

RITUAL AND IMPROVISATION: WAYS OF RESEARCHING, WAYS OF BEING IN MATHEMATICS CLASSROOMS

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We stood in a circle with nearly 60 sixth, seventh and eighth grade students on stage in a middle school auditorium and played ‘Vroom’. Vroom requires participants to pass an imaginary ball of energy around the circle through different physical and vocal cues. Laughter filled the room as students shouted loudly, made exaggerated physical movements, and paid careful attention to where the ball of energy was as it circulated the space. Tanner led the exercise as McCloskey participated and took notes. Vroom is one of many improv exercises and games that teaches and provokes groups to practice the ethos of improvisation we discuss in this article—an ethos we submit here to the field of mathematics education as a powerful way to frame, analyze, and reimagine our discipline.

Improv is an art form in which performers co-create spontaneous, theatrical performances. Improvisers work in groups to discover unscripted and unrehearsed scenes. Improv has been made popular as a comic form, and many people are familiar with the television show *Whose Line is it Anyway?* Our view of improv is that while it is undeniably joyful, improv is not inherently comedic and, contrary to prevalent perception, improvisational practices are not without structure or discipline. It is the ethos of improvisation that is enabled from the practice of disciplined improvisational methods that we consider in relation to mathematics education in this article. Practiced improvisers follow an ethos of improvisation that requires them to 1) say “Yes, and” to everything that happens in an improv scene, 2) defer to the collective, 3) share power with their fellow improvisers, 4) overcome their inhibitions, and 5) perceive, accept, affirm, and build off the offering of all other participants in the improvisation. We submit for consideration how these dispositional attributes might inform the teaching and study of mathematics.

Vroom is a game that Tanner has used to teach and practice the improvisational ethos. He has used this game and others like it in high school classes, college classes, professional and academic workshops, and community events to facilitate mindful, engaged, and equitable communities. Indeed, in less than an hour under Tanner and McCloskey’s guidance, the middle school students mentioned above—a group that had not yet worked together for long—began practicing an improvisational ethos by working across racial, gendered, socio-economic, and status difference to create improv scenes. Students courageously took risks as

they moved from this game into exercises that required them to create and perform short improvised scenes in which they explored contentious material such as teacher-student dynamics, family relationships, and politics. We offer that this improvisational ethos might inform our mathematics classrooms in similarly powerful ways. Indeed, we can imagine the middle school students taking part in the activities we describe below taking courageous risks to solve mathematics problems, ask powerful mathematical questions, or working together to construct new mathematical understandings.

We conceptualize an improvisational ethos of mathematics education by bringing two lines of scholarship together in this article. We highlight and theorize intersections between *ritual* in mathematics education and recent developments in *improvisational pedagogy*.

We build off King’s (2001) claim that thinking about conceptually-orientated mathematics as jazz improvisation “provides some clues to how the mathematics education community” might “think about appropriate forms of curriculum and instruction” (p. 14). This article explores improvisation in relation to a provocation offered by Towers and Martin (2009), that “further research employing the improvisational frame would enable us to gain a more nuanced understanding of the processes at play when groups interact to create knowledge of mathematics for teaching” (p. 48). Mathematics education researchers such as Shechtman and Knudsen (2009) have empirically studied the effectiveness of using methods from improvisational theater in professional development designed to support the teaching of mathematical argumentation. This article complements this recent interest in improvisation by conceptualizing and developing what we are describing as an *ethos* that underlies what improvisation might afford our field in terms of facilitating emergence, discovery, and more equitable communities. Indeed, this improvisational ethos offers a unique way to conceptualize mathematics education in light of current findings about the value of teachers’ “eliciting and using evidence of student thinking; facilitating meaningful mathematical discourse; and supporting productive struggle in learning mathematics” (NCTM, 2014).

Conceptual framework

In this section, we build a conceptual framework of an improvisational ethos as it relates to mathematics education

by clarifying connections between the ideas of *ritual* and *improvisation*. We then offer that the *ritual/improvisation* relationship is both similar to and different from the *ritual/exploration* relationship. These similarities and differences, we offer, are illuminating to researchers and educators with interest in creating flexible and complex teaching and research in mathematics education.

