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Successful learning environments support and harness students' identity-based motivation: A primer

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ABSTRACT

We build on identity-based motivation theory to integrate research on in-person and virtual learning environments so that we can articulate which features of virtual learning environments are likely to support or impede learning and identity exploration. Although students experience their identities as stable anchors for meaning-making and action, they construct what their identities mean in contexts. How students respond to the difficulties they encounter in their learning environment depends on whether they see engaging with schoolwork as an identity-congruent "us" or "me" thing to do. When engagement feels identity-congruent, students interpret the difficulties they encounter as signs of task importance. This interpretation fosters further engagement. When engagement does not feel identity-congruent, students interpret their difficulties as meaning that the task is not for them and disengage. Accessible norms about how learning works further influence these interpretations. Learning takes time and requires opportunities for active retrieval and use in novel settings. Hence, learning often feels difficult. Unfortunately, learning environments often convey that learning should feel easy and happen quickly. Learning environments conveying learn-through-difficulty norms support difficulty-as-importance interpretations. In contrast, learn-with-ease norms foster difficulty-as-impossibility interpretations. We discuss implications for learning, identity exploration, and the design of learning environments of taking an identity-based motivation perspective.

EDUCATORS HOPE THAT their students will be transformed by learning, gaining both a useful set of content knowledge and a roadmap to a life of purpose and engagement. Students' hopes are much the same. They see school success as a possible future identity (Oyserman, 2013; Oyserman & Fryberg, 2006), expect to go to college (Oyserman & Lewis, 2017), and want to have lives of meaning and purpose (Bronk, 2011; Bronk et al., 2009). Students and educators are right to have these hopes. Education does matter (for a review, Ritchie & Tucker-Drob, 2018). It can transform lives. People who have more education are better off; they are happier, healthier, and more likely to be employed and financially secure (e.g., Brunello et al., 2016; Conti et al., 2010; Duncan & Murnane, 2011). People who have more education benefit their communities—they are more likely to vote, run for public office, engage and invest in their schools (for reviews, Oyserman & Lewis, 2017; Oyserman, 2013). Learning environments are the paths forward, but they are not always well-designed. Well-designed learning environments support learning and

identity exploration. As we detail in this paper, poorly designed learning environments do not. Learning environments matter –they affect whether students access needed courses (Miller-Cotto & Lewis, 2020; Oyserman & Lewis, 2017) and their feeling of fit between the context of school and their identities (Jury et al., 2017; Oyserman et al., 2015) and values (Aelenei et al., 2020).[1] Poorly designed learning environments foreclose identity exploration (students' sense that their future paths to a variety of possible school-based identities and careers are open to them).

In the current paper, we build on identity-based motivation theory (Oyserman, 2007) and evidence from the metacognition literature to describe how well-designed virtual and in-person learning environments reduce these risks. To do so, we contrast two stylized kinds of learning environments: those fostering the idea that learning entails getting the right answer easily and quickly and those fostering the alternative that learning involves engaging with difficulty. Then we outline what identity-based motivation theory is and how it applies to creating learning environments that promote learning and identity exploration.

Learning Environments Frame Students' Interpretation of What Their Experiences of Ease and Difficulty Imply

Learning environments, the context in which learning occurs, frame students' sense of what ease and difficulty imply. Learning environments can foster the idea that learning should feel effortless or that difficulty is an inherent part of the experience of learning (Bjork, 1994; Yan et al., 2016). The first idea is consistent with the literature on "feelings of knowing." This literature documents that people use their metacognitive experience of ease while thinking as evidence of knowledge. That is, that they know or have already learned something (Koriat, 2008) or that their answer is correct (Ackerman & Thompson, 2017; Thompson et al., 2013). The second idea is consistent with the literature on "desirable difficulties." This literature documents that people are more likely to learn when they use strategies that feel difficult to apply and get things wrong along the way by failing, making errors, or forgetting as they test themselves (Yan et al., 2017).

