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COMMENTARY

Overcoming Fragmentation in Motivation Science: Why, When, and How Should We Integrate Theories?

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Abstract

Theories in motivation science, and in psychological science more generally, are in a state of fragmentation that impedes development of a robust body of knowledge. Furthermore, fragmentation hinders communication among scientists, with practitioners, and with policymakers and the public. Theoretical integration is needed to overcome this situation. In this commentary, I first provide an overview of the integrative frameworks presented in this collection of articles. Based on this overview, I discuss if and when we should integrate theories. Several non-trivial conditions need to be met for integration, including convergence of phenomena, constructs, and theoretical propositions. Next, I address strategies for integration, including rules for merging constructs and ways to integrate propositions. I also discuss how the generation of integrative frameworks, if not successfully enacted, can paradoxically lead to further proliferation rather than a reduction of theories. In contrast, successful integration reduces redundancy and simplifies the conceptual space used to describe, explain, or predict a set of phenomena. Successful integration may require not only theoretical work but also empirical validation, strategic efforts in the scientific community, and change of institutional policies. In conclusion, I argue that within-discipline integration alone is not sufficient to overcome the current theoretical stagnation in the field. Attention to advances in neighboring disciplines, formalization of models of motivation, and theoretical differentiation to consider the specificity of constructs, populations, and contexts are needed as well.

Keywords Motivation · Emotion · Theoretical integration · Achievement goal theory · Expectancy-value theory · Control-value theory · Self-determination theory

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Motivation science is in a state of fragmentation. Similar to other disciplines in psychological research, the field is characterized by a proliferation of constructs and theories that target the same or similar phenomena but remain in siloed territories. The resulting multiplicity and redundancy of concepts hinder communication not only among scientists but also with practitioners, policymakers, and the public. Regarding education, as Skinner (2023, p. 2) has aptly put it, "end-users are faced with a splintered and confusing picture of academic motivation." This problem has been recognized by many authors and has led to a general sense of discomfort with the current development—or lack thereof—in motivation research as well as psychological science more broadly (e.g., Anderman, 2020; Cronbach, 1957, 1975; Gigerenzer, 2017; Greene, 2022; Lawson & Robins, 2021; Marsh et al., 2019a, 2019b; Pekrun, 2023a, 2023b).

As such, it seems imperative to integrate existing conceptions to reduce complexity or at least better organize it. The articles in this collection serve this purpose. They address different sets of motivation theories and differ in level of granularity, but they share the aim to better organize the conceptual world of educationally relevant theories of motivation. In the following, I first provide a short overview of the frameworks presented in this collection. Subsequently, I discuss if and when we should integrate theories, and in which ways. In conclusion, I highlight the need to move beyond integrating existing theories to overcome the current theoretical stagnation in the field.

Frameworks to Organize and Integrate Motivation Theories

Theories of achievement motivation, or of students' academic motivation more specifically, are the primary target of the articles in this collection. However, several of the articles also consider theories of instruction (Hornstra et al., 2023; Fryer & Leenknecht, 2023; Martin, 2023; Noetel et al., 2023), and one article focuses on models of students' cognitive processing of learning materials (Dinsmore et al., 2023).

Elliot and Sommet (2023) use Elliot's hierarchical model to integrate constructs of achievement motivation. In this model, reasons for behavior as provided by need for achievement and fear of failure are seen as energizing competence-relevant behavior, achievement goals as providing direction, and achievement goal complexes as combinations of reasons and goals. Other key constructs in the literature are seen fitting within this model (e.g., competence beliefs as reasons, and intrinsic motivation and achievement as downstream outcomes of achievement goals). Similarly, non-achievement constructs, such as temperament and personality traits, are posited as additional reasons underlying achievement goal pursuit.

Skinner (2023) addresses students' academic motivation more specifically. She argues that the concepts of academic motivation addressed in different theories can be organized into an overarching framework by using four key units (or "guideposts") of motivation: motivational resiliency and vulnerability, academic identity, social ecologies, and developmental embeddedness. From a process perspective, she organizes these units along a sequence of four subsystems (or "buckets") including

context, self, action, and outcomes (for a similar approach, see Urhahne & Wijnia, 2023). Skinner lists more than 100 different single constructs that can be located within these metaconstructs of subsystems and key units.

The articles by Fryer and Leenknecht (2023), Hornstra et al. (2023), Martin (2023), and Noetel et al. (2023) address links between classroom instruction and students' motivation. Fryer and Leenknecht (2023) present a theoretical model ("self-system model for self-efficacy in the classroom") that integrates constructs from research on teacher clarity, teacher feedback, and students' self-efficacy. The model is embedded in Skinner's self-system model of motivational development (Skinner & Belmont, 1993) and uses the concept of structure (of teaching) to theoretically integrate clarity and feedback. Propositions are presented that explain the influence of clarity and feedback on self-efficacy, and implications for practice are discussed.

Martin (2023) aims to integrate models within and across the domains of motivation and instruction. He uses his motivation and engagement wheel (Martin, 2007) as a model for motivation, and his load reduction instruction model (Martin, 2016) as a framework to understand instruction. The wheel classifies constructs into four major categories: positive and negative motivation, and positive and negative engagement. The load reduction model integrates principles of direct and constructivist instruction. The integration of the two models leads to hypotheses on specific links between 11 different instructional principles, on the one hand, and 11 motivation and engagement variables, on the other.

Hornstra et al. (2023) combine propositions from self-determination theory and Rubie-Davies's (2015) high expectation theory. Rubie-Davis's theory targets teacher behaviors that are facilitated by high teacher expectations and promote student motivation and engagement, including mixed-ability grouping, a warm socioemotional climate, and goal setting coupled with feedback. The authors argue that these categories are aligned with teacher behaviors addressed in self-determination theory (structure, teacher involvement, and autonomy support), but also provide additional unique perspectives. Together, these sets of behaviors are thought to mediate effects of teacher expectations on students' need satisfaction and educational outcomes.

