Designing for Productive Disciplinary Engagement and Responsive Assessment with Situated Cognition and Expansive Framing

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Formative Assessment   Situated cognition   Expansive framing   Productive disciplinary engagement

This paper summarizes over two decades of design-based research that insistently draws on situative theories of cognition. This research is consistent with the current focus of AECT and the AECT Research and Theory Division. This focus primarily concerns enduring problems in education and only secondarily concerns the technologies used to help address such problems. The first decade of research consisted of collaborations with leading innovators in multimedia and immersive learning. This resulted in a "multi-level" model of assessment that balanced formative and summative assessment, balanced extrinsic and intrinsic motivators, and boosted performance without "teaching to the test." The second decade primarily concerned online contexts and included extended research of "open digital badges" and other web-enabled digital credentials. Embedding the design principles from Randi Engle (1965-2012) for productive disciplinary engagement and expansive framing resulted in a comprehensive framework called Participatory Learning and Assessment (PLA). This research qualified widely-held assumptions about "authentic" and "real world" instruction to address enduring problems such as online instructor "burnout," student social isolation, synchronous vs. asynchronous learning, and secure online assessment. Recent and current efforts extended these ideas to address historical and continuing inequities in education and help define a new consensus on our theories of learning transfer.

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AECT ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS & TECHNOLOGY

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Research & Theory

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The Research and Theory Division (RTD) supports the core mission of the Association of Educational Communication and Technology (AECT). The division:

- Promotes the development and advancement of theory.

- Promotes, presents, and disseminates research and scholarship that encompasses multiple perspectives.

- Advocates the study of social and cultural issues in the field.

- Supports, fosters, and mentors emerging scholars (AECT, 2023).

These goals are consistent with evolving goals of the broader association. The reorganized *Handbook of Research on Educational Communication and Technology* in the fifth edition (Bishop et al., 2020) highlighted a move away from educational *technologies* and toward educational *problems*. In the *Foreword* of the fifth edition, Reeves and McKenney pointed out that "the bulk of the scholarship in educational technology and communications has been focused on 'things' rather than on 'problems'" (2020, p. vii). In response, most chapters in the latest handbook "focus on difficult problems and how they can be addressed through *innovative* designs and *appropriate* technology" (p. vi, emphasis added). Reeves and McKenney pointed to persistent problems such as racial equity, teacher training, sustainability, and external partnerships as areas where AECT members should be directing their efforts.

In this spirit of innovative designs and appropriate technologies, this article summarizes a comprehensive approach to instruction and assessment that my colleagues and I call *Participatory Learning and Assessment*, or PLA. This approach emerged across two decades of design-based research. As will be elaborated, the first decade consisted of research-practice partnerships with leading innovators in instructional multi-media and educational video games; the second decade of research was mostly carried out in online learning using widely available tools.

This research has focused on enduring problems that transcend technology and that arguably eluded prior theories. Some of these problems have been relatively general:

- Balancing intrinsic and extrinsic motivation.

- Balancing formative and summative assessment functions.

- Raising achievement without teaching to the test.

- Overcoming historical and continuing discrimination and inequities.

Other problems targeted by this research have been more specific to online learning.

- Minimizing instructor burnout from excessive private instructor-student interaction.

- Reducing online learner isolation and increasing social engagement.

- Supporting online peer interaction in the absence of synchronous interaction.

- Ensuring valid online assessment evidence without intrusive and expensive online proctors.

This research draws intensively on contemporary situative theories of cognition (i.e., Lave & Wenger, 1991; Greeno, 1998). This work goes well beyond widespread characterizations of situated *learning* in terms of "authentic" and "real-world" contexts for instruction and assessment (e.g., Herrington et al., 2014). In particular, this work draws on the design principles that emerged in the research of Randi Engle (1965-2012) and colleagues. These principles suggest caution when drawing on authentic contexts defined by disciplinary experts. Instead, these principles suggest that learners problematize (i.e., contextualize) instruction from their own perspectives (which experts may or may not deem authentic).