Ease can signal to people that they have learned or already know something. This idea rings true because it has ecological validity. Things that we know, have seen, or heard before do feel more fluent—i.e., easier (Bjork et al., 2013; Schwarz, 2010). Material presented in ways that increase ease can yield better immediate performance (Phillips, 2017; Soderstrom & Bjork, 2015). This link between fluency and feelings of knowing is likely why educators often argue that learning should feel fun and effortless (e.g., Allen, 2016; Iten & Petko, 2016). Unfortunately, various cues, including cues that are not necessarily signs of learning, can trigger a metacognitive experience of fluency (Koriat & Bjork, 2006; Schwarz, 2011). Because ease signals already knowing, these extraneous ease cues can lead people to erroneously believe they already know (or have learned) the material. Not only can feelings of ease be misleading, but feelings of difficulty can be a signal of useful, active engagement, a sign that learning is occurring (Yan et al., 2017). Indeed, making initial learning easy often impairs longer-term retention and use over time and in new situations (Soderstrom & Bjork, 2015).

The norms supported in learning environments matter –by affecting how students interpret their experiences of ease and difficulty, they shape what students find motivating and self-relevant. Learning environments that support a learning-should-be-easy norm undermine both learning *and* identity exploration by reinforcing the idea that difficulty signals low odds of success –of being impossible and hence not worth pursuing. In contrast, learning environments that support a learning-entails-engaging-with-difficulty norm foster both learning *and* identity exploration by signaling that difficulty can signal worth. To make this case, we turn to identity-based motivation theory, a social psychological theory of self-regulation and goal pursuit that explicitly connects identity and interpretations of metacognitive experience (Oyserman, 2007, 2009a, 2009b).

Identity-Based Motivation

Identity-based motivation theory focuses on the motivational power of the self (Oyserman, 2015, Oyserman et al., 2017).[2] Identity-based motivation theory has three core aspects: dynamic construction, action-readiness, and procedural-readiness. Together, these core aspects provide a framework for understanding the interplay between people's sense of who they are, their actions, their interpretations of experienced ease and difficulty, and how learning environments may frame these processes. The idea of dynamic construction can feel counterintuitive. After all, people experience their identities as stable—they know who they are. This experience of stability is useful because it allows people to rely on their identities to make predictions. However, identity-based motivation theory suggests that experienced stability belies the context-sensitive construction of identities. That is, even though people experience their identities as stable, as something within themselves to be found or discovered, identities are better considered as created or constructed in the contexts they inhabit (Oyserman, 2019; Oyserman et al., 2012). Immediate situations and chronic contexts provide cues as to how people like themselves act, what people like themselves believe and value, and how to interpret metacognitive experiences of ease and difficulty while thinking about or engaging in tasks (Oyserman, 2009a, 2009b)[3].

That identities are constructed implies that fluency and disfluency are not necessarily useful cues for identity-relevance and irrelevance. Instead, something that is disfluent (hard to think about or do) could become a trigger for a to-be-constructed possible future identity. Difficulty is not an obstacle to identity exploration. Quite the opposite, disfluency opens the possibility for identity exploration, for considering the possibility that a particular kind of identity is "for us" or "for me." When people experience fluency, the experience provides no impetus to reexamine and explore.

This insight is a useful counterweight to the inference that fluency implies identity congruency and disfluency implies identity incongruency. People are likely to make these inferences when they believe that identities are essences that are found and discovered. If identities are found or discovered, ease might signal that something is a possible future identity, and difficulty implies the opposite. Having "discovered" their future selves, students can stop looking, potentially foreclosing identity exploration too soon.

To make this contrast more concrete, consider students working on challenging math problems. Students who assume that identities are discovered are likely to make three inferences from their experiences of difficulty. First, that difficulty means impossibility. Second that possible future identities entailing math are not for them. Third, that math itself is a waste of their time, not worth their effort. This set of inferences not only forecloses identity exploration but also reduces engagement with school. These inferences stand in contrast to the likely inferences drawn by students who experience their identities as created and constructed. They are likely to infer that difficulty could be a signal of importance and that current difficulty is uninformative of whether, or not, possible future identities entailing math are interesting. Hard things could be interesting worth doing; a career entailing math or math-based classes like chemistry might be worth pursuing. If failing along the way does not mean it is impossible, just because math is hard does not mean they cannot learn –so investing is worthwhile to work toward possible future identities requiring math. After all, passing an algebra or calculus gateway class is not the same as committing to a career in math itself. This set of inferences supports identity exploration and enhances engagement with school.