How we conceive of *ritual*

McCloskey (2014) developed ritual as an analytic framework and compared it to other constructs in mathematics education research. Informed by Quantz (2011), we offer the following definition of ritual for use in understanding practices in mathematics education: Ritual is that aspect of action that is formalized, traditionalized, symbolic, performance. Ritual is *formalized* because participants in a mathematics classroom practice bring certain expectations as to its appropriate temporal and spatial organization. In other words, rituals come to ‘look’ and ‘feel’ a certain way. Ritual is *traditionalized* because the practice appeals to the past or custom in some way. We see this in mathematics classrooms when teachers appeal to ‘the way they learned things back in my day’ or when a student introduces the way a parent encouraged or required them to complete an assignment. We consider how the ritual aspect of a practice is *symbolic* when we look for the meanings participants and observers make of a practice *over and above* the specific, situational function the practice serves. Regardless of its utility in the face of research, the ritual remains largely in place, thereby communicating implicit messages such as what and who ‘counts’ as being good at mathematics. Finally, we consider the *performance* nature of a practice with ritual aspects when we think about the ways that the participants in a practice are responsive to the ways that their engagement will be seen or heard or ‘read’ by others.

At an even more fundamental level, we share Gill and Boote’s (2012) critique of mathematics education’s tendency to “invoke culture as an explanation, rather than what needs to be explained” (p. 5). Gill and Boote argue for a more collective conception of culture, which contrasts with an individual conception (in which culture is understood as an influence on teachers’ and students’ individual psychologies), and with an interactional perspective (in which culture is understood as an emergent characteristic of individual classrooms). Ritual is a mechanism by which culture is propagated, or by which culture is upended and something new emerges.

It is important to note that the purpose of an analysis using the lens of ritual is not to determine whether a particular classroom practice is a ritual or not. After all, most social activity is likely to have at least some aspect of ritual to it, and it is therefore more illuminating to consider the degree, nature, and functions of the ritual aspects of any one practice, without lapsing into essentialism. Nor is the purpose to determine whether a practice is effective or ineffective, from a teaching or learning of mathematics perspective. Rather, the framework is useful as a way of noticing, describing, and understanding aspects of mathematics classrooms that may be cultural in nature.

How we conceive of *improvisation*

As mentioned at the outset, we draw on an ethos from improvisational theater that acts as a critical response to theories and practices that over-plan, over-design, and over-rationalize mathematics education. Researchers have considered the relevancy of the theory and practices of improvisation to a variety of academic fields. We are interested in how improvisation can be used to contribute different rituals to mathematics education that facilitate emergent acts of discovery in mathematics education. Improvisation is often associated with free play or unruly creativity. On the contrary, improvisational artists follow a series of disciplined rules and practices in order to facilitate improvisation and spontaneous co-creation. Indeed, theatrical improvisation is a particular way of being that expects emergence or difference in each new iteration or implementation of practice. Further, theatrical improvisation understands reality as inherently rife with potential that refers back to that which has come before. Improvisational practice, as briefly highlighted in the description of Vroom earlier, provides ways to work both with and against ritualized approaches to the teaching and studying of mathematics. We conceive of meaningful mathematical learning as an informed and principled adherence to the discipline of mathematics which allows teachers to employ rituals in the service of improvisational, genuinely mathematical interactions.

We regard improv as a way of being and a way of teaching that is directly antithetical to the many harmful power structures that are in play in traditional schooling. White supremacy, patriarchy, capitalism, colonialism, ableism, nationalism, and classism: all of these strains contribute to the logic that informs our institutions. Our field has been inextricably shaped by Enlightenment thinking. Consider Descartes’ “*cogito, ergo sum*” in which the individual is the primary unit of interest, independence is privileged over connectedness, and thinking is the primary activity so that cognitive epistemology is privileged over embodied and relational ways of knowing. Improv does not just nurture connection among people; it presupposes connection among people. Improv offers us an ethos that forces us to acknowledge, practice, and rely on the connections between us that in fact are already there but left untended. We have previously studied the ways that an improvisational ethos serves anti-racist work (Tanner, 2018) with young children in classrooms. We have come to believe that improv offers a way forward toward more democratic, more expansive ways of knowing and working together.

How are rituals and improvisation related to one another?

Whereas some conceptualizations of ritual portray it as opposite of ‘exploration’, we regard *ritual* and *improvisation* as distinct yet complementary activities to one another. That is, improvisational activity can and does happen within ritual activity, and ritual activity can and does serve improvisational goals. This is different from Sfard and Lavie’s (2005) argument that ritual activity often must precede meaningful mathematical activity. Whereas Sfard and Lavie widened the theoretical door by making the argument

that ritual activity might not always and only be rote (they draw upon young children learning to count in order to build community with and please their parents), Sfard and Lavie nevertheless relegated ritual activity as valuable only insofar as it contributes toward the trajectory toward ‘meaningful’ mathematical activity.