Noetel et al. (2023) generated a "cross-theoretical" model of 71 teacher behaviors that are thought to predict student engagement, derived from self-determination theory, achievement goal theory, mindset theory, and transformational leadership theory. The model identifies teacher behaviors that are either addressed in several of these theories or unique to one of them. The empirical validity of the model was tested in a longitudinal study of the predictive power of student-perceived teacher behavior on students' engagement in physical education. The results show that behaviors derived from multiple theories were predictive, thus, supporting the value of integrating propositions.

Finally, beyond the motivation domain, Dinsmore et al. (2023) address three models of cognitive processing of learning materials: Marton and Säljö's (1984) approaches to learning model that explains surface and deep processing as responses to different tasks and assessments; Alexander's (1997, 2003) model of domain learning that explains them as a function of stages in developing proficiency; and Winne and Hadwin's (1998) model of self-regulated learning. Dinsmore et al. discuss how the three approaches could be integrated by simultaneously attending to different

functional relations, time spans, and developmental mechanisms of cognitive processing, and they present a "fused" model that integrates assumptions from the approaches to learning and domain learning models.

Taken together, the seven articles demonstrate that it is possible to organize educationally relevant motivation constructs and theories in meaningful ways. Each of the integrative models showcases that it is useful to conceptually order constructs into overarching categories, and some of them also integrate explanatory and predictive propositions from different theories. Furthermore, the articles by Elliot and Sommet (2023) and Noetel et al. (2023) highlight that it is possible to not only generate integrative frameworks, but also to test their validity in empirically predicting outcomes.

However, open questions remain. The articles in this collection rest—at least implicitly—on the common assumption that integration is generally a good thing. Is this really true? Is integration always beneficial? If not, under what conditions should we integrate theories, and when should we refrain from attempting to do this (see also Martin's, 2023, discussion of boundary conditions)? What are good strategies to integrate theories? Finally, is integration of existing theories sufficient to overcome the current stagnation in the field, or do we need more than that?

Two Types of Integration

Answers to the above questions require clarity about the concept of integration. What exactly do we mean by "integration" when we talk about integrating theories? The term can take different meanings. Two variants may be most important. First, integration can mean to organize constructs and propositions from different theories in a common conceptual space while keeping the constructs and propositions as they are. This type of integration amounts to creating a metatheoretical framework hosting different theories (as exemplified, e.g., in the frameworks proposed by Hattie et al., 2020; Skinner, 2023; and Urhahne & Wijnia, 2023). Second, integration can mean to reduce the number of constructions and propositions by merging them.

The first type of integration could conveniently be called *metatheoretical integration*, and the second type *theoretical integration*. In the following, I use the term in the latter way, that is, to depict integration that merges constructs and propositions, thereby reducing their number and simplifying the conceptual space used to describe, explain, or predict a set of phenomena. Metatheoretical integration can be useful as a first step towards such integration, but cannot replace it.

Integration is one way to achieve theoretical change. Other strategies include differentiating theories (e.g., by creating subtheories for different constructs, populations, or contexts), revising theories (e.g., by formalizing propositions), generating new theories (e.g., after discovery of new phenomena), and discarding old theories (e.g., theories that have proven to be invalid or redundant). Integration can be combined with other options. For example, integration can lead to discarding redundant previous theories. Nevertheless, traditionally integration has not received much attention in work on the development of science. Instead, philosophers of science

have focused on competition between theories (rather than their integration), and resulting elimination of invalid theories, as drivers of scientific development (e.g., Lakatos, 1978; Popper, 1979).

Why and When Should We Integrate Theories?

Theoretical integration can serve two main purposes: increasing the parsimony of theories and easing communication. Both purposes require that the theories to be integrated (1) target the same or related phenomena and (2) show convergence of theoretical constructs and propositions. Both of these requirements are less trivial than it seems at first sight. Furthermore, sometimes it is necessary to further differentiate theories rather than integrating them.

Convergence Versus Divergence of Phenomena

Condition #1 seems trivial. At first sight, it may not seem to make much sense, and be not feasible practically, to integrate theories of phenomena that belong to different worlds of objects. However, there may be cases where integration makes sense even if the phenomena differ, as well as cases where integration has its limits despite the target phenomena being the same.

When different groups of objects function according to similar principles, then it may be useful to integrate related theories. We do not need fundamentally different theories for the movements of different planets in space—they behave according to the same functional rules. The same may be true for some psychological processes. An example is appraisal-based theories of motivation, on the one hand, and emotions, on the other. Appraisals are subjective judgments of situations and competencies. In motivation theories, alternative terms are used, such as expectancies, attributions, and values. In emotion science, "appraisal" is used as an umbrella term for these judgments. To the extent that the same sets of appraisals generate both motivation and emotion, and that they do so according to the same functional principles, it should be possible to integrate appraisal theories of motivation and emotion.

A case in point is expectancy-value theories of motivation (e.g., Eccles & Wigfield, 2020; Heckhausen, 1991), on the one hand, and control-value theory of emotions (Pekrun, 2006, 2021a, 2023c), on the other. Expectancy-value theories explain motivation as a function of expectancy and value appraisals, and control-value theory explains prospective emotions—such as hope, anxiety, and hopelessness—as a function of these same appraisals. Given assumed similarity of objects (motivation vs. prospective emotions) and similarity of their relations with antecedent appraisals, theoretical integration might be feasible and could prove fruitful.

Conversely, even when theories target the same phenomena, integration may not always be useful. Specifically, when the same phenomena are considered, but from different perspectives and on different levels, attempts to merge conceptions may do more harm than good. An example is cognitive (mental) versus neuroscientific concepts of "free will" (i.e., congruency between intentions and actions). From a dualist

perspective, any reductionist attempts to explain these relations by patterns of activation in brain areas alone may fail. Similarly, assuming that relations between intention and action can be explained using mental principles alone, while ignoring their physiological basis, is prone to fail as well. Both approaches target the same phenomenon—convergence of intention and action. However, they do so from different, complementary perspectives none of which can substitute the other.