Empirical Support

Results from experiments support each of the core assumptions of identity-based motivation theory (identity construction, identity as shaping, and being shaped by, the meaning of difficulty and

action). For example, Smith and Oyserman (2015) separately varied whether students considered difficulty a sign of importance or impossibility and whether they considered the interpretation common or uncommon. They designed their experiments to test the prediction that the particular memory (difficulty-as-importance, difficulty-as-impossibility) and how it is understood (relatively common for me, relatively uncommon for me) affects how students construct their identities and act and to rule out alternative explanations.[4] Students drew on their autobiographical memories but which memories came to mind differed as a function of instruction format. Students randomly assigned to the difficulty-as-importance groups read "experiencing difficulty working on a school task can be thought of as signaling importance, that what you are working on is worth your effort because it is important to you." Students randomly assigned the difficulty-as-impossibility groups read "Experiencing difficulty working on a school task can be thought of as signaling impossibility, that what you are working on is not worth your effort because it is not for you." Afterward, students estimated how often they had the experience. Students were either given a low-frequency response scale or a high-frequency response scale depending on their randomly assigned group. The response scale served as a contextual cue. It implied that the experience was, on average, common (high-frequency) or uncommon (low-frequency) among other students.

Students randomly assigned to the difficulty-as-importance, low-frequency scale group inferred that they interpreted difficulty as importance more than average –implying to them that they cared and could do it. These students' academic identities and academic actions were both positively affected as predicted. The same was the case for students randomly assigned to the difficulty-as-impossibility, high-frequency scale group. They inferred that they interpreted difficulty as impossibility less than average, and hence that they cared and could do it. The opposite occurred for the students randomly assigned to the other groups. They drew demotivating inferences about themselves, reported that academics were less central to their identity, and spent less time on difficult school tasks. Follow-up studies suggest that students benefit from being guided to make a connection between difficulty and importance. When asked, students tend to agree that difficulty means importance and disagree with the idea that it means impossibility (Fisher & Oyserman, 2017). At the same time, whichever interpretation is implied by the context influences what they do and how they think about themselves (Oyserman et al., 2018). When context does not provide an interpretation, students tend to respond as if they believed difficulty means impossibility, interpreting their metacognitive experiences of difficulty as implying that a school task is not for them (Elmore et al., 2016; Oyserman, 2015; Oyserman et al., 2018). To test the effect of context, the researchers randomly assigned students to one of three contexts (difficulty-as-importance, difficulty-as-impossibility, control). Those in the difficulty-as-importance context read statements worded to imply the possibility that difficulty means importance. Those in the difficulty-as-impossibility group read the same statements –worded to imply the possibility that difficulty means impossibility (those in the control group did not receive a survey). Considering that difficulty might imply importance mattered. Compared to students in the other two groups, who did not differ from each other, students in the difficulty-as-importance group scored higher on a challenging academic task and were more likely to describe academics as a future possible identity.

Besides cues to shape what difficulty mindsets imply, identity-based motivation researchers have used other simple cues to document identity construction. In some studies, researchers randomly assigned students to contexts that presented different visual cues such as overlapping or non-overlapping circles labeled "current me" and "future me" (Nurra & Oyserman, 2018). In other studies, researchers randomly assigned students to see graphs that did or did not organize information in terms of their social identities (Elmore & Oyserman, 2012) or possible future educational attainments (Destin & Oyserman, 2009). These cues momentarily affected how much students engaged with schoolwork (Destin & Oyserman, 2009; Nurra & Oyserman, 2018). They also

affected how much students endorsed school-focused possible identities and strategies (Elmore & Oyserman, 2012) and difficulty-as-importance or difficulty-as-impossibility mindsets (Oyserman et al., 2015).

Translation from Experiments to Educational Settings

While experiments only show momentary effects, a 12-session identity-based motivation intervention showed that effects persist over time (Oyserman et al., 2006; Oyserman et al., 2002). The identity-based motivation intervention included activities meant to bolster students' sense that school success is a possible future identity, that school is the path to attaining their adult futures, and that experiencing difficulties along the way is part of learning, normal, a signal of task importance. Following the intervention, students randomly assigned to the treatment condition had more school-focused possible identities and strategies to attain these identities than students in the school-as-usual condition (Oyserman et al., 2006). For them, but not for control group students, having school-focused possible identities was associated with a positive sense of connection to people with their racial-ethnic heritage. These changes in possible identities predicted academic trajectories, with increasing school-focused possible identities and strategies associated with a subsequent reduction in risk of grade retention and course failures. Treatment effects did not fade, even when students entered high school (Oyserman et al., 2006). Teachers can deliver this *PathwaystoSuccess* intervention to their classrooms with fidelity (Horowitz et al., 2018) and train others to do so (Oyserman et al., 2020). Quality of implementation matters. Teachers who implemented *Pathways-to-Success* with fidelity supported their students' identity-based motivation (possible identities, interpretation of difficulty as being about importance, not impossibility), which reduced academic risk (Oyserman et al., 2020).

