

Moving toward dignity-affirming invitations to embodied participation in the design of learning environments

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Abstract: This symposium questions a basic assumption in the research and design of embodied learning environments: that the embodied forms of participation we design for will always be taken up as good and desired by participants. Across five papers, we reflect on our own design work across various contexts to think about how embodied learning spaces have and can invite embodied forms of participation that engage learners in meaningful participation while also affirming their dignity and human becoming. Across our work we seek to understand how learners' dignity intersects with embodiment. Together our research offers new directions in embodied methodologies and the design of embodied technologies and activities.

In the last decade, researchers and practitioners in the Learning Sciences have championed the embodied foundations of learning (e.g., McDermott & Pea, 2020; Nathan, 2022), leading to improved understandings of the role of embodiment in various settings (e.g., Vossoughi et al., 2020), the development of frameworks and technology-mediated learning environments that leverage learners' embodied actions to foster new learning (Abrahamson & Lindgren, 2014; Danish et al., 2020), and the description of embodied pedagogies that can broaden learners' pathways for understanding complicated concepts, particularly topics in STEM (DeSutter & Stieff, 2017). However, a tacit assumption in the majority of this work is that learners are willing and desire to participate in such physical and visible ways. While the affordances of leveraging embodied resources for sense-making are well documented, designing embodied learning environments without attending to the lived embodied experiences of learners and their "linguistic and cultural-historical repertoires" (Gutiérrez & Rogoff, 2003, p. 22) can reiterate deficit perspectives of learning and diminish opportunities for dignity affirming educational experiences. By dignity affirming educational experiences we are referring to the ways we position learners to have meaningful and substantive interactions with learning materials that also affirm their personal identity and cultural and moral sensibilities (Espinoza et al., 2020). Dignity and learning are inextricably linked. The ways that educational environments sanction certain forms of participation within them can either legitimize or delegitimize learners' sense of worth. This is particularly important to attend to in embodied learning environments because the body is not just a source of intellectual activity, the humanizing and dehumanizing experiences of the lived body also impact cognition (Bustamante et al., 2019). Therefore, as educators designing for embodiment, we must attend to learners' repertoires of practice in order to honor learners' participation rights and affirm their educational dignity (Espinoza et al., 2020).

The goal of this symposium is to initiate dialogue on how we currently create embodied learning environments, and how we might do so in ways that increasingly honor learners' repertoires of practice and offer them dignity-affirming educational experiences. To explore this issue, this symposium brings together researchers involved in designing embodied learning environments to present a range of examples in which they have asked the following question of their work: *How can we invite learners to participate in embodied learning experiences in dignity-affirming ways?*

The first two papers discuss the use of embodied pedagogies in classrooms showing ways to honor learner dignity through movement. The next two papers discuss the design and implementation of embodied Mixed Reality platforms providing methodological guidance for future designs. The fifth paper draws from trauma-sensitive instruction and offers principles for developing inclusive instruction in embodied activity. Taken together, these papers take a critical look at embodied learning and offer suggestions for revising research methodologies and technology design that can move us forward toward building dignity affirming embodied learning environments.

The symposium will be organized as follows: (1) Co-chairs will share a brief introduction introducing the themes and issues to be discussed (3 min); (2) each project will present (10 min); (3) the discussant Molly Kelton will examine themes and juxtapositions across the papers with an eye toward how affirmations of dignity require us to re-consider common assumptions made in the field about learners' bodies and their experiences of embodied designs; (12 min); (4) we will take questions from the audience (10 min).

The Relationality of Theatre Games: How Undergraduates “Warm-Up” to Embodied Learning

Lindsay Lindberg, Ananda Marin, Andrea Kern, Marjorie Faulstich Orellana

Despite movement being beneficial for learning (Nathan, 2021), the majority of learning experiences in the academy are sedentary (Barbour, 2004). In order to combat this sedentary bias, learning activities must be designed carefully to accomplish engaging embodied learning practices. This paper describes the importance of allowing university students the opportunity to physically engage with “warm-up” activities as preparation for the physical and cognitive practices of embodied learning.

