frontiers | Frontiers in Education

TYPE Conceptual Analysis
PUBLISHED 17 April 2023
DOI 10.3389/feduc.2023.1036539

Check for updates

OPEN ACCESS

EDITED BY
Douglas F. Kauffman,
Medical University of the Americas – Nevis,
United States

REVIEWED BY
Abraham Flanigan,
Georgia Southern University,
United States
Michael S. Dempsey,
Boston University,
United States

*CORRESPONDENCE
Adam G. Gavarkovs
✉ adam.gavarkovs@mail.utoronto.ca

SPECIALTY SECTION
This article was submitted to Educational Psychology, a section of the journal Frontiers in Education

RECEIVED 31 October 2022
ACCEPTED 28 March 2023
PUBLISHED 17 April 2023

CITATION
Gavarkovs AG, Kusurkar RA and Brydges R (2023) The purpose, adaptability, confidence, and engrossment model: A novel approach for supporting professional trainees' motivation, engagement, and academic achievement.
Front. Educ. 8:1036539.
doi: 10.3389/feduc.2023.1036539

COPYRIGHT
© 2023 Gavarkovs, Kusurkar and Brydges. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

The purpose, adaptability, confidence, and engrossment model: A novel approach for supporting professional trainees' motivation, engagement, and academic achievement

Adam G. Gavarkovs[1,2]*, Rashmi A. Kusurkar[3,4] and Ryan Brydges[5,6,7]

[1]Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, ON, Canada, [2]The Wilson Centre, University of Toronto, Toronto, ON, Canada, [3]Amsterdam UMC Location Vrije Universiteit Amsterdam, Research in Education, Amsterdam, Netherlands, [4]LEARN! Research Institute for Learning and Education, Faculty of Psychology and Education, VU University, Amsterdam, Netherlands, [5]Department of Medicine, University of Toronto, Toronto, ON, Canada, [6]The Wilson Centre, University of Toronto, Toronto, ON, Canada, [7]Allan Waters Family Simulation Centre, St Michael's Hospital, Toronto, ON, Canada

Trainees often decide to pursue a career in the professions because they see it as a means to attain their life goals: to become the kind of person they want to be, to live the kind of life they want to lead, and to make the kind of impact they want to have on the world. The life goals trainees pursue through a professional career are derived from their conception of their ideal self and are thus the most important and self-defining goals that they possess. In this article, we propose a novel approach for designing training activities to harness the motivational potential of professional trainees' life goals, toward supporting their deep engagement in training activities. We propose that activities can be designed to help trainees make links between (1) the concepts and skills covered in an activity, (2) the professional practice behaviors that an activity prepares them to enact, and (3) the life goals that are served by enacting these professional practice behaviors. Informed by Control Theory and Self-Determination Theory, we predict that this design may promote trainees' adoption of activity-specific goals that emphasize deep understanding, long-term retention, and transfer, and enhance their autonomous motivation to attain their goals. However, there are some situations when this design may be less effective for, or even harmful to, trainees' motivation. Specifically, we predict that helping trainees establish a purpose for learning by linking an activity to their life goals may be most effective when they can adapt an activity to best align with their purpose, when they are confident in their ability to attain their activity-specific goal, and when they become engrossed in an activity because it affords interest- and curiosity-stimulating actions. We package our theoretical analysis into the PACE model of motivational design. When our predictions are supported by more empirical evidence, the model can help educators set the PACE for trainees, thereby motivating them to engage deeply in training activities.

KEYWORDS

instructional design, motivation, self-determination theory, goal setting, control theory

Introduction

Trainees often apply to professional training programs (e.g., medical school, social work, law school) because they see a professional career as a means to attain their long-term personal goals (Buddeberg-Fischer et al., 2006; Diekman et al., 2011; Bozek et al., 2017; Weber et al., 2021; Pfarrwaller et al., 2022). These personal goals may relate to the kind of person they want to be, the kind of life they want to lead, and the kind of impact they want to have on the world. To illustrate, consider the following quotes from a study of high school students who intended to apply to medical school (Wouters et al., 2017): "*I have always wanted to help people, and this is a form of helping people by means of health care and curing people, or improving quality of life.*" "*Being a doctor is highly regarded. I think that's one of the main reasons for the recent popularity of the study. Many people want prestige in society. I am not going to be a hypocrite and say, not me.*" For these high school students, a career in medicine represented a means to become the kind of person they desired to be (i.e., someone who helps people, someone who is respected in society). Other long-term personal goals that trainees report pursuing through a professional career include personal wealth, giving back to one's community, and fostering meaningful, long-term relationships with others (Scott et al., 2007; Wu et al., 2015; Goel et al., 2018).

We refer to the long-term personal goals that trainees pursue through a professional career as their *life goals*. Life goals are cognitive representations of desirable end states, or states of being, that trainees are committed to attaining over their lifetime (Milyavskaya and Werner, 2018). A trainee's life goals are derived from their conception of their ideal self, and are thus the most self-defining and personally important goals that they possess (Carver and Scheier, 1998).

Researchers and educators in professional education have, to date, largely ignored the powerful source of motivation that comes from seeing one's proximal learning actions as serving one's most self-defining goals (Miller and Brickman, 2004; Rovers et al., 2018). In this article, we propose a novel model for designing training activities to harness the motivational potential of professional trainees' life goals, toward supporting their deep engagement in such activities and preparing them to excel in their professional roles. Our model synthesizes two prominent theories—Carver and Scheier's Control Theory (Carver and Scheier, 1998) and Deci and Ryan's Self-Determination Theory (SDT). Though we draw on supportive evidence where available, our model should primarily be considered theoretical in nature at this time. Accordingly, this article contributes to the literature by proposing a theoretically informed set of predictions which can be tested through future empirical research.

Prompting life goal framing: A proposed design strategy

Trainees' life goals often influence their decision to apply to a professional training program. Once they begin training, however, trainees may be unlikely to spontaneously frame their engagement in training activities as helping them make progress toward their life goals. Rather, their life goals may fade into the background as they focus on achieving shorter-term goals tied to looming assessments and assignment deadlines (Carver and Scheier, 1998; Nakayoshi et al., 2021). That is, their shorter-term goals may become *functionally superordinate* in guiding their actions (Carver and Scheier, 1998). That said, trainees do not leave their life goals at the door of the classroom or simulation center; even if their life goals are not spontaneously salient, we assume they are still accessible (Malka and Covington, 2005). Consequently, trainees could be supported in making links between training activities and their life goals.

We offer the term *life goal framing* to describe the psychological process where a trainee frames their engagement in a training activity as helping them to make progress toward the life goals they pursue through their career (Ryan and Deci, 2017). When introducing an activity, educators could *prompt* trainees to engage in life goal framing, either in-person (e.g., during a lecture) or asynchronously (e.g., as part of an e-learning module; Code et al., 2006). We envision an effective prompt as comprised of two steps:

1. A prompt should encourage trainees to consider the professional skills that are enabled by the training activity. For example, in an asynchronous online module on 'The Physiology of Weight Loss' for medical students, a brief message could state: "*By learning about the physiology of weight loss, you will be prepared to counsel patients in realistic, sustainable weight loss attempts to support their long-term health.*"
2. A prompt should encourage trainees to consider how these professional skills serve the life goals they pursue through their career. For example, following the first part of the prompt described above, trainees could be posed the question: "*How does this outcome align with the kind of physician you want to be?,*" or *"How does this outcome align with what you want to accomplish through becoming a physician?*" In response to this question, a trainee could think: "*A more informed, realistic approach to obesity management will allow me to maintain trust with my patients, supporting the deep relationships I hope to have with them.*" This proposed second step of prompting may also be more directive, asking trainees to consider how utilizing professional skills can help them make progress toward a *specific* life goal. For example: *"How might this outcome help you to make a meaningful difference in the lives of your future patients?"*

A two-step prompt helps trainees make a concrete link between a training activity and their life goals, mediated through the skillful professional behaviors that an activity prepares them to enact. In other words, effective prompts emphasize that an activity affords a set of professional actions that, when enacted, serve a trainee's life goals. Trainees may spontaneously make the first link between a training activity and a set of professional skills (Nakayoshi et al., 2021). However, they may not regularly extend this link to their life goals, unless prompted to do so. Although a prompt may not be the only way to support the psychological process of life goal framing, we believe it represents the most "scaffolded" way of doing so, as it explicitly gives trainees the building blocks to link activities to their life goals. Therefore, we primarily focus on prompting as a strategy for supporting life goal framing, though we also touch on alternative approaches below.

We propose that prompting life goal framing holds great promise as a strategy to support trainees' deep engagement in training activities. However, motivational theorists reject the idea that

intervening on a single motivational construct is enough to optimize motivation (Keller, 2010). We do not believe that prompting life goal framing in isolation (i.e., without considering and supporting other motivational factors) will optimize trainees' motivation to deeply engage in training activities. Instead, we believe that life goal framing should be facilitated alongside other motivational factors that interact to enhance trainees' motivation. Such a model of motivational design would ensure that life goal framing is optimally beneficial. In this article, we propose such a model.

Article overview and aims

We have chosen Control Theory and SDT as the foundations for our model because they combine to present an understanding of *what* activity-specific goals trainees choose to pursue, *why* they choose to pursue them, and *how* different goal-motive combinations influence engagement in training activities. We begin our analysis by presenting a theoretical account of motivated engagement in training activities, based on Control Theory and SDT. Second, we draw on this theoretical account to consider the effects of prompting life goal framing on trainees' goal setting and motivation. Third, we propose three modifiable factors that may moderate the effects of prompting life goal framing. Fourth, we package our analysis into a novel model of motivational design, called the PACE model, which proposes four key conditions under which professional trainees will become and remain motivated to engage with training activities (i.e., Purpose, Adaptability, Confidence, Engrossment). The PACE model, when supported by more empirical evidence, can guide educators in creating the optimal conditions for trainees' deep engagement.

Strategies similar to prompting life goal framing have been investigated and explained from the perspective of other theories, particularly Situated Expectancy-Value Theory (SEVT) (Canning and Harackiewicz, 2019). Some of our predictions align with those derived from SEVT. Further, predictions we make regarding the moderators of life goal framing align with predictions that could be derived from other theories (Hidi and Renninger, 2006; Eccles and Wigfield, 2020). However, we have opted to explain the process of life goal framing in terms of Control Theory and SDT mechanisms because they provide a conceptual basis for: (1) linking the strategy of prompting life goal framing to other motivational design strategies, affording a more comprehensive model of motivational design than prompting in isolation, and (2) linking design strategies targeting motivation to design strategies targeting the metacognitive and cognitive processes underpinning learning (Ten Cate et al., 2004). Further, Control Theory mechanisms (Cleary et al., 2015; Brydges et al., 2016; Gandomkar et al., 2020) and SDT mechanisms (Kusurkar, 2023) have received extensive empirical support in professional education.

