From the Court to the Classroom: Opportunities for Engagement, Learning, and Identity in Basketball and Classroom Mathematics

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This study explored support for engagement in 2 settings: a high school basketball team and high school mathematics classrooms. Specifically, the study examined 3 aspects of these practices: (a) access to the domain, (b) opportunities to take on integral roles, and (c) opportunities for self-expression in the practice. Drawing on videotape and interview data from 2 African American high school students’ participation in basketball and mathematics class, as well as interviews with players’ teachers and coaches, this article analyzes how these 3 aspects of practices afforded differential engagement across settings. Findings indicated that the practice of basketball supported deep engagement as players had greater access to an understanding of the domain, were assigned and took up a unique role that was integral to the practice, and had opportunities to express themselves and feel competent. The high school mathematics classroom differentially afforded these opportunities, with 1 student taking them up and the other being unable to, and thus being less engaged. Potential implications of these 3 aspects of the practices for students’ practice-linked identities and learning are discussed.

Studies of learning in settings outside of school have documented differences in individuals’ abilities to solve problems across settings, illustrating that cognition
and learning can vary significantly by context (Lave, Ochoa, & de la Rocha, 1984; Nasir, 2000; Saxe, 1991, 1999). For instance, in a study of African American basketball players’ understandings of average and percent, Nasir (1996) found that although players could solve problems accurately involving average and percent problems in the context of basketball, they often had trouble solving the very same problems in a school format. Similarly, Taylor (2004, 2005) found that elementary school children demonstrated deeper understanding of place value when using currency other than base-10 blocks. The use of currency was associated with a common practice of purchasing candy at corner stores. Indeed, individuals in many cultures perform complex thinking in activities outside of school that they may not demonstrate in a classroom or school-related setting (Carraher, Carraher, & Schliemann, 1985; Lave & Wenger, 1991; Nasir, 2000; Rose, 2004; Saxe, 1991).

One conclusion researchers have drawn from these findings is that teachers might support better learning in school if they build on the understandings students are gaining outside of school (e.g., Rosebery, Warren, Ballenger, & Ogonowski, 2005). For instance, in one study researchers documented the nature of domain-relevant knowledge in Latino communities through home visits and interviews, then incorporated adults and ideas from community and family practices into school lessons (González, Amanti, & Moll, 2006; Moll & González, 2004). As another example, Lee (1993, 1995) drew on African American students’ cultural knowledge of the language form of signifying to teach literary analysis in inner-city Chicago high schools. This bridging of out-of-school and school knowledge is an important pedagogical technique and has shown promise with respect to learning outcomes in school. However, this line of research may not support a developed understanding of how out-of-school settings support learning or why students find them more engaging. Furthermore, knowing why students find settings outside of school engaging may also have implications for the way learning is arranged in school. However, it is critical to note here that not all out-of-school practices are highly engaging—we do not make this assumption in this article. Nonetheless, we do think it is instructive to better understand the nature of activity structures and features of engaging out-of-school practices.

Research concerned with understanding the nature of learning in out-of-school settings has highlighted important features of these learning contexts that matter for student learning. One important aspect of learning settings outside of school has been the distributed nature of problem-solving. This has been highlighted in studies of decision making among ship navigation personnel (Hutchins, 1995, 1997), as well as in studies of candy sellers in Brazil (Saxe, 1991, 1999) and elementary school students shopping in corner stores in California (Taylor, 2004, 2005). Often in these settings, lone individuals do not solve problems, but rather problem solving is embedded in a social network that collectively performs necessary tasks and cognitive work.
A related point is that learners or novices in out-of-school settings often have access to experts as a part of their practice (Lave & Wenger, 1991; Rogoff, 1990, 2003), whereby newcomers are apprenticed into the learning of knowledge and skills. In practices such as midwifery, tailoring, and dairy packing (Scribner, 1985), learners have regular and sustained contact with experts and are able to learn through observing and having responsibility for carrying out parts of important tasks. Thus, this apprenticeship structure serves as a kind of scaffolding (Nasir, Warren, Rosebery, & Lee, in press).

Another critical finding from studies of out-of-school learning settings has to do not only with how the learning is arranged, but also with the kinds of problems learners are likely to encounter and how they view those problems. In out-of-school settings, the problems that arise are often practical or applied (Bell, Bricker, Lee, Reeve, & Zimmerman, 2006; Goldman, Martin, Pea, Booker, & Pilner, 2006; Stevens, Mertl, Levias, & McCarthy, 2006), and they arise as participants are seeking to solve bigger problems or reach broader goals (Nasir, 2000, 2002).

Although these features offer some insight into some characteristics of informal settings that center around participants having resources for problem solving (which clearly has implications for learning and engagement), they only touch on ways that out-of-school settings can be organized to support engagement more directly.

The relation of student engagement in school to academic achievement has been an area of intense study in educational psychology over the past 20 years (Bandura, 1997; Dweck, 1999; Eccles, Wigfield, & Schiefele, 1998; Skinner, Chapman, & Baltes, 1988; Stipek, 2002). School engagement has been linked to factors such as students’ expectancy of success (Eccles et al., 1998) and control (Connell & Wellborn, 1991) over school-related tasks; it is viewed as a critical mediator between aspects of students’ motivation and their school success. An increasing number of researchers have also begun to connect affective components of students’ motivation to learn, including their sense of belonging and relatedness in the school setting, to their overall engagement (Connell & Wellborn, 1991; Furrer & Skinner, 2003). In a recent study, Furrer and Skinner found that children’s sense of relatedness not only predicted the stability of their engagement over the school year but was also linked to their feelings of control. They defined engagement as “active, goal-directed, flexible, constructive, persistent, focused interactions with the social and physical environments” (p. 149) and argued that it is related to the notions of the self that one constructs in relationship with others in particular social contexts. Our study supports the importance of a player’s feelings of support for one’s sense of self in both the contexts of basketball and school mathematics.

Engagement, then, has to do with students’ feelings of competence and mastery in a social context, as well as their sense that the context will offer relationships that support and value their unique selves. Researchers know less about the features of out-of-school settings that support a sense of connection to those settings
for learners. How does the organization of activities and participation structures foster engagement in the ongoing flow of interaction and tasks?