This research addresses a fundamental issue that emerged across two "expert consensus study reports" from the US National Research Council (NRC) and its successor, the National Academy of Sciences, Engineering, and Mathematics (NASEM). These reports are written by a carefully selected group of experts following a strict process that captures the consensus of that committee at that time. *How People Learn: Brain, Mind, Experience, and Schooling* (NRC, 2001) provided a consensus view of learning and transfer that strongly reflected the socio-constructivist orientation of committee co-chair John Bransford and was embraced by many cognitive scientists and educational psychologists at that time. The title and contents of *How People Learn II: Learners, Contexts, and Cultures* (NASEM, 2018) reflected the "social turn" (e.g., Gee, 1999) that was already underway when 'HPL I" was drafted. HPL II revealed a new consensus that (a) contexts and culture matter a lot in learning and (b) that contexts and culture matter a lot more than a similar group of experts concluded two decades earlier. It is noteworthy that HPL I included a chapter on the transfer of learning but *not* a chapter on culture, while HPL II included a chapter on culture but *not* a chapter on transfer. This suggests a lack of consensus and perhaps open disagreement about the implications of this social turn for our theories of transfer. This is important because our theories of transfer have profound implications for designing instruction, assessing learning, and testing achievement. The research summarized here aims to support a new consensus by deeply exploring the implications of situative transfer theories for instruction, assessment, and testing in light of other more established theories (Hickey & Pellegrino, 2005).

Responsive "Multi-Level" Assessment

The first phase of this research aligned formative and summative functions across multiple levels of increasingly formal assessments. This research drew on the assessment levels used in the more naturalistic evaluations of STEM curricula in Ruiz-Primo et al. (2002) and the innovative "conversational" approach to formative assessment in Duschl & Gitomer (1997). This phase consisted of design-based research in partnership with educators and students learning to use the innovations of leading technology innovators. The core approach emerged in studies of the *GenScope* multi-media curriculum for teaching introductory inheritance developed by Paul Horwitz (Hickey, Kindfield, et al., 2003). The approach was quasi-experimentally validated in studies of GenScope (Hickey & Zuiker, 2012), the *Quest Atlantis* videogame (Barab et al., 2007; Hickey, Ingram-Goble, & Jameson, 2009), and STEM multi-media programs from the

NASA-funded *Classroom of the Future* (e.g., Hickey, Taasobshirazi, & Cross, 2012). The approach was further refined in studies of participatory new digital media developed by the media scholar Henry Jenkins (Hickey, McWilliams, & Honeyford, 2011; Hickey, Honeyford, &McWilliams, 2013), and considerations of vocational education (Hickey, 2005).

At the core of this approach is the idea that a broader situative view of learning allows the same assessment to serve a summative *function* for one form of learning and a formative function for a different form of learning. Doing so sidesteps socio-constructivist concerns that summative assessment *purposes* undermine formative purposes (e.g., NRC, 2001; Pellegrino, 2002). The four assessment levels aligned in most of this research included the following:

- *Immediate* informal assessment of discourse.

- *Close* reflections on engagement.

- *Proximal* assessments of understanding.

- *Distal* tests of achievement.

Thus, for example, the close reflections on engagement can summatively assess prior engagement while also formatively assessing conceptual understanding. Changing knowledge representations across levels requires learners to transform the knowledge gained from formative feedback at the prior level. Directly addressing the widely cited concerns of Messick (1994) regarding *construct-irrelevant easiness* (i.e., "teaching to the test"), this preserves the validity of scores as meaningful evidence of learning. As long as learners were not directly prepared for each assessment, those scores are reliable estimates of transfer when grading work, measuring achievement, and evaluating curricula.