Leading work in the Learning Sciences has called for research that values new forms of relationality as outcomes of learning (DiGiacomo & Gutiérrez, 2016; Vossoughi et al., 2020), expanding what it means to take changes in participation as evidence of learning (Lave & Wenger, 1991). Warm-up activities provide an analytic opportunity in which this change in participation is visible over a short period of time as participants move from seated and still, to moving and active. Warm-ups in the performing arts are often used for participants to attune to both themselves and to the rest of the group. A warm-up invites participants to attend to themselves and move in a way that is safe and comfortable for them, and also begin to shift their attention to a learning community that is larger than themselves. As learners gain an intrinsic perspective of the group they constitute together, we are able to see the ways that moving becomes consequential for their learning (Hall & Jurrow, 2015). This shift in attention is both conceptual and physical, and can be brought about in part through a series of warm-up exercises.

We present data from one multi-year ethnographic project attending to undergraduates in a college course and a student-centered after school program for K-5th grade students. Using video data from three lessons in which a theatre artist guided a group of 30 undergraduates through warm-up exercises, we highlight one warm-up activity: “pass the clap.” This activity consists of participants working together to “pass” a “clap” around a circle (person 1 makes eye contact with person 2 on their left before clapping simultaneously; person 2 then turns to their left and claps with person 3, and so on). We present examples of how a theatre warm-up provided the opportunity to guide participants from an “I” centric view to a “we” experience of a learning environment.

Within “pass the clap,” new relations emerged as participants learned the rules and played the game. Empathy and trust are important sensibilities to cultivate in learning environments, and are commonly absent from traditional learning contexts (Cooper, 2010), but are deemed essential and normative in theatre and arts classes (Cummings, 2016). A sense of empathy can be developed through warm-up activities, including “pass the clap.” When the claps were not completely synchronized (1 beat), but were syncopated (2 beats), the theatre artist introduced a concept she called “oops - ta da!” which celebrated “mistakes” (like a syncopated or “dropped” clap) and turned them into cause for celebration. If a clap was “dropped” the rest of the class would theatrically say, “oops”. The two people clapping would say “Ta Da!” and everyone would clap to celebrate the moment. This practice provided new forms of relationality for students to engage with, and allowed mistakes to be viewed as positive opportunities for growth, empathy, and resilience. In this analysis, empathy is important in that the theatre artist guided the participants to express empathy for themselves as well as for their peers. By taking a group of undergraduates in an educational theory class from seated desks to standing up, clapping, laughing, and making eye contact, the theatre artist used warm-up games to develop new relations and build empathy between participants through a warm-up activity.

These viewpoints-inspired (Bogart & Landau, 2005) theatre workshops supported the development of intercorporeality (Meyer et al., 2017), or a sense of *withness*. Hahn and Jordan (2020) argue that evidence of intercorporeality is a change in participants' identities from “I” to “we”. Embodied anticipations begin to stabilize as reciprocal responsibility develops, which also supports empathy and intercorporeal trust. We see this in the

analysis of “pass the clap” as over time, participants shifted their participation strategies - they leaned forward to “catch” the clap, and collectively worked to build a community. Analysis of the students’ movements through the space and physical participation in the warm-up showed a developed sense of *withness*, and a substantial repertoire of language and body practices for engaging with this undergraduate course. This broadens conceptualizations of what embodied learning can look like and result in with young adult learners.

This attention to embodied learning and the role of warm-up practices on learning communities signifies “an epistemological and pedagogical shift and draw[s] attention to bodies as agents of knowledge production (Wilcox 2009, 105),” (Wagner & Shahajhan, 2015). Expanding possibilities in higher education through studying physical warm-ups from an interactionist and embodied perspective highlights how individuals’ movements can be understood in relation to the whole group activities. Designing embodied practices that are physically and socially accessible to participants is one important way to work towards pedagogy that addresses questions of power, oppression, and privilege (Wagner & Shahajhan, 2015).

