Motivating and Engaging Students Using Educational Technologies

Brett D. Jones

Introduction

What motivates individuals to engage in learning activities? Educators, administrators, researchers, and instructional designers have sought answers to this question, often because motivation is believed to affect learners' participation in learning activities and, consequently, their learning and achievement. The purpose of this chapter is to (a) provide a definition of motivation and the closely related concept of engagement, (b) discuss some of the antecedents and consequences of motivation, (c) list some motivation theories, (d) explain how motivation and engagement have been assessed, (e) discuss how instructors and instructional designers can design instruction to motivate students, (f) consider the motivating effects of current technologies, and (g) discuss some issues in the study of motivation and engagement. This chapter is aimed at a variety of audiences, including educators, administrators, and instructional designers who are interested in applying motivation concepts in instructional settings. For brevity, I use the term "instructors" throughout this chapter in reference to anyone who designs instruction, including teachers and instructional designers. This chapter is also intended to help researchers and students who are interested in understanding how motivation has been conceptualized and studied.

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Defining Motivation and Engagement

The words "motivation" and "engagement" are common to anyone who works with or studies learners in an educational setting. Yet, defining these terms precisely can be quite difficult, in part, because motivation and engagement have multiple definitions and meanings to different people in different contexts. I have found the definitions presented in this chapter to be (a) consistent with much of the research in the disciplines of education and psychology and (b) practical and useful to instructors and researchers. Readers who want to delve into the nuances of these constructs should read the *Handbook of Research on Student Engagement* (Christenson, Reschly, & Wylie, 2012a) because it presents a wider variety of perspectives related to motivation and engagement.

Motivation can be defined succinctly as "the extent to which one intends to engage in an activity" (Jones, 2018, p. 5). Note that this definition includes "the extent" of the motivation (which is the magnitude or energizing part of motivation) and "an activity" (which indicates the direction of the motivation). Therefore, motivation involves an amount of energy and the direction of that energy. Also note that motivation is an *intention* to do something, which provides an indication as to what the person intends to do in the future. For example, students might say, "I'm really motivated to learn Spanish." In this case, the magnitude is fairly high (they're "really" motivated), and the direction is toward the activity of learning Spanish. Although these students intend to learn Spanish, it is unknown whether they will actually engage in the activities required to learn Spanish. Once individuals participate in an activity, they are "engaging" in the activity, and they can either (a) stay motivated and intend to remain engaged or (b) lose their motivation and decide to stop engaging. Therefore, motivation precedes engagement (Christenson, Reschly, & Wylie, 2012b). For individuals to remain engaged over time, they must stay motivated and intend to continue engaging.

So what exactly is engagement? Engagement can be defined most simply as a learner's active participation in an activity. This simple definition becomes more complex when we try to define an "activity." A useful way of categorizing activities is to place them into a one of four levels ranging from general to specific (Skinner & Pitzer, 2012), as shown in Fig. 1. Engagement in prosocial institutions (e.g., engagement in school, church, 4-H, YMCA) is at the most general level and includes institutions that promote youth development and protect students from risks. Engagement in school activities (e.g., engagement in academics, sports, band, clubs) is at the next most general level, followed by engagement in classrooms within the school (e.g., engagement in the curriculum activities and engagement with a teacher and other students). Engagement with a particular learning activity is at the most specific level. For example, Zhou and Yadav (2017) examined the effects of media and questioning on students' reading engagement by comparing the engagement of students who heard a story read by a person, to that of students who used multimedia to read and interact with the story. Given these levels of activities,

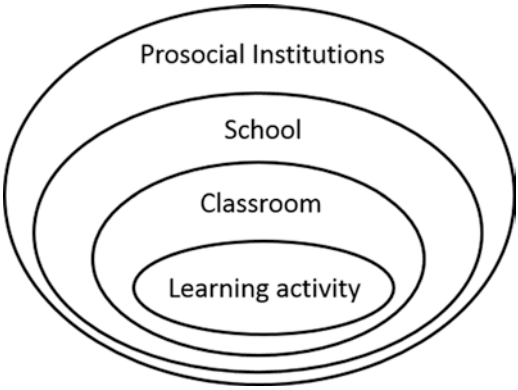

Fig. 1 Four levels of activities in which learners can engage

when discussing a learner's engagement, instructors and researchers need to carefully consider and specify the level at which they are focusing.

The simple definition of engagement provided in the prior paragraph becomes more complex when we try to define "active participation." Scholars have identified a few different dimensions of active participation. Most commonly, researchers have studied behavioral, cognitive, and emotional engagement (Fredricks, Blumenfeld, & Paris, 2004; Sinatra, Heddy, & Lombardi, 2015), and recently, some researchers have studied agentic engagement (Reeve, 2013). Behavioral engagement includes a variety of observable behaviors necessary to succeed, such as putting forth effort, persisting at activities in the face of difficulties, attending class, following class rules, and completing homework. Cognitive engagement has been conceptualized in at least two different ways (Fredricks et al., 2004): (a) as learners' psychological investment in learning, such as having a preference for challenges and hard work, and (b) as learners' use of strategic, self-regulated learning, such as paying attention, concentrating, using effective learning strategies, and using metacognitive strategies (i.e., planning, monitoring, and evaluating their cognition during tasks). Emotional engagement includes energized affective reactions in the classroom such as enthusiasm, enjoyment, and interest. Lastly, students who exhibit agentic engagement ask questions, tell their teacher what they like and do not like, and express their preferences and opinions (Reeve, 2013).

A construct related to engagement is *disengagement*, which can be defined as the absence of engagement. Learners who are disengaged put forth little effort, are passive, lack initiative, and/or give up working on a task (Skinner, Kindermann, & Furrer, 2009). Although some researchers have noted that engagement and disengagement are somewhat negatively correlated (i.e., as engagement increases, disengagement decreases, and vice versa), differences can exist in how they relate to other variables. For example, in one study, disengagement was more strongly related to students' exam grades than engagement (Robinson et al., 2017). Martin, Anderson, Bobis, Way, and Vellar (2012) have noted that both engagement and disengagement are needed to capture students' persistence at school.