Productive Disciplinary Engagement and Participatory Learning and Assessment

Our approach was first labeled PLA and further theorized when it moved into online learning around 2009. This approach was deemed "responsive" for responding to the different forms of knowing assessed at each level. As shown in Table 1, the assessments across levels capture (a) increasingly *formal* knowledge representations, (b) broader curricular orientation, (c) increasingly private *interactions* (after Hall & Rubin, 2013), and (d) lengthier *timescales* of learning (after Lemke, 2000).

Table 1

Responsive Assessment in Online Learning

	Example	Orientation	Formality	Interaction	Timescale
IMMEDIATE	Informal assessment of discourse via instructor comments on learner annotations and artifacts	Interactions	Very informal	Public	Hours
CLOSE	Summative assessment of engagement and formative assessment of understanding via student reflections	Activities	Informal	Local	Days
PROXIMAL	Summative assessment understanding and formative assessment of achievement via self-assessments	Curriculum	Semi-formal	Private	Weeks

	Example	Orientation	Formality	Interaction	Timescale
DISTAL	Summative assessment of achievement via secure time-limited multiple-choice achievement tests	Achievement	Formal	Discreet	Months

At the advice of James Gee, we embedded the design principles for *productive disciplinary engagement* (PDE; Engle & Conant, 2002) within these multiple assessment levels. These principles suggest that learners (a) *problematize* content from their own perspectives, (b) be given *authority* to solve the problems that result, (c) be held *accountable* to the discourse of the discipline, and (d) be given *resources* necessary to accomplish the first three principles. As introduced in Hickey and Rehak (2013), this synergy resulted in the comprehensive PLA framework. This new framework consisted of the five following situative design principles:

1. Use public contexts to give meaning to knowledge tools.

2. Recognize and reward productive disciplinary engagement.

3. Grade artifacts through local reflections on engagement.

4. Let individuals assess their understanding privately.

5. Measure achievement discreetly as necessary and appropriate.

In short, the first two PLA principles embrace Engle's PDE principles and the first assessment level, while the last three PLA principles represent the three other assessment levels.

A central idea in PLA is that public (to the class) contexts for student engagement were possible and reasonable when each student was problematizing content from their own perspective. Once each student has defined an initial context for problematizing course content, peers are ideally positioned to learn from each other, borrowing examples and insights, but necessarily transferring them to their own contexts, while thwarting plagiarism.

This public engagement was initially supported by the wiki tools in the open-source *Sakai* LMS, in what we called "wikifolios." Subsequently, we have come to rely on google docs (i.e., "G-portfolios") or the headers of new discussion forums in the Canvas and Blackboard LMS ("E-portfolios"). Working in Google Docs and discussion forum headers supports discussion via threaded instructor and student comments. But conventional forums are never used for substantive discussions in PLA. This reflects concerns that Thomas (2002) and others have raised about the incoherence and abstraction of traditional discussion forums. Instead, most interaction occurs via threaded comments directly on student artifacts or via social annotations on learning resources. In many cases, regular hyperlinked instructor announcements support additional focused interaction (see Feguson et al., 2010). This concrete interaction directly involving student artifacts and annotations supports a key insight that emerged early on in this work: *most students are happy to engage in discussions when their own work and their own ideas are in play.* Thus student posts or discussions are never graded and are seldom even required. This minimizes the dreary discussions that mandatory and graded posts often cause.

Extending PLA with Expansive Framing

The design principles for *expansive framing* emerged when Engle (2006) re-analyzed the student engagement and assessment performance from the original 2002 study. Engle searched for interactions responsible for "generative" learning that transferred readily and widely to performance assessments that were very different from the learning environment. She concluded that generative learning was best supported when students were (a) pushed to find numerous connections with people, places, topics, and times beyond the boundaries of the course and (b) encouraged

to position themselves as accountable authors who were contributing to a larger conversation that extends over time and space. These principles were rigorously validated in the experimental study in Engle et al. (2011) that compared expansively framed tutoring sessions in biology with "bounded framing" where learners were not pushed to make connections or position themselves as authors.