A Focus on Learning Environments

Pathways-to-Success involves engaging the whole classroom with group activities and focuses on creating a classroom norm of behavioral (show up, participate), cognitive (try an alternative route to understanding, persist), and emotional (school is for you) engagement. Norms carry emotional, attitudinal, and behavioral implications (Paluck, 2009; Tankard & Paluck, 2016). Students intuit what is normative by making inferences from features of their immediate environments (Cialdini & Goldstein, 2004; Paluck, 2009; Paluck & Shepherd, 2012; Sherif, 1936). These features include both peers and teachers (Roorda et al., 2011). Thus students are more likely to learn a norm about behavior if teachers attend to that behavior (Lane et al., 2020; Ma et al., 2018; Sai et al., 2020). For example, students who overheard teachers commenting to one another positively about a particular behavior were more likely to subsequently display that behavior (Zhao et al., 2020). The norms implied in a learning environment can widen or narrow the gap between students' school-focused aspirations and their school-focused attainments in several ways. First, norms provide inference tools. If norms imply that" we" focus on school, students are more likely to infer that persistence in the face of difficulty is worthwhile. Otherwise, they should be more likely to infer that quitting and switching to something else might yield a better path. Second, norms provide implicit answers to the "what do we do" and "how do we do it" questions at the heart of the impact of identity-based motivation.

Unfortunately, American classroom norms often imply that students should succeed with ease and without much effort (Xu, 2006, 2007). These norms seep into the minds of even the most school-focused students (Midgley & Urdan, 2001). A succeed-with-ease-and-without-effort norm undermines students' school-focused identity-based motivation in several ways. First, if learning should occur with ease, it should be fast. If so, there is no need to start well in advance of deadlines. Hence this norm reduces students' propensity to act in the present and increases their sense

that the future begins later rather than now (Oyserman, 2007). Like the hare in Aesop's tale, *The Tortoise and The Hare*, it leaves students with the impression that they can wait to get going. Second, believing learning should feel easy sets students up to misinterpret their own inevitable experiences of difficulty while learning as implying that schoolwork is not for them. Making it more likely that they will shift their attention elsewhere—triggering a negative spiral in which students self-handicap (Clarke & MacCann, 2016; Hirt & McCrea, 2009; Jones & Berglas, 1978) and disrupt one another (Duncan & Murnane, 2011; Rowan, 2011). We propose that the negative spiral triggered by succeed-with-ease-and-without-effort learning norms can be avoided by focusing on an engage-with-difficulty learning norm.

From an identity-based motivation perspective, learning norms that conflate ease (a metacognitive experience of fluency) with learning and with identity-relevance undermine students. In contrast, learning norms that link difficulty (a metacognitive experience of disfluency) with learning and with identity relevance support students in two ways. First, learn-through-difficulty norms direct students' attention toward content and experiences that are challenging and difficult, unlike learn-with-ease norms that misdirect students' attention toward content and experiences that feel easy. Second, learn-through-difficulty norms foster a productive interpretation of experienced difficulties as a "go" signal (possibly valuable and important for me), unlike learn-with-ease norms that foster a misinterpretation of experienced difficulties as a "stop" signal (not for me, a waste of my time). If difficulty signals value and importance, students are more likely to explore and engage. In contrast, if difficulty signals a low likelihood of success, then continuing to engage is a waste of time.

In sum, conflating ease with learning implies that the "right" content would feel easy to learn, hence everything else is irrelevant. In contrast, assuming that learning entails engaging with difficulty implies that difficult things can still be relevant, important, and valuable. A learn-with-ease norm is congruent with the experience of identity as stable –to-be-found and to-be-discovered. The clue to whether an identity is one's own is an experience of ease. If learning feels difficult, the identity is not one's own, implying that the content is irrelevant and a waste of time to learn. As a consequence, students in learning environments where this norm is salient are inclined to learn only the content they perceive as identity-relevant. Contrast this with students in learning environments with salient learn-through-difficulty norms that imply students have the task of creating and sustaining their identities by engaging with learning. Learning environments that recognize fluency but emphasize the productiveness of difficulty and disfluency scaffold the idea that difficult, disfluent content can still be important and valuable. Given that diverse content might later be relevant for identity construction, students in these learning environments are more likely to find school identity-relevant and worth investment. If our identity-based motivation predictions are correct, students are most likely to engage with schooling if they learn not only *about* their identities (identity exploration) but also *with* their identity-based motivation.

