seminal article? Or should it be called mindsets, a term many have used? What about the more general term self-theories, or lay theories, or naive theories? This challenge of coming up with an appropriate term was exacerbated by the fact that the same authors would often use numerous terms interchangeably. How, then, should researchers describe these fundamental assumptions about human attributes, which individuals develop to explain and understand their world? The seminal paper of Carol Dweck and Ellen Leggett (1988) introduced implicit theories of intelligence and implicit theories of personality as conceptual terms, which are both still widely used in research. In the last decade, however, more and more publications started to use the term “mindset” instead of or interchangeably with implicit theories. But are implicit theories and mindsets describing the same theoretical concept? How are lay theories and naive theories related to implicit theories and mindsets? The precise nature and meaning of the terms implicit theory or mindset have not been explicitly discussed in the relevant literature so far. Precise definitions are largely missing and it seems that scholars assume that their readers share the same understanding of what is meant by implicit theories, mindsets, or other terms.

Despite the proliferation of terms used to describe these personal theories of seeing and describing the world, one aspect of the concept has stayed constant. Regardless of the name, implicit theories (or their related terms) have always taken on two different forms. Dweck (1986) posited that people think of human attributes such as intelligence or social characteristics either as (1) immutable traits (i.e., people are born with a particular personality, which cannot be changed), or they view human attributes as malleable qualities

(i.e., people are able to continually improve their base capacity to do mathematics). Dweck and Leggett (1988) also argued that this belief about the malleability or fixedness of human attributes does not have to be limited only to *self*-beliefs. Rather, they can also encompass beliefs about other people, places, or phenomena. In addition, there has been debate about how context-specific these beliefs are--can one possess a fixed theory of personality, but an incremental theory of morality? A related challenge that we wrestled with as we conceptualized this special issue is the fact that definitional murkiness leads to challenges in measuring or assessing the construct. Are entity theory and incremental theory two unipolar constructs or two ends of a bipolar construct? How can entity versus incremental theorists clearly designated? The challenge of assessing this "messy" construct is made even more difficult by the fact that implicit theories are difficult to *directly* observe simply because they are just that--implicit! Therefore, definitional clarity is a *sine qua non* if we are to develop high quality assessments for the construct.

Overview

One purpose of this paper is to tidy up the messy wording/definition and measurement of implicit theories. Our hope is that by systematically reviewing the various ways scholars have defined and assessed the construct colleagues in the field can take one step closer toward definitional and conceptual clarity as well as create more valid and reliable ways to assess the construct. To be clear, our goal is *not* to come to one single authoritative definition of the construct, or to recommend the "best" way to assess it. Rather, our goal is to bring to bare tensions in the literature in how the construct is defined, conceptualized and assessed, and also identify areas of overlap.

"Same Same but Different"

"Same same but different" is a common phrase used by native Thai speakers when referring to things that appear similar but are still meaningfully different. This famous