Engle et al. (2012) further elaborated on expansive framing. They explained how expansive framing could support *intercontextuality* (Bloome et al., 2009). This is where learners form so many connections between their prior experience, current outside goals, and future contexts that the learning process becomes part of a larger "encompassing context." Experienced writers will recognize this state as the epitome of authorship. In support of this seemingly elusive goal for students, Engle et al. (2012) provided five compelling explanations for why expansive framing and intercontextuality should support generative learning:

1. *More intercontextuality between settings.* Helping learners imagine how they will use what they are learning in the future naturally leads them to adopt more productive learning strategies rather than simply completing the assignment.

2. *Recognizing relevance.* If learners have successfully imagined using what they are learning, they are more likely to recognize those opportunities for transfer when they present themselves.

3. *Transfer in prior knowledge.* The third explanation of expansive framing is positioning learners as authors of their own ideas will encourage them to transfer in more of their own relevant prior experiences. To the extent that peers find these experiences useful for their own learning, learners will be encouraged to transfer in even more of their prior experiences.

4. *Accountability to content.* If students successfully author new content at the intersection of their experiences and course content, they are more likely to feel a sense of "ownership" over that content. This is likely to engender confidence when using that knowledge in potential transfer settings.

5. *Generalization of authorship.* If students take up enough opportunities to author new knowledge, this experience should generalize to other knowledge in the domain and ultimately to knowledge in new domains.

Engle and colleagues provided empirical examples from other research to support each of these explanations. Presciently, in Engle's last publication before her untimely death, the 2012 paper also detailed a potential research agenda for expansive framing in the form of three types of studies that might be used to examine how expansive framing impacts transfer. These studies included *disentangling experiments*, *comparative classroom studies*, and *microgenetic investigations*. In key respects, our program of research aims to lay the theoretical and methodological groundwork for pursuing such efforts and moving this research into online settings.

Motivational Implications of PDE, Expansive Framing, and PLA

Before considering our current and future efforts, we point out that embedded within and (sometimes) alongside this assessment-related work is a situative consideration of motivation. This strand is rooted in early efforts to reframe motivation research from the study of individual factors to the study of broader social and cultural factors (e.g., Hickey, 1997; Hickey & McCaslin, 2001; Sivan, 1986). This work aimed to help resolve the acrimonious debates over the consequences of "extrinsic" rewards for "intrinsic" motivation (e.g., Cameron & Pierce, 1994, vs. Ryan & Deci, 1996). Readers are reminded that hundreds of experimental studies of the so-called "overjustification effect" (Lepper et al., 1973) have shown that intrinsic motivation and engagement in free-choice activity are diminished when learners are provided with arbitrary "extrinsic" rewards for their efforts (Tang & Hall, 1995). Readers are also reminded that this seemingly intractable debate illustrates how experimental and meta-analytic methods can't resolve such fundamental issues rooted in competing theories of learning (see Lepper et al., 1999).

Central to both the motivation and assessment work is one of the most important but least appreciated aspects of situative theory. The so-called *situative synthesis* concerns the way that one reconciles the tensions between (a) the way humans behave and process information, (b) the way that humans make sense of the world around them, and (c) the way that social and cultural systems function. As introduced in Greeno and Moore (1993) and elaborated in Greeno (1998), the prevailing "aggregative" reconciliation uses the aggregated activity of individuals to explain the functioning of larger sociocultural systems. In motivation, this is perhaps best illustrated by Bandura's (2000) theory of *collective efficacy*, whereby the efficacy of the group is entirely made up of the self-efficacy of the members of the group. This aggregative characterization of social and cultural activity assumes that there is no "disembodied group mind" (p. 76) that is independent of the collective beliefs of the members.