Our primary aim is to propose the PACE model of motivational design, toward informing educators' motivational design decisions in professional education contexts (e.g., medical school, law school), and perhaps in vocational training. The PACE model assumes that trainees possess a crystalized set of life goals that they pursue through their career, and that trainees can be prompted to see how enacting specific career-related activities (e.g., providing patient care) serves those goals. Further, the model relies on training activities having relevance to specific career-related activities that trainees will enact in the future. Our research team includes individuals working in the field of health professions education (HPE), whose past research has predominantly focused on medical trainees. Our examples and supportive references emphasize medical training. That said, we believe that PACE model will readily generalize to trainees in other professional training programs.

A theoretical account of motivated engagement in training activities

A control theory perspective on engagement

According to Control Theory, intentional behavior, including engaging in training activities, reflects a process of goal-directed feedback control (Carver and Scheier, 1998). The basic unit in a feedback control process is a discrepancy-reducing feedback loop (see Figure 1; Carver, 2015). To begin the loop, a trainee will set a goal (or goals) for what they want to accomplish during an activity (e.g., listening to a lecture, completing an online module). Then, they will specify some actions that they think might reduce the discrepancy between their current state (e.g., what they currently know or are able to do) and their goal state (e.g., what they want to know or be able to do). A trainee's planned actions may involve efforts to control aspects of their cognition, behavior, motivation, or environment (Butler and Winne, 1995; Pintrich, 2000; Fiorella and Mayer, 2015). For example, a trainee sitting down for a lecture might pull out a notebook (an effort to control their environment) and plan to summarize the most important points on each slide (an effort to control their cognition). Then, they might periodically monitor their progress (e.g., their developing competence) by comparing their goal state to internal inputs comprised of goal-relevant information (e.g., perceptions of mental effort when answering a self-assessment question; Blissett et al., 2018), or to inputs from the environment [e.g., returned feedback on a self-assessment question or a disapproving look by an instructor; (Butler and Winne, 1995)]. A trainee can use this information to construct a perception of their goal progress (e.g., their developing competence). Their subsequent course of action will depend on the difference between their perceived rate of discrepancy reduction (i.e., their perceived rate of progress) and their expected rate of discrepancy reduction. If a trainee perceives that their goal progress meets the expected rate (e.g., they are developing competence as expected), then they will likely continue with their current course of action, feeling positive and experiencing a sense of confidence (Carver and Scheier, 1990). If their progress seems slower than expected, then they might mobilize greater effort, adapt their actions, or adjust their goals. Once they can no longer detect a discrepancy between an input and their goal, they will consider their goal achieved and disengage from the activity. Empirical evidence offers support for the Control Theory perspective, showing that learners[1] instantiate elements of the feedback loop as they engage in learning activities (Bernacki et al., 2011), and that elements of self-regulation (e.g., self-monitoring) are

1 We use the term 'learner' when referencing studies not conducted among professional trainees, and 'trainee' in all other contexts.

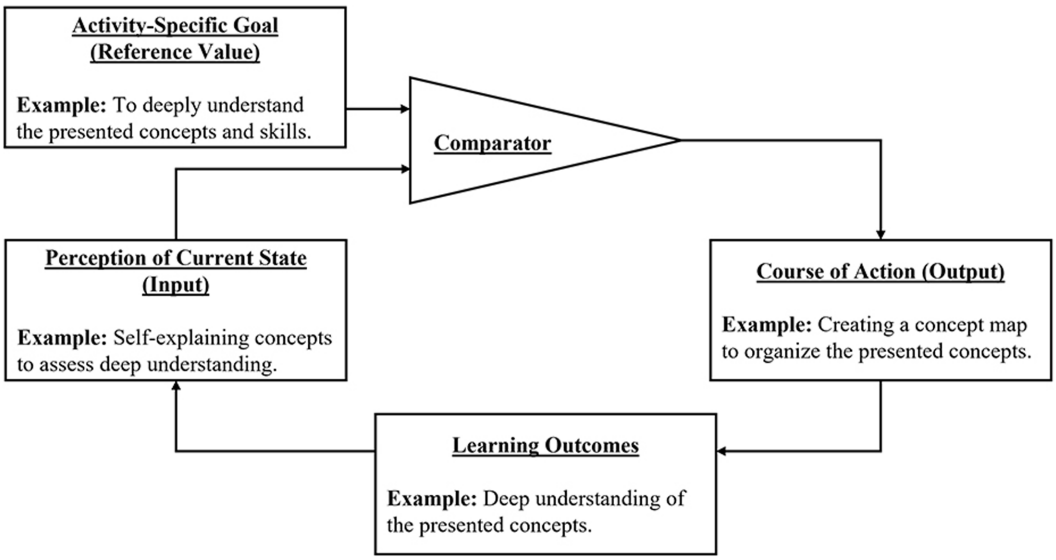

FIGURE 1
Schematic of a discrepancy-reducing feedback loop [adapted from Carver (2015), with permission].

associated with achievement (Sitzmann and Ely, 2011; Johnson et al., 2023).

Variability in how trainees engage in an activity may result from issues regarding each element of the feedback loop (i.e., the goal, the output, the input). For our present analysis, we focus on the goals a trainee sets for an activity, and their motivation to pursue and attain their goals. We propose that prompting life goal framing will influence a trainee's engagement through *what* goals they pursue for an activity and *why* they pursue them.

A control theory perspective on goal setting

The goals a trainee sets for an activity play a key role in directing their engagement. A trainee's goals inform the actions that they take, represent the standards against which they can compare their progress, and influence the sources of input information they monitor to make such comparisons (Butler and Winne, 1995; Greene et al., 2012). According to many scholars, the most desirable learning outcomes for professional training activities relate to deep understanding, long-term retention, and the ability to transfer knowledge and skills into complex professional practice situations (Mylopoulos et al., 2018; Rovers et al., 2018). Accordingly, the most desirable goals that trainees can set are generally those that emphasize deep understanding toward long-term retention and transfer. That said, trainees can set any number of goals for an activity. Why then, do they set certain goals and not others?

Trainees set goals based on an idiosyncratic interpretation of an activity, including its demands and affordances (Butler and Winne, 1995; Greene et al., 2012; Beckman et al., 2021). An important aspect of this interpretation are the longer-term goals that a trainee thinks they can make progress toward by engaging in the activity. Control Theory posits that trainees simultaneously pursue multiple, hierarchically organized goals, with short-term, situation-specific, *subordinate* goals serving longer-term, more general, *superordinate* goals (see Figure 2; Carver and Scheier, 1998; Milyavskaya and Werner, 2018). Goals lower down in the hierarchy specify a process, performance, or outcome to be attained in a specific situation. Trainees' activity-specific goals exist at this lower level. Goals higher up in the hierarchy specify the attainment of more general outcomes. For trainees, these goals might include passing their courses and developing the competencies required for effective professional practice. Subordinate goals provide the concrete means for making progress toward superordinate goals. That is, by attaining a subordinate goal (e.g., memorizing the important points covered in an online module), a learner *simultaneously* makes progress toward the linked superordinate goal(s) (e.g., passing an upcoming exam). At the pinnacle of the hierarchy are a trainee's life goals. Thus, by attaining goals at lower and intermediate levels of the hierarchy, trainees work toward manifesting their ideal selves (Carver and Scheier, 1998).

When trainees are tasked with completing a new training activity, Control Theory predicts that the activity-specific goals they tend to set depend on the superordinate goals they think they can make progress toward through the activity (Carver and Scheier, 1998; Milyavskaya and Werner, 2018). Consider the following scenario: a trainee sits down to complete an e-learning module after talking with a peer about an upcoming exam. Their goal of doing well on the exam is likely at the top of their mind. Like all goals, this superordinate goal functions as a reference value in a discrepancy-reducing feedback loop (see Figure 2). However, the output of this feedback loop is *not* an action response. Rather, it is a *reference value* for a subordinate feedback loop that is specific to the activity. Guided by the superordinate loop, *the reference value for a subordinate, activity-specific loop will be that which is best suited for reducing the salient discrepancy at the superordinate level*. For example, when a trainee sees an activity as a means of preparing for an upcoming exam, they will engage in the activity in a manner that they think will best prepare

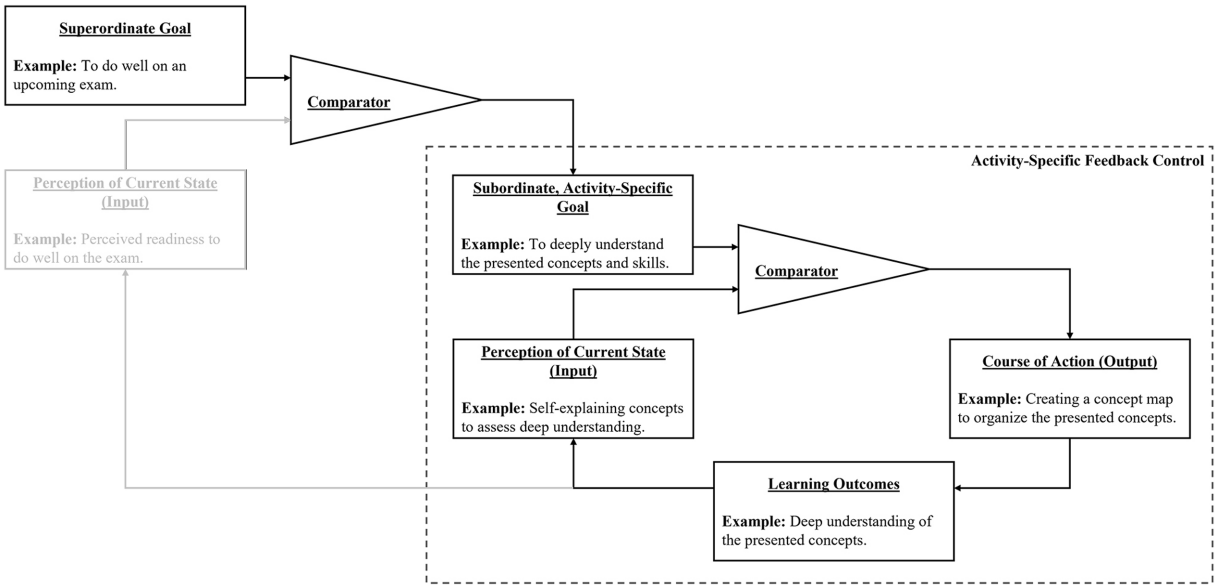

FIGURE 2
Hierarchical organization of feedback loop [adapted from Carver (2015), with permission].

them to get a desired grade. In doing so, the trainee's engagement in the activity can be considered as *simultaneously* reducing discrepancies at the subordinate and superordinate levels.