We are both former classroom teachers and current practitioners of improvisational theater. In our experience, a community that is successfully creating improvisational theater together relies on rituals. As argued above, an improvisational ethos is not simply a free-flowing, unstructured form of creative interaction. Rather, it requires knowledge and skills which are developed through study and engagement in the discipline. Like any discipline, improvisational theater is a community, and initiation involves participation in particular rituals. There are many rituals within the improv community, including any number of warm-up exercises, like Vroom, in which participants stand in a circle and practice the ‘Yes, and’ philosophy by making eye contact and interacting with one another in a variety of ways (Sawyer, 2003). Learning and mastering these exercises (which are sometimes called ‘games’) leads to the development of a) specific performative skills that one draws upon in performances, b) a general orientation toward the principles listed above, such as deferring to the collective and letting go of personal agendas, and c) identities as members of a local community of improvisers as well as possibly a larger community of improvisers. In this case, the performance of these exercises and subsequent practice with this particular improvisational ethos serve as mechanisms of symbolic initiation but also of substantive learning. These exercises are functioning as rituals that serve the improvisational ethos.

Relatedly, we have both had the experience as classroom teachers of implementing a familiar, cultural ritual within our classrooms and yet also improvising within the expected form, for example through teaching the standard long division algorithm that parents expect to see their children perform on homework and structuring final projects so that students create representations of their learning and reflections from the course. We both have co-created along with students and colleagues, new rituals of assessment in our classes, for example by replacing letter grades with feedback, self-assessment conversations, and multiple opportunities for revision and growth. And analogously, this more improvisational form of assessment should not be mistaken as anything-goes, unstructured, undisciplined, and lazy practice. On the contrary, the new ritual provided a rigorous, demanding, highly structured practice in which teachers and students alike provided extensive documentation, justification based on shared principles, with the goal of building consensus. And so, in our teaching and in our improvisational theater, we have found the benefits of drawing upon existing rituals, co-creating new rituals, always being guided by an ethos drawn from improvisational theater.

What might ritual and improvisation mean for mathematics teaching?

If meaningful mathematics learning is conceived of as the ability to participate in the practices of mathematics, then teaching improvisationally can be conceived as a skillful use

of rituals to foster improvisational interactions between students and disciplinary ideas. This refinement of the ‘instructional triangle’ (Cohen, Raudenbush & Ball, 2003) emphasizes the importance of emergent interactions that cannot be wholly predicted. Furthermore, the triangle itself (teacher—student—mathematics) is positioned within a social, cultural, and political context which implies pre-existing rituals that constrain but are available for use as resources. These rituals—many of which are received customs with limited relevance at best or harmful effects at worse (consider the timed test, as discussed in McCloskey, 2014)—have heretofore been ignored or dismissed or trivialized by many mathematics educators seeking to promote reform. But a ritual critique suggests that such a ritual must be acknowledged and reckoned with, perhaps looking for opportunities for improvisational approaches that might supplant the less desirable ones.

In any case, an improvisational approach to the rituals of mathematics teaching foregrounds the importance of the teacher as a creative, cultural, mathematical human being. The teacher must be a professional who knows the discipline of mathematics well enough to direct improvisational interactions. The teacher must engage relationally, drawing upon emotion and other embodied ways of knowing in order to be an effective leader in a classroom. Certainly this directly contradicts claims that de-personalized teaching and learning arrangements such as scripted curricula, online classes, and individualized instructional programs can offer rich, meaningful learning experiences with mathematics. Other activities with ritual aspects in mathematics classrooms that we have identified are: teachers’ textbook usage, teacher and student posing of story problems, expectations from teachers and curriculum developers that students ‘show their work’ and the routine of ‘going over homework’. When these practices are implemented without awareness of the weight they bear in our current cultural moment and without awareness of the ways they may undermine and contradict authentic meaning-making, then the ritual aspects may constrain their effectiveness or render them resistant to revision.

Some examples

Here we provide some examples of ways improv has been and could be applied to a mathematics classroom setting. We have organized these into three categories: the first two approaches use improv to teach pre-determined, specific mathematics (mathematical content and mathematical processes, respectively). The third approach is a fundamental re-imagining of teaching mathematics from current, typical ways of ‘doing school mathematics’, but for us this approach is most consistent with the ways that improv has shaped our own teaching. In each section, we refer to the game of Vroom to provide a point of comparison.