Virtual Learning Environments (VLEs), Edu-Games, and Simulations

Having articulated our identity-based motivation theoretical framework, we use our framework to make sense of the possible advantages and disadvantages of virtual learning environment (VLEs), a particular form of learning environment. We describe what VLEs are and how they might be used to bolster learning and identity exploration. Then, we summarize features of VLEs linked to enhanced learning based on meta-analytic reviews of VLEs and articulate how these features might affect identity-based motivation.

What Are VLEs?

Other than being virtual, VLEs share features with in-person learning environments (e.g., Ito et al., 2013). Thus, VLEs can support student agency. They can provide students opportunities to

actively shape their learning and interact with one another. Because they are virtual, VLEs can allow students to experience contexts and settings that they might not otherwise experience first-hand. The virtual environment can be represented in text or more immersively (e.g., 3D) and often includes digital games or simulations (Dillenbourg et al., 2002). Digital games are activities that have goals, are interactive, and provide feedback about goal progress. Feedback can be prerecorded or idiosyncratically based on user responses (Clark et al., 2016). Serious or edu-games are games that provide experiences that can be used to educate, train, or communicate with an audience using a game-like format (Allen, 2016; Clark et al., 2016). The hope is that these vivid, immersive experiences provide the scaffolding on which to build conceptual knowledge. VLEs can stand alone or be part of classroom activities, though they typically overlap with a physical environment (e.g., a classroom). VLEs do not require a particular pedagogical method, approach, or technology. As such, they can scaffold either a learn-with-ease norm that diminishes engagement with schoolwork and forecloses identity exploration or a learn-through-difficulty norm that enhances both.

That said, as our articulation of identity-based motivation highlights, to make sense of whether a VLE is likely to have positive impacts on learning, researchers must know which learning norm their VLE supports. Effective VLEs create the sense that learning the content is or could become an identity congruent "us" or "me" thing to do. We take up this issue in detail in the next section.

What Are the Features of VLEs, and Which Are Associated with Learning?

A yet unaddressed question is what learning norms VLEs typically foster and which features of VLEs support learning. To address these questions, we turn to several relevant meta-analyses. Though none provides information regarding effects for longer-term recall, integrative learning, or knowledge retention, each does report on immediate post-test performance (Clark et al., 2016; Sitzmann, 2011; Wouters et al., 2013). They suggest that serious games can improve immediate post-test performance and that their effect sizes are in the small-to-medium range. For example, declarative and procedural knowledge retention and self-related beliefs (e.g., self-efficacy, Clark et al., 2016) are higher among students playing serious games than in the usual instruction group.

At the same time, moderator analyses suggest that VLEs are not always beneficial compared to in-person instruction. Fortuitously, these analyses suggest particular features of learning environments associated with better performance. We term these features *gamification*, *engagement*, *connection*, and *learning supports*. We see these features as relevant to the design of learning environments, whether virtual or in-person. In the next sections, we operationalize each feature, summarize the finding, and connect it to the identity-based motivation literature.

Gamification

Gamification—providing game-like features, typically in the form of badges or points to document progress, is common in the design of edu-games. The meta-analytic reviews point to gamification as the single most helpful feature of edu-game design (Clark et al., 2016; Sitzmann, 2011; Wouters et al., 2013).[5] From an identity-based motivation perspective, there are several reasons why gamification could be helpful. First, engaging and feeling that one is learning are positive, motivating experiences (Sitzmann et al., 2010). To the extent that getting badges or points gives students a sense that they are making progress by moving toward a goal, they are likely to be motivating (Fishbach & Fergeson, 2007).

