

The role of emotion in early learning

Lukas D. Lopez^{1*} and Daniel Dukes²

¹Department of Family and Consumer Studies, University of Utah, Salt Lake City, UT, United States

²Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland

*Corresponding author: Department of Family and Consumer Studies, University of Utah, 225 S. 1400 E. Alfred Emery, Building 240, Salt Lake City, UT 84112, United States. Email: lukas.lopez@fcs.utah.edu

Abstract

Early learning is increasingly understood as a dynamic, multifaceted process embedded in the everyday lives of infants and young children. In this article, we focus on a critical yet relatively unacknowledged aspect of early learning: emotion. We begin by exploring the potential contribution of research on emotion to theories of early learning. We then review research on developmental cascades underpinned by dynamic, multimodal processes that characterize the first year of life. We highlight the rich, emotional nature of infant-caregiver interactions from the very first few days of life and how, after gross motor transitions, such exchanges create interpersonal contexts for infants' interactions with their environment. We consider emerging research in the everyday learning environments of infants and young children that demonstrates the extent to which these contexts are emotionally rich and how they affect early learning. Ultimately, we aim to broaden appreciation of emotion as an essential component of early learning.

Keywords emotional development, early learning, emotion expression

Early learning processes are increasingly construed as *dynamic*, *multimodal*, and *embedded within the natural environments* of infants and young children (Casillas, 2023; Li & Benitez, 2024; Tamis-LeMonda & Masek, 2023).¹ Specifically, behavioral, cognitive, motor, vocal, and language development depend on *dynamic* interactions with caregivers (Borjon et al., 2024; Goldstein & Schwade, 2008; Lopez et al., 2020; Masek et al., 2021). Researchers widely acknowledge that these processes are *multimodal*: Infants and caregivers coordinate their communication—visual attention, actions, gestures, touch, vocalizations—to suit their individual learning capabilities (Kosie & Lew-Williams, 2024; Lew-Williams et al., 2019; Williamson & Brand, 2014). Moreover, *embedded within natural environments*, factors such as the context of the activity, caregivers' mental health, and the broader cultural context also play significant roles in caregivers' responses (Bunce et al., 2024; de Barbaro et al., 2024; Tamis-LeMonda et al., 2019). Thus, to obtain a complete picture of early learning, researchers must consider not only individual differences in cognitive, behavioral, and social development, but also the physical, temporal, and cultural contexts in which learning experiences unfold.

Emotions play a critical role in learning and are sensitive to such individual differences and contextual factors. Indeed, in a recent

consensus article, leading emotion researchers from various academic disciplines highlighted this aspect of emotions and related affective processes (e.g., motivation, mood, feeling), emphasizing that “it has become increasingly difficult to deny that these processes are not only linked to our well-being, but also shape our behavior and drive key cognitive mechanisms such as attention, learning, memory and decision-making” (Dukes et al., 2021, p. 816). The contribution of emotional and affective processes to models of human cognition and learning has been highlighted elsewhere (Stussi et al., 2024), yet the intersection between cognition and emotion remains relatively unexplored in early learning. In previous studies, emotion understanding was considered to be interconnected with early social cognition (Reschke et al., 2017), and emotional communication was related to the development of executive functions (Castillo & Lopez, 2022). In this article, we aim to underscore the crucial role of emotion in early learning. Although we draw most support for this argument from the domains of attention, communication, and language, we believe other domains would also provide sufficient support (see Table 1).

Emotion, regardless of how it is defined, has not been fully incorporated into theories on *dynamic*, *multimodal* learning processes *embedded within the natural environments* of infants and young children (Casillas, 2023; Li & Benitez, 2024; Tamis-LeMonda & Masek, 2023). Here, we integrate emotion into these recent perspectives by leveraging cutting-edge research that is beginning

¹ For the sociodemographic characteristics of the studies reviewed herein, please see Table S1 in online materials.

Table 1. Cognitive development areas and emotion.