Tinglish phrase can also be applied to the wording issues related to the construct of implicit theories. In the academic literature one can find numerous terms describing the same thing--implicit theories (e.g. Dweck & Leggett, 1988), implicit beliefs (e.g. Haselhuhn, Schweitzer, & Wood, 2010; Howell & Buro, 2009), worldviews (Dweck, Chiu, & Hong, 1995a; Malmberg & Little, 2007), mindsets (Dweck, 2006), self-theories (Dweck, 2000), meaning systems (Hong, Chiu, Dweck, Lin, & Wan, 1999), lay theories (Molden & Dweck, 2006) and naive theories (Miele & Molden, 2010; Heider, 1958; Wegener & Petty, 1998). This incongruence in terminology is not a new phenomenon and can be traced back to the pioneering work of Solomon Ash (1946), Lee Cronbach (1965; implicit theory of personality), and Fritz Heider (1958; common-sense psychology). Heider (1958) studied interpersonal relations using common-sense psychology, which he also called naive psychology or implicit theory. In a similar manner, Dweck and her colleagues have introduced and popularized different terms without explicitly defining or distinguishing among the terms. The first term Dweck and her colleagues used was implicit theories (Dweck & Leggett, 1988). From there, self-theories and mindsets began gaining traction, and are now commonly used both in popular literature (e.g., Dweck, 2006) and in scholarly literature (e.g., Rattan, Savani, Chugh, & Dweck, 2015). The terms most often used in empirical studies to describe the research in the tradition of Dweck seems to be implicit theories, lay theories, self-theories, and mindsets. The use of different names can be partly explained by psychological disciplines in which the research was done. Lay theories and naive theories are more used in social psychology (e.g. Wesnousky, Oettingen, & Gollwitzer, 2015) and experimental psychology (e.g. Miele & Molden, 2010) whereas implicit theory and mindsets commonly used in educational (e.g. Bråten & Strømsø, 2004) and developmental psychology (e.g. Blackwell, Trzesniewski, & Dweck, 2007). However, many empirical studies also consequently use more than one of the aforementioned terms without recognizing the

inconsistent labeling; this is also true for studies published more recently in high impact journals such as Psychological Bulletin (implicit theory and mindset, Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013) or Proceedings of the National Academy of Sciences (lay theory & mindset in Yeager, Walton, et al., 2016). Are researchers really talking about the same construct but using different labels (cf. Hulleman, Schrager, Bodmann, & Harackiewicz, 2010 for an example in achievement goal theory)?

We start with the original label of implicit theories, which can be defined as, "core assumptions about the malleability of personal attributes. They are called 'implicit' because they are rarely made explicit, and they are called 'theories' because like a scientific theory, they create a framework for making for prediction and judging the meaning of events in one's world." (Yeager & Dweck, 2012, p. 303). Lay theories or naive theories can generally be described as common sense heuristics that people use to make sense of themselves and the world (Heider, 1958; Wegener & Petty, 1988). The term "theories" is one common aspect that the various terms share (naive theories, lay theories, self-theories), and describes a goal of holding an abstract understanding of the workings of the social world. A second common feature of these theories is that, unlike scientific theories, they tend to be intuitive and are formulated by lay people rather than experts in a field. A third common aspect is that people are not necessarily aware of their lay theories. They are rarely explicitly articulated in the mind of the person holding them. However, the term implicit can also cause confusion. In work on social cognition the term implicit is associated with the inability of people to report the existence or operation of some entity or past experience. But research exploring implicit theories of intelligence goes against this notion because people are often quite able to report their beliefs. For this reason, we agree with other scholars (e.g., Wegener & Petty, 1988) who argue that lay or naive theories are in fact accessible to the person holding those beliefs.

Given the description of lay or naive theories, could the term mindset also be considered a type of lay or naive theory? The term mindset was introduced in the non-academic book *Mindset* (Dweck, 2006) and has also been used in research publications ever since. Presently, from the perspective of scientific research a precise and meaningful definition of mindset is largely lacking. Turning to definitions from English dictionaries (Macmillian Dictionary, Merriam-Webster Dictionary, Online Etymology Dictionary, Oxford Learner's Dictionary) a mindset can be described as a particular way of thinking, a person's attitude or set of attitudes/opinions/ideas about something. A mindset may also be connected with some sort of stability or fixedness but this was not a common aspect of the different non-scientific definitions we observed. These definitions do not contain the three common aspects (theory, intuitive, unaware) that lay, naive, and implicit theories share. For these reasons, we believe that using the term mindset has a clear purpose for the scientific community to easily bridge the gap between the theoretical world of academic scientists on the one hand, and widespread practice among the general public on the other. We acknowledge how important it is for academic knowledge to make a positive impact on society. After all, as Schober, Brandt, Kollmayer, and Spiel (2016) noted, this is the third mission of science. That is, universities and academics should use the results produced by their first mission (teaching) and second mission (research) to address growing social, economic, and societal challenges. However, for rigorous research, where clear specification of terms is essential in correctly operationalizing the construct of interest, the use of the term mindset seems to do more harm than good.