Convergence Versus Divergence of Theories

Generally, if the constructs and propositions of different theories converge, then it may be useful to integrate (i.e., merge) them. If they diverge, then it may be better to refrain from trying to integrate them. In this case, it may be better to empirically investigate their relative validity and discard less valid theories. Alternatively, it may be possible to integrate diverging theories by explaining under which specific conditions each of them holds.

There are two major ways in which theories can diverge. First, they can simply address different constructs and relations between these constructs or at least use different terms denoting them. Second, there can be divergence in terms of contradictions between theoretical predictions for the same constructs, such as one theory proposing that extrinsic motivation is beneficial for student engagement, and another theory stating it is detrimental. In their call for papers, the editors of this collection asked authors to not only reflect on convergence and synergy of theories, but also consider points of divergence. In response, the articles in the collection focus on the first type of divergence. Together, they render ample evidence that existing theories of motivation diverge in the variables considered. They provide less evidence on contradictions between the propositions from different theories.

Progress in science has often been driven by theoretical controversies and attempts to resolve them. The current articles do not emphasize this type of divergence. Why? Does this mean that there are no theoretical controversies in the field? Does it mean that current motivation theories converge to the extent that they do not yield any contradictory predictions? The answer may be both yes and no. To an extent, the answer is yes because current motivation theories share a number of metatheoretical assumptions, such as assumptions about the importance of the self-system in mediating effects of the environment on motivation and action (Skinner, 2023).

The answer is no because there are, in fact, multiple controversies in motivation research—some of them settled, some of them not. For example, are relations between students' competence beliefs and their academic achievement primarily generated by effects of beliefs on achievement, or by effects of achievement on beliefs? Under what conditions exactly do extrinsic rewards undermine interest and intrinsic motivation, and when do they strengthen them? Does anxiety have negative effects on complex task performance, or is the relation curvilinear, such that a moderate amount of anxiety is beneficial (as would be suggested by adaptations of the Yerkes-Dodson law; Shih & Lin, 2017; Yerkes & Dodson, 1908)? Does membership in a high-ability group promote students' motivation and performance (spillover

effect) or undermine it (big-fish-little-pond effect; see, e.g., Dicke et al., 2018)? Does school tracking jeopardize or benefit students' motivation, and for which groups of students may tracking be beneficial or detrimental (e.g., Marsh et al., 2023)?

To make progress in motivation research, it may be useful to focus on resolving existing controversial issues. However, it is also important to consider under what conditions productive controversies arise. Two especially important conditions are (a) precision of theories and (b) precision of measures and empirical study designs to test them. Precise theoretical propositions and precise measurement are needed, otherwise contradictions may not be detectable. Progress in science provides examples. As a case in point, without the precision of Newton's theory of motion, combined with the precision of measures of motion developed in the 19th century, it would not have been possible to detect that Newton's conception was not able to adequately describe some of the motions of planets, and Einstein may not have developed his general relativity theory (see also Corda, 2021).

On both fronts, current psychological motivation research may be underdeveloped. Most of our motivation theories lack the precision of formal models, many measures of motivation show dubious psychometric quality, and many of our study designs and modeling procedures are not well suited to adequately test theoretical predictions about causal relations (see, e.g., Hamaker et al., 2015; Lüdtke & Robitzsch, 2022).

To understand lack of precision in theoretical propositions, it may be helpful to differentiate levels of specificity of relations between constructs. Specificity defines how easy it is to disconfirm propositions (i.e., their falsifiability). Weak propositions are true in most cases, such as the statement that all psychological variables are related in some way, or that effects of experimental treatments differ to some extent between conditions. As Meehl (1967, p. 110) put it, "the point-null hypothesis H0 is, in psychology, [quasi-] always false." In contrast, strong propositions are sufficiently specific to be disconfirmed by many possible cases.

Table 1 depicts a few types of relations that appear to be commonly proposed in motivation theories. On Level 1, the proposed relation just consists of an association between variables, without any causal claims. Propositions of this type can be made stronger by specifying the direction (positive vs. negative), functional form (e.g., linear), and strength of the relation (but see Van Tilburg & Van Tilburg, 2023, for limits on possible effect sizes in the multivariate world of psychological variables). Even if this is done, however, propositions of this type remain weak from a causal

Table 1 Levels of functional specificity of propositions

Level	Type of relation	Description	Example
1	Non-causal	A is associated with B	Self-concept correlates with achievement
2	Causal, weak	A has an effect on B	Self-concept has an effect on achievement
3	Causal, moderate	A has a positive effect on B	Self-concept has a positive effect on achievement
4	Causal, strong	A has a functionally specified effect on B	$y = ax^2 + b$, with y = achievement, x = self-concept

inference perspective. Levels 2–4 specify causal relations. On Level 2, it is specified that one variable influences another variable. On Level 3, the direction of the effect is specified, but the form of the function is left open—it could be any kind of monotonic function defining the effect. On Level 4, the functional form of the effect is defined. For predictive (rather than causal) relations, similar levels can be specified.

Obviously, it is easier to disconfirm Level 4 propositions than Levels 1–3 propositions. With Level 4 propositions, it is easier to detect contractions between theories, and it is easier to detect contradictions between theory and evidence. However, as they are summarized in the articles in this collection, almost all propositions of the motivation theories addressed are located on Levels 1–3. For example, the statement that factors in Martin's (2007) motivation and engagement wheel are correlated (e.g., Martin, 2023, p. 10) is a Level 1 statement; the statement that feedback impacts students' engagement (e.g., Fryer & Leenknecht, 2023, p. 14) is a Level 2 statement; and the statement that teacher support has a positive effect on student outcomes (e.g., Hornstra et al., 2023, p. 9) is a Level 3 statement. To make further headway in motivation science, it may be necessary to move beyond these levels and more precisely define the proposed relations.