Pedagogical challenges raised from science teachers about inviting adolescents in mixed classes to experience full body exercises

Roni Zohar

I developed and investigated an *Embodied Pedagogy for Teaching and Learning Physics* in doctoral research carried out under the guidance of Abrahamson and Eylon (Zohar, 2018). (<https://www.youtube.com/watch?v=oLCTJQ-GCLQ>). This pedagogy coheres with the embodiment paradigm which impacted educational research (Nathan, 2021). The central principle of this approach is to enable the learners to *physically experience* before using definitions or verbal explanations. “Experience first, signify later.” (Abrahamson & Lindgren, 2014). Our assumption is that actual physical experience can be used as a unique resource for learning complex concepts in physics by associating them with daily body activities. The pedagogy involves physical-dynamical engagement such as directed bodily experiences (informed movements); improvisation in movement mediating between imagination and reasoning, body actions and feelings; techniques combining walking and talking; selected aspects of the Feldenkrais method and relaxation (Zohar et al., 2017). In this pedagogy, students work either in pairs or collectively on a choreographic task that gives rise to difficulties of coordinating movements. We argue that solving the coordination problems and expressing explicitly these solutions create significant learning opportunities.

The research was done in a 10th-grade high school for female students (two dance classes and one physics class). We conducted the lessons in the school dance studio using *embodied pedagogy*. Through two case studies, We explored the potential of this pedagogy for learning two complex physics concepts: balance and angular velocity. We found that the students exhibited creativity and a profound understanding of the abstract concepts taught. They linked the ideas to concrete representations, to their personal world and to their private interests. The depth and insight of physics understanding that the students manifested in their summative projects were much beyond what can be achieved in regular instruction (Zohar et al., 2017).

After the doctorate research, I conducted a professional development workshop for science teachers and supported them to implement the *Embodied Pedagogy* in middle and high school classrooms. The following paragraphs depict different ways science teachers responded to the *Embodied Pedagogy* in the context of certain exercises and topics unrelated to the concepts of balance or angular velocity.

Teachers raised issues regarding the implementation of certain full-body exercises among students. For example, in one of the movement exercises for release and concentration, we raised our arms and, in the summer, where there are odors from the armpit area, students asked the teacher not to do the particular exercise. In addition, some female teachers decided not to do other movement exercises involving tapping on the armpit.

Another example is the embarrassment that some students had in pairs or group exercises that require physical closeness or touch. We should be aware that the students will naturally stand next to their friends or next to whom they are attracted to. Science teachers raised this issue in the context of teaching the concepts of attraction and rejection in chemistry and electric current in physics in which students resemble particles.

Adolescents are in a challenging time in many ways and body image and appearance are very important to them, especially when they learn in mixed classes of males and females. There is considerable debate in the literature concerning the issue of teaching adolescents in single-sex classes (Frances, 2011). As illustrated in the examples above this may be a central issue in learning that is carried out in embodied learning environments (especially with full-body). From my experience as a researcher, educator and dance & improvisation instructor, it is important for instructional designers to be sensitive to students’ age and cultural settings and conduct such learning in a single-sex classes. My recommendation for the mixed classes is to ask a group of students to demonstrate and if possible, to choose a group with the same gender.

Regarding the personal movement exercises, the teacher should consider recommending to those who do not do the exercises in class to watch the demonstrating students and to try to do it at home after class. This recommendation coheres with research on brain patterns that indicates the potential of learning from watching others (Flanagan & Johansson, 2003). From teachers' reports and from my personal experience some students who decline from participating in class will try to do the movement exercises at home when they are alone.

In conclusion, although according to the *Embodied Pedagogy* approach it is better to experience with our own body and although embodied learning environments can promote understanding of scientific concepts (Zohar et al., 2018), we as researchers, educators, and teacher trainers need to be aware of dignity affirming experiences in integrating embodiment-based experiences in our practice.

Designing Mixed Reality with Indigenous embodied knowledges

Meixi, Sean Dorr, Daniel Keefe, Vicente Diaz

For many Indigenous peoples, coming to know oneself and relations has been an endeavor actualized through whole-bodied intelligences (Simpson, 2017). Learning and knowing through collective embodied experiences with lands and waters is fundamental to cultivating generations of loving, interdependent young people who learn to uphold and advance Indigenous laws and ethics. The growing scholarship on embodiment in the learning or "learning on the move" (Marin et al., 2020), is concerned with how people's mobility between and through places is both the content and the processes of learning (Gutierrez, 2008; Ma, 2017; Marin, 2020; Taylor & Hall, 2013). Interfacing this with Indigenous understandings of mobility and knowing, Indigenous knowledges exist and are advanced through the living and material engagements across human bodies and place (Marin, 2020). In fact, Diaz's scholarship on seafaring (2019) illustrates "how native roots and routes are not mutually exclusive but mutually and powerfully constitutive and generative" (p. 33). In this paper, we focus on the conceptual intersections of embodied participation, Indigenous knowledge systems, and the design of Mixed Reality experiences that begin from Indigenous embodied knowledges (Back to Indigenous Futures, 2019). Additionally, we provide examples of how grounding the design of Mixed Reality technologies can expand intergenerational participation in computer science and Mixed Reality technologies and support the revitalization of seafaring practices in two Indigenous communities in Minnesota.