Instead of using the word mindset in academic research, we suggest using the terms incremental and entity theory (Dweck, 1986), which clearly refer to the research on the malleability of human attributes. On a higher level it seems justified based on enough conceptual overlap to treat them as specific types of lay theories, naive theories, or implicit

theories. However, from our perspective it seems desirable to avoid using different names for the same construct. Instead, we should come to some consensus about a standard way to name the construct. Our suggestion is just to use the term implicit theory because it captures all aspects of the construct and is by far the most commonly used term, and the one with which Dweck and her colleagues started.

Can People Hold More Than one Theory?

Another question we faced regarding implicit theories is the question of whether people can simultaneously hold both an incremental and an entity theory in the same domain (e.g., achievement; see Anderson, 1995; Schunk, 1995). Most conceptual papers and empirical studies have treated the two implicit theories as mutually exclusive beliefs. For example, Dweck et al. (1995b) argued that, "believing that something cannot be changed is the logical opposite of believing it can be changed" (p. 323). In fact, in all of their empirical work, Dweck and her colleagues have conceptualized incremental and entity beliefs as opposite ends of a single continuum (e.g. Dweck & Leggett, 1988; Dweck et al., 1995a). However, there were some critical comments about the appropriateness of a unidimensional conceptualization and the possibility of holding competing cognitions. Especially in achievement situations individuals could simultaneously entertain incremental and entity beliefs (Schunk, 1995). Anderson (1995) argued that it was possible that incremental and entity theories were simply knowledge structures, which were freely available for individuals to access. Whether people accessed one or the other depended on how the specific context made one belief more salient than the other. This could be quite possible given the seeming ease with which both theories can be experimentally manipulated (Dinger & Dickhäuser, 2013). Although Dweck and colleagues (1995b) also recognized the possibility that people can hold both beliefs at the same time this did not lead to major changes in the operationalization of implicit theories in their empirical studies. In the vast majority of

empirical studies, instead of two unipolar constructs of implicit theories one bipolar construct is used (see the latest meta-analysis of Burnette et al., 2013; Tempelaar, Rienties, Giesbers, & Gijselaers, 2014). This is usually accomplished by reverse scoring the entity scale measure and combining it with the incremental scale score to calculate a mean implicit theory score. From a methodological point of view, such a consolidation would be only acceptable when the two unidimensional implicit theory scales prove to be strongly inversely related.

Studies dealing with this issue are rare (e.g. Bråten, & Strømsø, 2004; Howell & Buro, 2009; Malmberg & Little, 2007; Tempelaar et al., 2014). Findings show that bivariate correlations, when reported, vary widely (ranging from -.02 to -.78) but in general are too weak. Some studies using exploratory factor analysis have revealed two distinct factors (e.g. Dupeyrat & Mariné, 2005). And confirmatory factor analyses have shown better model fit for a two-factor model compared to a single bipolar factor model (see Tempelaar et al., 2014). These findings suggest a much looser coupling of entity and incremental theories and raise doubts about whether they should be treated as a single bipolar construct in empirical research. Perhaps, as other scholars have done (e.g., Chen, 2012; Dai & Cromley, 2014; Tempelaar et al., 2014), both the entity theory and incremental theory construct should be modeled together--treating each as its own construct.