However, gamification is not always helpful. This can be the case if gamification takes the form of a game about something separate from the to-be-learned content. Similarly, the to-be-

learned content may be extraneous rather than integral to each badge's meaning. In both of these cases, students may absorb unintended meta-messages about the content itself—that it is boring, irrelevant, and about the game or gamified aspect of the experience—that only that part is interesting. The meta-analytic results support this prediction. Games and gamification framed as individual competition over points or scores undermine student learning (Clark et al., 2016). One possible remedy might be setting up collaborative or group processes (Wouters et al., 2013). From an identity-based motivation perspective, another possibility would be to make sure that the badges are integral to the to-be-learned content and that students share rather than compete over engaging with this content. Badges could be obtained for engaging, separate from tests of knowledge acquisition. From an identity-based motivation perspective, this would solidify the idea that the content and learning itself are valued possible identities. Attaining badges could provide a feeling of progress just from engaging. This may provide students motivation to keep going.

Our identity-based motivation framework suggests that several linked ways in which gamification can have positive effects. As just noted, badges can create a sense that one is moving forward and making progress. The idea that making progress is possible may trigger a sense that the future is close, that one has, or could have, the competencies needed to make progress, but that engagement is needed for this to occur. When people experience the future as close, they are more likely to take action (Lewis & Oyserman, 2015). Students are more likely to focus on their possible future identities and take action to attain these identities when they experience the combination of having or possibly having self-competencies in a context of uncertain externalities in which success is not a given (Smith et al., 2014). Badges, by providing discrete temporal waypoints, may attenuated experienced distance to the future. By signalling movement, badges make the future feel close and immediate. If the future starts now, students are more likely to take the requiring current action to work on their goals.

Engagement and Connection

Another reason that digital learning may be more effective than in vivo learning is that it supports students' engagement and connection to schoolwork. That is, games or gamification help when they increase student content engagement (Sitzmann, 2011) and connect to classroom instruction (Sitzmann, 2011; Wouters et al., 2013). Indeed, Clark and colleagues (2016) report positive effects of edu-games only if teachers provide instruction linked to student scores or progress within the game or gamified environment. They found that games (gamification) were more effective when teachers provided scaffolding feedback to students—if once students gave answers and received scores, their teachers worked with them to gain mastery over concepts. The meta-analyses do not provide process-level information as to why that might be. We use an identity-based motivation lens to predict why teacher-provided scaffolding feedback is critical for the effectiveness of edu-games. Edu-games provide experiences and can test immediate performance. But having an experience and being able to score well in the context of that experience is beneficial only to the extent that teachers and instruction can build from this experiential foundation to provide deepening construct knowledge beyond what was operationalized (and tested) in the game. When teachers scaffold this way, they are teaching. They are not remediating tutors who assist students in scoring any game points they missed. For teachers to scaffold successfully, they need to understand the structure of the edu-game. Moreover, the edu-game itself should not make the content seem trivial compared to the separate narrative of the game. This content and schoolwork, not the game itself, provide the building blocks for possible future identities.

The importance of engagement is also highlighted in analyses showing that students in regular instruction classes had the learning advantage over students in virtual environments when in-person learning environment actively engaged them in the learning experience (Sitzmann, 2011).

Educators consider three dimensions of engagement (Qahri-Saremi & Turel, 2016). These are behavioral engagement –using the program, coming to class rather than cutting, not disrupting oneself and others, emotional engagement—liking and feeling part of the school, and cognitive engagement—persistence and willingness to try difficult material. Digital environments generally focus on liking and use. Behavioral engagement (use) and emotional engagement (liking) can promote game persistence. But the point is not that students play a game, get points, and earn badges. The point is that the game teaches them something and that learning feels identity-congruent, an "us" or "me" thing to do. Using and liking without a willingness to engage with difficulty is not enough to promote learning (Bjork & Bjork, 2011; Yan et al., 2016). The implication is that, although not assessed in the meta-analyses, edu-games that foster learn-through-difficulty norms increase the likelihood that students interpret their metacognitive experiences of difficulty as an integral feature of the learning process. In contrast, edu-games that foster a learn-with-ease norm increase the likelihood that students see difficulty as a signal that things are going badly. That may be because gamification can not only increase liking and likelihood of use but also make accessible norms of challenge, a "no pain, no gain" frame that affords students a chance to learn by actively engaging with difficulty.

Learning Supports

Regarding learning supports, edu-games that entailed multiple sessions yielded better results than instruction as usual (single-session edu-games did not, Clark et al., 2016; Wouters et al., 2013). This finding fits the broader cognitive psychological learning literature that suggests that deep learning and knowledge retention require multiple chances to engage with the material (Rawson & Dunlosky, 2011; Roediger & Butler, 2011). At the same time, it is possible that this finding is an artifact driven by the fact that edu-games are helpful if connected to instruction rather than separate from it.