In contrast, the situative synthesis characterizes the activity of individuals as "special cases" of sociocultural activity. In other words, human behavior & information processing, *and* human sense-making are ultimately best explained in terms of participation in social and cultural practices. A worthwhile caveat here highlights the difference between the work of learning scientists and the work of cognitive scientists. As a learning scientist, I have pursued new solutions to enduring problems by *assuming* that the situative synthesis is true (rather than arguing that it *is* true). In doing so, I sidestep the more fundamental naturalistic debates about the nature of human cognition, as played out in the widely-cited debate between Anderson et al. (1996) and Greeno (1997). Rather, I ask whether *assuming* that intrinsic *and* extrinsic sources of motivation are both special cases of socially situated activity reveals a new path forward in this seemingly intractable debate (Hickey, 2003). In pragmatic terms, this means moving beyond the prevailing study of sociocultural influences on individual motivation to explore how sociocultural and situative theories of learning lead to entirely new theories of motivation (summarized in Hickey & Granade, 2004) and related issues such as classroom management (Hickey & Schafer, 2006)

This new way of thinking about extrinsic incentives was explored in a quasi-experimental study of two pairs of carefully matched classrooms playing Quest Atlantis. Students in two classrooms were provided extrinsic incentives (i.e., "badges" for their physical and virtual avatars); students in the other two classrooms were instead encouraged to fulfill their curiosity and interests (following Lepper & Malone, 1987). Multiple levels of assessment and motivational measures revealed that the students in the extrinsic incentive condition showed significantly larger gains in disciplinary learning knowledge and significantly greater disciplinary engagement and situational interest. Rejecting the overjustification hypothesis, the students who were rewarded with extensive incentives demonstrated slightly larger gains in personal interest in the topics studied (Hickey & Filsecker, 2012; Filsecker & Hickey, 2014)

In a subsequent program of research, the situative synthesis uncovered promising new ways of using and studying digital "badges" and other "micro-credentials." In contrast to conventional assessments and credentials, these new open digital badges could contain actual claims of competence and links to web-enabled digital evidence supporting those claims. As elaborated in Casilli and Hickey (2016), these developments have profound implications because they downplay the value of traditional approaches to validation (of evidence) and accreditation (of credential value) while elevating the importance of perceived *credibility* (which has long been dismissed as an element of "face" validity, Popham, 1990). Naturally, these new ways of recognizing learning and achievement helped rekindle the debate over extrinsic incentives. Following their widely reported introduction in a national competition, several influential observers argued that such badges were inherently extrinsic (i.e., Jenkins, 2012; Resnick, 2012). But a longitudinal study of the thirty badges systems funded in the national competition (Hickey, Willis, & Quick, 2015) uncovered four very different types of badge systems:

- *Competency-based* systems awarded badges for individualized mastery of specific competencies. These badges were associated with external (i.e., "extrinsic") incentives such as course credit or new opportunities.

- *Completion-based* systems awarded badges for completing complex investigations, projects, and portfolios. These badges focused more on intrinsic sources of motivation such as interest and curiosity.

- *Participation-based* systems awarded badges for participation in social learning and group projects. Arguably these badges were more focused on "engaged participation," a more sociocultural form of motivation introduced in Hickey (2003).

- *Hybrid systems* awarded badges for two or three of the above functions.

A follow up study found that the participation-based badge systems were far more likely to result in a thriving badge-based "ecosystem" after the initial funding was exhausted. It turned that most of the other badge systems were unable to sustain (or, in some cases, even implement) their ambitious plans for individualized assessment of competency or completion (Hickey & Chartrand, 2020).