Area (0–5 years)	Some key theories	Emotion in theory	Examples of emotion research	Next steps in emotion research
Executive Function (EF)	Core EFs (Diamond, 2013)—inhibition, working memory, and cognitive flexibility Hot & cold EFs (Zelazo & Carlson, 2012)—emotionally salient hot EF and affectively neutral cool EF	Classic EF accounts emphasize “cold” cognition and do not incorporate emotional context. Zelazo’s hot/cool distinction explicitly includes emotion-laden self-control (e.g., delay of gratification).	Delay of gratification tasks inherently involve reward/emotion. EFs are associated with emotion regulation. Hot/cool EF research (Zelazo et al., 2024) shows that emotional context affects performance.	Researchers should explore how children’s emotions affect their performance on EF tasks (e.g., Kerr & Zelazo, 2004) and how emotional communication regulates behaviors and supports the development of EFs (e.g., Castillo & Lopez, 2022).
Language & Communication	Statistical word learning (Saffran et al., 1996)—probabilities between speech sounds Statistical word-object learning (Smith et al., 2018)—linking words to referents Infant-directed speech (IDS; Theissen et al., 2005)—exaggerated speech aids learning Turn-taking (Goldstein & Schwade, 2008)—verbal feedback to infants supports learning Working memory (Baddley, 2003)—temporary storage of information to complete tasks Dual-processes models (Smith & DeCoster, 2000)—two memory systems: one slow and gradual, and one quick and more instant Multiple memory systems (Stanton, 2000)—memory systems for different domains (cognitive, sensorimotor, and affective)	Emotion is absent from research on statistical learning (besides research that compares language to emotion; e.g., Hoemann et al., 2020; Ruba et al., 2022). Research on IDS has acknowledged emotional aspects of speech (Fernald et al., 1989; Spinelli et al., 2017). Little mention of emotion. Dual processing and multiple memory accounts of adult memory consider emotion, but working memory research in cognitive development generally does not.	Emotional aspects of IDS promote learning (Fernald et al., 1989; Spinelli et al., 2017). Turn-taking is also affected by emotions and affective processes (de Barbaro et al., 2024; Fields-Olivieri & Cole, 2022; Wass et al., 2023). Studies show that emotions influence infants’ and young children’s memory of objects and events (Flom & Bahrick, 2010; Hertenstein & Campos, 2004; Wang, 2008).	Researchers should investigate how emotional communication (e.g., in speech, physiology, emotion expressions, and self-reports; e.g., Nencheva et al., 2024) influences language learning in natural environments. Researchers should examine how the emotional context of interactions (e.g., physiological arousal, vocal communication, and emotional expressions) influences memory formation and development.
Perception & Attention	Sensorimotor stage (Piaget, 1970)—learning from direct experience Zone of proximal development (Vygotsky, 1978)—learning supported by knowledgeable adults Ecological theory (Gibson, 1966)—learning from perceptions of environmental stimuli	Almost no emotional component. Theories mostly focus on information uptake rather than affect.	Infants’ attention is influenced by emotion: Parental emotions guide infants’ attention and crossing behavior on the visual cliff (Sorce et al., 1985), and emotional expressions influence infants’ visual attention (Flom & Johnson, 2011; Hoehl & Striano, 2010).	Researchers should explore how emotional communication influences infants’ attention in natural environments (e.g., LoBue et al., 2025).
Social Cognition & Theory of Mind (ToM)	Theory-theory (Gopnik & Wellman, 1994)—children form intuitive theories about others’ minds Simulation (Gallese & Goldman, 1998)—children use their own mind to imagine others Early social cognition (Baillargeon et al., 2010)—infants show early ToM understanding when assessed using spontaneous-response tasks	ToM theories traditionally focus on beliefs and intentions, not emotion. Emotional states are often treated separately as “emotion understanding.”	Research shows that emotion understanding and ToM are linked (Reschke et al., 2017). Early emotion understanding predicts later ToM (O’Brien et al., 2011).	Researchers should explore how parents’ talk about feelings, sharing affect, emotion perspective taking, and empathy affects the development of social cognition and ToM.
Social Learning	Social learning theory (Bandura, 1977)—behavior, cognition, and environment interact to shape learning. Social learning in animals (Galef, 1988)—learning by observation and imitation	While Bandura’s theory included emotion as an outcome or a motivational factor, cognitive processes were core to the theory. Emotion was only peripheral in Galef’s theory.	Affective Social Learning extends social learning to cognitions, behaviors, and values—how to feel about objects in the environment through others’ emotional expressions—thereby transmitting culture (Dukes & Clément, 2019; Gruber et al., 2022).	Researchers should explore how emotions influence children’s learning about values, norms, and morals from their family and peers.