Another construct closely related to disengagement is *disaffection* (Skinner et al., 2009), which includes the behaviors of disengagement, but also includes withdrawing mentally (not paying attention) and ritualistic participation (going through the motions). Readers interested in this construct should read Skinner et al. (2009) for a more complete description and to examine the items they administered to elementary school students, which include those related to behavioral disaffection (e.g., "I don't try very hard at school") and emotional disaffection (e.g., "When I'm doing work in class, I feel bored.").

Antecedents and Consequences of Motivation and Engagement

Many scholars consider motivation to precede engagement, such that motivation is one's intent, and engagement is one's actions (Christenson et al., 2012b). This leads to the practical and important question: What factors influence one's motivation? Often, many factors are involved in affecting learners' motivation, including those external to the learner (e.g., the instructional design, the curriculum, the learner's peers, the school and community culture) and those internal to the learner (e.g., beliefs, values, affect, needs, personality characteristics). Figure 2 shows how these concepts are related at the level of the class or learning activity. In the remainder of this chapter, I focus on mostly these two levels and less on the school and prosocial institution levels shown in Fig. 1.

Figure 2 shows that the internal and external variables interact (as depicted by the vertical double-headed arrow) to affect learners' perceptions in a learning environment, which then affect students' motivation and engagement in the learning environment. Ultimately, these factors affect outcomes, such as learning and

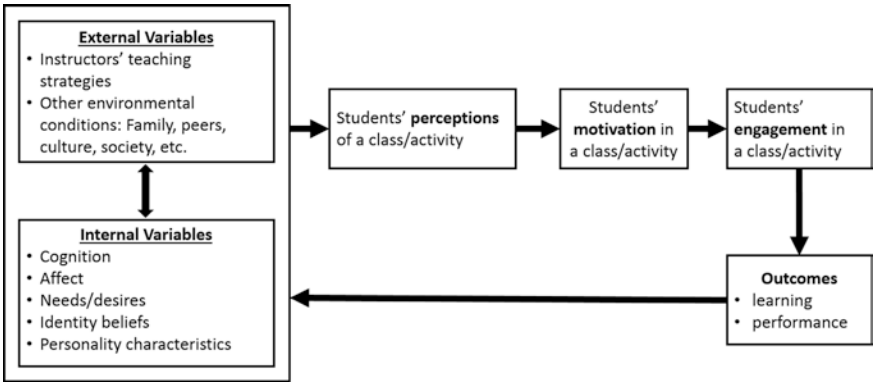

Fig. 2 Simplified representation of the MUSIC® Model of Motivation. (From *Motivating Students by Design: Practical Strategies for Professors* by B. D. Jones, 2018. Copyright 2018 by Brett D. Jones. Adapted with permission)

performance (Hughes, Luo, Kwok, & Loyd, 2008; Ladd & Dinella, 2009). The outcomes then cycle back to affect the internal and external variables. Let's consider an example of this process.

> Mia is a ninth-grade student who values learning to speak Spanish because she believes that it will help her achieve her career goals (an internal variable). Mia enrolls in her high school Spanish language class, and after the first week, she perceives it to be useful to helping her become a better Spanish speaker. Therefore, she is motivated to do well in her Spanish class, and she engages in the class assignments. Unfortunately, Mia did not do well on the first test in the class (an outcome). Her low grade decreased her self-efficacy for speaking Spanish (an internal variable) and caused her teacher (an external variable) to consider whether there was something he could do to help Mia improve. Mia's teacher shows her a new app that she can use on her iPad that will help her learn Spanish, and consequently, her Spanish self-efficacy increases a little because she believes that she can succeed in the class if she uses the app. She also believes that the extra effort it will take to succeed will be worthwhile because she still finds the class useful (a perception of the class) and is motivated to engage in the class assignments.

This example provides a demonstration as to how external and internal variables can interact to affect learners' perceptions of the learning environment, motivation, engagement, and outcomes.

Some researchers study only certain parts of this model. For example, researchers have investigated how internal variables (e.g., goals) affect students' motivation to engage in massive open online courses (MOOCs) and have documented that students enroll to gain knowledge or skills in a particular topic, to earn a certificate, to meet other people interested in the topic, and to advance in school or in a career (Hew & Cheung, 2014; Williams, Stafford, Corliss, & Reilly, 2018). Once they are then enrolled in the course, students' perceptions of the course will also affect their motivation to engage in the course activities. Certain course perceptions are especially critical to predicting students' motivation, as I will describe in a following section. As an example, students' perceptions of the usefulness of a MOOC platform (icourse.com) were found to be related to their motivation (intentions) to continue using the platform (Yang, Shao, Liu, & Liu, 2017).

Motivation Theories

Motivation would probably be easier to understand if there was one grand theory of motivation that could explain all of human motivation. However, researchers have been unable to identify such a theory or construct, and as a result, motivation researchers now study motivation using a variety of constructs and "mini-theories" (Reeve, 2005). A construct is defined as "an individual characteristic that we assume exists in order to explain some aspect of behavior" (Miller, Linn, & Gronlund, 2013, p. 81). For example, *interest* is a construct because it is an individual characteristic and it can't be seen (i.e., it must be assumed to exist). As an example, an instructor might say "Juan is very interested in robotics." This instructor can't see Juan's interest in robotics, but she can infer it from Juan's behaviors (e.g., Juan stays afterschool

to work in the robotics lab) and verbal statements (e.g., Juan says "I like trying to figure out how to use the different sensors on the robot.").

One problem with the mini-theories' approach to motivation is that it has led to a lot of theories, which can make it difficult for instructors and researchers to know which ones are most useful in different situations. I provide an alphabetical list of several theories related to motivation and engagement in Table 1. It is beyond the scope of this chapter to provide an explanation of each of these theories. Even trying to provide a one- or two-sentence description is difficult because it can lead to confusion and misunderstandings for readers unfamiliar with nuances of the theories. Readers interested in these theories should consult the explanations provided by the primary developers of the theories (see the references in Table 1).