This paper is based in the Back to Indigenous Futures project partnership with Dakota and Micronesian communities in Minnesota, a community-engaged project purposed towards cultural revitalization and shared learning of their traditional ecological knowledge systems. We view dignity-affirming contexts within the design of Mixed Reality developments in computer science as beginning from the intellectual grounds of Indigenous knowledge systems, specifically, *Paafu*. We target Mixed Reality as the medium specifically because this technology lends itself to embodied experiences.

Designing effective Mixed Reality, embodied experiences is challenging, in part, because the technology can take many forms; these are often described as existing along the Reality-Virtuality Continuum (Milgram et al. 1994). Immersion and presence vary across the continuum and affect the degree of embodiment that is experienced within each. Embodiment in the technological sense refers to what degree one feels the body they are inhabiting is their own, the location of the body is consistent with the mental representation of location, and there is a sense of agency in one's movements (Borrego et. al, 2019). When this definition is juxtaposed with the working definition of embodiment we've used thus far, the question then is not simply how well the technology affords advancing embodied Indigenous knowledge, but also how whole-bodied Indigenous intelligences might advance our conceptions of place, design, and mobility.

Paafu: Indigenous embodied knowledge to support mixed reality development

Paafu, from navigators of the Central Carolines, is a way of organizing the rising and setting of stars for teaching directionality - or simply put, to determine where one is in relation to other markers in seafaring (Diaz, 2019). In the following sections, we highlight the ways in which *Paafu* is conceptually and mathematically advancing the community-based Mixed Reality experiences. Specifically, we highlight using two concepts: (1) wave swells and (2) moving islands, and discuss the ways we are engaging these ideas to create a platform that Micronesian and Dakota families can engage with to tell, listen, and embody their stories of lands, canoes, and journeying across place.

Indigenous design 1: Wave swells In *Paafu*, the outrigger of the canoe faces in the direction of *Tan Mailap* (Altair rising), from whence also flows a major swell from due east of the island of Polowat, for in traditional Carolinian seafaring knowledge, stars and sets of swells serve as proxies for each other in their respective domains (Diaz, 2021), rendering both especially effective instruments for reckoning direction, as well as timing. Moreover, being attuned to the particular and idiosyncratic rhythm and tempo of a particular

swell/rising or setting star, as experienced bodily in the pitch and roll and sonics of a canoe, can also indicate location, direction, and time. Recognizing these embodied skills and knowledges as a set of inherently mathematically dense activity, our design of Mixed Reality experience also acknowledges and builds upon the rigourous of Indigenous design that is embodied in this knowledge set.

Indigenous design 2: Moving islands Likewise, we build upon the traditional Carolinian seafaring concept of *etak*, or “moving islands,” an ancient technique for calculating distance traveled, or position at sea, by triangulating the speed of the islands of departure and destination with that of a third reference island, as these are further “plotted” at sea and in the sky (through the aforementioned reflexivity and indexicality between sea and sky as illustrated in the correlative status between certain swells and certain rising and setting stars. (Diaz, 2011; 2021). Recognizing the sky and the sea as mutual markers and time keepers for directional and navigational purposes is also another way to recognize how Indigenous personhood is reckoned through mirroring relationships with the natural elements through their instrumentalized usage for the purposes of travel in both geographic and ontological terms: relating to the relationships that exist between swells and stars, sea and sky, in nature, is also an example of how Indigenous people “plot” selfhood relationally, in time/space. for the purposes of efficacious travel and for defining one’s sense of self historically and culturally. How might this concept, or better yet, technology of moving islands challenge the temporal, spatial, ontological, and bodily-assumptions and norms that inform and underwrite computer graphic design and production? In what ways might Mixed Reality technology help explain as well as benefit from these radically different instruments of time/space imaging?