An SDT perspective on motivation

Though a trainee's goals have an important directive influence on their behavior, a trainee must also have the motivational energy to translate their goals into an effective course of action. According to SDT, a trainee's motivation to pursue their goals can be characterized in terms of its *quantity*, or amount, as well as its *quality*, or type (Ryan and Deci, 2017). SDT distinguishes between *intrinsic* and *extrinsic* motivation based on the underlying reasons for goal pursuit. Intrinsic motivation involves a desire to pursue a goal for pure interest or curiosity, whereas extrinsic motivation involves a desire to pursue a goal to attain an outcome that is external to the activity. Trainees are intrinsically motivated to engage in an activity when they find engagement rewarding itself (i.e., because it is interesting), whereas they are extrinsically motivated when they engage to attain some other outcome (e.g., to do well on an upcoming exam, to make progress toward their personal goals). SDT further distinguishes between four subtypes of extrinsic motivation, which differ based on whether the reason(s) for pursuing a goal remain external (and thus behavior feels forced) or have been internalized to various degrees (and thus behavior feels more self-determined). Extrinsic motivation may involve a desire to pursue a goal to comply with external demands (called 'external regulation'), to avoid feelings of guilt or shame (called 'introjected regulation'), because one sees the personal value in goal attainment (called 'identified regulation'), or because it feels consistent with one's identity and deeply held values (called 'integrated regulation'). Given their shared self-determined basis, researchers often combine identified and integrated regulation with intrinsic motivation to form 'autonomous motivation': a desire to pursue a goal because it is interesting, enjoyable, or personally meaningful. By contrast, 'controlled motivation' (combining external and introjected regulation) reflects a desire to pursue a goal to comply with external demands or to avoid feelings of guilt or shame. Trainees will often possess both autonomous and controlled motivation for an activity, due to a multiplicity of reasons for wanting to pursue their activity-specific goals (Kusurkar et al., 2013a; Nakayoshi et al., 2021).

Quantitative research on the effects of autonomous and controlled motivation in professional education can be grouped into three types of studies: (1) studies that cluster trainees into different motivational profiles (i.e., levels of autonomous and controlled motivation), (2) studies that weight trainees' levels of self-reported autonomous and controlled motivation to create a relative autonomous motivation (RAM) score, and (3) studies that consider trainees' level of self-reported autonomous and controlled motivation separately (Kusurkar, 2023). These studies have found that: (1) trainees clustered into high autonomous motivation profiles tend to report greater use of deep study strategy use and greater studying time compared to those clustered into low autonomous motivation profiles (Kusurkar et al., 2013a; Orsini C. A. et al., 2018); (2) trainees' RAM score is positively associated with their use of deep study strategies and negatively associated with their use of surface study strategies (Kusurkar et al., 2013b; Orsini et al., 2019); and (3) trainees' autonomous motivation is positively associated with their deep study strategy use (Isik et al., 2018). Studies outside of professional education have also demonstrated a relationship between autonomous motivation and deep processing in the context of a single activity (Vansteenkiste et al., 2004). This body of literature clearly demonstrates that a greater amount of autonomous motivation is associated with a pattern of academic engagement that supports deep understanding.

Another key focus of SDT is on the social and environmental factors that facilitate or undermine autonomous motivation. SDT claims that all humans require the satisfaction of three basic psychological needs—autonomy (the desire to feel in control of one's

actions), competence[2] (the desire to feel efficacious in one's actions), and relatedness (the desire to feel connected to others)–and that the satisfaction of these needs facilitates autonomous motivation (Ryan and Deci, 2017). Based on these claims, researchers have suggested that satisfying trainees' basic psychological needs in learning contexts can facilitate their autonomous motivation (Kusurkar et al., 2011). Indeed, studies in professional education have generated evidence that trainees' basic psychological needs satisfaction is positively associated with their RAM score (Orsini C. et al., 2018; Orsini C. A. et al., 2018).

Integrating perspectives on motivated engagement

Taken together, Control Theory and SDT emphasize the importance of *what* goals trainees pursue, and *why* they pursue them, in influencing *how* they engage in training activities, and ultimately their learning outcomes. When trainees set goals emphasizing deep understanding *and* are autonomously motivated to attain their goals, Control Theory and SDT predict they will be more likely to: (1) use learning strategies that help them construct a deep understanding of concepts and skills, (2) regularly self-monitor their progress to make sure they do not go off track, (3) self-monitor their progress in terms of how deeply they understand the presented concepts and skills, (4) adapt their approach to learning if their progress is slower than expected, and (5) persist in the face of difficulties or distractions. We predict that prompting life goal framing, under certain circumstances, can simultaneously (1) encourage trainees to set goals that emphasize deep understanding and (2) enhance their autonomous motivation to attain their goals, thus supporting these salubrious outcomes.[3]

Proposed effects of prompting life goal framing

Proposed effects on goal setting

We have proposed that a prompt for life goal framing should be comprised of two steps: (1) helping trainees link the concepts and skills presented in an activity to the professional practice behaviors that such concepts and skills enable and (2) helping trainees link these professional practice behaviors to their life goals. From a Control Theory perspective, these links represent a superordinate-subordinate pair of goals, creating a salient three-level hierarchy (see Figure 3). We predict that, when trainees perceive professional practice behaviors (e.g., providing realistic, sustainable obesity management care) as serving their life goal(s) (e.g., helping others), they will become more committed to the goal of skillfully engage in these behaviors (i.e., the intermediate-level goal in Figure 3). When trainees perceive that engaging in an activity will help them to attain their practice goal, they will be encouraged to set an activity-specific goal to deeply understand the presented concepts and skills in a manner that affords long-term retention and transfer (i.e., the lower-level goal in Figure 3). This is because an activity-specific goal emphasizing deep understanding, long-term retention, and transfer, rather than superficial understanding or memorization, optimally reduces the discrepancy at the intermediate level (i.e., preparing trainees to engage in skillful future practices).

Some indirect evidence supports this prediction. Research conducted among undergraduate students (Shell et al., 2013) and pre-service teachers (Lee et al., 2015; Lee and Turner, 2017; Lee and Turner, 2018) has shown that, when learners believe they need to retain and apply the concepts and skills covered in their coursework to attain their future goals, they tend to adopt course goals emphasizing deep learning (Lee et al., 2015), use more knowledge building strategies (Shell et al., 2013; Lee and Turner, 2018), use more metacognitive strategies (Shell et al., 2013), invest in regulating their effort (Lee and Turner, 2017), manage their time and study environment (Lee and Turner, 2017), and study for longer periods of time (Shell et al., 2013).

Proposed effects on motivation

When a trainee perceives that completing an activity will help them make progress toward their life goals, their motivation will, by definition, be extrinsic, given the activity represents a means to attain a separable end state (i.e., their life goals). SDT suggests that the specific type of extrinsic motivation will depend on the self-endorsed basis of the framed life goal. A life goal is self-endorsed when it is seen as wholly consistent with one's personal values (Ryan and Deci, 2017). If a framed life goal is self-endorsed, then we predict that prompting life goal framing will have a strong identified-regulating effect, which occurs when one personally endorses an action because it helps them make progress toward valued goals. Prompting life goal framing may even verge on having an integrated-regulating effect, which occurs when one feels like an action aligns with their deeply held values and long-term aspirations (Vansteenkiste et al., 2018). Regardless of whether the effect is identified-regulating or integrated-regulating, the resultant motivation will be autonomous in nature. We expect that linking an activity to one's self-endorsed life goals will result in a more autonomous form of motivation than linking an activity to any other goals. However, trainees may not self-endorse all their life goals. They may pursue some life goals because they have *introjected* an external expectation to be a certain kind of person or live a certain kind of life, without actually endorsing that expectation themselves (Carver and Scheier, 1998; Deci and Ryan, 2000). For example, perhaps a trainee pursues the goal of gaining social prestige because they feel like climbing the social ladder is something they *ought* to do. If a trainee links an activity to an introjected life goal, they may also experience

2 We distinguish *confidence* as discussed in Control Theory and *competence* as discussed in SDT. Feelings of confidence are derived from expectancy judgments regarding the probability that one will attain their goal (Carver and Scheier, 1998). Competence is a phenomenological experience characterized by the efficacious navigation of one's environment when faced with challenges (Ryan and Deci, 2017). Confidence can be high when faced with an easy task, but competence satisfaction requires feeling successful (or anticipating success) at more challenging tasks.

3 Other outcomes may result from autonomously pursuing activity-specific goals emphasizing deep understanding, such as an increase in confidence that one will achieve their superordinate life goals, and an increase in mood and well-being (Carver and Scheier, 1998; Ryan and Deci, 2017).

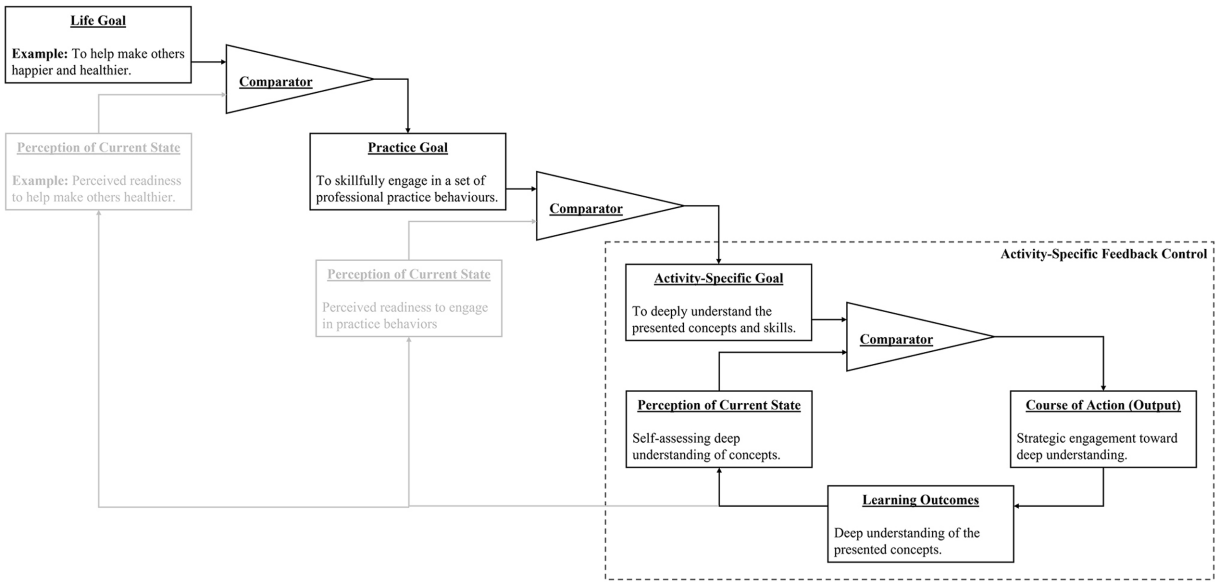

FIGURE 3
Proposed relationships between life goal framing, goal setting, and engagement [adapted from Carver (2015), with permission].

the activity as something they 'ought' to do, fostering controlled rather than autonomous motivation.