Some researchers have developed theories and models that go beyond motivation in an attempt to integrate motivation, volition, and learning. In the context of

Table 1 Examples of theories related to motivation and engagement

Theories
Arousal theories (Berlyne, 1960; Duffy, 1957)
Attachment theory (Ainsworth, 1979; Bowlby, 1969)
Attribution theory (Weiner, 2000)
Behaviorist theories (Skinner & Epstein, 1982)
Belonging theories (Baumeister & Leary, 1995; Goodenow, 1993)
Caring theories (Johnson, Johnson, & Anderson, 1983; Noddings, 1992; Wentzel, 1999)
Competence theories (Elliot & Dweck, 2005; Harter, 1978; White, 1959)
Domain identification theory (Osborne & Jones, 2011)
Emotion theories (Pekrun, 2009)
Expectancy-value theory (Wigfield & Eccles, 2000)
Flow theory (Csikszentmihalyi, 1990)
Future time perspective theory (Lewin, 1942; Nuttin & Lens, 1985)
Goal orientation theories (Ames, 1992; Maehr & Midgley, 1991; Nicholls, 1984)
Goal setting theories (Locke & Latham, 2002)
Goal theories (Ford, 1992; Locke & Latham, 2002)
Identity and identification theories (Finn, 1989; James, 1890/1981; Voelkl, 1997)
Interest theories (Hidi & Renninger, 2006; Krapp, 2005; Schraw & Lehman, 2001)
Locus of control (deCharms, 1968)
Rewards and intrinsic/extrinsic motivation theories (Cameron & Pierce, 1994; Deci, 1975; Deci & Ryan, 1985)
Self-concept theories (Marsh, 1990; Shavelson & Bolus, 1982)
Self-determination theory (Deci & Ryan, 1985, 2000)
Self-efficacy theory (Bandura, 1986, 1997; Pajares, 1996)
Self-esteem theories (Rosenberg, 1979)
Self-regulation theories (Bandura, 1986; Pintrich & de Groot, 1990; Zimmerman, 2000)
Self-theories of intelligence (Dweck, 1999, 2006)
Self-worth theories (Covington, 1992)
Social cognitive theory (Bandura, 1986, 1997)
Stereotype theories (Aronson & Steele, 2005)

educational technologies, Astleitner and Wiesner (2004) presented an integrated model of multimedia learning and motivation, and Keller (2008) explained an integrative theory of motivation, volition, and performance. I encourage readers to review these references if they are interested in more comprehensive models that include detailed relationships between motivation, learning, and performance.

Assessing Motivation and Engagement

Because motivation is defined as an individual's intent, it is difficult to measure. How do you measure someone's intent to do something that they haven't done yet? Because of this difficulty, researchers do not usually assess motivation directly; instead, they measure motivation-related constructs (such as those that are part of the mini-theories listed in Table 1) and then infer someone's motivation based on these constructs. For example, researchers have used "self-efficacy" as one measure of students' motivation. Self-efficacy is a person's judgment of his/her capabilities to complete a certain task (Bandura, 1986). Someone who says "I'm confident that I can solve 10 double-digit addition problems" (e.g., 12 + 45) has a high self-efficacy for completing double-digit addition problems. Self-efficacy is not motivation, but students who have higher levels of self-efficacy for an activity are more likely to choose to engage in the activity, put forth more effort in the activity, and persist at the activity when faced with challenges (Bandura, 1997). All of these outcomes (i.e., choice, effort, and persistence) can be considered indicators of one's motivation to engage in an activity and possibly similar activities. Consequently, researchers may assess students' self-efficacy as a measure of their motivation to engage or reengage in a particular activity (e.g., van der Meij, van der Meij, Voerman, & Duipmans, 2018).

Because motivation-related constructs and engagement constructs are often measured similarly, the explanations in this section are relevant to both constructs. I find that instructors often determine students' motivation and engagement by observing students' behavior and/or assessing the quality of their work. For example, an instructor may infer that students are motivated and engaged if they pay attention or ask questions during class and/or score highly on tests and assignments. These types of observations and assessments are often very useful and practical for instructors. Researchers generally use a wider variety of measures than instructors, including (a) self-reports (e.g., questionnaires, interviews, stimulated recalls, think-alouds, and dialogues), (b) behavioral measures, (c) ratings by others, and (d) physiological data (e.g., neuroscientific data). In a review of measures used to assess academic engagement in technology-mediated learning experiences, Henrie et al. (2015) found that 61.1% of the studies used quantitative self-report measures (e.g., questionnaires), 39.8% of studies used qualitative measures (e.g., interviews, open-ended questionnaire items, discourse analysis, observation), 34.5% of studies used quantitative observational measures (e.g., frequency of behaviors observed or

monitored), and 11.5% of studies used other measures (e.g., performance, biophysiological sensors).

Self-Reports

The most common method used by researchers to study learners' motivation has been to assess learners' self-reports on questionnaires because they directly assess students' perceptions or beliefs, they can produce reliable scores, they are easy to score, they can be standardized across contexts, they can be administered quickly, and they can be administered online (and therefore, they can be used when learners are at a distance or unavailable in person) or with paper and pencil. Questionnaires can include one or more "instruments," "inventories," or "scales" that are usually comprised of three or more items that students rate on Likert-type scales (e.g., 1 = *strongly disagree*, 2 = *disagree*, 3 = *somewhat disagree*, 4 = *somewhat agree*, 5 = *agree*, 6 = *strongly agree*). For example, the college student version of the MUSIC® Model of Academic Motivation Inventory (Jones, 2012) includes a "usefulness" scale with five items that assess learners' perceptions of the extent to which an activity or class is useful to their future. Two of the items are "In general, the coursework was useful to me" and "The knowledge I gained in this course is important for my future." Students respond to these items by providing a rating from 1 (*strongly disagree*) to 6 (*strongly agree*). The scores from these two items and the three other items in the scale are averaged to produce a score that indicates the extent to which students believe that the course is useful to their future. This usefulness scale is considered to be an indirect measure of students' motivation because students are more likely to be motivated to engage in a course when they find it useful to their future (Wigfield & Eccles, 2000). As an example, Streiner and Bodnar (2019) used this usefulness scale (along with other scales) to assess students' perceptions of a gamified learning environment. Then, they made changes to the game platform and reassessed students' perceptions using the scale again to examine how students' perceptions were affected by their changes to the platform.