Using Vroom as a pedagogical tool for teaching mathematical content

In this first category, we place uses of improv for teaching specific mathematical content. Imagine, for example, a teacher incorporating a rule into the game of Vroom in which, if a participant declares “hexagon!,” “triangle!,” “dodecagon!,” or the

name of another polygon, the appropriate number of subsequent people (in this case: 6, 3, 12, respectively) must spin around before the implementation of the next Vroom command. In this case, students would be practicing—in an engaging and active way—mathematics vocabulary.

A similar use of improv as a pedagogical tool is proposed in McKnight and Scruggs (2008), who share a lesson plan called *Geometry Walk* developed by Bradley Berlage, a middle school mathematics teacher. This improvisational activity invites students to experience and explore geometric forms by moving around the classroom embodying a variety of forms such as “point, square, sphere, acute angle, *etc.*” (p. 151) After embodying these forms, students are asked to reflect through writing or discussion, so that they are provided opportunities to connect their kinesthetic movements with verbal representations and terminology.

In both the polygon Vroom activity and the *Geometry Walk* activity, students are interacting with specific mathematical content (in both cases: mathematics terminology and classification) through improv exercises.

Using Vroom as a pedagogical metaphor for practicing mathematical processes

In this second category, teachers would not necessarily incorporate mathematical ‘content’ into the game of Vroom, but would rather use Vroom as an example for practicing norms of acceptance, collaborative problem-solving, risk-taking, and playfulness. So, after playing Vroom for 10 minutes, using whatever commands and rules the leader may choose, the teacher then may ask the students to reflect together on what they did and how they are next going to work on applying the ‘spirit’ of Vroom to their mathematics. For example: as the students work in small groups on problems together, they may try to work on listening attentively and affirmatively to what the last person said and to refer to it in their own ‘next steps’.

Knudsen and colleagues (2018) provide several suggestions for using improv games and exercises to practice skills and dispositions that can then be brought to bear on developing mathematical argumentation for middle schoolers. For example, in the improv game *Gift Giving* participants stand in pairs and take turns offering imaginary gifts to one another. The first partner holds an imaginary object in her/his hands, approximating the object’s physical attributes as best s/he can. They hand it to the partner, who accepts the imaginary gift, pretends to unwrap it, and then says, “Thank you for the _____”, making their best guess about what it might be. The first partner then says, “You’re welcome” and proceeds to explain why they got that particular gift for them. This exercise, in addition to providing practice for the theatrical skills of objectwork, provides an opportunity for a mathematics teacher to help students practice accepting conjectures as gifts (‘Yes, and’) during mathematical argumentation. Knudsen and colleagues write “Conjectures are like gifts—they are offers that one student makes to the group. And while in the conjecturing phase, the conjecture is acknowledged and received without judgment. The analysis and discussion about its truth are left to the next stage, justification” (p. 50).

Using Vroom as a pedagogy: committing to the practice of an improvisational ethos

This last category is the one that is the most challenging to think about. But as practicing improvisers, we have experienced that improv can be a profound practice that transcends fun activity and informs the way we view and interact with the world. Indeed, we both have also come to regard improv as challenging and difficult work, in which ‘fun’ seems less apt than descriptors like ‘rewarding’, ‘joyful’ and ‘challenging but meaningful’.

When Tanner taught Vroom to his high school English class, they went on to begin every class session with 5-10 minutes of playing Vroom. This activity became more than an active, playful way to transition the class into a collaborative community—although it was that, too. Over the course of the semester, Vroom became a ritual opening for the participants in that class, a formalized, traditionalized, symbolic performance. It was formalized in that the game was played with students standing in a circle with particular postures, stances and physicalities. The game was traditionalized in that when Tanner initially introduced the game to the class, he shared the commands and rules he had learned, but over time the class added and amended to the rules so that they developed their own customs; the game became a unique blend of inherited and created practices. The participants performed the Vroom ritual for and with one another, and it is the symbolism of Vroom that we are most interested in here. Tanner has described elsewhere (2018) how games like Vroom came to carry significant meaning for the participants. It both signaled and substantiated that this English class was an emergent, shared enterprise for the entire group. Authoritarian, individualistic hierarchies were disrupted. Vroom both indicated and enacted a change to the typical classroom dynamic.