This paper traces the generative tensions and possibilities of refusing colonial assimilation (Diaz, 2019; Back to Indigenous Futures, 2019) into dominant ideas of the development of Mixed Reality and experiences, by centering the particular knowledge systems of a community and using that as the grounds for digital technology development. Instead of discourses of technological access that presume deficit-orientations common in STEM, we are interested in how first, Indigenous knowledges can advance our understandings of technology, design, and embodiment, and secondly, how these Mixed Reality tools can also further Indigenous knowledge and futures for Indigenous young people, families, and communities.

Building meaningful participation using embodied Mixed Reality technologies

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We represent a larger team of researchers who developed an embodied Mixed Reality (MR) learning environment that blends elementary grade students’ movement through play with a virtual interface depicting various scientific phenomena (Danish et al., 2020). Designed for classrooms, we use motion tracking technology to track the movement of up to 10 students at a time while remaining students make observations and mediate their peers’ activity. Our environment focuses on coordinated, collective activity amongst participants, and thus *meaningful embodied participation* occurs when students work collectively, using their bodies and adapting their actions in response to their peers, to explore scientific phenomena.

Although our previous studies show that creating embodied learning opportunities for young children supported complex scientific modeling (Danish et al., 2020), our design has implicitly assumed that all children wanted to participate in this physical way. Their “willingness” to participate in embodied activity over time was never questioned. Espinoza et al. (2020) explain that meaningful participation is deeply intertwined with students’ educational dignity influencing how they act in educational environments. This led us to question how meaningful embodied participation through our environment affirmed or did not affirm the dignity of students. In this paper, we revisited a past study to interrogate moments where the lack of focus on dignity affirming designs may have inadvertently led to problematic experiences for our participants. We examined multiple interactions before settling on two episodes for further analysis in which first and second grade students were exploring states of matter. We then utilized methods of Interaction Analysis, IA, (Jordan & Henderson, 1995) to explore how some students’ meaningful embodied participation did not appear to elicit a potentially desired response from peers, and yet which upon further reflection in our IA sessions may have thus been disappointing or frustrating for the participants. We discussed how student participation was meaningful, what student interactions were missed by the facilitators (us), or peers during each moment, and questioned how we could have better supported students in dignity-affirming ways. The following case descriptions include the main observations from each case followed by some general implications for embodied technology design.

In the first episode, the class was divided into three groups and each group took turns modeling states of matter using our MR platform. One student, Mary, did not join her modeling group when it was their turn to embody a state of matter. She quietly observed from the back of the class while her group constructed a model of gas particles with their bodies, and other groups shared observations from the sidelines. After the round ended, the classroom teacher asked Mary if she wanted to participate in the embodied activity which she declined. The

teacher then offered Mary an alternative role as an observer and annotator which she accepted. In this way, Mary was provided an alternative way to engage in the modeling without having to physically work with her peers in the moment raising the questions: (1) What methods could we have used to learn why Mary did not want to participate in the embodied activity? (2) As the embodied activity unfolded and Mary's personal goal changed, how could we have made space for Mary to express her changed goals? (3) Might we have benefited from asking Mary and the other students how they'd like to participate in the first place?

In the second episode, the instructors had half the students modeling states of matter by moving while the other half of students gestured to give students-as-particles energy from the outside. As this activity unfolded, the screen depicted particles changing states of matter which caused modeling students to move faster but the gesturing students to stop and watch the screen. We also found that modeling students then dominated the following discussion, even though gesturing students raised their hands to share their ideas. This made us question whether our platform, which is designed to track the modeling students' movement in the center of the room, may have inadvertently privileged their embodied activity over the gesturing students' activity. Since the MR environment is limited by the number of students it can reliably track in a classroom space, how might we adapt the environment to involve the observing students' embodied activity? How might we better support observers in taking as active a role in discussing their peers' embodied activity as they'd like?

Ultimately, these cases suggest the need for pedagogical measures and tools that regularly check for student willingness to participate. Also, designers of embodied classroom technologies need to carefully examine how the different forms of participation might privilege certain students' conceptual contributions over others.