Integration Versus Differentiation

If propositions converge, they can be merged. However, often it may be useful to further differentiate propositions rather than integrating them (see also Martin, 2023). For example, a straightforward, integrated conception of negative emotions would be to state that these emotions are detrimental to students' academic motivation and achievement. However, the extant evidence suggests that this may not be true for all negative emotions, all persons, and all task conditions. As such, theoretical differentiation is needed. From the perspective of the cognitive-motivational model of emotion effects that is part of control-value theory (Pekrun, 2006), it is especially important to distinguish between effects of different emotions varying along the valence, arousal, and object focus dimensions, and between effects of emotions on different processes mediating students' achievement (see Pekrun et al., 2023).

For example, anxiety can deplete students' working memory resources and undermine their interest and intrinsic motivation, but can boost extrinsic motivation to invest effort in order to avoid failure. Furthermore, anxiety can promote detail-oriented, analytic thinking which can be helpful on some types of tasks. A differentiated set of propositions is needed to explain these different effects, and the interplay of different mechanisms and task conditions in generating performance. Simply characterizing emotions like anxiety, confusion, or shame as detrimental to engagement and achievement may not be sufficient.

Similar principles may hold for various constructs of motivation, such as different types of extrinsic motivation as addressed in self-determination theory (Ryan & Deci, 2017), or the nuanced effects of performance-approach goals on motivation and achievement as explained in Elliot's achievement goal theory (e.g., Elliot, 2005). The world of emotions is not black and white, and the same holds true for motivation. Integration is needed where constructs and propositions are redundant,

but differentiation is needed to more fully understand the complexity of psychological processes.

How Should We Integrate Theories?

The articles in this collection aptly document the amount of redundancy between constructs and propositions in current motivation research, and each of them makes proposals on how to integrate constructs or propositions from two or more of the current theories. Which conclusions can we derive about how to best integrate theories of motivation? To tackle the task of integration, we first need a definition of the conceptual space of motivation—how do we want to define this concept? Answers define the range of theories to be integrated. Subsequently, strategies need to be specified to integrate (a) motivation constructs and (b) propositions linking constructs. However, achieving these tasks alone may not be sufficient—we also need strategies to implement proposed changes.

Defining the Conceptual Space of Motivation

Motivation can be broadly defined as factors that underly energization and direction of behavior. This view is shared by authors of the present set of articles. For example, Elliot and Sommet (2023, p. 3) state that, "in the scientific literature on motivation, motivation means the energization and direction of behavior." Similarly, Skinner (2023, p. 16) explains that "Motivation … focuses on the processes underlying the energy, direction, and durability of action." However, when framed in such a broad way, the definition may be overinclusive (Pekrun, 2023a; see also Murayama & Jach, 2024). Taken literally, the definition would imply that all factors energizing behavior, such as neurohormonal processes, activation of cortical and motor areas in the central nervous system, arousal of the sympathetic and parasympathetic nervous systems, or nutrition should be considered motivation. Similarly, all factors providing direction, such as biologically prepared or acquired stimulus-action schemata, would be motivation. Furthermore, a broad energy-and-direction definition would imply that emotions are motivation, and that affective science is a subfield of motivation science—a perspective that affective scientists likely would not want to endorse.

In fact, it seems that the motivation theories synthesized in the present articles do not use such a broad view. Rather, they focus on mental representations of behavioral possibilities, their antecedents, and their outcomes, as exemplified in constructs of goals, ability beliefs, expectancies, attributions, values, intrinsic versus extrinsic motivation, and underlying needs. The conceptual space of these constructs is more specific than suggested by a broad energy-and-direction definition. I have proposed to call this space *core motivation*, defined as mental processes that directly influence goal direction, intensity, and persistence of behavior (Pekrun, 2023a; see also Liem & Elliot, 2018). In terms of this definition, core motivation comprises *proximal mental determinants of behavior*. Feelings of desire and cognitive representations

of desired states and actions (such as goals, expectancies, values, and intentions) are prime motivation constructs according to this definition. In most motivation episodes, these feelings and cognitions are combined—core motivation includes cognitive representations of states and actions, combined with a feeling of desire.

The concept of core motivation may be just one among several possibilities to define the conceptual space of motivation. However, whatever specific definition is used, it may be better to define the space before making attempts to integrate theories located in the space, and it may be better to use a theoretical definition rather than just lists of theories that happen to exist at a given point in time.

Integrating Constructs

Integrating propositions requires an integration of constructs. If propositions address different constructs, they cannot be properly merged (as noted earlier, herein I use the term "integration" to denote merging rather than only organizing propositions). The articles in this collection make abundantly clear that motivation research is plagued by the multiplicity of terms used, coupled with redundancy among many of them, suggesting that integration is needed. Jingle-jangle fallacies are typical for the field—the same term being used to denote different constructs (jingle fallacy), and different terms to denote the same construct (jangle fallacy). An example of a jingle fallacy is using the term "self-efficacy" to denote both task-specific expectancies in a given situation, and expectancies to be able to master task demands that are generalized across tasks and time (Marsh et al., 2019a, 2019b). An example of a jangle fallacy is using various terms to denote expectations to successfully perform a task, such as expectancy of success (Eccles & Wigfield, 2020), self-efficacy expectation (Bandura, 1977), or action-control expectancy (Pekrun, 2006). These terms may be more equivalent than previously thought.

Jangle fallacies can be resolved by merging terms, either by selecting one of the terms currently in use or by creating a new one. For the above example, using "self-efficacy expectation" instead of success expectancy or action-control expectancy might be a solution for some purposes. In contrast, jingle fallacies need to be resolved by differentiating—rather than integrating—terms. In the example cited above, one solution would be to clearly differentiate between task-related and generalized self-efficacy expectations.