Researchers often check the reliability of a scale by showing that the scale items are highly correlated (e.g., calculating Cronbach's alpha) and may correlate the scale scores with other scale scores or outcomes (e.g., grades) to provide evidence for the validity of the scale (e.g., we would expect the usefulness scale to correlate with behavioral engagement). Questionnaires can also include open-ended items that allow students to provide text responses.

Besides questionnaires, other types of self-reported data include interviews (verbal responses to questions), stimulated recalls (recall of thoughts about prior performances on tasks, sometimes while they are watching a video of their prior performance), think-alouds (verbalizations of thoughts, behaviors, and feelings during a task), and dialogues or discourse analysis (conversations between two or more individuals) (Schunk, Meece, & Pintrich, 2014).

Despite the variety of self-report measures available and their frequent use, these measures have several limitations, including (a) the possibility that learners provide responses that are socially acceptable instead of their true beliefs, (b) that individuals' self-reported responses do not match their actual behavior, (c) that young children may not be able to provide accurate responses, and (d) that self-report measures must be completed at a time separate from engaging in the activity, which can interfere with the learner's engagement (Bowman, 2010; Fulmer & Frijters, 2009). In addition, it can be difficult to assess learners' levels of engagement over time with questionnaires, especially during shorter durations (e.g., a 20-minute activity). To capture learners' motivation or engagement over time, researchers have used the experience sampling method (Hektner, Schmidt, & Csíkszentmihalyi, 2007) in which individuals are contacted at various points during an activity or a day and asked to stop what they're doing to answer questions related to their motivation and engagement (e.g., Xie, Heddy, & Greene, 2019).

Readers interested in using a self-report questionnaire might consider one of the 14 surveys that Henrie et al. (2015) identified to assess students' behavioral, cognitive, or emotional engagement in technology-mediated learning environments. When selecting a measure of engagement, it is important to select one that assesses engagement at the activity level intended (see Fig. 1 for some possible activity levels). Similarly, it is important to recognize that some self-report measures assess students' perceptions of a class or activity (e.g., "This class is useful to my everyday life."), whereas other measures assess students' perceptions of a domain, such as mathematics (e.g., "Mathematics is useful to my everyday life."). For example, to determine how an online educational game would affect students' attitudes toward mathematics after playing the game for 14 weeks, Mavridis, Katmada, and Tsiatsos (2017) assessed students' perceptions of mathematics (as a domain), as opposed to examining how students perceived the usefulness of the game itself.

Behavioral Measures

Behavioral measures can be used to assess learners' motivation and engagement by documenting their actions. Behavioral measures include watching learners' behaviors in real time (or on video) and counting the frequency of behaviors (e.g., number of times students ask questions) or keeping track of the amount of time learners spend on an activity (more time spent is assumed to indicate that learners are more motivated or engaged). As noted by Henrie et al. (2015): "In technology-mediated learning settings, behavioral engagement can potentially be measured by computer-recorded indicators such as assignments completed; frequency of logins to website; number and frequency of postings, responses, and views; number of podcasts, screencasts, or other website resources accessed; time spent creating a post; and time spent online" (p. 43). A limitation of behavioral measures is that they do not capture learners' thoughts and feelings. Therefore, although these measures allow researchers to document the extent to which learners' exhibit certain behaviors, these

measures don't allow them to determine *why* they engaged in it, which could be important to understanding learners' motivations in some situations.

Ratings by Others

As opposed to measuring learners' behaviors directly, observers (e.g., teachers, peers, parents, trained researchers) can *rate* characteristics that indicate learners' motivation or engagement. For example, in one study, students' engagement was measured by rating their attention, effort, persistence, verbal participation, and positive emotion using a 7-point scale ranging from 1 (*not at all*) to 7 (*extremely*) (Reeve & Jang, 2006). Ratings by others may provide a more objective measure than learners' self-reports. However, ratings may require more inference about learners' motivation or engagement than measuring behavior directly.

Physiological Data

Recent technological advances have allowed researchers to study students' motivation and engagement using physiological data. Physiological data, such as neuroscientific data, may allow researchers to identify the neural mechanisms that underlie learners' motivation and engagement and explain the processes involved in motivation-related behaviors. As an example, neuroscientists have examined the effects of rewards on individuals' motivation-related behaviors (Hidi, 2016).

Brain activity can be measured using functional magnetic resonance imaging (fMRI) and electroencephalogram (EEG) event-related potentials (Kim, Reeve, & Bong, 2017). An fMRI produces brain scans that show changes in brain activity in different regions of the brain while the individual lies in a machine and participates in mental tasks. EEGs produce waveforms based on the individual's brain signals. The EEG waveforms indicate the rise and fall of brain signals from different parts of the brain. Lin and Parsons (2018) noted that EEGs and other new brain imaging techniques may be especially useful in studying media multitasking. For example, virtual reality-based neuropsychological assessments allow researchers to situate participants in virtual environments while completing multiple tasks (e.g., Parsons & Barnett, 2017). This type of assessment can allow researchers to track more closely how participants are engaging in multiple tasks and how they switch from one task to another.