Reflecting the value of a new situative synergy involving both motivation and assessment, this work resulted in an extensive set of design principles for "where badges work better" (Hickey & Willis, 2017; Hickey, Willis, & Quick, 2015), a new framework for badge functions (Hickey, Uttamchandani, & Chartrand, 2020), and seven "new arguments" about motivating learning with digital badges. As elaborated in Hickey & Schenke (2019), these new arguments are:

1. *Digital badges are inherently meaningful.* Relative to traditional incentives and credentials, digital badges can contain specific claims and evidence supporting those claims that make them more meaningful

2. *Open digital badges are particularly meaningful.* Digital badges consistent with the Open Badges Infrastructure metadata system can be readily shared and read by humans and machines and can circulate in social networks where they can gain additional meaning

3. *Open digital badges are particularly consequential credentials.* Newly available "endorsement" features make it possible for issuers of open digital badges to invite organizations to formally endorse a class of badges before they are issued and then endorse individuals (e.g., members or that organization) to endorse a specific badge after examining the claims it contains in light of the provided evidence.

4. *The negative consequences of extrinsic rewards are overstated.* While the overjustification effect is real, a focus on it overlooks other relevant factors. These include the potentially positive short-term behavioral consequences of extrinsic incentives, their apparently positive neurological consequences (Hidi, 2016), and their joint potential for fostering "communal" motivation. It seems possibly and even likely that these other factors may well overwhelm any potential negative consequences that follow from the overjustification effect.

5. *Focus primarily on social activity and secondarily on individual activity.* This follows directly from the situative synthesis above. Theoretically, this means understanding both extrinsic incentives and intrinsic motivators and as special cases of socially engaged participation. Practically, this means studying the consequences of badge systems for learner discourse before considering their consequences for individual behavior or cognition.

6. *Situative models of engagement are ideal for studying digital credentials.* Most open digital badge systems are used to recognize learning in digital networks, most of which feature social components. Brown and Adler (2008) pointed out that digital social networks represent a fundamentally new form of engagement that transcends traditional models that focus on individual behavior or cognition.

7. *Study motivation and digital credentials at three increasingly formal levels.* Consistent with the study reported in Filsecker and Hickey (2014), this means examining the impact of badges on (a) productive disciplinary engagement, (b) intrinsically motivated engagement and situational interest, and (c) changes in personal interest and the broader educational ecosystem.

Recent and Current Efforts

Recent years have included efforts to use PLA to design a range of online learning contexts. This includes undergraduate courses in learning theory (Chartrand et al., 2020), graduate courses in education (Hickey, 2015a, 2015b), a fully online secondary school (Itow, 2018), self-paced technical training courses (Hickey, Duncan, et al., 2020), and "big" open online courses completed by hundreds (rather than thousands) of open learners (Hickey & Uttamchandani, 2017).

Another strand of our recent efforts is presenting the PLA framework in a less-theoretical manner for broader audiences. Hickey, Chartrand, and Andrews (2020) translated the five PLA design principles into 15 discreet steps for instructional designers who are presumably more grounded in cognitive-constructivist theories of learning. Hickey, Duncan, et al. (2020) presented a subset of those steps for designing g-portfolio courses. These steps were presented without the design principles or theory and were intended for educators who are moving online but have little or no grounding in learning theory. These two papers have been useful in two self-paced professional development courses used by hundreds of secondary teachers who transitioned to online learning during the pandemic (Chartrand & Hickey, 2020; Hickey & Harris, 2020).

One strand of our current efforts is advancing new design principles that are specific to particular audiences. Hickey and Harris (2021) extended PLA into a new set of design principles specifically concerning assessment in online courses:

1. *Embrace situative reconciliation over aggregative reconciliation.*

2. *Focus on assessment functions rather than purposes.*

3. *Synergize multiple complementary types of learner interaction.*

4. *Use increasingly formal assessments that capture longer timescales of learning.*

5. *Embrace transformative functions and systemic validity.*

6. *Position learners as accountable authors.*

7. *Reposition minoritized learners for equitable engagement.*

8. *Enhance the validity of evidence for designers, evaluators, and researchers.*

9. *Enhance the credibility of scores and efficiency for educators.*

10. *Enhance the credibility of assessments and grades for learners.*

Readers may note that this set combines principles from our prior efforts with a new principle from other current efforts (described next). This synergy illustrates a key point of design-based research—that it evolves continually.