Note. This table provides examples of theories from a nonexhaustive list of research areas that are traditionally considered cognitive or behavioral, either to the exclusion or under acknowledgement of emotion. It also includes more recent research that has begun to integrate emotion into early learning processes and highlights potential directions for future study.

to show that dynamic interactions in natural environments are imbued with emotions (e.g., Fields-Olivieri & Cole, 2022; Nencheva et al., 2023, 2024; Wass et al., 2022, 2023). We begin with an overview of prominent early learning theories, pointing out that they largely neglect the role of emotion. We then review research on developmental cascades underpinned by *dynamic*, *multimodal* processes during the first year of life, before considering what emotion research can tell us about the *embedded*, contextual nature of early learning. We argue not only that emotion is an essential part of any explanation of early learning, but also that, as such, any theory of early learning that does not include emotion should no longer be considered comprehensive.

Early learning theories

Traditional theories of development, despite their differences, agree that basic developmental mechanisms involve the integration of internal factors in the developing child with external factors and experiences that promote learning. For Piaget (1970), this process took the form of assimilation and accommodation of new information. For Vygotsky (1978), this distinction occurred between actual development and operating in the zone of proximal development, where new information is learned. For attachment theorists such as Bowlby and Ainsworth (1978), this process of integration was central to the development of internal working models. Thus, at a fundamental level, while theorists have agreed on the integration needed for early learning, traditional theories rarely consider emotion as a component of that learning.

Dynamic systems theory is perhaps the most influential contemporary theory of development that accounts for the complexity of internal and external factors for early learning (see Van Geert, 1998, for integration with traditional theories). This theory specifies that developmental change takes place across interwoven developmental domains at multiple time scales (Smith & Thelen, 2003). For instance, current theories that take a dynamic systems approach have emphasized the interplay among motor, perceptual, language, and cognitive development in natural environments at multiple time scales to the exclusion of emotional development (Iverson, 2021; Li & Benitez, 2024; Smith et al., 2018; Tamis-LeMonda & Masek, 2023).

When emotion researchers have adopted dynamic systems approaches, it has usually been to study outcomes related to emotional development or emotion (see Camras & Witherington, 2005; Hollenstein et al., 2017) rather than to study how emotion affects other learning domains that are traditionally considered more cognitive, such as attention, memory, and even social cognition. Recent examples of such research highlight the similarities in learning about emotion and language (Hoemann et al., 2020; Ruba et al., 2022). In one, researchers showed how sensory and motor developmental transitions afford infants opportunities to learn about emotion categories in ways similar to how they learn about object categories (Hoemann et al., 2020). For example, the ability to grasp toys allows infants access to more encouraging smiles from caregivers.

While these important examples inform us about learning about emotions, such research can leave cognitive research on attention and language untroubled. For example, in language learning, recent methodological advances have yielded remarkable breakthroughs in understanding how developing infants interact with

the environment to promote early learning. Statistical word-object learning models have leveraged head camera recordings from infants' everyday language environments to show that infants learn the names for objects by linking their visual input for objects with co-occurring adult verbal responses (Clerkin & Smith, 2022; Vong et al., 2024): If a caregiver labels an object for the attending child in different contexts, such as a banana at lunch and then again later, at the grocery store, the infant will be more likely to learn and retain the name for that object. This demonstrates that two requisite components are required to learn words for objects: 1) infants' visual attention to an object and 2) a tightly coupled adult verbal response (Clerkin & Smith, 2022; Vong et al., 2024). In a sense, the developing infants' visual and motor abilities create a *curriculum* for learning (Smith et al., 2018), the foundational skills necessary for the job.

We argue that emotions are also foundational for learning because they help create an encouraging interpersonal curriculum. For example, just as curious infants learning to walk begin to encounter a greater variety of objects and more adult verbal responses (Karasik et al., 2014), they are also likely to be motivated to take the next step by an encouraging affective vocal tone. With new, exciting possibilities for exploration comes the potential for greater dangers: While any baby is likely to elicit wonder, joy, and delight, a mobile infant is more likely to also elicit reactions of fear, frustration, and anger. The inquisitive child in the grocery store saying "banana" for the first time is likely to be met with expressions of pride and delight by the onlooking caregiver until the child reaches for the banana at the risk of falling over, eliciting fear or anger in the caregiver. This simple example demonstrates the power of integrating measures of emotion when assessing early interactions between children and their caregivers, and suggests why theories that fail to include such measures are unlikely to be comprehensive.