Every Body Belongs: Principles for Inclusive Instruction in Embodied Learning Activities

Morgan Vickery

Often student participation in embodied activities relies on a set of normative ideals that students' bodies look, function, and respond in a particular way. These ideals are grounded in the valuation of mesomorphic, masculine, motor-competent, and 'able' bodies as worthy of attention and praise whereas expressions of difference (in activity participation, in setting, or in degree of physicality) often fails to activate the same level of social capital within peer groups (Fitzgerald, 2005) and is treated as noncompliance by instructors (Goodwin, 2020). I draw upon scholarship related to trauma, disability, physical education, yoga, and dance in learning to consider how principles for inclusive instruction in these domains might provide insights for designing embodied activities where all bodies are welcomed, respected, and valued. Here, I propose a 3-faceted framework for designing embodied learning environments as trauma-sensitive, body-positive, and disability-inclusive.

There is a breadth of work which has been conducted to research and implement trauma-informed practices in schools at the interaction, classroom, school, and system levels. The 'trauma-sensitive' facet of this framework expands on Goodwin's (2020) 'graduated instructional prompts' framework which offers principles for trauma-sensitivity during embodied activities: (a) the avoidance of language which might be interpreted as a demonstration of dominance or function as microaggression (for example "everyone can see you," "stop being disruptive," or the use of condescending/infantilizing tones), (b) respecting bodily autonomy, sanctity, and ownership and thus avoiding physical contact/coercion, (c) recognition that student non-cooperation or resistance to participation may indicate that triggers may be present, and (d) respecting students' refusal to participate.

The second facet refers to dance, yoga, and body-image scholarship to inform principles for constructing body-positive and dysphoria/morphia-sensitive embodied learning environments. Considering how such environments frequently require the collection of video movement tracking data, I raise concerns regarding the use of tools which make depictions of one's body visible to students (i.e. mirrors, projected camera views, etc). The ongoing use of mirrors and self-views in performance arts spaces has been shown to lead to students' use of self-objectifying language, comparison of bodies to their peers, and increased distress resulting from self-focused attention (particularly for students experiencing body dysphoria/morphia) (Radell et al., 2020). Picket and Cunningham (2017) also convey the importance of diverse representation of bodies in embodied learning spaces, acknowledgement of body nonconformity and authenticity by instructors (for example, sharing when a pose is difficult or impossible), the removal of hierarchical and evaluative language to refer to movements (i.e. not referring to certain poses as "beginner" poses), and normalizing asking questions, admitting limitations, approaching discussion of bodies from a holistic perspective (as opposed addressing appearance / size).

The third component for this framework draws on disability and physical education literatures' emphasis on attending to the social dynamics that exist between students; the use of competitive games where students may be excluded or activities in which students may feel the need to "blend in" are cited as problematic in disability-inclusive physical education spaces (Bertills et al., 2019). Furthermore, the explicit teaching and reinforcement

of cooperative learning practices (i.e. shared negotiation of goals, shared decision-making, constructive feedback, approaching individual accountability, etc) in peer groups has been shown to promote inclusion of students with both physical and cognitive disabilities (Grenier, 2006). Grenier (2006) also notes how ‘inclusion’ is not synonymous with “the same experience for all students in the same setting” but that instructions should work to identify, remove, and/or provide accommodations for barriers that students may encounter in activity.

Together these fields suggest that student experiences in embodied learning environments are multifaceted and cannot always be recognized or explained solely through observable actions and talk. Thus, I argue that we must embrace an expanded version of the ‘universal trauma’ principle (Goodwin, 2020) to teaching; we must presume that all students have experiences which lead to vulnerability in non-trauma sensitive, non-body-positive, and non-disability-inclusive environments. By making this assumption and over-compensating for these assumptions in our work, we ensure that students do not fall through the cracks regardless of how their trauma, mental health, and disability manifest externally. To conclude, I refer to Fitzgerald’s (2005) recognition that the normative ideals that (re)enforce these barriers for students are deep-seated in the habitus of modern-day schooling and thus cannot be resolved exclusively with such instructional “superficial remedies.” I acknowledge that the above categorizations should not be treated as comprehensive but rather a vehicle to facilitate discussions about expanding our notions of inclusion in embodied learning activities.

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