Kim et al. (2017) cite several advantages of using neuroscientific data to study motivation. First, it may be possible to identify distinct patterns of neural activity, which could help researchers to distinguish more clearly among motivation constructs. Second, it may be possible to define "motivation" more precisely and identify the diverse and dynamic subprocesses involved in motivation and engagement. Third, it may be possible to use neuroscience methods along with other methods

(e.g., self-reports, behavioral measures, ratings by others) to overcome the limitations of those methods. Some of the limitations of using physiological data to study learners' motivation and engagement include that these data require learners to enter into a machine (fMRI) or wear a cap with sensors (EEG), which restrict the types of activities in which learners can participate. Other limitations are the cost of the technologies and the skills required to use the technologies and interpret the data produced.

Designing Instruction to Motivate and Engage Students

Identifying motivating and engaging strategies that are consistent with theories and research can be overwhelming for instructors because of the plethora of mini-theories and constructs available (see Table 1). To help instructors make sense of this information, I developed the MUSIC® Model of Motivation (Jones, 2009, 2018), which is based on motivation research and theories, including, but not limited to, the theories listed in Table 1. The five key principles of the MUSIC model are that instructors need to ensure that students: "(1) feel *empowered* by having the ability to make decisions about some aspects of their learning, (2) understand why what they are learning is *useful* for their short- or long-term goals, (3) believe that they can *succeed* if they put for the effort required, (4) are *interested* in the content and instructional activities, and (5) believe that others in the learning environment, such as the instructor and other students, *care* about their learning and about them as a person" (Jones, 2018, p. 9). The first sound in each keyword of these five principles (i.e., eMpowerment, Usefulness, Success, Interest, and Caring) forms the acronym MUSIC.

Figure 2 shows that learners' *perceptions* of the class or learning activity are central to their motivation and engagement. The MUSIC model focuses on five specific perceptions (i.e., empowerment, usefulness, success, interest, and caring) that researchers have found to be critical to students' motivation in educational settings. Therefore, instructors need to consider how learners' internal variables (e.g., cognition, affect, needs/desires, identity, personality characteristics) and external variables (e.g., family, peers, culture, society) will interact with the instructional design to affect how learners perceive the instructional environment. These design considerations occur within the broader design of the class or activity.

Figure 3 shows the five basic elements of the MUSIC model design cycle: (1) select the course objectives, (2) select the instructional and MUSIC model strategies, (3) implement the strategies, (4) assess students' MUSIC perceptions and progress toward the course objectives, and (5) evaluate the assessment results to identify whether there are problems (Jones, 2018). The MUSIC model design cycle can be integrated with or complement other more complete instructional design models (e.g., Dick, Carey, & Carey, 2015). In the remainder of this section, I provide some example strategies that are consistent with the components of the MUSIC model (see Jones, 2018, for more strategies).

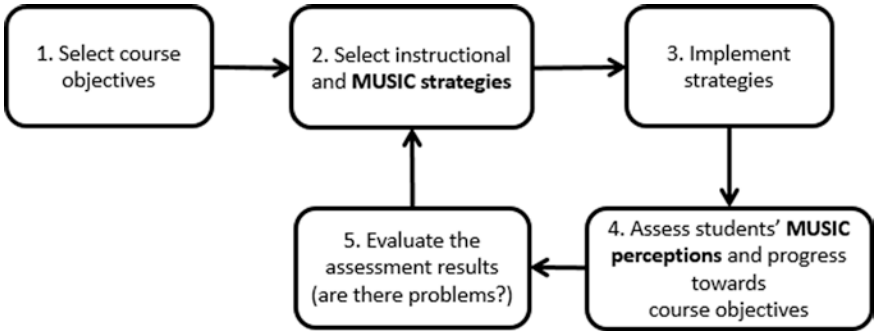

Fig. 3 The MUSIC® Model of Motivation design cycle. (From *Motivating Students by Design: Practical Strategies for Professors* by B. D. Jones, 2018. Copyright 2018 by Brett D. Jones. Adapted with permission)

Empowerment Strategies

Learners tend to be more motivated and engaged when they are *empowered* (Deci & Ryan, 2000). In the MUSIC model, empowerment is defined narrowly to indicate that students have the autonomy to make decisions within their learning environment. The importance of learner autonomy in educational technology settings is evidenced by the publication of several research articles presented in a special issue of the journal *Educational Technology Research and Development* (ETR&D) titled "Technology-Enhanced Ownership and Autonomy" (Lan, 2018). Yet, *learner autonomy* is not always synonymous with the concept of *empowerment* in the MUSIC model. Instead, empowerment is most consistent with the "right of learners to determine the direction of their own learning" (Benson & Voller, 1997, p. 2), as opposed to simply allowing learners to be autonomous by working on their own. For learners to feel empowered, they must believe that they have choices and have some freedom within their learning environment. Students enrolled in an online course that requires students to work independently to read a textbook chapter and complete an online quiz may be learning autonomously, but may not feel any empowerment if they don't believe they have any choices in these activities.

Instructors can empower students by giving them choices. Jones (2018) provides examples such as allowing choices within assignments, allowing students to choose which assignments they want to complete, allowing choice of assignment topics, and allowing choice of assignment format (e.g., traditional paper, video, project, product, model). In a design to increase student tutors' perceptions of empowerment, Park and Kim (2016) designed a virtual tutoring system that gave students choices over (a) their tutoring goals for the lesson, (b) the lesson delivery format, and (c) the tutee they want to teach. In another study of peer feedback using a web-based tool (Yuan & Kim, 2018), college students reported that they experienced autonomy when they were given choices about the criteria they could use to assess their peers' work. As Yuan and Kim explain, "They were asked to choose two of the

following three criteria: (a) accuracy of the content, (b) language of the essays (i.e., grammar, spelling, wording, syntax), and (c) avoiding plagiarism (i.e., A minimum of two sources should be used; paraphrasing needs to follow the three-word rule)" (p. 30).

By definition, learner-directed approaches to teaching give students some control over their learning and can promote feelings of empowerment. Common learner-directed approaches include problem-based learning, project-based learning, inquiry approaches, case studies, and constructivist approaches. Other strategies to empower students include avoiding controlling rules and language and allowing students to talk more during classes (Jones, 2018).