For both integrated and differentiated constructs, clear definitions are needed before propositions on relations between constructs can be judged and—possibly—integrated. Different strategies to define constructs are used in the literature, including (a) operational definitions that define constructs by related measures; (b) definitions by additive lists of objects; (c) prototype definitions that conceptualize families of objects, with some objects being at the core and others closer to the border of the concept; and (d) definitions based on the common core of usages of the term. To simplify scientific language and ease communication, often a combination of variants #c and #d may be fruitful (Pekrun, 2019). For example, using the common core strategy, existing complex definitions of personality can be replaced by an integrative, less complex definition. Using this view, personality can be defined as the set of

psychological characteristics that (a) can vary between persons and (b) are relatively stable over time (Guilford, 1959; Pekrun, 1988). These two features are sufficient to define personality in a precise and efficient way.

After having defined constructs, we need to judge if they are sufficiently similar to be merged or not. Lawson and Robins (2021, p. 346) have proposed a useful set of rules to evaluate the similarity of constructs, making it possible to decide if they show sufficient overlap ("twin constructs") or are related but still distinct ("sibling constructs"). Lawson and Robins suggest similarity can be judged by considering the extent to which the constructs (1) are defined in a conceptually similar way; (2) show overlap in their theorized nomological networks; (3) show overlap in their observed nomological networks; (4) have measures that correlate strongly with each other; (5) have measures that together form a strong general factor; (6) have measures that show little incremental validity over each other; (7) have similar developmental trajectories; (8) share underlying causes (such as environmental factors, genetic dispositions, and neural mechanisms); (9) are causally related to each other; and/or (10) are state/trait manifestations of the same underlying process.

In addition, it is important to consider the purpose of using terms. Constructs, and terms denoting constructs, can often be organized in a hierarchical fashion. As long as two terms do not denote exactly the same phenomenon (i.e., they are "sibling constructs," not "twin constructs"), it may be useful to keep both of them for nuanced descriptions. Alternatively, if nuanced differences are not of interest, it may be useful to use superordinate terms and constructs ("parent constructs"; Lawson & Robins, 2021). For example, for some purposes, it may be useful to distinguish between the above-mentioned terms denoting expectancies. For other purposes, it may be helpful to integrate them using a superordinate term. Doing so can increase parsimony by simplifying descriptions as well as explanatory and predictive propositions (see below for the case of emotions, positive affect, and negative affect). However, caution needs to be exerted in doing this—integration comes at the risk of overlooking important differences between the original constructs.

As such, for scientific purposes it is often better to be a "splitter" than a "lumper" (Darwin, 1857; Simpson, 1945). This may be different if the goal is to communicate with practitioners and the public—using a smaller number of broad constructs instead of making fine-grained conceptual distinctions can ease transmitting core messages. For example, when explaining main findings on self-concepts, expectancies, and perceptions of control to students and teachers, it may be useful to use broad, simple terms from everyday language, such as self-confidence, that combine these constructs (e.g., Pekrun, 2014).

Integrating Propositions

Once constructs have been defined with sufficient precision, propositions from different theories can be checked for cross-theoretical redundancy. Tools such as theory mapping (Gray, 2017) can be used to this end. However, chances for finding redundant propositions that can be merged may be higher for weak propositions and lower for strong propositions (see Table 1), creating a paradoxical situation: Increasing the

precision of propositions may come at the cost of increased difficulty to integrate them across theories. If proposed relations between the same constructs differ across theories, then two strategies could be used to make progress: empirically testing the relative validity of the contradictory propositions, or specifying under what conditions which of the propositions should be true. Combining both strategies may often be best.

Integration of propositions can take different forms. The following six cases of integrating propositions on causal and predictive effects may be especially important (see Table 2). I depict the six cases using the smallest numbers of constructs needed (2–4). Variants can be created by integrating more constructs using the same principles. In addition, various combinations of the options are possible.

1. *Identical effects*: Theory 1 posits that A impacts B, and Theory 2 posits the same. The two propositions can be integrated in the joint proposition that A impacts B, provided that the two theories define A and B in the same way and propose the same type of effect. For example, different interference theories of anxiety claim that anxiety depletes cognitive resources, making it possible to integrate their propositions into one (although it may, in fact, be necessary to distinguish between different types of resources; see also Mikels & Reuter-Lorenz, 2019).
2. *Reciprocal effects*: Theory 1 posits that A influences B, and Theory 2 posits that B influences A. If both propositions are thought to be true, they can be integrated by stating that A and B are linked by reciprocal causation. In this way, previous "self-enhancement" and "skill-development" models of the link between self-concept and achievement have been integrated in current reciprocal effects models of the two constructs (Marsh, 1990; Marsh et al., 2018). Similarly, models that explain relations between anxiety and achievement as being generated either by effects of anxiety on achievement (interference models), or by effects of achievement level on anxiety (deficit models), have been integrated into reciprocal effects models (Pekrun, 1992; Pekrun et al., 2017).
3. *Chains of effects*: Theory 1 posits that A influences B, and Theory 2 posits that B influences C. A theory combining the two propositions could state that A influences B, B influences C, and B mediates the relation between A and C. Similarly, if Theory 1 posits that A influences C and Theory 2 posits that A influences B and B influences C, then the propositions from the two theories can be combined

Table 2 Heuristic model for integrating theories

Option	Type of integration	Theory 1	Theory 2	Integration
1	Identical effects	A → B	A → B	A → B
2	Reciprocal effects	A → B	B → A	A ⇆ B
3	Chain of effects	A → B	B → C	A → B → C
4	Joint causes	A → C	B → C	AB → C
5	Joint outcomes	A → B	A → C	A → BC
6	New effects	A → B	C → D	A → B ↓ ↓ C → D

by stating that B mediates the effects of A on C. Using this logic, A. Elliot and I created our joint model of achievement goals and achievement emotions which posits that goals impact emotions, and that emotions are mediators in the effects of goals on achievement (Pekrun et al., 2006, 2009).