However, game designers often focus on other features that distract from learning rather than support it. These distracting features include transporting students to a different context, creating a vivid, immersive experience, developing a personalized avatar, or creating a first-person point-of-view. Although the meta-analyses do not delve into why these design features distract from learning rather than improving it, we can infer why by using an identity-based motivation lens. We suspect that these features introduce extraneous information and stimuli without boosting engagement beyond that achieved by gamification. Consider narrative— defined as having a plot or narrative line. VLEs that tell a story yield (non-significantly) *less* learning than those without a narrative. VLEs with *less* visually rich (schematic) features supported learning more than edu-games with cartoon-like or realistic visuals (Clark et al., 2016; Wouters et al., 2013). Those with first-person points-of-view were also not helpful compared to having no perspective in the game (Clark et al., 2016). Clark and colleagues tested the effect of narrative in games intended to have recreational value. In these games, students encounter a fictional story or a set of goals. They receive feedback—in the form of a score, a win, advancement to a new level, or a narrative resolution. None of these features helped student learning. Neither did game variety—having to do something different to engage at as the edu-game unfolded. Instead, these features only matter to the extent that they induce more engagement. From an identity-based motivation perspective, when these extraneous features are successful, students become deeply involved in something that is not relevant to learning. Being provided these learning-irrelevant features implies to them that they care about or like the game or gamified features, that the to-be-learned content beyond the game or gamified features must be boring, irrelevant, and identity-irrelevant, "not for them." So why were these features so often put into games? We assume that these not-found-to-be-useful features are common for two reasons. First, game designers and educators start with games rather than learning. Second,

they fall prey to the notions that learning should feel easy—or students will quit and school-work disguised—or it will feel irrelevant.

An Integration: Leveraging Identity-Based Motivation to Enhance Learning in VLEs

Meaningful learning comes with effort (Kornell & Bjork, 2007; Yan et al., 2016). Students who learn things this way can apply what they know in new ways and new settings. Meaningful teaching involves transmitting knowledge, excitement about learning, and productive beliefs about learning and oneself as a learner (Alexander, 2018; Yan & Oyserman, 2020). Teachers need to know how to afford their students chances to be active learners and scaffold student-inquiry back to the core content and issues (Alexander, 2018; Oyserman, 2015). From an identity-based motivation perspective, students engage more and hence learn more with a learn-through-difficulty norm. They benefit if features of the environment support a feeling of movement and progress in ways that make current engagement compelling and emphasize aspects of the task that make engagement with school feel identity congruent, an "us" or "me" thing to do.

To do all of this, teachers need to know the content, figure out how to present it in ways that are relevant to students' developmental capacity, prior knowledge, and experience, and scaffolds students' capacity to develop as active, life-long learners. Active student engagement increases students' confidence in learning and their actual learning in contexts in which teachers are experts in how to transmit and scaffold learning. Otherwise, active student engagement may scaffold confidence but not actual learning. Being able to judge whether one knows or has learned the material is not a simple task. It is especially tricky for students who are not yet proficient. These students are often unaware of what proficient would look like and hence often overestimate how much they know and how well they have done on tests, a conundrum termed "unskilled and unaware" (Feld et al., 2017; Kruger & Dunning, 1999). Students who are not yet proficient often confuse the grades they want to attain with the ones they likely will attain given their current efforts (Serra & DeMarree, 2016) and proficiency (Feld et al., 2017; Zell & Krizan, 2014). Because they overestimate their expertise, these students are likely to feel confident and hence may experience negative feedback as unfair, resulting in anger rather than corrective action (Feld et al., 2017; Kruger & Dunning, 1999).

The likelihood that students will overestimate their proficiency and respond to negative feedback with anger or retreat is magnified in environments that foster learn-with-ease norms. Students in these environments are unlikely to assume that learning requires effort and indeed may assume the reverse, that difficulty implies impossibility. As a result, they spend too little time on difficult problems (Ehrlinger et al., 2016). Moreover, because they infer that success is impossible for them if a task feels difficult to think about or do, they are unlikely to engage with difficulty or use desirably difficult learning strategies. Over time, this can accumulate up to a feeling that being in school itself is identity-incongruent ("not for me," "not for us"). That is, students can be misled by the sense they make of their metacognitive experiences of difficulty. Teachers may be unable to help them for two reasons. First, they may not consider the identity-based motivational implications of the interpretations that students make. Second, they may fall prey to the same interpretations themselves.