This new strand of work embraces contemporary "asset-based" responses to historical and continuing inequities and discrimination to provide a practical and theoretical alternative to outdated "deficit-based" responses. This work draws directly from the critique of Engle's PDE principles by Agarwal and Sengupta-Irving (2019). Reviewing the four PDE principles summarized above, they first conceded that (1) problematizing invites students to transfer in their unique cultural and linguistic experiences, (2) granting authority to explore those problems gives students an active role in constructing knowledge, (3) accountability ensures that authority comes with a justification that is open to critique, and (4) providing culturally relevant resources might tap into diverse student interests.

Agarwal and Sengupta-Irving's (2019) concessions are important because they argue that PDE is inherently more asset-based than most other modern (e.g., socio-constructivist) curricular frameworks. Illustrating progress in this regard in the learning sciences, they questioned the extent to which the existing PDE principles will support students who identify

with minoritized communities, given the extensive evidence that such students are routinely "positioned out" of classroom discourse and/or positioned as lazy or disruptive by teachers and peers who are more advantaged and/or privileged (e.g., Paris, 2012). This means that implementing PDE (and by extension, expansive framing and PLA) while ignoring the realities of power and privilege limits support for equity. For example, Agarwal and Sengupta-Irving argued that problematizing content in ways that challenge culturally dominant ways of knowing can lead to racialized controversies that can harm minoritized learners. In response, they introduced new *Connective and Productive Disciplinary Engagement* (CPDE) principles for inviting minoritized students to position themselves as having unique experiences and (therefore) expertise. These principles are (1) use sociopolitical uncertainties (SPUs) to help problematize disciplinary knowledge, (2) curb undue social authority, (3) ensure equitable accountability, and (4) treat sociopolitical controversies as resources.

We have been using the CPDE principles to further refine a graduate course on educational assessment that has long served as the testbed for PLA ideas and practices. Over three annual cycles of iterative refinement, we have piloted new course features and then included the effective ones across assignments (Hickey & Lam, 2022, 2023). This work has resulted in a new framework that we are calling *culturally-sustaining educational assessment* (CSEA) that consists of a new set of assessment design principles:

1. Include optional sociopolitical uncertainties (SPUs) that invite, but do not require, students who identify with minoritized communities to position themselves as having valued relevant experiences and expertise.

2. Instructor informal assessment of disciplinary discourse should position *all* students as having valued experiences and expertise and carefully introduce additional SPUs as appropriate.

3. Encourage students to reflect on how social and cultural factors impacted their engagement without requiring them to speak for their community.

4. Instructors should read cultural reflections and directly respond to particularly compelling ones in public or private feedback as appropriate.

5. Include formative self-assessments for all student choice controversies to efficiently foster familiarity with those issues.

6. Include exam items that assess the achievement of some (but not all) of the controversies and SPUs and ensure that those items function appropriately.

Initial evidence from student engagement and anonymous course evaluations suggests that this approach has indeed been successful. For example, these new features appear to have encouraged students to introduce new SPUs beyond those presented in the assignments and to reveal minoritized identities (e.g., LGBTQ+) that might otherwise have remained hidden.

The other strand of our current work is helping ensure that Randi Engle is credited for the ideas that we are enthusiastically building on. While Engle (2011) summarized applications of the PDE principles through 2010 (and other related research), the larger body of work on PDE and then expansive framing has yet to be systematically reviewed. To this end, Hickey, Chartrand, and Harris (2021) systematically analyzed the 31 empirical studies that included these actual terms in their titles or abstracts. We are currently conducting a thematic review of the 2715 peer-reviewed publications that reference these two frameworks. Within this effort, Freedman et al. (2023) thematically analyzed the 32 publications concerning diversity, equity, and inclusion, while Harris et al. (2023) thematically analyzed the subset of this research concerning teacher education.