Another common practice to measure implicit theories is just to include entity theory items (e.g. Hong, Chiu, Dweck, Lin, & Wan, 1999; Lüftenegger et al., 2015; Pomerantz & Kempner, 2013; Yeager, Romero, et al., 2016) whereby disagreement with these statements reflects the endorsement of an incremental theory. This procedure is mainly chosen to avoid a possible bias because the incremental theory statements tend to be more compelling and the more socially desirable choice, and respondents tended to universally endorse them (Erdley, Loomis, Cain, Dumas-Hines, & Dweck, 1997; Pomerantz & Kempner, 2013). Hence, the inclusion of incremental theory statements has the potential to interfere with students'

endorsement of entity theory statements. On the other hand, offering only entity theory items runs the risk of an acquiescence response bias, which results in an overestimation of an entity theory endorsement.

There are also measures that are constructed to follow a strict bipolar conceptualization of implicit theories (e.g. Spinath & Schöne, 2003). They are, however, used less often (e.g. Dickhäuser, Dinger, Janke, Spinath, & Steinmayr, 2016; Lüftenegger, Tran, Bardach, Schober, & Spiel, in press). In this format, respondents complete statements by indicating, using a 6-point semantic differential, the degree to which a certain quality is malleable (sample item: "You have a certain amount of intelligence 'that cannot be changed' versus 'that can be changed' ''). In this way, respondents can decide between entity and incremental theory on a continuum within one statement. Respondents disagreeing with entity statements are therefore given the opportunity to choose an incremental theory thus avoiding a possible acquiescence bias.

From our perspective, there is enough evidence that challenges the traditional and still dominant conceptualization that incremental and entity theories appear to be each other's opposite. In addition to theoretical considerations a number of empirical studies suggest that people can hold more than one implicit theory. However, because there are relatively few empirical studies, it is difficult to discern where the weight of the evidence falls. For this reason, we recommend further empirical studies exploring, for example, whether modeling incremental and entity theories separately as their own unidimensional constructs has better predictive validity than modeling the incremental and entity theories as opposite ends of the same construct.

Classification of Entity versus Incremental Theorists

How do researchers decide whether to classify a participant as an entity theorist or an incremental theorist? Dweck and colleagues (1995a), for example, categorize respondents as

entity theorists if their overall implicit theory score is 3.0 or below (on a 6-point scale), and as incremental theorists if their overall score is 4.0 or above. The subjects in the middle, the mixed or neutral group, are normally excluded from former analysis (according to Dweck et al., 1995a, this group tend to be about 15% of a sample). An empirical strategy for the classification of the three groups (entity, incremental, mixed) is using 1 Standard Deviation above and below the theory of intelligence mean score (Blackwell et al., 2007). There are several critical issues associated with these classification strategies. First, from a theoretical perspective cutoffs suggest that a clear differentiation between different categories based on specific criteria is possible. However, as far as we know clear criteria that differentiate the different groups at a specific point are still missing as well as a clear definition of the mixed group. Additionally, the merit of *a priori* categorization of individuals into specific groups can be quite misleading (Peterson, 1995). Second, different frequencies of the three groups exist across samples and domains, and the use of a fixed cutoff criterion limits generalizability. Third, based on the criterion for exclusion the mixed group could be quite large. Tempelaar et al. (2014), for example, found 64% of the whole sample (n = 4594) belonging to the mixed group when using M ± 1SD as a classification criterion. The remaining 18.2% of entity theorists and 17.8% of incremental theorists would represent extreme groups and conclusions drawn by results of extreme group comparisons are strongly limited (Preacher, Rucker, MacCallum, & Nicewander, 2005).

From a methodological perspective, dichotomizing the implicit theory construct has substantial negative consequences. Depending on design and analysis this can include loss of information about individual differences, loss or overestimation of effect size, loss of power, spurious statistical significance, or loss of measurement reliability (MacCallum, Zhang, Preacher, & Rucker, 2002). These consequences can be easily avoided by application of standard methods of regression or correlational analysis to the original (undichotomized)

measures. Another possible alternative to dichotomizing the construct is simply to model both constructs within a person-centered analytical approach (e.g., cluster analysis or latent profile analysis). By doing this, scholars are able to create groups not by arbitrary cutoffs. Rather, the groups are formed by what the actual data reveal. Finally, if we recognize the possibility of endorsing both implicit theories simultaneously, then a strict dichotomization along with the exclusion of a mixed group becomes less defensible. From our perspective, there is no good reason for dichotomizing the implicit theory measure, nor is there a good reason to exclude the mixed group.