Developmental and policy research may offer some insight. Researchers concerned with understanding the ways that community-based organizations support youth have highlighted the interpersonal aspects of participation and engagement in after-school and community-based settings (Eccles & Gootman, 2002; Heath & McLaughlin, 1993; Hirsch, 2005). Specifically, this research has shown that in spaces outside of school, young people often have opportunities to build positive mentoring relationships with adults and are offered safe spaces within which to participate competently (Eccles & Gootman, 2002; Heath & McLaughlin, 1993). In Hirsch’s study of Boys and Girls Clubs, he found that adolescents highly valued the sense of “family” in the after-school program, and this sense of family and personal connection with adults and other young people was a positive resource for adolescents negotiating difficult neighborhood contexts and supported their engagement in the practices of the after-school club.

This research offers some insight into the kind of features of out-of-school settings that may promote engagement, but much more work is necessary. Furthermore, researchers might also consider how features of learning settings are structured in such a way as to make it possible for differences in levels of engagement to occur. Experts know little about variation in participation within and across learning settings, though they know that such variation exists, both over time and across individuals. Researchers have little in the way of theory to account for such individual differences in learning and engagement within the same practices.¹

IDENTITIES AS LINKS BETWEEN ENGAGEMENT AND LEARNING

As we have noted, research on engagement has linked engagement with a sense of belonging. Similarly, research on identity and learning has highlighted the intertwining of identity and learning and has pointed out that when an individual feels that his or her identity is linked to settings, he or she is more engaged and learns more (Nasir, 2006; Wortham, 2006). However, scant research exists that has examined the supports for identity development in specific cultural practices: What is it about some out-of-school learning settings that makes them positive environments for the development of identities that support learning?

Furthermore, although identity has recently been a popular construct in the educational literature (Sfard & Prusak, 2005), there is not consistent agreement about

¹Here and throughout the article, we use the term practice to denote recurring, goal-directed activities that involve two or more people. We use the term activities to denote the smaller tasks that make up practices.
what is meant by the term identity. Some theoretical perspectives view identity as a global construct—the stable and coherent sense one comes to in adolescence and carries with him or her from place to place (Erikson, 1968; Jensen, 2003; Phinney, Horenczyk, Liebkind, & Vedder, 2001). Other formulations view identity as a way that one is positioned and positions himself or herself both in the moment and over time across social practice. This conception of identity highlights how it is locally and interactionally constructed and shifts in relation to the social setting and actors (Hand, 2006; Holland, Lachiotte, Skinner, & Cain, 1998; Nasir & Saxe, 2003). Not surprisingly, these two perspectives remain largely distinct in the literature. We join Wenger (1998) in conceptualizing identity such that we keep in perspective both its local and global dimensions as we explore the interaction between them. Clearly we as people don’t remake ourselves in every social interaction, but just as clearly we don’t achieve identity for once and for all at any one point in time—we renegotiate it across the life span and in the multiple contexts of our lives. In this article we focus on what we call practice-linked identities, by which we mean the sense that there is a connection between self and the activity. More specifically, practice-linked identities are the identities that people come to take on, construct, and embrace that are linked to participation in particular social and cultural practices.

Practice-linked identities are fundamentally related to engagement. Recall that Furrer and Skinner (2003) characterized engagement in terms of both the level and intensity of one’s interactions in a social context. The practice-linked identity one negotiates in relation to a practice is shaped by the nature of engagement that is afforded and constrained within the features of the practice. In other words, practices, by virtue of their organization, norms, conventions, and structures, afford different levels of engagement for participants, and thus differentially support the development of practice-linked identities. Because practice-linked identities are defined as a sense of connection between the self and the practice, it is likely that in practices in which an individual feels this sense of closeness, that he or she is more likely to be more engaged. That is, the person is more likely to participate more extensively and more intensely.

The literature on engagement and learning in practices supports the idea that settings vary in how well they support the engagement of participants in general. We argue that they may also vary with respect to the range of the types of participation that are considered appropriate. Some practices may afford a wider range of acceptable engagement, whereas others may require high levels of engagement from all participants. For instance, in the practice of performing a surgery, deep engagement may be the norm. In the practice of watching television, a wider range of engagement may be acceptable—one could be watching intently, multitasking, or even sleeping.

This article focuses on the ways that two contrasting settings (basketball and school math) make opportunities for engagement available and thus support prac-
tice-linked identities and learning. Specifically, we highlight three aspects of the practices of high school mathematics and basketball\textsuperscript{2} that seem to be important for engagement: (a) access to the domain as a whole, as well as to specific skills and concepts within it; (b) integral roles and accountability for carrying out those roles; and (c) opportunities to engage in self-expression, to make a unique contribution, and to feel valued and competent in the setting. Let us explain a bit more about each of these three aspects of practice. By access to the domain, we mean the extent to which participants have the opportunity to learn both about the practice as a whole and about the specific tasks and subskills that make up domain knowledge. By integral roles, we mean the extent to which participants are held accountable for particular tasks in a practice and are expected to become competent and even expert in a subset of activities that are essential to the practice. By opportunities to make a unique contribution and feel valued, we mean ways that students can incorporate aspects of themselves into the practice. In this article, we explore these three aspects of the practices of high school basketball and high school mathematics classrooms that we studied, illustrating how they have implications for youths’ engagement. Furthermore, we examine the variation in the range of engagement that each practice afforded and in how these practices were taken up in different ways by individual participants.