4. *Joint causes*: Theory 1 posits that A influences C, and Theory 2 posits that B influences C. In this case, it would be possible to merge constructs A and B into one superordinate construct AB and to combine the propositions into the statement that AB influences C. Emotions and positive versus negative affect are an example. To the extent that different positive emotions have the same effect on an outcome variable, they could be combined into the global construct of positive affect. Similarly, if different negative emotions have the same effects, they can be subsumed under negative affect. This strategy may be useful for some outcome variables. For example, effects of emotions on overall hedonic well-being may be captured by using summary constructs of positive and negative affect. The strategy may be less useful for other outcomes, such as students' task performance, for which different positive and negative emotions have differential effects.
5. *Joint outcomes*: Theory 1 posits that A influences B, and Theory 2 posits that A influences C in the same way. It would be possible to merge the two by positing that A influences a merged construct BC. For example, if one theory states that boredom reduces students' intrinsic motivation, and another theory states that boredom reduces their extrinsic motivation, then an integrated proposition would be that boredom decreases students' motivation (without differentiating between types of motivation). This proposition would have some theoretical plausibility as well as empirical support (e.g., Pekrun et al., 2023).
6. *New effects*: Theory 1 posits A influences B, and Theory 2 posits C influences D. An integration of the two theories could connect the elements from the two theories, for example, by positing that A influences C, and B influences D. Using propositions on both causal and non-causal relations, this is the strategy Martin (2023) employed to integrate his load reduction model of instruction with his motivation and engagement wheel.

Option #1 (merging identical propositions) trivially reduces the number of propositions, thus increasing parsimony. Options #4 (joint causes) and #5 (joint outcomes) also reduce the number of propositions. Options #2 (reciprocal effects) and #3 (chains of effects) keep the number of single constituent propositions constant, but better connect them than the original theories. Option #6 (proposing effects that connect theories) increases the number of propositions. This option can be a powerful tool to integrate theories by creating new links that combine their constructs. Although this type of integration implies to increase rather than decrease the overall number of propositions, it allows new insights and creates a broader theory that contains the original theories as subtheories.

Options #4 and #5 reduce the number of propositions by merging constructs. To use option #4, it is necessary that the constructs subsumed under the umbrella AB causal construct do in fact show *functional homogeneity*—they need to have the same effects on C. If they are functionally heterogenous relative to C (i.e., if the

principle of functional homogeneity is violated), then explanatory power may be lost, and integrating the propositions may do more harm than good. Similarly, to use option #5, the constructs merged in the umbrella BC outcome construct need show functional homogeneity in terms of having the same relation with the causal construct A; violations of this homogeneity assumption would reduce explanatory power.

Loss of power due to lack of attention to functional homogeneity is likely one reason why broad frameworks that integrate many propositions are often less precise than medium- or small-range theories containing a limited number of integrated propositions. If broad frameworks merge constructs that are functionally heterogeneous, then they come with a loss of explanatory and predictive power. Similarly, if they just juxtapose constructs without integrating propositions linking them, then they may also lack power. Small theories may lack power because they explain (or predict) only a small set of phenomena; broad theories may lack power due to lack of depth. From this perspective, integrating theories comes with a bandwidth-fidelity dilemma that may be best solved in medium-range integration (this could be called the *Goldilocks principle of theory integration*).

Paradoxical Side Effects

Generating integrative theories aims to simplify our world of theories while preserving—or even enhancing—descriptive, explanatory, and predictive power. However, generating such theories may, in fact, increase rather than reduce complexity. For example, the current set of articles presents more than seven integrative frameworks. For the time being, these frameworks exist in addition to the single theories they address, thus increasing the overall number of available theoretical models. If integrative models combine subsets of original theories, then generating these models can even multiply the overall number of models. For example, if we consider nine different theories (as in Skinner's, 2023, Table 1, list of prominent theories) and each attempt to combine some of these theories includes three of them (as in the framework by Dinsmore et al., 2023), then there are 84 possible combinatory models. Obviously, such a situation would be prone to increase rather than reduce complexity and confusion.

There may be three possible ways out of this dilemma. First, it might be possible to keep the original theories but to merge different integrative models, thus reaching a second-order integration. Second, it might be possible to keep the original theories and to settle on a few of the integrative models while discarding others. Third, it would be possible to integrate the original theories in such a way that each of them can be discarded, in favor of only keeping the integrated model (the above-mentioned reciprocal effects models are an example). Obviously, the third option is the only one that reduces complexity as defined by the overall number of theoretical models.

However, this preferred option is effortful, requires in-depth theoretical and empirical work, and requires acceptance by the scientific community to be successful. Overcoming previous, fragmented theories by merging them may be a rare

occurrence that is difficult to achieve (for a promising example in the present collection, see Dinsmore et al., 2023). Furthermore, theoretical thinking alone may not be sufficient. Empirical evidence supporting the robustness of mergers is critically important as well, as exemplified in the intriguing analysis of combining predictions from four theories that is presented by Noetel et al. (2023).

Making Integration Impactful

Integration and differentiation of theories are part of the overall process of change in the sciences (as well as the humanities). However, especially in the social sciences, successful change is less of a natural given than one might think. For change to be successful, it needs to be backed up not only by empirical evidence, but also by consensus in the scientific community. This is similarly true for an integration of existing theories, for further differentiation of theories, and for discarding theories.

Earlier calls to integrate theories in psychology have met with little success (see Greene, 2022, for the case of educational psychology). It would be unfortunate if the same happens to the integrative frameworks presented in the current articles. As mentioned in several of these articles, there are strong forces to stay within one's silo, such as the opinion power of leading theorists, the preferences of editors and reviewers, and traditions within study programs at universities. Adding to these forces, it is tempting to reduce the challenge of dealing with the complexity of current theories by simply focusing on one of them and ignoring others. Moreover, self-centered motivational reasons may play a role. For some originators of psychological theories, the dictum cited by Mischel (2008) may still hold: "Psychologists treat other people's theories like toothbrushes—no self-respecting person wants to use anyone else's."