Definition and Malleability of Intelligence

As noted earlier, there is little empirical evidence suggesting that individuals' belief about the malleability of intelligence is strongly inversely related to their belief in the fixedness of intelligence. A possible explanation may be that people have varying personal definitions of intelligence (Dupeyrat & Mariné, 2005). Empirical evidence reveals that neither laypersons nor experts see intelligence as a unidimensional construct. This more nuanced (and Western cultural) conception of intelligence typically consists of three distinct dimensions: practical-problem solving (fluid ability), verbal ability (crystallized ability), and social competence (Sternberg, 1985). Sternberg also noted that experts include motivation as a fourth dimension of intelligence. Individuals use these implicit dimensions to form abstract characterizations and to evaluate their own intelligence, and that of others (Sternberg, 1985). Simply asking about the malleability of intelligence, therefore, is likely incongruent with most people's multidimensional view of the construct. People might believe that verbal ability, for example, is a fixed trait, but simultaneously believe that social competence is malleable. This might especially be the case for adults because they are more likely to have had many opportunities developing competencies in different contexts over multiple phases of life (Dupeyrat & Mariné, 2005).

Alternative Approaches for Assessing Implicit Theories

Although incremental and entity theories are implicit in their nature they are traditionally observed using explicit measures. Implicit theory assessments across domains typically use a standard assessment adapted from the original measure of implicit theories of intelligence (Dweck, 2000). This assessment is a brief self-report questionnaire asking respondents to rate the degree to which they endorse entity or incremental statements from a given domain. Alternative assessments are largely missing, especially those that tap into implicit theories in an implicit fashion. Implicit measures such as priming or the implicit association test (IAT) provide information about the construct of interest without directly asking people for a verbal report (for an overview see Fazio & Olsen, 2003). The appeal is that the outcomes of implicit measures can more easily reduce the effects of social desirability. Furthermore, they avoid common shortcomings of self-reports such as the risk of acquiescence responding or that people report more than they actually know (flawed introspectionism; Nisbett & Wilson, 1977). To the best of our knowledge only one study by Mascret and colleagues (2015) examined implicit theories using an implicit measure. They created a single-target IAT to measure if individuals adhered to an entity theory or incremental theory. Their findings are only partly in accordance with findings from explicit (self-report) measures.

Studies using measures other than self-report are scarce. Behavioral measures to identify or investigate implicit theories are lacking. However, three neuroscience studies (Mangels et al., 2006; Moser et al., 2011; Schroder et al., 2014) provide a new perspective on the induction and consequences of implicit theories and give more insight in the neural mechanism of implicit theories. Clearly, exploring how implicit measures, behavioral measures, and a neuroscience perspective can complement and extend explicit self-reports is an area that is ripe for future research.

Virtual Reality

Another way to assess implicit theories could involve the use of computer technologies. The capabilities of computer technologies have grown exponentially since the first assessments of implicit theories were developed. This increased capacity allows researchers to capture and analyze a large variety of data from research participants engaging in authentic tasks. One of the downfalls of asking participants to respond to survey items is that it is difficult to get situationally specific beliefs while people are engaging in a difficult task. Survey responses that assess students' implicit theories of intelligence capture what students believe about intelligence in general. However, as we have argued earlier, implicit theories might function as knowledge structures (see Anderson, 1995), which are freely accessible and are activated by certain cues presented within the environment. For example, students might be immersed in a virtual world in which they have to figure out how to source of an ecological problem, which would involve designing scientific experiments to test hypotheses, but could also require students to collaborate with other students effectively. Some students, for example, might believe that their ability to figure out the causes of the disaster are fixed, but that their ability to write a compelling argument to their colleagues detailing how they arrived at such a conclusion is augmentable. This type of domain specific assessment could be explored using virtual environments.