Little available evidence provides direct support for our predictions. Across two experiments, Davis et al. (2016) asked undergraduate students to consider either 'how' or 'why' they pursued a goal of getting good grades. The 'why' prompt could be conceived as prompting students to reflect on the personally valued goals that they could make progress toward by getting good grades. Compared to students in the 'how' condition, students in the 'why' condition perceived getting good grades as more self-concordant (i.e., aligned with their interests and values), more personally meaningful, and reported being more motivated to pursue this goal (Davis et al., 2016). As students in the 'why' condition tended to rate getting good grades as more aligned with their interests and values, we can speculate that they tended to link getting good grades with self-endorsed superordinate goals. On mostly theoretical grounds, then, we predict that prompting life goal framing will enhance trainees' autonomous motivation, but only when the linked life goal is self-endorsed. Research suggests that individuals tend to pursue *self-transcendent* life goals like helping others and giving back to their community with more autonomous motivation, whereas they pursue self-indulgent goals like being wealthy, famous, and respected by others with more controlled motivation (Sheldon et al., 2004). Thus, prompts may be more effective when they orient trainees toward life goals like helping others, contributing to the community, and fostering meaningful relationships. In addition, framing an activity in terms of self-transcendent life goals may uniquely support trainees' need for relatedness, as they can see their work mattering to the lives of others (Grant, 2008a). Some research suggests that highlighting the self-transcendent instrumentalities of academic and occupational work can enhance individuals' motivation and performance (Grant, 2008b; Grant and Hofmann, 2011; Yeager et al., 2014; Colonnello et al., 2020).

Proposed moderators

Many factors might *moderate* the effects of life goal framing on goal setting and motivation (e.g., future time perspective; Hilpert et al., 2012). Given our aim of proposing a model that educators can use to design training activities, we focus on factors that educators can modify in the context of an activity. In the following subsections, we draw on Control Theory and SDT to propose three potential moderators: trainees' confidence in activity-specific goal attainment, the interest-enhancing affordances of an activity, and the adaptability of what an activity entails (e.g., its objectives and resources). By choosing not to cover an exhaustive set of moderators, we intend for our model to help busy educators design motivating training without requiring that they spend too much time on motivational design. We believe that Keller's attention, relevance, confidence, and satisfaction (ARCS) model of motivational design is well used across educational contexts because it provides busy educators with a memorable acronym reflecting a manageable set of four modifiable factors (or categories of factors; Keller, 2010). We aim to provide educators with a similarly manageable set of factors (and a similarly memorable acronym), with life goal framing at the center. That said, we enthusiastically invite other researchers to consider other moderating factors, and to suggest any evidence-based changes to our model.

Confidence in goal attainment

According to Control Theory, before and during goal pursuit, trainees can make expectancy judgments regarding the probability that they will attain their goals (Carver and Scheier, 1990, 1998). Trainees may not always feel confident that they will attain their activity-specific goals, perhaps because they do not think that they

can execute the necessary actions, or that their actions will result in goal attainment. When a trainee has linked their activity-specific goals to their life goals, a negative expectancy judgment may induce *poorer* motivation than if they had not made such links (Binning and Browman, 2020). When one's life goals are on the line, failure at the activity carries more weight (Carver and Scheier, 1990). A trainee with low activity-specific confidence may interpret failure at the activity as failure at making progress toward their most valued goals. In turn, this may reduce the degree to which they perceive engagement as self-determined. Accordingly, we predict that trainees with higher levels of confidence will experience higher levels of autonomous motivation if they engage in life goal framing. By contrast, at some threshold of low confidence, trainees will experience lower levels of autonomous motivation if they engage in life goal framing. That is, we predict that a life goal framing prompt will be *counterproductive* among non-confident trainees with respect to their autonomous motivation.

In support of this prediction, Durik et al. (2015) taught undergraduate students a novel multiplication technique in a lab setting, with half randomized to receive information regarding the future value of the learning task, and half randomized to receive no additional information.[4] Among students with high self-reported competence in math, ostensibly leading to higher confidence for the task, situational interest and performance was higher among those who received future value information compared to the control group. Conversely, among students with low self-reported competence in math, situational interest and performance was lower among those who received future value information compared to the control group (Durik et al., 2015). A similar pattern of results has been reported in other, but not all studies (Canning and Harackiewicz, 2015; Hecht et al., 2020). Notably, one study reported that when learners generate their own reasons for why an activity is valuable, rather than receive externally provided value information, the opposite pattern emerged: prompting less confident learners raised their performance but had no effect on more confident learners (Canning and Harackiewicz, 2015). One interpretation is that, when given the latitude to do so, less confident learners may focus on superordinate goals that are more attainable given their current knowledge and skills (rather than requiring they learn new knowledge or skills) and that are less central to their sense of self (Canning and Harackiewicz, 2015). However, life goal framing involves making links between an activity and one's most self-defining goals, so we expect that life goal framing may only enhance autonomous motivation when a trainee feels confident that they will attain their goals for an activity.[5]

Interest-enhancing affordances of the activity

Control Theory posits that trainees will choose to engage in an activity in a manner that they believe will reduce the discrepancy between their current state and their goal state. However, the actions that trainees take are also influenced by the *affordances* of the activity (Bower, 2008). We define an affordance as a possible interaction between a trainee and aspects of their learning environment (e.g., educational content, instructors, peers; Norman, 2013). Thus, the actions that a trainee takes during an activity are jointly determined by: (1) their beliefs regarding the actions that can help them attain their goal and (2) the actions that an activity is designed to facilitate or constrain (Butler and Winne, 1995; Pintrich, 2000).

The actions that trainees take during an activity, in addition to moving them closer to their goal, can also affect their situational experience of interest (Sansone et al., 2019). Situational interest has been described as a phenomenological state of focused attention and positive affect that is triggered by an interaction between a learner and their environment (Hidi and Renninger, 2006; Sansone et al., 2019). For instance, Durik et al. (2015) assessed situational interest using a self-report measure comprised of three items: "The [multiplication] technique is interesting," "Using this multiplication technique is fun," and "The learning program was enjoyable." Researchers have found that opportunities to wrestle with challenging problems, manipulate concepts, engage with realistic narratives, and encounter novel or unexpected information can stimulate situational interest (Renninger and Hidi, 2011; Sansone et al., 2011; Rotgans and Schmidt, 2014; Lamnina and Chase, 2019). We consider this process to reflect intrinsic motivation, because the source of the motivation to engage in the activity derives from feelings of interest that are stimulated by, and inherent to, the activity (Ryan and Deci, 2017).

Life goal framing may indirectly increase trainees' situational interest by focusing their attention on interest-enhancing elements, thereby increasing the effect of such elements on trainees' interest.[6]

4 Several studies referenced in this and subsequent sections (Durik and Harackiewicz, 2007; Sansone et al., 2011; Canning and Harackiewicz, 2015; Durik et al., 2015; Hecht et al., 2020) manipulated learners' perceptions of extrinsic value by providing them with information regarding the professional or personal value of the activity. We do not consider these sources of value to be equivalent to learners' life goals. However, we do believe that the psychological process of linking one's present actions to their future goals is the same, regardless of whether the future goals are one's life goals or are less self-defining (Acee et al., 2018). Consequently, we believe that these studies provide support for our predictions regarding the moderators of life goal framing.

5 How trainees attribute the causes of their expected failure might influence the magnitude of the moderating effect of confidence (Graham, 2020). If failure is attributed to a stable factor, (e.g., lack of ability), then expected failure at attaining one's activity-specific goal may be perceived as predictive of one's failure to attain other, similar subordinate goals, and ultimately one's failure to attain their life goal(s). In such a situation, prompting life goal framing may be especially threatening to a trainee's ideal self and may result in especially poor motivation.

6 Life goal framing may also increase a trainee's situational interest *via* a *direct* pathway. Control Theory predicts that trainees will experience positive affect when they feel they are making good progress toward their goal (Carver and Scheier, 1990). Therefore, life goal framing may directly increase a trainee's situational interest by focusing their attention toward an activity and stimulating positive affect as they make progress toward their goal (Sansone et al., 2019). Though situational interest is often associated with intrinsic motivation in the SDT framework, in this case interest is a direct consequence of making progress toward goals that are pursued for extrinsic reasons. We do not consider interest that is stimulated by goal progress to be reflective of intrinsic motivation.

For example, a study from Sansone et al. (2011) involved an online lesson on HTML coding for undergraduate students that included optional examples and exercises manipulating HTML code. Half of the students were randomized to receive information regarding the personal or professional value of the lesson, and half were randomized to receive no additional information. Students who received future value information clicked to manipulate HTML code more often than those who did not. Manipulating HTML code was found to predict students' post-activity interest, as well as their achievement on a post-lesson quiz. These studies provide some evidence that, when learners perceive an activity to be more personally meaningful, they may experience greater situational interest. Further, this effect may be mediated by the actions that a learner takes in pursuit of their activity-specific goal. However, the effect of life goal framing on trainees' situational interest may only hold if an activity affords actions that are interest-enhancing. In the study by Sansone et al. (2011), the lesson was designed to afford students' manipulation of HTML code: they could choose to access the optional examples and exercises to help them attain their goal for the lesson. If the lesson had not integrated opportunities for students to manipulate HTML code, then this action would not have been possible. When an activity affords actions that are interest-enhancing, deep engagement in an activity may stimulate greater situational interest than if these affordances are absent. This prediction has not yet received empirical attention; for example, Sansone et al. (2011) did not manipulate the presence or absence of the optional examples and exercises, so it is unclear whether students who received value information would have reported less interest if they were not able to engage in these optional elements.