**METHODS**

**Participants**

Participants were eight African American high school varsity basketball players at a school site in Northern California, four of whom were high math achievers and four of whom were what we called average math achievers. High and average achievers were chosen on the recommendations of teachers and coaches. The original design was to compare high and low math achievers. However, the school from which these data were drawn did not allow low achievement. Students who were struggling were provided assistance through mandatory tutoring sessions and other extra help. One student in this study was even required to repeat a grade so that he would fulfill college requirements. Additionally, the players’ ability to play on the basketball team depended upon their grades in school. They had to maintain a B average in their classes, which they were not allowed to miss due to unexcused absences. Players had more or less difficulty in meeting these standards in their mathematic classrooms, which we characterize in terms of average and high achievement. Low achievement was not possible because players would be

\textsuperscript{2}It is important to note here that we are referring only to the specific practices that we studied. Both high school math classrooms and basketball teams vary tremendously, and we do not contend that our very small sample is representative of these practices as a whole.
dropped from the team. Average math achievers in this context were students who struggled in mathematics, even though their grades may have been Cs with the help that they received. Players were in the 10th and 11th grades and participated in a range of math classes at their school, including algebra, geometry, and pre-calculus. We focus on the participation of two focal players for the purposes of this article: Kevin and Vaughn. We focus on these players as their experiences and patterns of participation were representative of the high and average achievers, respectively, and because they were both equally strong basketball players and students who were serious about their schooling, but who varied in the nature of their participation in their mathematics classrooms.

Research Methods

The study drew on a variety of research methods, including observing players as they participated and learned in basketball practices and games and in their respective math classes. Observations occurred regularly twice weekly over the course of a school year and were captured with fieldnotes and videotape. Players were also interviewed about both their learning and their participation in both settings. Furthermore, coaches and teachers were interviewed twice (once early in the fall and once in the spring) so we could get their views on each student/player and the nature of that student’s participation in class and on the team. Mathematics classes (including Algebra II, geometry, and pre-calculus), basketball practices, and games were videotaped each for approximately 19, 15, and 12 hr, respectively. Content logs were made of the videos, and key episodes were identified and transcribed. Identification of the key episodes was carried out by an analysis of the activities in the basketball versus mathematics context in terms of the implications for students’ identity and learning. In particular, the analysis focused on the features of these contexts and the individual participation within them (e.g., the structure of the activities; the roles for students, teachers, and coaches both with respect to learning the skill or concept and with respect to one another; and the opportunities for students’ participation to be validated vs. criticized or marginalized). Additionally, cases were compiled for each of the eight players that included their interview transcripts, coach and teacher interviews about them, and key episodes. The episodes we include in this article were chosen from many similar episodes and are representative of common patterns of participation and interaction for these students/players.

FINDINGS

First we introduce Kevin and Vaughn as our two focal students. We then compare their engagement both within and across basketball and the mathematics class-
room by analyzing episodes of interaction and the perspectives they and the
teacher/coach offered on the students’ participation. In particular, we examine
Kevin’s and Vaughn’s engagement in the two practices with respect to the three as-
pects of practice—access to the domain, integral roles, and opportunities for
self-expression and competence—and reflect on the type of practice-linked identi-
ties they developed. Finally, we consider high school basketball and high school
mathematics as contexts for engagement and learning. We offer an analysis of how
engagement is structured in these practices generally and in relation to the devel-
opment practice-linked identities.

Our goal is twofold. First, we examine the interaction between these practices
and the individuals who engage in them, keeping at the fore the many layers of nu-
ance in understanding the organization of learning settings and individual engage-
ment. Second, we hope to make apparent key differences in this math classroom
and basketball team with respect to the support for engagement. We begin by intro-
ducing our two focus students, Kevin and Vaughn.

Introducing Kevin and Vaughn

Kevin and Vaughn were equally good basketball players, consistently playing on
the first string during important games and scoring regularly. Although they were
in the same geometry class, Kevin was significantly more successful that Vaughn
in terms of both his class participation and his grades. Both boys took basketball
and their academic achievement seriously, thus the differences between them were
not due to lack of effort or persistence.

Kevin

Kevin, a junior, was a top student and a top scorer on the basketball team. He
stood more than 6’ tall and had a large build. Although Kevin held high status in the
school context (in part due to his presence on the basketball team), he did not seem
to define himself by his team membership. He was a bit of a loner both in and out of
class, which might have been due, in part, to his mood fluctuations.

Kevin’s geometry teacher described him as an extremely bright and committed
student. Kevin’s participation in his geometry class was marked by intense concen-
tration, high engagement, and consistent contributions, which positioned him as
one of the academic leaders of the class. He did not participate in the off-task, so-
cial interchange in class. When the teacher was up at the board reviewing home-
work problems or lecturing on new topics, Kevin verbally tracked the moment-
to-moment line of mathematical inquiry and had a unique ability to anticipate the
teacher’s questions before she asked them. He was always prepared: for tests, to
discuss homework, and to engage in class discussion.
He was somewhat shy, usually stressed out, and was thorough and careful about his work. At times he would get upset with himself, or others, for making mistakes or failing. On the court, this led to frustration when his team did not perform at the level of the players’ abilities, and it caused him to be hard on himself when he missed a crucial move or shot. When he was in one of these moods, he was difficult to talk to and to coach. In the classroom, where he was not reliant on others, he did not often let himself get into incompetent positions.

**Vaughn**

Vaughn was a sophomore at Eastside who stood about 6’3” and was slender but muscular. He was personable, handsome, and popular among his fellow players and classmates (especially the girls). Vaughn struggled with academic work, seemed committed to achieving the grades necessary to participate on the team, and wanted to go on to college. He was also a high scorer for the basketball team.

Vaughn stood out among his fellow players in that his consistent disposition was playful and cheerful. He always greeted people with a smile and, if he knew them well enough, a bit of friendly teasing. This came across in his interactions with his geometry teacher, whom he respected and yet teased all the time.

On the court, Vaughn was the backbone of the team. During practice drills he was focused, particularly if the coach was anxious or eager to make the practice count. If the intensity started to slip, however, Vaughn could become absorbed in the social interaction taking place. His tendency to move back and forth between concentration and relaxation was also evident in his participation in his mathematics class, where he alternately zoned out and came back to attention with regularity. This zoning out was facilitated, in part, by the seat he chose—in the very front of the room, nearest to the teacher, on the left side. The seat was set apart from the rest of the seating in the room and was turned perpendicular to face the side of the teacher.

Although Vaughn participated in his math class, he rarely volunteered or spontaneously responded. When asked a question, though, he could usually answer it with a little help from his teacher. He didn’t seem particularly curious about mathematical concepts. He seemed to be in the class to get his work done, which he did on a fairly regular basis.