This idea is not a new one. Researchers in science education, for example, have been developing assessments using immersive virtual environments (=IVEs) to assess students' science inquiry skills (see Clark-Midura & Dede, 2010; Ketelhut et al., 2013; for a review see Nelson & Ketelhut, 2007). For example, Ketelhut et al. (2013) started with the premise that high quality assessments are inextricably linked to learning. In the context of science learning, Ketelhut et al. argued that, "it is impossible to assess [the deeper understanding of what scientists do] without embedding its assessment in content" (p. 176). The potential

power of IVEs is that they are able to immerse participants in a dynamic learning environment and create a physical and affective experience of "being there" (Dede, 2009) while interacting with actual academic content. Some empirical research has revealed that IVEs are effective when they build a cohesive and compelling narrative to engage students in a particular learning space (Barab, Sadler, Heiselt, Hickey, & Zuiker, 2007; Girard et al., 2013; Rowe, Shores, Mott, & Lester, 2010). This affordance of IVEs allows social scientists to immerse participants in a learning context that feels quite real and natural, where they are enacting practices that are authentic to the learning context. By situating assessments within an appropriate learning context, assessment creators can increase the ecological validity of their assessments.

Translating this approach from assessing scientific inquiry skills to assessing implicit theories is possible, but will require significant work if these approaches are to be reliable and valid. For example, researchers could design an environment in which students have to use an assortment of strategies to solve a series of problems that get progressively more difficult. Researchers could then observe whether students used those strategies in a systematic way, or if they just provided an answer and either moved on when getting it right or quit when they failed. According to Dweck and Leggett (1988), people holding a fixed theory might behave just like those holding an incremental theory of ability until they run into significant challenges. By observing what students do and say in the face of challenges, researchers can make inferences about students' theories of ability.

Of course, assessing implicit theories in this way requires researchers to be absolutely clear about what it actually means to hold a fixed or incremental theory of ability, and what specific things they do and say. For example, although Dweck and her colleagues have pointed to goal orientations, effort beliefs, use of strategies, and persistence in the face of failure as outcomes of implicit theories of ability, it is not yet clear how researchers would

assess students' beliefs about the fixedness of ability rather than, for example, beliefs about effort. Other than giving up in the face of failure or refusing to use strategies, what specific things do students do or say to show that they think that their abilities are static versus malleable? In the earlier example of presenting students with progressively more difficult inquiry challenges, does giving up on a challenge mean that students think that they are not smart enough to figure it out, or does it instead mean that students felt that it was not worth their efforts to go through the trouble of engaging in those strategies? Those are two different constructs—the first is a fixed theory of ability, but the second is an example of students' cost value beliefs. Creative design decisions will have to be implemented that assess students' implicit theories of ability without bluntly asking them whether they think that their ability is static or augmentable. Thus, although assessments using virtual environments hold great promise in their ability to assess beliefs at a finer grain size couched within specific learning contexts, designing such assessments will take much work before they can be reliably and validly used.

Summary and Conclusions

Despite the rich literature base and long history of research on implicit theories, there still remain large gaps in the research base. By outlining the conceptual controversies in the current literature, we highlighted the fact that much theoretical work still needs to be done in examining whether the implicit theory construct is indeed multidimensional or unidimensional. We also highlighted the need to examine how ongoing changes in how both laypersons and experts view the concept of intelligence change the way in which we conceive of the concept of implicit theories of intelligence. Our review also highlighted large gaps in our understanding about practical issues such as how to assess implicit theories in much more sophisticated ways than what scholars have traditionally been able to do. Our hope is that this

special issue will encourage scholars from a wide range of disciplines to thoughtfully examine how they can operationalize and assess implicit theories.

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