As such, concerted efforts may be needed to overcome fragmentation. Due to collective effort invested in the past 15 years, it was possible to tackle the task of increasing replicability and generalizability of findings in several subdisciplines of psychology. Maybe this type of effort is needed for overcoming fragmentation as well. As a first step, it may be especially important to reach consensus about the definitions of constructs and meaning of terms (Elliot, 2023; Pekrun, 2023a). We may not have too many theories proffering truly different propositions on motivation, but we certainly have too many jingle-jangle fallacies in the field.

To work toward consensus in using terms, the procedures developed in other disciplines could be used for guidance. For example, *consensus conferences* are a common tool used across fields within medicine to reach agreement and standardize the use of terms. The agreement processes used to this end are driven by scientific societies and supported by financial infrastructure as well as honorary work on committees. This is considered an ongoing task that develops in stages but is not thought to be finalized at any given point in time, thereby being open to remediation based on scientific progress. An example is the Diagnostic and Statistical Manual of Mental Disorders (DSM) organized by the American Psychiatric Association. Possible critique of this manual notwithstanding, it represents progress above an unorganized jingle-jangle world of personal preferences in using terms. I could imagine that this

type of consensus processes could be used in motivation science, and in psychological and educational research more broadly, as well.

In addition, as advocated by Gigerenzer (2017), *editorial strategies* and *institutional policies* could be revised to better acknowledge the importance of theoretical integration. Editors could solicit publications on theory integration, as the editors of this collection have done it, and reserve space in journals for these publications. Institutions could acknowledge achievements in theory integration by providing related work with sufficient weight in reaching decisions about hiring, tenure, and promotion, as it is currently already done in many departments to acknowledge open science practices. Similarly, *criteria for evaluating* psychological (and educational) research on institutional and national levels could be amended to not only acknowledge innovative theory development but also work that integrates and consolidates existing theories in a way that helps psychology to mature and become a cumulative science.

Looking Beyond Integration: Overcoming Stagnation in Motivation Science

Integrating constructs and propositions can be a powerful tool. However, I do not think that integration of existing conceptions alone is sufficient to overcome the current theoretical stagnation in motivation science. Most theories in the field date back to the 1970s and 1980s, and their theoretical foundations have not changed much since then (my own theoretical work is no exception; e.g., Pekrun, 1988, 1992, 2006, 2023c). This may mean one of two things. One possibility is that the fundamental principles governing motivation have been sufficiently fleshed out, such that further refinement may be needed, but no fundamental change. The other possibility is that change is overdue, even in defining fundamental principles.

The latter view is backed up by the fact that neighboring disciplines, such as theories of decision-making or models of cognitive processes, have undergone dramatic change during the past 40 years. This view also has plausibility relative to the success or failure of current motivation theories to explain human behavior and its outcomes. For example, in contrast to cognitive variables like intelligence or prior knowledge, motivational variables rarely explain more than 10% of the variance in behavior and outcomes (see, e.g., Hattie et al., 2020; Noetel et al., 2023; Richardson et al., 2012; and see Pekrun, 2021b, for possible reasons in studies on teacher motivation).

In the following, I briefly discuss three possible advances that may help to overcome stagnation and make motivation theories more powerful: (1) attending to progress in related disciplines; (2) formalizing theories of motivation; and (3) better capturing the specificity versus generality of motivation processes across persons, situations, and contexts. This may lead not only to revision and differentiation of existing theories of motivation, but also to the generation of new theories and to discarding some of the existing theories.

Attending to Related Fields of Research

Following up on ancient conceptions of the human mind, such as Plato's tripartite model, contemporary psychology deals with three primary categories of mental faculties: cognition, emotion, and motivation. Similar to different motivation theories representing siloed territories within motivation science, there also is a lack of communication between motivation science, on the one hand, and cognitive and affective science, on the other. Each of these disciplines lives in its own supersilo, with separate journals, societies, study programs at universities, etc. Motivation science could break out of its silo by communicating with cognitive and affective scientists and attending to progress that has been made in these fields.

For example, across major theories considered in the current collection, there is a conspicuous lack of attention to emotions. Anxiety is the only emotion that is mentioned more frequently in these articles (Elliot & Sommet, 2023; Martin, 2023; Skinner, 2023), and there is a general neglect of positive emotions in the collection, except for the framework proposed by Skinner (2023). Affective science has overcome the traditional overemphasis on negative emotions for understanding human agency and considers positive emotions as critical for human growth (e.g., Fredrickson & Joiner, 2018). For negative emotions as well, it is important to consider progress in emotion research to understand their motivational relevance. For example, as argued earlier, it may be misleading to simply characterize emotions like anxiety, shame, or confusion as detrimental—depending on task conditions and context, they can promote rather than undermine motivation and engagement.

Similarly, it may be important to attend to advances in cognitive science to make further progress in developing motivation theory. For example, how should we conceptualize motivational cognitions as they are processed in working memory; what is the role of executive functions and prospective, event- or time-based memories of intentions and actions for current motivation (McDaniel & Einstein, 2007; Möschl et al., 2020); and how could we conceptualize the impact of motivation on processing information from working memory to long-term memory?

Beyond psychology, it may be important to attend to developments in related disciplines, such as behavioral economics and neuroscience. For example, since the 1960s, economists have abandoned the view that perceived value is a linear function of objective value (see, e.g., Kahneman & Tversky's, 1979, prospect theory). In contrast, psychological studies of motivation still conceptualize associations between values and other variables in a linear fashion, even if this is not made explicit but only visible from the linear statistical methodologies used. Similarly, neuroscientific investigation has made progress in uncovering the physiological basis for many motivated processes that are relevant for education; motivation research may benefit from attending to the findings (see, e.g., Immordino-Yang et al., 2009, 2019; Kang et al., 2009; Murayama, 2019).