Emotion and early learning

Some theories have focused on learning about emotions. For example, constructionist accounts of emotional development largely focus on young children's development of emotion concepts (e.g., joy, anger; Hoemann et al., 2019). Researchers have applied a developmental cascades framework to emotional development with useful and interesting results (Hoemann et al., 2020). The following lines of research highlight the impact of emotion on infants' learning beyond learning about emotions.

Emotion dynamics as a basis for early learning

Early emotional exchanges are foundational to contingent, multimodal communication with caregivers. Long-established models of behavior and cognition describe how infants favor face-to-face interactions with caregivers from birth and over the first year (Beebe et al., 2016; Trevarthen, 1979). Researchers have long included emotion in their studies of these first interactions. In the first few months of life, before infants are linguistically competent, dyadic *protoconversations* are rooted in exchanges of emotional expression in which infants use their early expressions of emotion to maintain the ebbs and flows

of communication (Trevvarthen, 1979). Infants use positive affect, teasing, clowning, and joking to engage their caregivers (Reddy & Mireault, 2015), as well as negative affect and protests with emotional cries and shrieks if they become disengaged (Tronick, 1989). Caregivers typically use ostensive, exaggerated emotions and infant-directed speech in response to infants' emotional bids to re-engage them (Bourvis et al., 2018; Wu et al., 2023), while some researchers suggest an innate propensity to detect such learning opportunities (Csibra & Gergely, 2011; Dukes & Clément, 2017). Indeed, emotion exchanges predict gaze following in infants (Astor et al., 2020; Noonan et al., 2021), an important skill for early learning (Tomasello et al., 2005). The prosodic, emotion-related aspects of infant-directed speech also promote learning (Fernald et al., 1989; Spinelli et al., 2017). These examples highlight that when considering the first social interactions, which themselves constitute early learning experiences, emotion and affective processes are vital and should not be ignored; most importantly, their inclusion can explain more than measures of behavior or cognition alone (see Dukes et al., 2021; Stussi et al., 2024, for elaboration).

In contemporary studies on emotion dynamics—the ebbs and flows of emotions over time—researchers have used second-by-second analysis of infants' free play and challenging tasks with young children and caregivers in the lab to predict emotion socialization behaviors, emotion dysregulation, and behavioral problems (Cole et al., 2020; Lunkenheimer et al., 2020; Somers & Luecken, 2022). Generally, these studies suggest that parent-child emotion exchanges that demonstrate positive coregulation patterns and affective flexibility (i.e., the ability to transition from negative to positive emotion states) predict young children's self-regulation abilities and effortful control (Hollenstein et al., 2017; Wass, 2021), skills that in turn predict social and cognitive development in young children (Nigg, 2017). Emotion exchanges also likely promote early learning beyond the typically studied emotion socialization behaviors and children's self-regulation. Notably, “the glue that holds protoconversations together is not just contingency but the exchange of emotions” (Tomasello et al., 2005, p. 681) and “social bonding via the sharing of emotions... is foundational to virtually all forms of uniquely human cooperation and shared intentionality.” (Tomasello, 2019, p. 31). If this is correct, in addition to their established importance for emotional socialization, early emotion dynamics are the basis for communication, social learning, and behavioral and cognitive development more broadly.

Next steps on research on emotion dynamics and early learning

Much research in this area has focused on a constrained set of emotion-related learning outcomes (e.g., emotion regulation, emotion socialization, emotion understanding). However, emotion dynamics are highly likely to have diffuse effects on several interrelated developmental domains, such as cognitive, language, and moral development (e.g., Dahl & Campos, 2013; Nencheva et al., 2024). For instance, some aspects of emotion dynamics, such as physiological arousal and word valence, may facilitate language learning (Nencheva et al., 2024), while others, such as labelling context, may not be as important (Ogren & Sandhofer, 2021). Therefore, researchers should seek to gain a more comprehensive understanding of emotion's role in early learning.