Usefulness Strategies

Learners are motivated to learn about a topic and engage in activities related to that topic when they believe that what they are learning is useful to their goals in life (Brophy, 1999; Eccles & Wigfield, 2000). For example, when college students perceive that mobile learning content is useful, they are more motivated to adopt mobile learning (Hao, Dennen, & Mei, 2017). Similarly, Korean university students who reported that their MOOC course was useful were more likely to report higher levels of learning engagement (Jung & Lee, 2018).

Instructors can help learners understand the usefulness of topics and activities by explicitly explaining the usefulness of the content. Other strategies to convey usefulness include having students explain to one another the usefulness of the content (McGinley & Jones, 2014) or having others (e.g., professionals, experts, former students) explain the usefulness (Jones, 2018). Online virtual worlds (e.g., *Second Life*, http://secondlife.com) are another way that instructors can provide educational experiences that are otherwise more difficult or expensive to engage in; examples include touring a replica city from the past, designing clothing, setting up a store, practicing language skills in foreign cities, and examining 3D molecules (EDUCAUSE, 2008; Harrison, 2009).

Success Strategies

For learners to be motivated to engage in activities, they need to believe that they can succeed at the activities (Bandura, 1986). When learners do not believe that they can succeed, they will not engage, or if they do engage, they will not willingly engage for long unless they begin to experience success. Therefore, success beliefs are critical to learner engagement. Individuals' success beliefs for an activity are influenced by their prior experiences with that activity, by what others tell them (i.e., verbal persuasion such as "you can do it!"), by watching others engage in the activity, and by their physiological reactions to that activity (e.g., heart rate, perspiration)

(Bandura, 1986). In a study designed to increase secondary students' perceptions of success in an inquiry physics activity, researchers used verbal persuasion by having an animated pedagogical agent give learners motivational messages during the activity (e.g., "Oh, this one looks difficult, let's take some time to look at it"; van der Meij, van der Meij, & Harmsen, 2015, p. 389). Using an experimental design, the researchers were able to document interaction effects between the experimental conditions (which received the motivational messages) and the control condition (which did not receive the motivational messages). As is typical in these types of studies, increases in students' perceptions of success (i.e., self-efficacy) were used as an indicator of students' motivation, and they were assumed to be important because other studies have linked higher self-efficacy to higher achievement.

Instructors can also help students believe that they can succeed by attributing students' struggles and failures to their lack of effort and/or use of inadequate strategies (Weiner, 2000). Students are more likely to persist in the face of failure when they believe that they can succeed by exerting more effort or by trying different learning strategies (Dweck, 1999, 2006). Instructors can also ensure that their expectations for students are high, but reasonable; otherwise, students may experience debilitating anxiety, which can reduce their motivation. Instructors can help students succeed and reduce anxiety by matching the difficulty levels of the learning activities and assignments with the abilities of the students (i.e., the activities are not too easy or too difficult).

Some studies of online learning have measured "teaching presence" as a way to assess the extent to which students believe that instructors support their success through their design and organization of the course content (Jung & Lee, 2018; Shea, Pickett, & Pelz, 2003). Teacher presence includes instructional strategies that help students believe that they can succeed in the course, such as providing feedback, helping to solve problems, and resolving technical issues (Gregori, Zhang, Galván-Fernández, & Fernández-Navarro, 2018). Providing honest, frequent feedback is a critical means to let students know whether or not they are being successful.

Interest Strategies

Researchers generally agree that the "interest" construct can be divided into *situational* interest and longer-term, *individual* interest. Situational interest refers to the interest and enjoyment students experience at any one moment as they engage in an activity (Schraw & Lehman, 2001). Individual interest refers to the interests students have developed over time, and as a result, they value the topic or activity, have more knowledge about it, and tend to like it (Hidi & Renninger, 2006). Consequently, interest strategies in the MUSIC model include both those that interest learners in particular activities (e.g., playing a video game, solving mathematics problems) and those that take into consideration learners' individual interests (e.g., an interest in learning about history, an interest in tennis). Students who are more situationally interested in an activity tend to be more motivated and engaged in that activity (Hidi

& Renninger, 2006). For example, when students find that using the social web tools in a course is enjoyable and interesting, they are more likely to rate their active learning higher in the course (Molinillo, Aguilar-Illescas, Anaya-Sánchez, & Vallespín-Arán, 2018).

Instructors can increase students' situational interest by using strategies that catch and hold students' attention, such as using novelty and limiting distractions (Jones, 2018). Other strategies include piquing students' curiosity about the content or stimulating emotional arousal by providing surprising information, showing enthusiasm, and pacing instruction appropriately (i.e., not too quickly or slowly). Some instructors have used massively multiplayer online games (MMOGs) in higher education courses, and students have found them to be fun and reduce boredom in classes (Bawa, Watson, & Watson, 2018). Some of the motivating characteristics of MMOGs that are most directly related to students' interest include "content elements such as user-friendly language, detailed and rich descriptions, scintillating imagery, interesting and appealing storylines and narratives," and "fantasy elements such as variety of locations including cities, forests, skylines, seas, and castles, customized alternative personas, variety of customizable characters, classes such as elevens, dwarfs, monsters, variety of occupations and skill mongering, variety of tools related to occupations, and variety of in-game trade options" (Bawa et al., 2018, p. 181). These findings also demonstrate how empowering students (e.g., providing choice of locations and customized personas) can affect students' interest, thus demonstrating how an instructional design decision (such as giving students choices) can affect their perceptions of more than one MUSIC model component (i.e., empowerment and interest).

Instructors can increase students' individual interest by relating course content to students' interests or allowing students to choose from different topics so that they can choose topics that are more interesting to them. Instructors can also create situational interest because individual interest begins originally as situational interest and then develops over time into individual interest (Hidi & Renninger, 2006). Lastly, all of the other MUSIC model components can also be used to promote individual interest (Jones, Tendhar, & Paretti, 2016; Osborne & Jones, 2011); therefore, generally creating motivating and engaging learning environments can help students develop a longer-term interest in the topic or activity.