Formalizing Theories of Motivation

Major theories of motivation include causal propositions that are moderately strong at best (Level 3 in Table 1). They define the direction of effects, but do not further specify the functional form of these effects (except for the implicit definition provided by using linear statistics to test propositions). Progress in terms of increasing explanatory and predictive power as well as falsifiability could be made by formalizing motivation theories and better defining the functional relations proposed to link motivation to antecedents and outcomes (see, e.g., Haslbeck et al., 2022; Robinaugh et al., 2021; for the benefits of formalizing theories in psychology),

An early formalized theory of motivation was developed by Atkinson and Birch (1970). Unfortunately, this model was not widely considered by the community of motivation researchers, and with very few exceptions (Kuhl & Blankenship, 1979), it was never tested empirically. Two reasons may have contributed to this failure: First, the model is mathematically complicated, and motivation researchers at the time may have lacked the mathematical expertise needed to deal with it. Second, for core parameters of the model, empirical measures were lacking.

Relative to this pioneering work, current motivation theory is lagging behind, suggesting that there is room to catch up. However, current motivation theories are also lagging behind relative to the development in related fields. Econometric models of decision-making have achieved a high level of formal sophistication and explanatory power, suggesting that they could be used as models for further developing motivation theories. Similarly, for a few affective states that have important motivational properties, computational models have been generated that can guide theory development. Examples are current models of surprise and curiosity (e.g., Dubey & Griffiths, 2020; Modirshanechi et al., 2022). Models of this type could be developed for other motivational states as well.

Persons, Situations, and Contexts: Specificity Versus Generality

All of the major motivation theories considered in the present set of articles assume—explicitly or implicitly—that fundamental principles of motivation universally hold in our species. This is a plausible assumption that is suited to preserve theoretical parsimony, and it is shared by theories of other psychological processes (e.g., emotions; Pekrun & Goetz, 2024). Expectancy-value theories posit that expectancies of success and (positive) values positively predict motivation and decisions (Eccles & Wigfield, 2020); self-concept theories assume that academic success generally boosts students' academic self-concept, and vice versa (Marsh et al., 2019a, 2019b); self-determination theory postulates that all humans share basic needs for competence, autonomy, and relatedness, and that satisfaction of these needs is generally beneficial (Vansteenkiste et al., 2020).

However, open questions remain, from both theoretical and empirical perspectives. Why exactly should principles of motivation be the same across all persons, situations, and contexts (except for reasons of parsimony)? What exactly are the

basic building blocks of psychological processes that are universal, and in what way can the interplay of these building blocks vary across persons and tasks? For example, it is sensible to assume that the effects of emotions on working memory, intrinsic motivation, different types of extrinsic motivation, and holistic versus detail-oriented modes of thinking are universal. However, the interplay of these mechanisms may vary across persons and task conditions (Pekrun & Goetz, 2024). How should we understand person- and task-specific variation in this interplay, and how could we derive differential predictions for effects on motivation and performance in different persons and on different tasks?

Recent methodological developments have made it possible to examine such variation in a more granular and systematic way than before. For example, methods such as dynamic structural equation modeling make it possible to examine both within-person relations between variables and the variation of these relations across persons. In this way, idiographic and nomothetic perspectives on functional relations can be combined. In dynamic structural equation modelling, any variation of relations across persons would manifest in random effects (i.e., variance of within-person effects across persons; see, e.g., Hamaker et al., 2018; Niepel et al., 2022).

The resulting findings may represent challenges for motivation theories: The relations between variables may contradict current propositions of these theories for more people than would be expected from principles of universality alone. How should we interpret empirical cases in which need satisfaction reduces rather than strengthens positive outcomes, or in which individual success reduces rather than boosts students' self-concept?

Possible variation of functional relations can occur not only across persons but also across situations and sociocultural contexts. Even if current findings suggest that basic principles hold across cultures (Marsh et al., 2019a, 2019b; Pekrun & Goetz, 2024; Vansteenkiste et al., 2020), we should be prepared to deal with possible exceptions from this rule. There may be more context-specific violations of our general rules of psychological functioning than we previously thought. Too many of our empirical studies are still focused on samples from WEIRD (Western, Educated, Industrialized, Rich, Democratic) countries (Henrich et al., 2010). More research with diverse samples and in diverse contexts will be needed to reach robust conclusions that confirm or disconfirm universal principles.

Conclusion

Fragmentation of theories is a problem for science as well as practice, in both motivation research and psychology more generally. As Gigerenzer (2017, p. 134) noted, "The resulting patchwork of theories resembles the political map of Germany and Italy before 1870: mostly small and loosely related territories that occasionally battle but mainly ignore each other." As such, integration is needed to organize theories, increase their parsimony, and make it possible to communicate, both among scientists and with practitioners and the public. Focusing on educationally relevant theories of motivation, the articles in the present collection represent important steps towards achieving this aim. Collectively, they provide both metatheoretical

integration that organizes the conceptual space of motivation theories, and theoretical integration that merges constructs and propositions, thereby reducing unnecessary complexity and redundancy. However, it also becomes clear that integration is not easy to achieve. This may be especially true for theoretical–rather than metatheoretical–integration. To be successful, such integration will require not only theoretical work but also empirical validation and strategic efforts in the scientific community, including consensus building procedures, change of editorial strategies, and revision of institutional policies. Furthermore, it is important to acknowledge that integration within the field alone may not be sufficient to overcome theoretical stagnation. More work is needed to advance motivation science, including integration with recent developments in neighboring fields, formalizing theories, and differentiating them to adequately consider the specificity of different motivational phenomena, populations, situational conditions, and sociocultural contexts.

Declarations

Conflict of Interest The author declares no competing interests.

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