Emotion, motor development, and learning from multimodal communication

Emotion exchanges motivate infants' motor development and increase multimodal communication and learning about people, actions, and objects. For example, infants' curiosity drives their motor exploration (Tamis-LeMonda & Masek, 2023): They show and give objects to elicit parental emotions (Reddy & Trevvarthen, 2004), and parents express joy to encourage their infants' developing motor skills (Karasik et al., 2008). Emotion exchanges further promote or inhibit actions after infants begin to crawl and walk (Adolph & Hoch, 2019; Campos et al., 2000). For instance, infants rely on parents' emotion expressions when deciding if it is safe to crawl over a dropoff or walk down a slope (Adolph & Hoch, 2019; Karasik et al., 2008; Sorce et al., 1985), and parents express anger and fear to prohibit mobile infants' actions and teach them about actions, objects, and norms (Campos et al., 2000; Dahl & Campos, 2013). Infants, in turn, express frustration from having their goals blocked (Pemberton Roben et al., 2012). These emotional exchanges are potent opportunities for infants to learn about people, as well as about how those people feel about the actions they take and the objects they discover (Dukes & Clément, 2019).

Two recent theories highlight the central role of emotion in social learning about people, actions, and objects in the environment. First, the theory of affective social learning (Clément & Dukes, 2017; Dukes & Clément, 2019) provides a framework for how infants and young children learn valuable information about their environment from emotional communication, such as which objects might be worthy of further attention, fear, and delight. Second, the theory of emotion as information (Gweon, 2021; Wu et al., 2021) demonstrates that emotions are an important source of input for infants and young children when learning about the physical and social world, such as people's beliefs and desires (Wu & Schulz, 2018), how to use an object (Wu & Gweon, 2021), and how probable obtaining a certain object may be (Lopez & Walle, 2022). Together, these theories provide a new perspective on the traditional, primarily cognitive and behavioral accounts of social learning (Gruber et al., 2022) and add a solid basis for integrating emotion dynamics with motor and perceptual development that promotes multimodal early learning.

Empirical lab-based research has also shown the importance of emotion exchanges for infants' attention and learning. For instance, checking in with adults' emotions is theorized to be central to developing attention-sharing abilities, which promote cognitive and language development (Tomasello, 2019; Tomasello et al., 2005). Recent research supports this hypothesis: Emotion exchanges have been associated with increased attention sharing in infancy (Kidby et al., 2023; Rollins & Greenwald, 2013). This situates emotion as an important component of infants' attention and learning abilities during locomotor transitions.

Next steps on emotion, motor development, and learning from multimodal communication

Researchers should include measures of emotion in conjunction with novel methods used in studies on motor transitions and early learning conducted in natural contexts. For instance, using head cameras to examine infants' attention to emotion expressions

and objects during emotion exchanges in natural environments should provide interesting insights. Although indexing naturally occurring emotion expressions is difficult, an initial attempt using the facial activation coding system (Ekman & Friesen, 1978) provides an excellent starting point (LoBue et al., 2025). Moreover, using head cameras with other methods, such as physiological measures of emotion (Wass et al., 2022) and audio recorders assessing vocal emotion expressions (Fields-Olivieri & Cole, 2022), would likely provide further evidence of the vital role emotion plays in early learning.

Early learning is embedded in (emotional) natural environments

Some research on emotion dynamics and emotion socialization has been conducted in natural environments, such as in early education settings (e.g., Denham et al., 2022; Garner et al., 2019; Lopez et al., 2024). But few studies on cognitive processes related to attention and language learning have considered emotion (Li & Benitez, 2024; Tamis-LeMonda & Masek, 2023). Our main argument here is that emotion exchanges relate not only to emotional development but also to attention and language development more generally. In support of this view, researchers recently studied the effect of parents' emotions in natural environments on the language development of 24- to 30-month-olds (Nencheva et al., 2023). Using a combination of day-long home audio recordings and ecological momentary assessments, they measured parents' emotions via 12 text message surveys over the course of the day. Infants and parents had more responsive communication, and infants learned more words in positive *emotional environments* when parents were experiencing "positive, high-energy emotions" (Nencheva et al., 2023, p. 7). In a follow-up study, experiencing a range of emotion dynamics and learning emotion labels in the first five years of life was positively associated with children's vocabulary development (Nencheva et al., 2024).