When trainees find an activity to be personally meaningful but devoid of interest-enhancing affordances, Sansone and colleagues' Self-Regulation of Motivation model proposes that they can also *self-regulate* their experience of interest by switching up how they complete the activity to make it more interesting (Sansone et al., 2019). In Control Theory terms, this involves trainees adopting a subordinate goal of experiencing interest as a means to help attain their activity-specific learning goal, and then executing 'interest-enhancing strategies' in service of this subordinate goal (Sansone and Smith, 2000). In support of this proposal, Jang (2008) taught undergraduate students about correlation in a manner that was purposefully designed to be uninteresting. Half were randomized to receive information that learning about correlations could improve their teaching practices in the future, communicated in an autonomy-supportive manner, and half were randomized to receive no additional information. Compared to students who did not receive future value information, students who did reported using more interest-enhancing strategies during the lesson, such as varying how they completed the lesson to hold their attention. However, a potential danger in relying on trainees to regulate their own interest experience is that their choices for enhancing their interest may not contribute to their goal achievement (Sansone et al., 2012). Indeed, Jang (2008) did not find a relationship between interest regulation and achievement after controlling for identified regulation. Therefore, we predict that prompting life goal framing, *via* its effects on (1) setting goals for deep understanding and (2) autonomous motivation, will lead to deeper engagement in an activity. If an activity contains interest-enhancing affordances, deeper engagement may lead to greater levels of interest. However, if an activity is devoid of interest-enhancing affordances, then deeper engagement may not translate into greater interest, or trainees may utilize their own interest-enhancing strategies to get through the activity, potentially at the expense of their achievement.

Adaptability in how to engage in an activity

Trainees may adapt how they engage in an activity in two ways. First, they may redefine the boundaries of the activity in response to pursuing activity-specific goals that extend beyond the prescribed activity, because they feel that such goals better reduce the discrepancy at the superordinate level (Carver and Scheier, 1998). For instance, consider a trainee tasked with completing an e-learning module on glucose metabolism. They perceive that completing the module can help them make progress toward their life goal of helping others, because understanding glucose metabolism can help them care for their future patients with diabetes. They might feel like the activity would be *better aligned* with their life goal if they supplemented the module by accessing the clinical practice guidelines for type II diabetes, or information on how to care for patients with obesity in a non-biased manner. When trainees engage in these adaptations, they modify the affordances of the activity.

This form of adaptation can be likened to the process of *job crafting*. Job crafting refers to a process whereby employees redefine their job so it feels more significant and serves an important purpose (Wrzeniewski and Dutton, 2001). That is, employees exercise their own self-regulatory capacities to balance how their job serves the needs of the organization *and* their own personal goals. Employees can craft their job by adding tasks beyond those specified in their formal job description (Wrzeniewski and Dutton, 2001). Such crafting aligns with what we are proposing, though trainees craft a prescribed training activity, rather than a prescribed job. When trainees' life goals become functionally superordinate in guiding their actions, they may be more likely to adapt an activity in ways that will better prepare them to practice in a manner consistent with their life goals. Supporting this view, one study found that employees whose ideal future work self was more salient were more likely to engage in proactive work behaviors (Strauss et al., 2012), potentially including job crafting (Tims and Bakker, 2010).

A second way that trainees can adapt what an activity entails is by self-regulating their actions *within* the boundaries of a prescribed activity, in a manner that they think best reduces the discrepancies at the activity-specific and superordinate levels. For instance, revisiting previously viewed slides in an e-learning module is an expression of adaptive self-regulation, as is deciding to skip certain elements of the module. When trainees engage in this type of adaptation, they do not modify the affordances of the activity, but rather choose how they utilize such affordances.[7]

When a trainee's adaptations are based on their life goals, the adaptations they choose to make may further support their basic needs satisfaction. By crafting the activity to be more aligned with their ideal self and deeply held values, they will likely feel their engagement as more *autonomous*. By deeply engaging in the activity they have created, they are likely to feel *competent* through the knowledge and skills they acquire (Vansteenkiste et al., 2008). And

7 The distinction between these two types of adaptation become somewhat blurry for open-ended activities where the boundaries of the activity are ill-defined.

sometimes a trainee's modifications to the activity may involve interactions with peers, patients, or experts, which can enhance their feelings of *relatedness*. Greater needs satisfaction may further enhance their autonomous motivation to engage in the activity (Hope et al., 2019). We predict that, when trainees are able to adapt an activity to better align with their life goal(s), they may feel more autonomously motivated to engage in the activity. Studies in the job crafting literature suggest that it relates to need satisfaction and, in turn, work engagement (Slemp and Vella-Brodrick, 2014; Bakker and Oerlemans, 2019). Another body of literature has consistently demonstrated that providing learners with choices regarding their actions can support their autonomous motivation (Ryan and Deci, 2017).

Summary of predictions for the effects of prompting life goal framing

We have made several predictions, currently only supported by indirect or few sources of evidence, about how prompting life goal framing in the proposed two-stage manner will:

1. Encourage trainees to set activity-specific goals emphasizing deep understanding, long-term retention, and transfer. This prediction is indirectly supported by previous studies (Shell et al., 2013; Lee et al., 2015; Lee and Turner, 2017; Lee and Turner, 2018).
2. Enhance trainees' autonomous motivation to pursue an activity-specific goal, unless the framed life goal(s) are introjected. This prediction is not yet supported by direct empirical evidence.
3. Enhance trainees' autonomous motivation to pursue their activity-specific goal when they are confident that they can attain their goal, but not when they are not confident. This prediction is indirectly supported by a small body of evidence (Durik et al., 2015).
4. Enhance trainees' autonomous motivation to a greater degree when an activity embeds interest-enhancing affordances. This prediction is indirectly supported by a small body of evidence (Sansone et al., 2011).
5. Enhance trainees' autonomous motivation to a greater degree when they can adapt what the activity entails to better align it with the framed life goal(s). This prediction is indirectly supported by previous studies (Slemp and Vella-Brodrick, 2014; Bakker and Oerlemans, 2019).

Given the lack of evidentiary support for our theoretical account, we propose the need to test our predictions *via* randomized controlled trials (including factorial trials), potentially using moderation analyzes to test predicted moderators, and mediational analyzes to test predicted mechanisms (Spencer et al., 2005; Cook and Artino, 2016).

Of note, we conceptualize life goal framing as a process of linking one's *existing* life goals to their work on an activity. We do not expect (nor intend for) life goal framing to influence the degree to which trainees endorse certain life goals. Other interventions based on SDT principles have shown to influence learners' valuation of certain life goals (Ryan and Deci, 2017). These efforts could be considered as *complementary* to life goal framing.

The PACE model of motivational design

We intend for our analysis to help educators positively influence trainees' motivation, engagement, and learning. To help educators apply the results of our analysis, and researchers consider ways of testing it, we have packaged our predictions into the PACE model of motivational design. 'Motivational design' refers to the process of specifying the conditions under which trainees become and remain motivated to engage in an activity, and then designing instruction to facilitate these conditions (Keller, 2010). We offer the PACE model as a distillation of key modifiable conditions under which life goal framing is predicted to be most effective, and which trainees will be optimally motivated to learn.

P stands for purpose: Trainees must establish a purpose for learning

A purpose is no ordinary reason; Damon et al. (2003), p. 121 define a purpose as "a stable and generalizable intention to accomplish something meaningful to the self and of consequence to the world beyond the self." This definition shares many similarities with that of a life goal, which is highly self-defining, and which often involves a self-transcendent component. Therefore, establishing a purpose for learning aligns with life goal framing, particularly when directing trainees toward self-transcendent goals like helping others and giving back to their community. We argue that trainees may not routinely establish a purpose for learning, unless prompted to do so. When it comes to designing a prompt, SDT tells us that a prompt should be delivered in a needs-supportive manner. Needs-supportive strategies include using non-pressuring language (e.g., avoiding the use of words like 'should' or 'must') and acknowledging trainees' perspectives [e.g., that they might initially be disinterested in an activity; (Vansteenkiste et al., 2018)]. A recent meta-analysis found that utilizing both of these strategies when communicating a rationale for engaging in an activity resulted in higher levels of engagement and performance, compared to when these strategies were not used (Steingut et al., 2017). Additionally, in concordance with prior conceptual work, we believe that the effect of a prompt on goal setting and motivation will depend on the depth at which trainees process the prompt and make appropriate links between the activity and their life goals (Acee et al., 2018). To this end, a prompt may also incorporate additional scaffolding to support life goal framing among trainees who find it difficult to link activities to their life goals. For example, a prompt could incorporate quotes from physicians describing how a topic enabled them to practice medicine in ways aligned with their life goals. Future research could investigate when and for whom additional scaffolds might be most effective.

We are not proposing that every lecture, e-learning module, or simulation activity needs to begin with a prompt for life goal framing. When a prompt is strategically positioned within a coherent set of activities (e.g., those that share a broad topic), its effects may reverberate across activities. Further, once trainees have been repeatedly prompted to engage in the process of life goal framing, they may begin to engage in this process on their own (Acee et al., 2018).

It may also be possible to emphasize the links involved in life goal framing without using a prompt. For example, an activity could involve vicariously simulating a professional practice scenario in a

manner that highlights life goal attainment. Colonnello et al. (2020) randomized some medical students to receive information about a patient's emotional preparation prior to watching a surgical video involving the patient [e.g., "In the days before the surgery, (the patient) felt worried and unsure. We discussed his concerns with him and provided detailed information about the postoperative period, and today, he faces this surgery with the hope that he will soon return to his regular life and loved activities"]. Other medical students only received basic information about the patient. Compared to students who received basic information, students who received emotion-related information reported being more motivated to rewatch the video and scored higher on a post-video knowledge test. One interpretation of their results is that the emotion-related information highlighted to students that performing surgery is not just a technical exercise; rather, it can have meaningful implications for a patient's health and happiness. For students who strongly endorse helping others as a life goal, this emphasis may have been highly motivating. Trainees could also be provided with opportunities to engage in simulated professional practice scenarios in a manner that highlights how practice can serve trainees' goals to help others and develop meaningful relationships with patients. Future research could investigate how such vicarious and simulated activities also support the psychological process of life goal framing.

A stands for adaptability: Trainees must feel like they have the latitude to adapt an activity in a manner aligned with their purpose for learning

When trainees can craft an activity to fit their unique purpose(s), they may experience greater needs satisfaction, thus supporting their autonomous motivation. Educators can support adaptability in two ways. First, they can convey an openness for trainees to seek out other materials and resources outside a prescribed activity; that is, to 'make an activity their own'. In so doing, it is important for trainees to strike a balance between adaptations that optimize discrepancy reduction toward superordinate goals and actions that serve the prescribed objectives of an activity. Educators can further support adaptability by allowing trainees to choose whether and how they engage with elements of an activity. For example, educators can provide learners with the ability to freely navigate an e-learning module, rather than forcing them to click through a linear sequence.

C stands for confidence: Trainees must feel like they can attain their goal for an activity

We have argued that the beneficial effects of prompting life goal framing are moderated by a trainee's level of confidence. Confidence must be considered carefully in designed activities, to avoid the potentially negative effects outlined above. For a review of strategies for designing activities to buoy trainees' confidence, we refer readers to other works (Keller, 2010).