Caring Strategies

Students tend to be more motivated in courses when they have quality relationships with the instructor and other students in the class (Wentzel, 1999). Conversely, learners are less motivated when they perceive that their instructor does not care about their learning, or others in the class make them feel unwelcome (e.g., they experience bullying). For example, students are more likely to rate their active learning higher in a course that incorporates social web-based collaborative learning

when they believe that they have good interactions with their teacher (Molinillo et al., 2018).

Instructors can show students that they care by being approachable and relatable to students, by respecting students, by showing students that they care about their academic success, and by being flexible and accommodating when students experience extraordinary events, such as a death in the family (Jones, 2018). As an example, students are more likely to complete MOOCs when they perceive a stronger teacher presence (Gregori et al., 2018), which includes strategies that could promote a positive relationship between the students and the instructor such that students believe that the instructor cares about their learning (e.g., welcoming new students, encouraging participation).

Evidence for the MUSIC Model

Students and instructors find the five categories of MUSIC model strategies useful in helping them to organize a wide variety of motivational and engagement strategies (Jones, 2016). The multidimensional MUSIC model appears to provide a parsimonious model that includes the breadth of strategies identified by researchers, yet not provide too many categories that overwhelm instructors. Furthermore, quantitative research has confirmed that students find the five MUSIC model components to be distinct perceptions in samples of college students (Jones, Li, & Cruz, 2017; Jones & Skaggs, 2016; Jones & Wilkins, 2013), pharmacy students (Pace, Ham, Poole, & Wahaib, 2016), middle and high school students (Chittum & Jones, 2017; Parkes, Jones, & Wilkins, 2017; Schram & Jones, 2016), and elementary school students (Jones & Sigmon, 2016). The MUSIC model has been used to analyze learners' motivation-related perceptions in a variety of contexts, including online courses (Hall, Jones, Amelink, & Hu, 2013; Jones, 2010; Jones, Watson, Rakes, & Akalin, 2013), informal video gaming environments (Evans, Jones, & Akalin, 2017; Evans, Jones, & Biedler, 2014), STEM (science, technology, engineering, and mathematics) education programs (Chittum, Jones, Akalin, & Schram, 2017; Jones et al., 2015; Lee, Kajfez, & Matusovich, 2013; Schnittka, Brandt, Jones, & Evans, 2012), engineering courses (Jones et al., 2016; Jones, Epler, Mokri, Bryant, & Paretti, 2013; Mora, Anorbe-Diaz, Gonzalez-Marrero, Martin-Gutierrez, & Jones, 2017), K-12 classes (Chittum & Jones, 2017; Jones, Sahbaz, Schram, & Chittum, 2017; Martin & Morris, 2017; Remijan, 2017), and undergraduate face-to-face courses (McGinley & Jones, 2014; Tu & Jones, 2017).

Although the MUSIC model provides one way to conceptualize and organize motivation-related instructional strategies, the ARCS model (Keller, 1979, 1983) has also been used in the field of educational technology over many years. ARCS is an acronym for Attention, Relevance, Confidence, and Success, which align with some of the MUSIC model components: Attention aligns somewhat with the Interest component, Relevance aligns somewhat with the Usefulness component, and Confidence and Success align somewhat with the Success component of the MUSIC

model. The ARCS model does not explicitly include empowerment or caring strategies, likely because it is rooted in expectancy-value theory, which does not emphasize these constructs; nonetheless, the ARCS model has been a useful tool for educators and researchers (Li & Keller, 2018).

The Motivating Effects of Current Technologies

A particular technology is not, in itself, motivating or engaging to students. Rather, technologies are motivating to the extent that they affect students' perceptions in a certain context (such as the perceptions described in the prior section). Therefore, instructors and researchers need to consider how technologies affect the motivation and engagement of particular types of students in certain contexts. A technology that motivates younger students in one country may or may not motivate older students in the same country or in a different country. For example, in a review of studies using *Facebook* as a learning tool, Manca and Ranieri (2013) found that some studies reported that the use of *Facebook* increased students' interest and behavioral engagement (e.g., participation, discussion, exchanging information). Yet, they also found other studies reporting that students in other contexts did not want to join *Facebook* for their courses and/or that they did not like using *Facebook* for their courses. These findings suggest that *Facebook* may be a useful tool to increase students' motivation and engagement in some courses for some purposes, but not others, depending on the type of students and courses.

Although it's beyond the scope and space limitations of this chapter to explain how a variety of technologies can be used to motivate students in various contexts, I provide a few examples of current technologies that show promise for affecting students' motivation and engagement (along with relevant references that may be of interest to readers). Audience response systems (a.k.a. clicker technologies) have been shown to have a somewhat positive effect on students' motivation and engagement, yet the size of the effects depend on the course content, class size, and types of questions (Hunsu, Adesope, & Bayly, 2016). Virtual and augmented reality have been used to simulate learning environments, and they appear to be effective in creating learning experiences that can increase students' interest and enjoyment (Makransky & Lilleholt, 2018; Yeh & Lan, 2018). Game-based learning also shows the potential to motivate students (Giannakas, Kambourakis, Papasalouros, & Gritzalis, 2018), although the nature and design of the game tasks can influence students' motivation and engagement (Eseryel, Law, Ifenthaler, Ge, & Miller, 2014). Mobile devices (e.g., phones, tablets) continue to be studied in both formal and informal educational settings (Krull & Duart, 2017), and apps on these devices (e.g., *GroupMe*) have been used to facilitate engagement in discussion, group work, and other course-related activities (Gronseth & Hebert, 2019). Using social networking sites such as *Twitter* (Junco, Heiberger, & Loken, 2011) and *Facebook* (Moorthy et al., 2019) has also been shown to motivate and engage students in certain contexts. Intelligent tutoring systems and adaptive instructional systems

(Sottilare, 2018) are another approach to engaging students in learning. Other possible uses of technology include helping students with disabilities to stay engaged, such as by using an app on a tablet to regulate their emotions (Fage et al., 2019). To conclude, many different technologies are being used to motivate students in many different ways. The aim of instructors and researchers should be to understand *how* these technologies can be used most effectively to motivate and engage different students in different contexts.