This can be difficult to imagine in a mathematics classroom, but we claim here that a true improvisational ethos would mean that mathematics class would feel and look more like a game of Vroom. A typical question we hear is, “But if we taught our math classes improvisationally, how we would ever cover all the topics we need to cover?” To this we offer that if we remain beholden to current curricular mandates which require ‘coverage’ of hundreds of ‘standards’ this is indeed impossible. Teaching improvisationally requires a release of control and an embrace of trust, and this is only possible if teachers and schools are more accountable to the discipline of mathematics than to current lists of mandated standards for ‘coverage.’ This may seem far-fetched, but we remind readers that in the not-so-distant past, there was a mainstream proposal in the U.S. mathematics education landscape for a curriculum based on fewer, bigger mathematical topics which gained a considerable amount of traction. NCTM’s *Curricular Focal Points* (2006) pointed toward a K-8 curriculum in which each grade level focused on three big mathematical ideas. In such a framework, teachers and students would have the time and space to respond to one another improvisationally. The point here is not to hash out the doomed fate of CFP, but rather to point out that the hyper-standardized moment in which we find ourselves is not inevitable. It would be possible for mathematics classrooms

to look and feel more improvisational, more like Vroom. We have experienced this in our own classroom teaching and our research agenda involves implementing these characteristics in larger and longer mathematics classroom settings.

What might ritual and improvisation mean for research into mathematics teaching?

When it comes to *research* into mathematics teaching, we can be informed by improvisation and ritual in several ways. Firstly, ritual and improvisation can serve as analytic categories which enable researchers to notice new and different things. Elsewhere (e.g., McCloskey, 2014) we have written extensively about the promise of ritual as analytic lens, particularly in the new questions that it raises. Why do we do the things we do in our mathematics classrooms? What functions do these practices hold for various groups, in different times and in different places? Here we add to that argument by proposing that improvisation provides answers to at least one of the questions that we care about: How can we be respectful to tradition and to the obligations (Herbst & Chazan, 2011) and expectations of social groups outside the classroom while also being responsive and respectful to the current needs of the students in our mathematics classrooms? Improvisation offers guidelines and principles for moving forward in this way. Classroom mathematics teaching does not occur in a vacuum, despite mathematics' reputation as an apolitical, acultural, and disembodied discipline that is separate from the people and places from which it is practiced. Teachers and especially researchers would do well to develop tools and approaches that allow them to notice and utilize the lenses and methodologies afforded by ritual and improvisation.

Conclusion

Whereas ritual has served for us to raise new and important questions for the activity in mathematics classrooms, improvisation points toward ways of teaching, ways of researching, and ways of being. Zazkis and Mamolo (2009) argued that mathematics educators need to facilitate “unanticipated students' thinking and the teacher's skill and sensibility in developing new explanations and new instructional engagements” (p. 56). Improvisation provides a unique and specific way to take up that charge. Many of us who value the discipline of mathematics and the practice of collaborative, responsive meaning-making, now seek to account for the cultural influences that have largely been ignored or regarded as hindrances toward 'reform' efforts. Those of us who advocate that all students need increased opportunities to make meaning and to engage in authentic, exploratory ways with important mathematics can look to ritual and improvisation for insights about productive paths forward. Ritual invites us to consider emotion, body, culture, collectivity, and psyche in the classroom and an improvisational ethos invites us to move beyond consideration toward evocation and enactment. Indeed, the ethos being created and practiced in the game of Vroom is one that we see as transferable to mathematics teaching and research.

Critical education scholar Chris Emdin recently delivered the keynote address at the NCTM Annual Meeting. In his talk

he called for mathematics classrooms to become more joyful. All students deserve access to the mathematics practices and joy of mathematics. But too many students' school mathematics experiences have focused solely on developing procedural skills, leave them unprepared to engage in rich discourse, to take risks with conjectures, and to create new mathematical justifications. Such classrooms are characterized more by compliance than by creativity and connection. We regard an improvisational ethos as a way to practice a different set of emergent rituals that produce more flexible and responsive norms that allow for more explicit access to joyful mathematical experiences. Such improvisational mathematical experiences are not only more joyful, but are also more authentic to the actual doing and practice of mathematics itself. Additionally, by becoming attuned to the omnipresence of rituals in our classrooms—both productive ones such as the Vroom exercise from improv, and the unproductive ones such as a limited reliance on the rituals of 'the way we used to do math', our classrooms can become more emergent, collaborative spaces. Mathematics classrooms can become more joyful. Understanding rituals and improvisation can help us.

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