In this spirit of supporting Engle's legacy, we recently published an extended entry in an educational encyclopedia as a tribute to Engle's contributions (Hickey, 2022). Finally, a chapter in a forthcoming *Handbook of Educational Psychology* (Hickey & Lam, in press) argues for a new model of transfer that insistently includes ideas from Agarwal and Sengupta-

Irving. This brings equity and justice for the first time in discussions of transfer. In this way, we hope both sets of ideas find their way into a new situative/sociocultural consensus on transfer theory.

Appreciations, Concessions, Conundrum, and Conclusions

My colleagues and I deeply appreciate that these efforts were recognized by the runner-up *2022 Theory Spotlight Award* from AECT's Research and Theory Division. We also appreciate the foundations, agencies, and university initiatives (listed below) that supported many of these efforts, as well as the support and (sometimes) patience of the students, departmental colleagues, and administrators at the schools and universities where this research was conducted.

We concede that some of our ideas qualify (and potentially challenge) assumptions about learning theory and practice held by many members of AECT and the broader Learning Design and Technology community. We assume there will never be a "sociocultural revolution" that overturns or supplants prevailing theories and associated practices. For complex reasons, this is actually consistent with our goals and the situative synthesis summarized above.

While on the margins of this paper and this work, we believe that the situative synthesis can help address another theoretical conundrum in the LDT community and beyond. This conundrum concerns the divide between proponents of socio-constructivist theories and practices and proponents of cognitive-associationist theories that underpin artificially intelligent tutors, personalized adaptive learning technologies, and competency-based education. This divide helped fuel the dissolution/rebranding of the International Association of K-12 Online Learning (iNACOL) in 2018 and the establishment of several new organizations. Proponents of personalized competency-based learning within iNACOL formed the new Aurora Institute and broadened their focus beyond technology-based learning, with the continued support of the Gates and Zuckerberg foundations (Barnum, 2018, 2019). iNACOL members who advocated the socio-constructivist Community of Inquiry framework (e.g., Archambault et al., 2022) joined the newly formed *National Standards for Quality* and helped draft a new set of online teaching standards (National Standards for Quality, 2018) that emphasized collaborative learning and instructor-student relationships over personalized competency-based learning.

On the one hand, skeptics question the theory and evidence behind personalized competency-based learning (e.g., Enyedy, 2014, see Barnum, 2020; Pane, 2018; Pane et al., 2017). On the other hand, proponents point to supporting evidence (e.g., Koedinger et al., 2010; Connections Academy, 2018), while influential foundations and many policymakers appear convinced of the potential of personalized learning. Indeed our own research (Hickey, Robinson et al., 2019) found that one intelligent tutoring system was significantly more effective and dramatically more efficient in preparing students for success in a "gateway" undergraduate STEM course, compared to a remedial "developmental education" course. More pragmatically, hundreds of thousands of U.S. K-12 students are already attending full-time virtual schools or taking virtual courses from K-12 Stride Inc. or Connections Academy Inc. that largely rely on personalized computer-adaptive learning technologies. It seems that our academic programs might be well-served to more systematically advance and study these approaches.

In conclusion, we are encouraged by and encouraging of the many efforts in LDT and related communities to address the discrimination and injustice that continues to plague our educational systems. While much work remains to be done, recent years have seen a surge of relevant research in LDT (e.g., Glazewski and Ertmer, 2020), the Learning Sciences (e.g., Esmonde & Booker, 2016), and Educational Psychology (e.g., Zusho & Kumar, 2018). A central question that deserves further theoretical and empirical consideration is whether the claim that learner "agency" as supported by personalized competency-based learning is indeed the most effective and appropriate response to these challenges (as argued by Sturgis & Casey, 2018, see the Aurora Institute, 2023). It seems impossible that any single class of approaches can address this complex and multifaceted issue. Sustained, concerted, and well-supported effort is needed on all fronts.

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