We believe that training activities can be designed to establish and maintain trainees' confidence at high levels, such as by matching the difficulty of the activity to the capabilities of trainees. When trainees come into an activity with varying levels of prior knowledge, personalizing instruction based on trainees' prior knowledge can help ensure that trainees are presented with contents that are of an appropriate challenge. However, personalization may not always be possible, especially with large and diverse groups. Accordingly, there may be trainees who experience lower confidence in their ability to succeed at an activity, despite an educator's best intentions. In this case, it may be desirable to offer trainees an opportunity to link their work on an activity to less self-defining goals (Canning and Harackiewicz, 2015).

E stands for engrossment: Trainees must become engrossed in goal pursuit based on feelings of interest

Effective life goal framing can combine with efforts to afford interest-enhancing actions to further support autonomous motivation. Based on SDT, maintaining learners' intrinsic motivation also requires facilitating needs satisfaction (Ryan and Deci, 2017). To date, strategies directed toward trainees' interest have received a significant amount of attention in the professions education literature in the form of serious games and gamification (Wang et al., 2016; Dankbaar, 2017; Rutledge et al., 2018; Gentry et al., 2019; Maheu-Cadotte et al., 2021; Silva et al., 2021; Min et al., 2022).

In summary, we predict that trainees will be highly autonomously motivated to pursue a goal emphasizing deep understanding, long-term retention, and transfer when an activity is designed to: (1) help them establish a *purpose* for learning, (2) provide them with *adaptability* in crafting the activity to better align with their purpose, (3) support their *confidence* that they can attain their goals, and (4) stimulate their *engrossment* in the activity by enhancing feelings of interest as they pursue their goals. By *setting the PACE* for trainees, educators can help support their effective engagement in instructional activities. To illustrate how the PACE model can be applied in practice, we have provided an example in Supplemental Digital Appendix 1.

Relation of the PACE model to the ARCS model of motivational design

Keller's ARCS model has received significant attention in education (Li and Keller, 2018), including in professional education (Cook et al., 2009; Daugherty, 2019; Lounsbery et al., 2020). According to the ARCS model, for learners to be motivated, their *attention* must be stimulated through feelings of curiosity, they must perceive an activity to be *relevant* to their current lives or future goals, they must be *confident* that they can succeed at an activity, and they must feel *satisfied* by the consequences of their engagement (Keller, 2010). The ARCS model outlines design strategies aimed at facilitating each of these conditions and integrates a systematic process for selecting, applying, and evaluating strategies. The ARCS model is grounded in expectancy-value theories of motivation, whereas the PACE model is grounded in Control Theory and SDT; despite this, both models arrive at a similar set of conditions. A noteworthy exception is that the PACE model emphasizes the importance of establishing a *particular* form of relevance—linking an activity to one's self-endorsed life goals, mediated through the professional practice behaviors that a training activity can enable. We propose that linking an activity to one's life goals in this way will foster a highly meaningful form of relevance (Prinski et al., 2018) *and* promote the adoption of desirable activity-specific goals. On the other hand, the ARCS model emphasizes

relevance more broadly, as it is intended to be a generalizable model that can be applied across many different populations of learners. For many learning populations, prompting life goal framing in the manner we have proposed is not possible. The ARCS model prescribes the completion of a comprehensive audience analysis that *could* orient educators toward life goal framing as an appropriate relevance-enhancing strategy for professional trainees. However, we suggest that, in the context of educators' busy schedules, it is preferable to direct them toward the 'highest yield' form of relevance for professional trainees, which we expect will help them to design more motivating training activities in a feasible manner.

Considering the role of assessment

Training activities are often linked to assessments that are separable from activities themselves. Doing well on assessments represents a salient goal for trainees (Nakayoshi et al., 2021). Thus, when trainees engage in activities, they may often pursue a goal of doing well on upcoming assessments (i.e., by setting an activity-specific goal that reduces the discrepancy toward this superordinate goal). These activity-specific goals may align with, or misalign with, the activity-specific goals encouraged by life goal framing. If trainees believe that doing well on an assessment calls for memorization of factual knowledge, then they are likely to set activity-specific goals emphasizing surface understanding and short-term retention. By contrast, if trainees believe that doing well on an assessment calls for deep understanding of practice-relevant concepts and skills, then they are likely to set activity-specific goals emphasizing deep understanding. Upcoming assessments may also induce a more autonomous or controlled motivational orientation toward training activities (Kusurkar et al., 2023). If trainees see an assessment as high stakes, irrelevant to future practice, as facilitating competition with peers, or as generally trying to control their behavior, then an assessment will likely contribute to a controlled motivational orientation. By contrast, if trainees see an assessment as low stakes, authentic to future practice, as facilitating teamwork with peers, and as helping them improve their knowledge and skills *via* feedback delivered within a needs-supportive environment, then an assessment will likely contribute to an autonomous motivational orientation (Kusurkar et al., 2023).

PACE strategies may be more important when activities are tied to 'controlling' assessments, because they 'balance the scales' in relation to the controlling influence of assessments. However, these dual influences may cause trainees to pursue two activity-specific goals: (1) an activity-specific goal emphasizing deep understanding, encouraged by life goal framing and (2) an activity-specific goal emphasizing surface understanding, compelled by a looming assessment. The potential incompatibility of these goals may disrupt self-regulation (Kim et al., 2023). On the other hand, PACE strategies may be more effective when activities are tied to 'autonomy-supportive' assessments, to the extent that they amplify the goals and motives encouraged by assessments, rather than conflict with them. When a trainee sees an assessment as helping them to build to the competencies involved in professional practice, the goal of doing well on the assessment can be considered subordinate to (i.e., serving) their practice goal(s) (i.e., the intermediate goal in Figure 3) and the life goals they pursue through their career (i.e., the subordinate goal in Figure 3). In this case, the saliency of an assessment may also contribute to a desirable purpose for learning. Future research should further investigate the relationship between instructional design and assessment design as it relates to motivation.

Conclusion

Trainees in the professions self-select into rigorous and demanding programs in part because they perceive their career path will help them attain their life goals. While trainees' life goals influence why they apply to professional training, trainees may fail to routinely *see the forest for the trees* as they engage in the daily activities that comprise their training. Prompting life goal framing aims to help trainees perceive their engagement in any situated activity as helping them make progress toward their life goals. If successful, prompting life goal framing could lead trainees to imbue any activity with the personal meaning ascribed to their most self-defining goals. However, there are circumstances when life goal framing may be ineffective at best, or counterproductive at worst. Hence, we call for future research that tests our PACE model's theoretical predictions for how to design training activities to support greater autonomous motivation and deeper understanding.

Author contributions

AG conceived of the manuscript and prepared the initial draft. RK and RB contributed to the conceptual ideas expressed in the manuscript and contributed to subsequent drafts. All authors contributed to the article and approved the submitted version.

Funding

AG is supported by a Canada Graduate Scholarship from the Canadian Institutes of Health Research, which also provided funds for open access publication fees.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2023.1036539/full#supplementary-material

References

Acee, T. W., Weinstein, C. E., Hoang, T. V., and Flaggs, D. A. (2018). Value reappraisal as a conceptual model for task-value interventions. *J. Exp. Educ.* 86, 69–85. doi: 10.1080/00220973.2017.1381830

Bakker, A. H., and Oerlemans, W. G. M. (2019). Daily job crafting and momentary work engagement: a self-determination and self-regulation perspective. *J. Vocat. Behav.* 112, 417–430. doi: 10.1016/j.jvb.2018.12.005

Beckman, K., Apps, T., Bennett, S., Dalgarno, B., Kennedy, G., and Lockyer, L. (2021). Self-regulation in open-ended online assignment tasks: the importance of initial task interpretation and goal setting. *Stud. High. Educ.* 46, 821–835. doi: 10.1080/03075079.2019.1654450

Bernacki, M. L., Byrnes, J. P., and Cromley, J. G. (2011). The effects of achievement goals and self-regulated learning behaviors on reading comprehension in technology-enhanced learning environments. *Contemp. Educ. Psychol.* 37, 148–161. doi: 10.1016/j.cedpsych.2011.12.001

Binning, K. R., and Browman, A. S. (2020). Theoretical, ethical, and policy considerations for conducting social-psychological interventions to close educational achievement gaps. *Soc. Issues Policy Rev.* 14, 182–216. doi: 10.1111/sipr.12066

Blissett, S., Sibbald, M., Kok, E., and van Merrienboer, J. (2018). Optimizing self-regulation of performance: is mental effort a cue? *Adv. Health Sci. Educ. Theory Pract.* 23, 891–898. doi: 10.1007/s10459-018-9838-x

Bower, M. (2008). Affordance analysis - matching learning tasks with learning technologies. *Educ. Media Int.* 45, 3–15. doi: 10.1080/09523980701847115

Bozek, B., Raeymaeckers, P., and Spooren, P. (2017). Motivations to become a master in social work: a typology of students. *Eur. J. Soc. Work.* 20, 409–421. doi: 10.1080/13691457.2017.1283587

Brydges, R., Hatala, R., and Mylopoulos, M. (2016). Examining residents' strategic mindfulness during self-regulated learning of a simulated procedural skill. *J. Grad. Med. Educ.* 8, 364–371. doi: 10.4300/JGME-D-15-00491.1

Buddeberg-Fischer, B., Klaghofer, R., Abel, T., and Buddeberg, C. (2006). Swiss residents' speciality choices--impact of gender, personality traits, career motivation and life goals. *BMC Health Serv. Res.* 6:137. doi: 10.1186/1472-6963-6-137

Butler, D., and Winne, P. H. (1995). Feedback and self-regulated learning: a theoretical synthesis. *Rev. Educ. Res.* 65, 245–281. doi: 10.3102/00346543065003245

Canning, E. A., and Harackiewicz, J. M. (2015). Teach it, don't preach it: the differential effects of directly-communicated and self-generated utility value information. *Motiv. Sci.* 1, 47–71. doi: 10.1037/mot0000015

Canning, E. A., and Harackiewicz, J. M. (2019). "Utility value and intervention framing" in *The Cambridge Handbook of Motivation and Learning*. eds. K. A. Renninger and S. E. Hidi (Cambridge, UK: Cambridge University Press), 645–662.

Carver, C. S. (2015). Control processes, priority management, and affective dynamics. *Emot. Rev.* 7, 301–307. doi: 10.1177/1754073915590616

Carver, C. S., and Scheier, M. F. (1990). Origins and functions of positive and negative affect: a control-process view. *Psychol. Rev.* 97, 19–35. doi: 10.1037/0033-295X.97.1.19

Carver, C. S., and Scheier, M. F. (1998). *On the Self-Regulation of Behavior*. Cambridge, UK: Cambridge University Press.