Our review of VLEs and edu-games suggests that they can scaffold engagement with difficult learning. By applying identity-based motivation theory to what meta-analytic results suggest, we inferred the circumstances in which VLEs and edu-games can be successful. Specifically, they are more likely to be successful when they structure an engage-with-difficulty or difficulty-as-importance mindset and a sense of imminence, that now is the time to get going and that school is the path to future selves. This insight is important because, as noted by Alexander (2018), it is simply not the case that each and everything a student does in school is somehow relevant to their current or future self. Instead, students need to have a general sense that school is the path forward, and therefore relevant.

Conclusions

Educators should care about virtual learning environments and edu-games for several reasons. First, being in a digital space is common for students. Almost all (92%) adolescents currently go online daily and nearly three in four (72%) play games, regardless of their socioeconomic status, age, race, or gender (Lenhart, 2016).[6] Second, there are times when distance learning is necessary and understanding which features of VLEs improve learning is critical. Third, VLEs and edu-games can partner with face-to-face instruction to improve learning by framing difficulty as a signal of importance, thus increasing student connection and engagement with learning, and making school identity-congruent and relevant.

Taken together, the literature to date suggests that edu-games and VLEs hold the promise of a more immersive, tailored-to-students experience, and opportunities for discovery. Work-to-date suggests that when VLEs work, they increase engagement and connection with schoolwork and are linked to teacher-scaffolded continued learning. When students engage with VLEs and edu-games, they can learn *about* their possible future identities and *with* their identity-based motivation. This is more likely when the VLE learning norm does not conflate ease with learning but instead links learning and engaging with difficulty. That is, VLEs and edu-games can be set up in ways that help students discover things about themselves—who they might become, and about what their experiences of difficulty imply. For example, they may discover that becoming an expert in a STEM topic or academic discipline could be a possible future identity. Taking an identity-based motivation lens suggests that exploring a particular identity is not enough in and of itself to increase academic engagement. Indeed, whether identity exploration leads to academic engagement is an open question (e.g., Alexander, 2018). However, as we have shown, VLEs and edu-games can leverage identity-based motivation to increase the experienced identity-relevance of school, boost engagement, and hence, learning. We focused on the processes by which VLEs can create learn-through-difficulty norms that facilitate these processes. In doing so, we hope to highlight ways in which education can fulfill its promise of providing students an ever-expanding toolkit packed with content knowledge and productive interpretations of their meta-cognitive experiences of ease and difficulty while thinking.

When done well, VLEs create a space that promotes learning and transfer of learning to contexts outside of the game space. For this learning to happen, the activities, the organization of these activities, and the learning norms fostered in the virtual environment need to support identity-based engagement and productive interpretation of difficulty. Each of these factors matters whether the virtual learning environment entails learning about a subject (e.g., geology) or one's future self (e.g., a virtual version of *Pathways-to-Success*).

Notes

1. Complementing family supports and mentors (Baker et al., 2020; Reddy, Rhodes, & Mulhall 2003; Rhodes, 2020).
2. Operationalizing the self as having temporal (past, current, and future), personal (e.g., traits such as I am persistent), and social (e.g., I am Latina, a student, a girl, an American) aspects.
3. Contexts can be culturally supportive, yielding positive racial-ethnic, class, gender, and other identities, or undermining, making such identities harder to sustain.
4. To rule out the possibility that people recalled different experiences when shown high- and low-frequency scales. Students only saw the frequency question and response scale after they completed the recall task. To rule out the possibility that the response scale itself shaped students' ability to report the frequency of occurrence, both high-frequency and low-frequency response scales were constructed to accommodate any response from 1 to infinite. In the low-frequency scale, fine-grained options appeared at the lower end of the scale, and the scale ended at 11 or more. In the high-frequency scale, the first option was ten or less, followed by a series of fine-grained options, and ending with an option of 30 or more.
5. As noted by Foster and Shah (2020), gamification is distinct from a game. As we outline next, both can foster or undermine learning about and with identity-based motivation.
6. Though socioeconomic factors affect home access to broadband (Anderson, 2019; Tsetsi & Rains, 2017).

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