We now turn to an examination of how these two students participated in school math and in basketball. First we present episodes of the students’ activities in the geometry classroom and in basketball to explore how Vaughn and Kevin participated in them and how the organization of the activities supported their participation. We then offer an analysis of their engagement in basketball more broadly and how this reflected their practice-linked identities as basketball players.
Kevin and Vaughn in Basketball Practice

In the following transcript, the team is practicing for an upcoming game. As it is an important game in their season, practice is even more intense than usual. The following vignette occurs about 45 min into the practice, and players are using one half of the court to practice their defensive play, where they switch covering particular offensive players as the other team moves on the court. The team is subdivided into two squads for the purposes of this drill—some players are wearing white jerseys and are playing offense, whereas the other team is wearing red jerseys and are playing defense. Both Vaughn and Kevin are wearing red and are thus practicing the defensive play. As this vignette begins, players are on the court in their positions, one white and one red player are at the half-court line, and the white player is preparing to bring the ball into play. The coach is standing between them explaining the “box” defense.

There are three critical points to notice in this transcript. The first is that the relation between the subskills and moves they are making in practice is explicitly tied to what they will need to know to be successful in the game, and that domain knowledge is facilitated by the feedback structure. The second is that each player is held accountable for fulfilling the responsibility that comes with his position. The third is that despite the fact that this practice is quite serious and intense, opportunities for self-expression and play are allowed as a part of the practice (not just as a subscript). Note that in the transcript, C stands for the coach and P for an anonymous player. The numbers on the far left indicate a turn. Parentheses denote actions or explanations.

Episode A

1  C: Alright, let’s go, ya’ll can switch up. You can start up and Chris *(another player)* can yell box, then after you run it you can go to four across or you could go five out or either ya’ll can just get there or Chris can call it out. OK so run one thing into another and you don’t have to run the same thing back to back, necessarily.

2  P: Last time, Chris ran box *(He uses his hand to show the trajectory that Chris ran)*, so I still go over there, or?

3  C: No, box you come over here then the two of you screen over here. Alright? OK. *(to all)* So, we can start in box. *(interrupts himself)* So these are the three main of the five main sets. Tomorrow on the board we’ll go over all five sets. And you know what’s going to happen because you’ll either set in a box four across or five out. OK, so here we go. Sam, you’re going need to communicate and if you see that he gets caught up, you’re saying switch and your stepping out in Bettencourt, so of course, if Sam’s going to Bettencourt, he’s going to try to drive into Samson so again so he gets it, everyone is halfway between your man and the ball. *(Vaughn and another player are playfully physically acting out what this would look
like in a very low-key way) And if there’s a lull period, let’s say they swing the ball around a little bit and Joseph, you and Samson and Bettencourt are on the other side, the weak side, you may have a chance to be able to switch, when they are dribblin over here or whatever, alright, so if you can get back on ‘em that’s even better. Alright, here we go. So we’re goin’ box. (The coach steps off to the side and the offensive player brings the ball into play by stepping over the half-court line. The player with the ball passes it to his teammate right under the basket [who is being guarded by Vaughn], after struggling a bit to find an open player to pass to. As the defensive players move and “swing” the coach verbally affirms that they are doing a good job [“good,” “good”]. The player with the ball scores. The coach gently chastises Vaughn for allowing this score.)

4 C: Aw, come on Vaughn, Come on now. The guy you’re guarding (he means in the upcoming game) is six inches taller. Come on. (the other players laugh a bit and tease him briefly)
(The game continues as the ball goes back into play. This time the point guard dribbles to the right and passes again to the post player [just under the basket]. Kevin is now guarding this player. He scores again.)

5 C: Uh-uh, Ok now that time you gotta switch it, if he comes over the cross screen you bump below and switch, OK? On that cross screen. (Players chat a bit and laugh. The point guard points to another player and says something teasingly. The ball goes back into play as the offensive player dribbles right, then back left, then passes to the middle and as Samson switches, Vaughn blocks the pass. The point guard claps to communicate to his team to pass the ball back to him so he can refocus the flow of the ball.)

6 C: Alright, hold the ball on top, hold the ball on top. (to a specific player) Now especially when you got caught. OK, it was good that you switched, but you gotta yell switch, cause what happened was you switched out which was a smart move, but Kevin came out too, because he didn’t hear a “switch.” So as soon as you know you are going to switch, yell out switch. (to all players) Whoever is the man that’s switching out has got to call out switch, then Kevin would know to take your man. (Vaughn and the same other player as before are again jostling back and forth a little as the other player gets in the position to guard him and pushes against him a little. They both smile) OK, here we go let’s go box. (The point guard dribbles left and then right at the top of the key. Kevin switches out.)

7 C: There you go Kevin! OK Good. Good good good. Call it out loud, Sam, gotta say switch.
(The ball goes to the player that Vaughn is guarding on the right wing. Vaughn steps toward the player with his arm up as the player shoots. The ball bounces off of the rim.)

8 C: Box box box! (Steve goes up and gets the rebound.)

9 C: Alright let’s go up top. Now, chances are their going to knock down our shots, So Vaughn, Vaughn, Vaughn make sure to close out all the way on
that shot. Cause five times … at least half the time they’re going to knock down that shot.

(The offensive player dribbles and another red player switches out to put his body between the player with the ball and the basket.)

10 C: Good good good. OK, go again. OK here we go up top. Here we go four across.

(The ball goes back into play and both the offensive and defensive team have picked up their pace and are playing with speed and intensity.)

11 C: Good, good. Jump to ball, Kevin and everybody else, jump to ball.

(Kevin blocks a shot with a loud smack. Another player laughs and says, “Ooo, man!” Kevin keeps up the intensity. He fouls another player, then smiles, as if to break the tension.)

12 C: Just take the charge Kevin, just be ready to step up. (Players smile and laugh before the next play begins.)

We now consider this segment of activity with respect to access to the domain, integral roles, and opportunities for expression.