Further evidence shows that emotional environments affect the availability and quality of early learning opportunities. Clinically depressed mothers who are by definition likely to experience depressed mood and episodes of excessive or inappropriate guilt (American Psychiatric Association, 2013) do not engage as effectively in emotion exchanges, do not respond as sensitively to their children's emotions, and are less verbally responsive to their infants than are mothers who are not depressed (Reissland et al., 2003; Silk et al., 2011; Tronick & Reck, 2009). In recent studies using day-long home audio recordings, infants' vocalizations containing negative affect (i.e., cries) were less likely to elicit contingent adult responses (Fields-Olivieri & Cole, 2022; Wass et al., 2023), and contingent responses between depressed mothers and infants with high levels of negative affect did not result in infant soothing (de Barbaro et al., 2024). Furthermore, household chaos affects infant-parent emotion regulation and physiological arousal levels, which together contribute to parents' diminished responsivity (Wass et al., 2022). This is problematic since diminished responsivity and emotion exchanges, which are trademarks of maternal depression, harm emotional, cognitive, and language development (Slomian et al., 2019). Overall, this approach—assessing contextual and emotional factors that influence infant-caregiver responsive

interactions and infants' learning outcomes across developmental domains—aligns with the view that emotions are shaped by contextual factors in natural learning environments and play a pivotal role in early learning.

Next steps on early learning in emotional natural environments

The dependence on laboratory research and the relative dearth of ecologically valid studies in most emotional development research merit further scrutiny and raise the issue of whether results from these studies generalize beyond the lab. This problem could relate to the difficulty of defining and measuring naturally occurring emotions. Rather than controlling for elusive emotions in developmental research on learning, studying different aspects of early emotional experiences would help create a more complete picture of the emotional environments of infants and young children. For instance, research on natural learning environments should be integrated with work that assesses naturally occurring emotion words and facial action movements (e.g., LoBue et al., 2025), physiological arousal (e.g., Wass et al., 2022), emotions expressed vocally (e.g., Fields-Olivieri & Cole, 2022), functions of parents' emotional actions (e.g., Dahl & Campos, 2013), infants' behavioral responses to emotion expressions (e.g., Özden et al., 2025), and functions of teachers' and toddlers' emotion expressions in early education settings (e.g., Lopez et al., 2024). Assessing different aspects of emotional experiences in natural settings would not only allow researchers to study the variability of emotion-related processes across diverse individuals, contexts, and cultures, but would also contribute to understanding the primary role of emotion in early learning environments.

Furthermore, if emotions are shaped by contextual factors in natural environments (e.g., parents' mental health, household chaos), they should be studied in a more diverse range of natural settings. This aligns with a learning *in vivo* approach, bridging theoretical models of learning with the everyday experiences of families from diverse cultural backgrounds (Casillas, 2023), who are generally underrepresented in the studies we have cited (see Table S1).

Coda: emotion as a goal of early learning

We began by pointing out a fact that every parent already knows, but that has been historically underacknowledged by researchers (Dukes et al., 2021): Emotion is a fundamental component of early learning and development. From the very first days of life, dyadic infant-caregiver interactions are imbued with emotion and evolve thereafter to include other people and objects in the environment. Emerging research increasingly demonstrates the role emotion plays in motivating and maintaining early learning opportunities, both quantitatively and qualitatively. Indeed, substantial evidence, pieces of which have existed for decades, demonstrates that emotion is integral to early learning and cognitive, behavioral, and social development. For example, drawing conclusions from her research on language development, Bloom (1998) pointed out that "Language... emerges in the second year out of a nexus of developments in emotion, social connectedness,

and cognition.” (p. 1272). Therefore, emotion should no longer be overlooked in contemporary theories of learning.

A new article takes this argument even further, arguing that infants engage in early interactions primarily for the sake of enjoyment, and that language, cognitive, and moral development occur almost incidentally (Carpendale & MacGillivray, 2025). If this is correct, emotion may not simply be a vital yet underacknowledged component of early learning; it may, in fact, be its very foundation.

Supplementary material

Supplementary material is available at *Child Development Perspectives* online.

Author contributions

Lukas Lopez (Conceptualization [lead], Writing—original draft [lead], Writing—review & editing [equal]), and Daniel Dukes (Conceptualization [supporting], Writing—original draft [supporting], Writing—review & editing [equal])

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