Cleary, T. J., Dong, T., and Artino, A. R. Jr. (2015). Examining shifts in medical students' microanalytic motivation beliefs and regulatory processes during a diagnostic reasoning task. *Adv. Health Sci. Educ. Theory Pract.* 20, 611–626. doi: 10.1007/s10459-014-9549-x

Code, J. R., MacAllister, K., Gress, C. L., and Nesbit, J. C. (2006). *Self-Regulated Learning, Motivation and Goal Theory: Implications for Instructional Design and E-learning*. In: Sixth IEEE International Conference on Advanced Learning Technologies.

Colonnello, V., Mattarozzi, K., Agostini, A., and Russo, P. M. (2020). Emotionally salient patient information enhances the educational value of surgical videos. *Adv. Health Sci. Educ. Theory Pract.* 25, 799–808. doi: 10.1007/s10459-020-09957-y

Cook, D. A., and Artino, A. R. (2016). Motivation to learn: an overview of contemporary theories. *Med. Educ.* 50, 997–1014. doi: 10.1111/medu.13074

Cook, D. A., Beckman, T. J., Thomas, K. G., and Thompson, W. G. (2009). Measuring motivational characteristics of courses: applying Keller's instructional materials motivation survey to a web-based course. *Acad. Med.* 84, 1505–1509. doi: 10.1097/ACM.0b013e3181baf56d

Damon, W., Menon, J., and Cotton Bronk, K. (2003). The development of purpose during adolescence. *Appl. Dev. Sci.* 7, 119–128. doi: 10.1207/S1532480XADS0703_2

Dankbaar, M. (2017). Serious games and blended learning; effects on performance and motivation in medical education. *Perspect. Med. Educ.* 6, 58–60. doi: 10.1007/s40037-016-0320-2

Daugherty, K. K. (2019). ARCS motivation model application in a pharmacy elective. *Curr. Pharm. Teach. Learn.* 11, 1274–1280. doi: 10.1016/j.cptl.2019.09.009

Davis, W. E., Kelley, N. J., Kim, J., Tang, D., and Hicks, J. A. (2016). Motivating the academic mind: high-level construal of academic goals enhances goal meaningfulness, motivation, and self-concordance. *Motiv. Emot.* 40, 193–202. doi: 10.1007/s11031-015-9522-x

Deci, E. L., and Ryan, R. M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. *Psychol. Inq.* 11, 227–268. doi: 10.1207/S15327965PLI1104_01

Diekman, A. B., Clark, E. K., Johnston, A. M., Brown, E. R., and Steinberg, M. (2011). Malleability in communal goals and beliefs influences attraction to STEM careers: evidence for a goal congruity perspective. *J. Pers. Soc. Psychol.* 101, 902–918. doi: 10.1037/a0025199

Durik, A. M., and Harackiewicz, J. M. (2007). Different strokes for different folks: how individual interest moderates the effects of situational factors on task interest. *J. Educ. Psychol.* 99, 597–610. doi: 10.1037/0022-0663.99.3.597

Durik, A. M., Shechter, O. G., Noh, M., Rozek, C. S., and Harackiewicz, J. M. (2015). What if I can't? Success expectancies moderate the effects of utility value information on situational interest and performance. *Motiv. Emot.* 39, 104–118. doi: 10.1007/s11031-014-9419-0

Eccles, J. S., and Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: a developmental, social cognitive, and sociocultural perspective on motivation. *Contemp. Educ. Psychol.* 61:101859. doi: 10.1016/j.cedpsych.2020.101859

Fiorella, L., and Mayer, R. E. (2015). *Learning as a Generative Activity*. New York: Cambridge University Press.

Gandomkar, R., Yazdani, K., Fata, L., Mehrdad, R., Mirzazadeh, A., Jalili, M., et al. (2020). Using multiple self-regulated learning measures to understand medical students' biomedical science learning. *Med. Educ.* 54, 727–737. doi: 10.1111/medu.14079

Gentry, S. V., Gauthier, A., L'Estrade Ehrstrom, B., Wortley, D., Lilienthal, A., Tudor Car, L., et al. (2019). Serious gaming and gamification education in health professions: systematic review. *J. Med. Internet Res.* 21:e12994. doi: 10.2196/12994

Goel, S., Angeli, F., Dhirar, N., Singla, N., and Ruwaard, D. (2018). What motivates medical students to select medical studies: a systematic literature review. *BMC Med. Educ.* 18:16. doi: 10.1186/s12909-018-1123-4

Graham, S. (2020). An attributional theory of motivation. *Contemp. Educ. Psychol.* 61:101861. doi: 10.1016/j.cedpsych.2020.101861

Grant, A. M. (2008a). Does intrinsic motivation fuel the prosocial fire? Motivational synergy in predicting persistence, performance, and productivity. *J. Appl. Psychol.* 93, 48–58. doi: 10.1037/0021-9010.93.1.48

Grant, A. M. (2008b). The significance of task significance: job performance effects, relational mechanisms, and boundary conditions. *J. Appl. Psychol.* 93, 108–124. doi: 10.1037/0021-9010.93.1.108

Grant, A. M., and Hofmann, D. A. (2011). It's not all about me: motivating hospital hand hygiene by focusing on patients. *Psychol. Sci.* 22, 1494–1499. doi: 10.1177/0956797611419172

Greene, J. A., Hutchinson, L. A., Costa, L., and Crompton, H. (2012). Investigating how college students' task definitions and plans relate to self-regulated learning processing and understanding of a complex scientific topic. *Contemp. Educ. Psychol.* 37, 307–320. doi: 10.1016/j.cedpsych.2012.02.002

Hecht, C. A., Grande, M. R., and Harackiewicz, J. M. (2020). The role of utility value in promoting interest development. *Motiv. Sci.* 7, 1–20. doi: 10.1037/mot0000182

Hidi, S., and Renninger, K. A. (2006). The four-phase model of interest development. *Educ. Psychol.* 41, 111–127. doi: 10.1207/s15326985ep4102_4

Hilpert, J. C., Husman, J., Stump, G. S., Kim, W., Chung, W., and Duggan, M. A. (2012). Examining students' future time perspective: pathways to knowledge building. *Jpn. Psychol. Res.* 54, 229–240. doi: 10.1111/j.1468-5884.2012.00525.x

Hope, N. H., Holding, A. C., Verner-Filion, J., Sheldon, K. M., and Koestner, R. (2019). The path from intrinsic aspirations to subjective well-being is mediated by changes in basic psychological need satisfaction and autonomous motivation: a large retrospective test. *Motiv. Emot.* 43, 232–241. doi: 10.1007/s11031-018-9733-z

Isik, U., Wilschut, J., Croiset, G., and Kusurkar, R. A. (2018). The role of study strategy in motivation and academic performance of ethnic minority and majority students: a structural equation model. *Adv. Health Sci. Educ. Theory Pract.* 23, 921–935. doi: 10.1007/s10459-018-9840-3

Jang, H. (2008). Supporting students' motivation, engagement, and learning during an uninteresting activity. *J. Educ. Psychol.* 100, 798–811. doi: 10.1037/a0012841

Johnson, W. R., Durning, S. J., Allard, R. J., Barelski, A. M., and Artino, A. R. Jr. (2023). A scoping review of self-monitoring in graduate medical education. *Med. Educ.* 2023:15023. doi: 10.1111/medu.15023

Keller, J. M. (2010). *Motivational Design for Learning and Performance: The ARCS Model Approach*. Berlin, Germany: Springer Science and Business Media.

Kim, Y., Yu, S. L., Wolters, C. A., and Anderman, E. M. (2023). Self-regulatory processes within and between diverse goals: the multiple goals regulation framework. *Educ. Psychol.*, 1–22. doi: 10.1080/00461520.2022.2158828 [Epub ahead of print].

Kusurkar, R. A. (2023). "Self-determination theory in health professions education" in *The Handbook of Self-Determination Theory*. ed. R. M. Ryan (New York: Oxford University Press), 665–683.

Kusurkar, R. A., Croiset, G., Galindo-Garre, F., and Ten Cate, O. (2013a). Motivational profiles of medical students: association with study effort, academic performance and exhaustion. *BMC Med. Educ.* 13:87. doi: 10.1186/1472-6920-13-87

Kusurkar, R. A., Croiset, G., and Ten Cate, T. J. (2011). Twelve tips to stimulate intrinsic motivation in students through autonomy-supportive classroom teaching derived from self-determination theory. *Med. Teach.* 33, 978–982. doi: 10.3109/0142159X.2011.599896

Kusurkar, R. A., Orsini, C., Somra, S., Artino, A. R., Daelmans, H. E. M., Schoonmade, L., et al. (2023). The effect of assessments on student motivation in health professions education: a review. *Acad. Med.* (in press).

Kusurkar, R. A., Ten Cate, T. J., Vos, C. M., Westers, P., and Croiset, G. (2013b). How motivation affects academic performance: a structural equation modelling analysis. *Adv. Health Sci. Educ. Theory Pract.* 18, 57–69. doi: 10.1007/s10459-012-9354-3

Lamnina, M., and Chase, C. C. (2019). Developing a thirst for knowledge: how uncertainty in the classroom influences curiosity, affect, learning, and transfer. *Contemp. Educ. Psychol.* 59:101785. doi: 10.1016/j.cedpsych.2019.101785

Lee, J., and Turner, J. (2017). The role of pre-service teachers' percieved instrumentality, goal commitment, and motivation in their self-regulation strategies for learning in teacher education courses. *Asia Pac. J. Teach. Educ.* 45, 213–228. doi: 10.1080/1359866X.2016.1210082

Lee, J., and Turner, J. E. (2018). Extensive knowledge integration strategies in pre-service teachers: the role of percieved instrumentality, motivation, and self-regulation. *Educ. Stud.* 44, 505–520. doi: 10.1080/03055698.2017.1382327

Lee, J., Turner, J. E., and Thomson, M. M. (2015). A structural equation model of pre-service teachers' perspections of future goals and current course-related motivation. *Jpn. Psychol. Res.* 57, 231–241. doi: 10.1111/jpr.12082

Li, K., and Keller, J. M. (2018). Use of the ARCS model in education: a literature review. *Comput. Educ.* 122, 54–62. doi: 10.1016/j.compedu.2018.03.019

Lounsbery, J. L., Reidt, S. L., and Pittenger, A. L. (2020). Motivational design to grab attention, establish relevance, build confidence, and achieve satisfaction about evidence-based medicine for pharmacists. *J. Am. Coll. Clin. Pharm.* 3, 639–644. doi: 10.1002/jac5.1203

Maheu-Cadotte, M. A., Cossette, S., Dube, V., Fontaine, G., Lavallee, A., Lavoie, P., et al. (2021). Efficacy of serious games in healthcare professions education: a systematic review and meta-analysis. *Simul. Healthc.* 16, 199–212. doi: 10.1097/SIH.0000000000000512

Malka, A., and Covington, M. V. (2005). Percieving school performance as instrumental to future goal attainment: effects on graded performance. *Contemp. Educ. Psychol.* 30, 60–80. doi: 10.1016/j.cedpsych.2004.04.001

Miller, R. B., and Brickman, S. J. (2004). A model of future-oriented motivation and self-regulation. *Educ. Psychol. Rev.* 16, 9–33. doi: 10.1023/B:EDPR.0000012343.96370.39

Milyavskaya, M., and Werner, K. M. (2018). Goal pursuit: current state of affairs and directions for future research. *Can. Psychol.* 59, 163–175. doi: 10.1037/cap0000147

Min, A., Min, H., and Kim, S. (2022). Effectiveness of serious games in nurse education: a systematic review. *Nurse Educ. Today* 108:105178. doi: 10.1016/j.nedt.2021.105178

Mylopoulos, M., Kulasegaram, K., and Woods, N. N. (2018). Developing the experts we need: fostering adaptive expertise through education. *J. Eval. Clin. Pract.* 24, 674–677. doi: 10.1111/jep.12905

Nakayoshi, Y., Takase, M., Niitani, M., Imai, T., Okada, M., Yamamoto, K., et al. (2021). Exploring factors that motivate nursing students to engage in skills practice in a laboratory setting: a descriptive qualitative design. *Int. J. Nurs. Sci.* 8, 79–86. doi: 10.1016/j.ijnss.2020.12.008

Norman, D. (2013). *The Design of Everyday Things*. New York: Basic Books.