**Access to the Domain**

The structure of this basketball practice offers insight into the way access to learning the domain of basketball is made available for players. Players are learning a defense such that one team blocks the other from scoring. This competence is dependent upon other smaller skills, such as attending to where the ball is, dribbling, anticipating likely moves, and blocking shots by jumping.

Early in the transcript, at Turn 3 the coach explains that they are going to be learning three of the five sets in the box defense, setting the day’s lesson in the context of the broader practice. He then marks for them to begin the physical moves for a specific play: “OK, so here we go.” He also provides detailed information about carrying out this defense in the context of the upcoming game (in other words, he describes how the moves he is teaching them will need to be applied). Furthermore, this instruction includes advice for different possibilities of the kinds of responses from the other team that might come up: “Let’s say they swing the ball around a little bit and Joseph, you [and members of the opposing team] are on the other side, the weak side, you may have a chance to be able to switch, when they are dribblin’ over here…” This specificity about both how to carry out the moves and who has responsibility for carrying out which moves is consistent throughout the transcript and also appears in Turns 5, 6, and 9. Also consistent is the explanation for when a particular skill will be useful or important, such as in Line 9 when the coach tells Vaughn “So Vaughn, make sure to close out all the way on that shot. Cause … at least half the time they’re going to knock down that shot.”

These links between overall competence and the particular subskills and moves that players need to master are also evident in players’ responses to the inter-
viewer’s (Intv) question, “Are you a good basketball player?” Consider Kevin’s answer to this question:

Kevin: Yeah, I do.
Intv: How do you know?
Kevin: I mean, I consider myself to be an okay basketball player, because it’s something I’m good at, I can shoot pretty good, I can shoot with my right hand, and I can’t shoot with my left hand that great but I can use it, and I can’t dribble that well, well, I can dribble, but not like the point guards on the team. So I would say I’m an okay basketball player.

Similarly, Vaughn (in answer to the same question) said:

Vaughn: No.
Intv: No? Why not?
Vaughn: No. Because good basketball players can score when they want to, get the ball to open players when it’s needed, and good basketball players win games. You know, like a good basketball player is so much, to be a good basketball player you have to do everything, you got to pass the ball, you have to shoot the ball, you have to have good ball-handling skills. You can’t be one-dimensional and be a good basketball player. And I still feel that I have a lot of work to do on my defense, my ball handling, little things like shot fakes, jab steps, stuff that I have to work on, which makes me not a good basketball player.

Note that despite the fact that Kevin and Vaughn differed in their global assessments of competence, they both offered a precise idea about the specific skills and ways of engaging in the practice that indicate competence in basketball. The game of basketball, marked by definitive plays and moves that players continually practice, affords self-assessment that is grounded in concrete activities in which one progresses on a developmental basis. Each player evaluated and even defined competence in terms of multiple dimensions (e.g., scoring, physical dexterity, peer comparison, timing, ball-handling skills).

We should note that the defensive play that they were learning to run is a part of a standard set of defenses. This means, first, that players are expected to learn and carry out these plays—they can’t just go out on the court and improvise. It also means, though, that they have access to watching other players and teams carry out the same plays, and they have the opportunity to learn from that observation. This makes the task a bit more transparent and explicit.

Access to the domain is also fostered through ongoing feedback on learning during practice. The coach gives instructions, the players attempt physically to carry out the play, and then they get immediate feedback. Players also provide feedback to one another, such as when the point guard claps to remind his team to return the ball to him. This feedback has two important purposes. Feedback is both corrective and encouraging. For instance, in Turn 4 when the coach expresses dis-
appointment with Vaughn (“Come on Vaughn, come on now …”), embedded in this statement of disappointment is also an encouragement—carried in his tone. He implies “I know you can do better than that,” so that Vaughn knows that his performance is not in line with the skill/potential the coach has assessed him to have. At the same time, the feedback offers specific and context-relevant ways for players to improve their practice.

Another form of feedback comes through the display and correction of mistakes. Mistakes, in basketball, are clear and public (e.g., the point where the coach stops play to offer specific feedback to a player, like telling Sam to call “switch” in Turn 7). However, mistakes are considered a normal part of the activity and being corrected is not perceived as a threat to one’s ability. There are multiple chances embedded in the practice to try again, as well as playful teasing and joking around mistakes.

In basketball, then, players have solid access to the domain. The domain is made transparent through explicit attention to the specific skills and moves in basketball plays in relation to particular game situations. Players’ moves garner immediate feedback from other individuals and from the team’s success and failure on the court. Players are held accountable for improving their skills in the domain through the roles and positions they take on for the team.

**Integral Roles**

Players are assigned specialized roles that support them in learning a particular subset of skills especially well. It is important to note that these roles are also integral to the functioning of the team—one exists in relation to the others—which positions the players as important assets to their teammates and the team as a whole. There are several places in Episode A when the coach speaks to a particular player with a particular role and offers feedback to improve the play, along with a rationale for why that move or skill is important for a player playing that role (Turns 2, 6, and 9). For instance, Vaughn played the off-guard position (between a guard and a forward), whereas Kevin played the center or the power forward position. Thus, Vaughn was responsible for strong defense and determining (to some degree) the flow of the ball during play, whereas Kevin was responsible for getting rebounds and scoring. These assigned roles were inextricably linked to each other through the practice, as is illustrated in Turn 6, when the coach tells another player that calling out “switch” is the only way for players to decide their next moves.

These roles also made clear what players were not responsible for—neither Kevin and Vaughn were responsible for bringing the ball into play or for making the first passes of the play. Kevin clearly articulated his sense of his role in his interview:

Kevin: I think my role is probably rebounding and going back up for the shot, I guess.
Intv: What position do you play?
Kevin: I play center and I play the (inaudible), which is like power forward.
Intv: So you’re the big rebounder on the team. Anything else that you feel like your teammates count on you for?
Kevin: Keeping them calm, I guess.
Intv: Keeping them calm?
Kevin: Yeah, like when they’re about to—like if somebody get a hard foul and they start talking, breaking them up, I guess, telling them don’t trip, just keep playing.