Issues in the Study of Motivation and Engagement

In this section, I review some of the issues faced by researchers studying motivation and engagement. A strength of the current state of the research is that investigators are studying a variety of motivation and engagement constructs in many different settings. A good knowledge base exists upon which researchers can continue to build in the future. However, my goal in this section is to discuss some of the challenges that researchers should address in future studies to ensure that they are contributing as productively as possible to the existing literature.

Construct Issues

A problem with using constructs to infer a learner's motivation is that researchers often define these constructs differently or use the same name for different constructs (Schunk, 2000). This has caused confusion because it is difficult to compare and interpret findings across studies. Therefore, it is critical that researchers define their constructs precisely and that practitioners seek to understand the constructs as they are defined by the researchers. As a case in point, researchers studying *learner autonomy* need to provide their definition of this construct because there are at least five possible ways to interpret this concept, as noted by Benson and Voller (1997). As another example, the word *motivation* tends to be used "loosely" across studies to mean different things in different studies. Researchers need to give a specific definition of motivation in their studies. In addition, researchers should not substitute the word *motivation* for other constructs. If researchers are measuring self-efficacy, then they should refer to the construct as *self-efficacy* and not *motivation* because the two constructs are not synonymous.

Similarly, it is important for researchers to define *engagement* precisely because the engagement construct can be measured at different levels (see Fig. 1) and defined in different ways. Unfortunately, most researchers who have studied digital technologies in learning environments have not provided clear definitions of student engagement, as documented in a study by Henrie et al. (2015). Even when clear definitions of engagement are provided, there can be overlap in some definitions. For example, a student asking questions during a class could be considered an

instance of behavioral engagement (the student is behaviorally participating in class appropriately) or cognitive engagement (the student is curious or recognizes his confusion and is seeking clarity). Researchers need to decide how to handle these situations and explain their procedures clearly to their readers.

A problem in defining motivation separately from engagement is that some constructs can be considered both motivation constructs and engagement constructs. For instance, the *interest* construct can be viewed as a motivational construct because it predicts students' choices, effort, and persistence (Hidi & Renninger, 2006). Learners who are interested in a topic are often motivated to participate in tasks related to that topic. Yet, interest is very similar conceptually to emotional engagement, which refers to learners' affective reactions in the learning environment. Affective reactions play an important role in current conceptions of interest (Hidi & Renninger, 2006; Pekrun, 2009). Researchers who study interest need to provide a clear definition of interest and how it may be different from other motivation and engagement constructs.

Researchers have also documented the importance of affect and emotional states in students' motivation more generally (Kim & Pekrun, 2014); yet, more research is needed to clarify the relationships between emotions and motivation. In some studies, positive emotions are associated with increased student engagement (Reschly, Huebner, Appleton, & Antaramian, 2008; Skinner & Belmont, 1993), and emotion regulation has been positively related to monitoring motivation in online collaborative environments (Xu, Du, & Fan, 2014). However, in other studies, emotions have not significantly impacted students' behaviors (Zhou, 2013). Other studies have examined emotions as mediators. For example, the emotional construct "anxiety" mediated the relationship between students' success perceptions and their interest in a competitive gameplay activity (Hong, Hwang, Tai, & Lin, 2015). Further studies are needed to explicate the relationships between students' emotions, motivation, and behavior.

Methodological Issues

Given the confusion that can arise in defining constructs, researchers need to not only define their constructs precisely but also explain their construct measures thoroughly. Importantly, researchers need to ensure that their construct definitions are consistent with what their measures assess. At a minimum, descriptions of self-report measures (such as quantitative scales) need to include the name of the scale, an explanation of what the scale measures, the number of items in the scale, the number of response options and option labels (e.g., *strongly agree*), any modifications the researchers made to the original scale, sample items, and reliability and validity evidence related to the use of the scale previously and in the present study. Sample items can be especially useful in helping readers to understand what the measure assesses.

Because learners' motivation can vary over time (van Roy & Zaman, 2018), researchers need to consider *when* they are measuring learners' motivation and what conclusions they can draw based on their findings. It may be necessary to measure learners' motivation over several time points to assess learners' range of motivations. For example, one study examined the effects of an animated pedagogical agent on secondary students' perceptions of success and usefulness before, during, and after an inquiry physics activity (van der Meij et al., 2015). The researchers were able to document changes in students' perceptions over time and identify interaction effects between the experimental and control groups over time. This type of study can provide useful information about when learners' motivation-related perceptions change, which can help identify possible design elements that affected these perceptions.

Interpretation Issues

Researchers need to ensure that they interpret their findings accurately. Some researchers have assumed that if a motivation-related construct (e.g., self-efficacy) increases, that "motivation" increases, which may not be true. The fact that a student's self-efficacy for a task increases does not necessarily indicate that the student's motivation for the task increases because learners may believe they can complete a task (i.e., they have a high self-efficacy for a task), yet still not be motivated to engage in the task.

Conclusions

Because motivation, engagement, and related constructs are often defined and used differently, consumers of research (e.g., instructors, researchers, college students) must strive to understand the construct definitions, assessment measures, and procedures used by the researchers to interpret research findings appropriately. For example, consumers cannot assume that they know what "motivation" or a particular motivation construct means in a particular study; instead, they need to determine how the researchers defined it in their study. Researchers must also do their part by explaining their work precisely (e.g., defining all constructs) and discussing the strengths and limitations of their work. Although researchers may never agree completely on how motivation- and engagement-related constructs should be defined and used, clear explanations of constructs, assessment measures, and procedures will help others to interpret research findings.

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