Orsini, C. A., Binnie, V. I., and Jerez, O. M. (2019). Motivation as a predictor of dental students' affective and behavioral outcomes: does the quality of motivation matter? *J. Dent. Educ.* 83, 521–529. doi: 10.21815/JDE.019.065

Orsini, C. A., Binnie, V. I., and Tricio, J. A. (2018). Motivational profiles and their relationships with basic psychological needs, academic performance, study strategies, self-esteem, and vitality in dental students in Chile. *J. Educ. Eval. Health Prof.* 15:11. doi: 10.3352/jeehp.2018.15.11

Orsini, C., Binnie, V., Wilson, S., and Villegas, M. J. (2018). Learning climate and feedback as predictors of dental students' self-determined motivation: the mediating role of basic psychological needs satisfaction. *Eur. J. Dent. Educ.* 22, e228–e236. doi: 10.1111/eje.12277

Pfarrwaller, E., Voirol, L., Piumatti, G., Karemera, M., Sommer, J., Gerbase, M. W., et al. (2022). Students' intentions to practice primary care are associated with their motives to become doctors: a longitudinal study. *BMC Med. Educ.* 22:30. doi: 10.1186/s12909-021-03091-y

Pintrich, P. R. (2000). "The role of goal orientation in self-regulated learning" in *Handbook of Self-Regulation*. eds. M. Boekaerts, P. R. Pintrich and M. Zeider (San Diego, CA: Academic Press), 451–502.

Prinski, S. J., Hecht, C. A., and Harackiewicz, J. M. (2018). Making learning personally meaningful: a new framework for relevance research. *J. Exp. Educ.* 86, 11–29. doi: 10.1080/00220973.2017.1380589

Renninger, K. A., and Hidi, S. E. (2011). Revisiting the conceptualization, measurement, and generation of interest. *Educ. Psychol.* 46, 168–184. doi: 10.1080/00461520.2011.587723

Rotgans, J. I., and Schmidt, H. G. (2014). Situational interest and learning: thirst for knowledge. *Learn. Instr.* 32, 37–50. doi: 10.1016/j.learninstruc.2014.01.002

Rovers, S. F. E., Stalmeijer, R. E., van Merrienboer, J. J. G., Savelberg, H., and de Bruin, A. B. H. (2018). How and why do students use learning strategies? A mixed methods study on learning strategies and desirable difficulties with effective strategy users. *Front. Psychol.* 9:2501. doi: 10.3389/fpsyg.2018.02501

Rutledge, C., Walsh, C. M., Swinger, N., Auerbach, M., Castro, D., Dewan, M., et al. (2018). Gamification in action: theoretical and practical considerations for medical educators. *Acad. Med.* 93, 1014–1020. doi: 10.1097/ACM.0000000000002183

Ryan, R. M., and Deci, E. L. (2017). *Self-Determination Theory: Basic Needs in Motivation, Development, and Wellness*. New York: The Guilford Press.

Sansone, C., Fraughton, T., Zachary, J. L., Butner, J., and Heiner, C. (2011). Self-regulation of motivation when learning online: the importance of who, why and how. *Educ. Technol. Res. Dev.* 59, 199–212. doi: 10.1007/s11423-011-9193-6

Sansone, C., Geering, D. M., Thoman, D. B., and Smith, J. L. (2019). "Self-regulation of motivation: a renewable resource for learning" in *The Cambridge Handbook of Motivation and Learning*. eds. K. A. Renninger and S. E. Hidi (Cambridge, UK: Cambridge University Press), 87–110.

Sansone, C., and Smith, J. L. (2000). "Interest and self-regulation: the relation between wanting to and having to" in *Intrinsinc and Extrinic Motivation: The Search for Optimal Motivation and Performance*. eds. C. Sansone and J. M. Harackiewicz (San Diego, CA: Academic Press), 341–372.

Sansone, C., Smith, J. L., Thoman, D. B., and MacNamara, A. (2012). Regulating interest when learning online: potential motivation and performance trade-offs. *Internet High. Educ.* 15, 141–149. doi: 10.1016/j.iheduc.2011.10.004

Scott, I., Wright, B., Brenneis, F., Brett-Maclean, P., and McCaffrey, L. (2007). Why would I choose a career in family medicine? Reflections of medical students at 3 universities. *Can. Fam. Physician* 53, 1956–1957.

Sheldon, K. M., Ryan, R. M., Deci, E. L., and Kasser, T. (2004). The independent effects of goal contents and motives on well-being: it's both what you pursue and why you pursue it. *Personal. Soc. Psychol. Bull.* 30, 475–486. doi: 10.1177/0146167203261883

Shell, D. F., Hazley, M. P., Soh, L., Ingraham, E., and Ramsay, S.. (2013). *Associations of Students' Creativity, Motivation, and Self-regulation with Learning and Achievement in College Computer Science Courses*. IEEE Frontiers in Education Conference, pp. 1637–1643.

Silva, R. D. O. S., Pereira, A. M., Araújo, D. C. S., Rocha, K. S. S., Serafini, M. R., and de Lyra Jr, D. P. (2021). Effect of digital serious games related to patient care in pharmacy education: a systematic review. *Simul. Gaming* 52, 554–584. doi: 10.1177/1046878120988895

Sitzmann, T., and Ely, K. (2011). A meta-analysis of self-regulated learning in work-related training and educational attainment: what we know and where we need to go. *Psychol. Bull.* 137, 421–442. doi: 10.1037/a0022777

Slemp, G. R., and Vella-Brodrick, D. A. (2014). Optimising employee mental health: the relationship between intrinsic need satisfaction, job crafting, and employee well-being. *J. Happiness Stud.* 15, 957–977. doi: 10.1007/s10902-013-9458-3

Spencer, S. J., Zanna, M. P., and Fong, G. T. (2005). Establishing a causal chain: why experiments are often more effective than mediational analyses in examining psychological processes. *J. Pers. Soc. Psychol.* 89, 845–851. doi: 10.1037/0022-3514.89.6.845

Steingut, R. R., Patall, E. A., and Trimble, S. S. (2017). The effect of rationale provision on motivation and performance outcomes: a meta-analysis. *Motiv. Sci.* 3, 19–50. doi: 10.1037/mot0000039

Strauss, K., Griffin, M. A., and Parker, S. K. (2012). Future work selves: how salient hoped-for identities motivation proactive career behaviors. *J. Appl. Psychol.* 97, 580–598. doi: 10.1037/a0026423

Ten Cate, O., Snell, L., Mann, K., and Vermunt, J. (2004). Orienting teaching toward the learning process. *Acad. Med.* 79, 219–228. doi: 10.1097/00001888-200403000-00005

Tims, M., and Bakker, A. B. (2010). Job crafting: towards a new model of individual job redesign. *SA J. Ind. Psychol.* 36, 1–9. doi: 10.4102/sajip.v36i2.841

Vansteenkiste, M., Aelterman, N., De Muynck, G., Haerens, L., Patall, E. A., and Reeve, J. (2018). Fostering personal meaning and self-relevance: a self-determination theory perspective on internalization. *J. Exp. Educ.* 86, 30–49. doi: 10.1080/00220973.2017.1381067

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., and Deci, E. L. (2004). Motivating learning, performance, and persistence: the synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *J. Pers. Soc. Psychol.* 87, 246–260. doi: 10.1037/0022-3514.87.2.246

Vansteenkiste, M., Timmermans, T., Lens, W., Soenens, B., and Van den Broeck, A. (2008). Does extrinsic goal framing enhance extrinsic goal-oriented individuals' learning and performance? An experimental test of the match perspective versus self-determination theory. *J. Educ. Psychol.* 100, 387–397. doi: 10.1037/0022-0663.100.2.387

Wang, R., DeMaria, S. Jr., Goldberg, A., and Katz, D. (2016). A systematic review of serious games in training health care professionals. *Simul. Healthc.* 11, 41–51. doi: 10.1097/SIH.0000000000000118

Weber, A., Delport, S., and Hodgetts, A. (2021). Motivating factors influence student paramedic choice of paramedicine as a career. *Australas. J. Paramed.* 18, 1–6. doi: 10.33151/ajp.18.975

Wouters, A., Croiset, G., Isik, U., and Kusurkar, R. A. (2017). Motivation of Dutch high school students from various backgrounds for applying to study medicine: a qualitative study. *BMJ Open* 7:e014779. doi: 10.1136/bmjopen-2016-014779

Wrzeniewski, A., and Dutton, J. E. (2001). Crafting a job: revisioning employess as active crafters of their work. *Acad. Manag. Rev.* 26, 179–201. doi: 10.5465/amr.2002.4378011

Wu, L. T., Low, M. M. J., Tan, K. K., Lopez, V., and Liaw, S. Y. (2015). Why not nursing? A systematic review of factors influencing career choice among healthcare students. *Int. Nurs. Rev.* 62, 547–562. doi: 10.1111/inr.12220

Yeager, D. S., Henderson, M. D., Paunesku, D., Walton, G. M., D'Mello, S., Spitzer, B. J., et al. (2014). Boring but important: a self-transcendent purpose for learning fosters academic self-regulation. *J. Pers. Soc. Psychol.* 107, 559–580. doi: 10.1037/a0037637