In this excerpt, Kevin articulates his role as a rebounder and scorer in line with his position as sometimes center and sometimes power forward. It also interesting to note in this quote that he not only describes his skill-linked role on the team (his position), but he also describes his social role on the team. That is, he included “keeping them calm” as a part of his role on the team. This sense of Kevin as “keeping them calm” was reiterated in the interview with the coach. The coach described Kevin this way:

Yeah, I mean, arguably he was the top two players, probably he and J are the two best. He and J definitely were the two best players on the team if you had to say. So, yeah. But he’s been very consistent that way. I think he actually plays basketball the way he goes about everything else, he kind of just does it. He’s going to be really successful, just looking at his improvement he’s made in the classroom and everything else, which is great. His role is kind of the rock, in terms of when other guys may be less consistent, he was always there to, you know, be a presence, whether it’s helping the team win a game or helping the team just, somebody you can fall back on to point to about here’s just somebody who’s going hard every day. So, yes, he’s been real positive. Real positive.

Notice the similarity in how Kevin described his role and how the coach did so. Kevin said his job is “keeping them calm,” and the coach called him “the rock.”

Vaughn also had a sense of his role on the team:

I defend the other team’s best player. And then offense, getting the plays started, getting us into the offense, and just being a leader out there, you know, they see me going at it and playing hard then they usually just follow my example. I’m not like a real talkative leader, I just show by example. So if they see me pushing myself, then they push themselves.

Vaughn said that his role is to defend the other team’s best player and to get the plays started in the offense—both consistent with his position as the off guard. Like Kevin, Vaughn also discussed his social role on the team. He said that he is a
leader, one who leads quietly, by example. The coach expanded on this description of Vaughn in our interview with him:

He’s our preacher. So he’s actually, he’s got a positive influence that, um, he might be one of the captains next year because he actually sets a really positive example. Sometimes he gets a little nutty, a little crazy, but he’s been real positive. In fact I remember having a lot of respect for him even from the beginning of the year, even before the season started, the guys were scrimmaging a lot on their own, and some of the guys were getting on one of the other guy’s cases and just making fun of him, and he actually had a run in with a lot of the guys on the team because he kind of stood up for this other guy and created a lot of tension. I had a lot of respect for him at his age to kind of stick up for somebody else, there was no self-interest there but he was sticking up for somebody else and realizing he was gonna take a lot of crap for it. So that’s pretty rare, especially for a high school guy to be doing that with his teammates. And so I think that he kind of sets a positive example that way. Yeah, so he’s kind of our moral leader.

In this quote, the coach highlights leadership and being a positive example, consistent with Vaughn’s sense of his role as “I just show by example.” Like the players in describing their competence and their roles on the team, this coach, to some degree, discussed game-linked skills, but he emphasized the moral, social, and emotional contributions that players made to the team. This positioning of players as being involved in both teaching and learning important life lessons connects students’ selves, and the development of those selves, to the sport in key ways. In that respect, basketball is not just about learning to shoot, dribble, and win games, it is a canvas upon which players are expected to compose themselves as people.

Opportunities for Self-Expression

The notion of roles can be perceived as restrictive to what students do and can be within a particular activity. As we argued earlier, however, rather than limit them, the positions that the players played in basketball provided shape and substance to their participation. They allowed them to evaluate their performance compared to higher level players and professionals and to identify a trajectory for their learning over time. In addition to these positions, however, the coach recognized Kevin and Vaughn as having key social roles on the team. It was through these social roles that the players expressed themselves, inserting their personalities and emotions into them to make the established positions their own.

Kevin expressed his seriousness about basketball, by “keeping [other players] calm,” for example if they “get a hard foul and they start talking.” It was something for which he could be counted on, a consistent part of his personality that could help the team “win a game” or that they could “fall back on” if needed. Vaughn’s social role was similarly critical to the success of the team. He expressed his enthu-
siasm for the sport as he carried out his position, “getting the plays started, getting [the players] into the offense, and just being a leader out there.” Thus, these social roles were avenues for self-expression as well as important aspects of these players’ success in fulfilling their basketball positions on the team.

The players’ dedication and commitment to basketball comes through in the transcript in the constant flow of activity and the intensity of the coach as he calls out orders for the players to follow. At the same time, though, there is playfulness and a relaxed aspect to the practice. For example, in Turn 11, the coach yells at Kevin to “jump to ball.” Kevin then blocks a shot, slapping the ball loudly as he does so, for which he is teased by another player. He later smiles, as if to acknowledge that his behavior could be perceived as over the top. This teasing and playing as an accepted part of the practice offers players a chance to be who they are and have fun in practice. Despite the fact that the work they are doing is very serious, there is lightness around doing the work, particularly in the small moments of interaction in between the plays (Turns 4, 5, 6, 11, and 12). Note that these arguably off-task interactions are not prohibited by the coach because they don’t get in the way of the work that needs to get done. The players know where the limits are, in part because the way that practice is structured, such that there is an ebb and flow to the need for focus and intensity in the activity.

Another aspect of basketball that allows for putting something of oneself in the practice was the responsibility for decision making that the players have in the context of the game. Players had the responsibility to make decisions by signaling their intention to others through their actions (“You can start up …”) or by calling out plays (“… and Chris can yell box”). During game play this entailed split-second decision making and drawing on ritual ways of communicating one’s intentions to the other players. We see this in Turn 3, when the coach says the following:

Sam, you’re going need to communicate and if you see that he gets caught up, you’re saying switch and your stepping out in Bettencourt, so of course, if Sam’s going to Bettencourt, he’s going to try to drive into Samson so again he gets it … and if there’s a lull period, let’s say they swing the ball around a little bit and Joseph, you and Samson and Bettencourt are on the other side, the weak side, you may have a chance to be able to switch, when they are dribblin’ over here or whatever.

This excerpt illustrates that competence is also about making good decisions about plays during the game and communicating those decisions to one’s teammates. The players were told that it was their decision to make when to call switch—and although there were multiple contingencies that the coach offered as possibilities, the final decision on this was left to them—and this choice impacted all of the other team members and the outcome of the play. The decision encompassed both talk and “stepping out” on Sam’s part, which the other players would need to recognize in the repertoire of moves that Sam made during games. Sam’s decision to indicate
a switch through his actions would affect a chain of events that would significantly change the course of everyone else’s play. Thus, it was important for him to express it clearly and when he was sure that it was warranted.

This decision making was a part of a broader set of responsibilities that players shouldered. In the transcript we see that players were accountable to one another for running the defense so that they block shots of the opposing team or prevent them from scoring (Turns 4, 5, and 6). They were also accountable for running the play, communicating, and paying attention to what the other team is doing, such that they can adapt the movements of the defense to what happens in the game.

Thus, players were accountable for mastering a concrete set of skills and for making particular kinds of decisions in play. However, the players perceived the intertwining of social roles (I’m the motivator; I have the most patience, etc.) in the context of enacting these skills and decisions as allowing them to express who they are in their practice of the sport. Players seemed to feel as though they occupied a unique and valued place (and one that incorporated who they were) that they developed and were offered as they participated on the team.

Vaughn, in describing the emotional experience of playing basketball said the following:

“It’s like, it’s like the only time—I play because it’s fun. It’s fun. It’s fun. It’s like, when I get angry, when I get frustrated, when I get sad, if I play basketball it kind of like leaves me, you know? And it’s like basketball to me is like an art form, the better I am in myself, the way I play describes who I am, you know. If it’s dunking on somebody, going up strong and powerful, just aah! all in they face. So it’s, I’m aggressive and I’m powerful and I’m really straightforward. But if it’s sort of like a spin move, a finger roll, it shows finesse. It’s like when I get to where I need to be, where I’m somewhat satisfied as a junior next year, you’d be able to watch me play basketball and know who I am.

In this quote Vaughn articulates his practice-linked identity in relation to basketball, aligning his sense of self with his way of participating in the sport and highlighting the way his basketball play (for him) is an expression of who he is. In this statement, Vaughn also conveys a clear sense of trajectory and a strong emotional connection to and engagement with the activity.

As a social practice that was enacted in the local context of this high school, basketball was structured to afford engagement that promoted players’ practice-linked identities. This engagement was marked by participation that was central to domain, but it also reflected individual strengths and differences that players brought to the court. Parts and wholes of the practice were made visible to the players who had specialized roles that ensured that the parts functioned smoothly to serve the whole. Part of what it meant to function smoothly as a team was that the players helped each other gain and refine their skills, they used their knowledge of
the team and their impression of the situation at hand to make decisions, and they supported one another emotionally in these decisions as they played out on the court.

The practice-linked identities that were supported in the setting of basketball were strong, as both Kevin and Vaughn were able to feel and express a sense of connection between who they were and the practice of basketball. Specifically, both and Vaughn were able to take on roles for which they were accountable and had leadership responsibilities, and the structures of the practice allowed them to express themselves through their practice and bring something of themselves to the game—both in playful interactions and in taking on important social roles on the team. Similarly, all of the players we studied took on roles for which they were accountable in terms of both skills and team support. Furthermore, the learning of their practice was supported by their access to the domain and the preservation of the connections between the domain as a whole and various aspects of it. These means of accountability and expression allowed students to develop identities in basketball that incorporated important aspects of who they were as people.

We turn now to the practice of school mathematics (as instantiated in one particular geometry classroom in this high school). We begin our analysis of the context of school mathematics by examining Kevin and Vaughn’s participation in their geometry class in two separate episodes.

High School Mathematics

Kevin Participating in School Mathematics

In the excerpt of classroom interaction that follows, which takes place during a typical day in geometry class, the teacher is reviewing a set of homework problems on the board while students are sitting in their seats, participating in the discussion. The problems involve finding equations for lines. The homework problem they work on in the first segment of the excerpt asks them to find the equation for the line that passes through the points (–6, –7) and (6, 7). Similarly, for the second segment they look for a line through points (1, –7) and (1, 4).

There are several points to notice in this transcript. The first is that the conversation between the teacher and students follows a typical Initiation, Response, Evaluation (IRE) format (Cazden, 1988) and is centered on recalling the steps of various mathematical procedures that produce the equation of a line. The discussion is structured such that the meaning of students’ choices with respect to different forms of equations and graphical representations for lines is left unexamined. The second point to notice is that those students who have solved the problem have the opportunity to describe their mathematical procedure, whereas other students sit and watch. And he third is that a particular style of participation that marginalizes involvement by students who do not rapidly and accurately answer the teacher’s questions is reinforced through the
activity structure. Note that in the transcript, T stands for the teacher, K for Kevin, L for Liz, and S for an anonymous student. The numbers on the far left indicate a turn. Parentheses denote actions or explanations. A slash (/) indicates overlapping speech.

Episode B

[28:00]
1 T: So what did you do to find the equation of a line? (to the class)
2 K: I did, um, (flips through pages) \(y_1\) over \(y_3\)
3 T: So that’s finding the slope/
4 K: /I mean \(y_1 - y_3\) (frowns)
5 T: /right?
6 K: Yep.
7 T: So \(y_2\) … you can say \(y_2 - y_1\). And what did you substitute in for your y’s?
8 K: 7 minus 7
9 T: So, 7 minus 7. Is there a negative in there?
10 K: Yeah.
11 T: So, one of them/
12 K: /It’s negative. Seven plus seven
13 T: Yeah. So you’re saying/
14 K: /6, or negative six. 6 plus 6
15 T: Yeah, so remember that you have to go in the same order. You wouldn’t want to have negative 6/
16 K: /14 over 12
17 T: So your slope is 14 over 12.
18 K: 7 over 6.
19 T: 7 over 6. Now, would you use the point-slope formula or the slope-intercept formula?
20 K: Point slope.
21 T: Point slope? OK
22 K: So you go \(y_2 - y_1\) equals m times \(x_2 - x_1\). So then you go \(y_2\) plus 7 equals 7 over 6 \(x_2\) plus 6.
23 T: So you can just make these x and y. And then, Kevin, did you leave it in this form, or did you make it into slope-intercept form?
24 K: Slope intercept.
   (They work through rest of the problem. The teacher then starts the next problem.)
25 T: OK. The other one was number 6, right? (looking out at the class)
26 K: Yeah. (His voice is the only one heard.)
27 T: It’s (1,4) and (1, –7).
28 K: (mumbles something to himself and looks over his paper)
29 T: Can somebody else tell me how they found the equation of this line? Kevin raises his hand.) Besides Kevin cause he just did the last one. pause)
30 K: They don’t mind.
31 T: But we need other people to participate. Liz? (Kevin starts spinning around in his chair)
32 L: So you start with (inaudible).
33 T: OK. So you’re finding the slope. \( y_2 - y_1 \). Over?
34 L: Over \( x_2 - x_1 \).
35 T: Good.
36 L: I mean 7 – 7, 1 – 1.
37 T: First we want the y’s on top, so we go …
38 L: \( x + 7 \)
39 S: \( 4 + 7 \)
40 T: Why is it plus 7 instead of negative 7?
41 S: ‘Cause you/
42 T: /Because a negative of a negative?
43 S: Because negative of (inaudible)
44 T: And then in the denominator?
45 S: /1 –1
46 L: /1 –1
47 T: Oh boy. What’s 1 – 1 in the denominator going to give us? What kind of slope it that?
48 S: Um. (pause)
49 T: What if you have a zero?
50 K: Negative? (speaks in a funny voice)
51 T: Can you have a zero in the denominator?
52 K: Nope.
53 T: What’s that called when the zero is in the denominator? (looking at the class)
54 K: Undefined slope. (under his breath)
55 T: Undefined slope. (Kevin smirks and looks down.) If you have zero in the numerator, like zero over 4, that’s just zero, right? But if you have something like 4 over 0, that’s undefined. That means we have an undefined slope. Does anyone remember what kind of line has an undefined slope?
56 K: A negative.
57 T: Is it horizontal or vertical? (Students alternately call out horizontal and vertical.)
58 T: Horizontal is zero.
59 K: It’s vertical.
[37:40]

In the first segment of this excerpt (up to 32:11), Kevin is engaged with the teacher in one-on-one discussion in which he has a particular form of access to domain through her questioning. As Kevin engages in the IRE sequence with the teacher, other students sit quietly and are comparatively marginalized. Furthermore, even Kevin, who participates extensively, simply reproduces the mathematical procedures in collaboration with the teacher.

Before we offer an extended analysis of this episode, we present a second episode from math class, this one involving Vaughn, which further illustrates the nature of the participation structures and activity structures in this high school math class. After presenting the second episode, we analyze the practice of this high
school math class with respect to the three dimensions of practice we identified in our analysis of basketball: access to the domain, integral roles, and opportunities for self-expression.

**Vaughn Participating in Mathematics Class**

In the following excerpt, students are in the midst of solving geometry problems in groups, and the teacher is walking around the room helping groups as needed. Vaughn’s group is working on a problem (see Figure 1) that involves knowing how to solve for the geometric mean of a right triangle, when the teacher walks over. Vaughn (like Kevin) attempts to engage the teacher’s questions about the solution. However, he is unable to take on a specialized role, thus constricting his access to the domain and his opportunities for self-expression through the mathematics. In this excerpt, T stands for the teacher, V for Vaughn, and S for an anonymous student. A slash (/) denotes overlapping speech, and parentheses are used to indicate actions or explanations.

**Episode C**

[39:22]

(The teacher walks over to the group of students sitting in the back right of the classroom. Vaughn is sitting next to a girl, and in back of another basketball player.)

1 T: Do you guys have any idea about how to find the …? (points to the student’s paper) OK. Do you remember that w is the geometric mean, x between the hypotenuse and the whole hypotenuse? (talking mainly to one girl) (Vaughn and the other basketball player are chatting softly with each other; occasionally laughing. The teacher finishes explaining to a girl and starts to walk away. Vaughn bends over to look at the girl’s paper, which causes the teacher to turn back around.)

![Figure 1](image-url)  
**FIGURE 1** Geometry task from Episode C.
2 T: So Vaughn, w is the geometric mean between the section of the hypotenuse closest to x, and the whole hypotenuse, which is x + y.
3 V: So it would be, it would be \( x \ldots w \) over \( x \) equals
4 T: /Equals
5 V: /w over. No.
6 T: Equals something over w (Another student asks her a question and she turns to her.)
7 V: \( xy \) over \( w \)? (calls it out)
8 T: So what you want Vaughn … if the geometric mean is w, then w appears twice in the equation. You know what I mean. You know how if \( x \) is the geometric mean between \( \frac{3}{10} \), it would be radical thirty. Can you see it? So the \( x \) appears twice if it’s the geometric mean. In this case, the \( w \) is the geometric mean so \( w \) appears twice.
9 V: Wait, I don’t get this. (Calls out across the room to T as she works with another student. She looks over at him, but he’s turned to get help from the girl next to him.)
10 T: What kind of triangle is this?
11 S: It’s an equilateral triangle.
12 T: Tasha, this is the second time I’ve asked you guys not to eat jelly beans. You guys are eating Tic Tacs over there. You all know you’re not supposed to eating in class.
13 V: I know. They were throwing stuff. (grins and looks over at the girls)
14 T: So don’t eat in class.
15 V: I know. What the heck is wrong with you girls? Whatcha all thinking? (smiles as he says in a teasing voice)
16 T: No, not Tic Tacs. That’s eating.
17 S: F-U. (points accusingly at V)
18 V: (smiles as he says something in high girlish voice and points back) [52:58]

As Episode C opens, the teacher is checking to see if the students in Vaughn’s row understand aspects of the task. Vaughn doesn’t pay attention to the teacher’s explanation until she begins to walk away. Vaughn suddenly focuses on the assignment and looks over at the paper of the girl sitting next to him. The teacher notices this, comes back, and gives Vaughn an opportunity to explain his process. After a couple of interchanges, when Vaughn appears to be confused, the teacher turns to help the girl beside him. As she does this, he calls out the correct response. She turns back to him after a less than a minute and gives him an example. He again works on the problem until he’s stuck and calls out for help. The teacher notes this, but Vaughn looks to the girl beside him for that help. The teacher then returns to the group and asks them to identify what type of triangle they have. She gets distracted when chastising a group of girls for eating in class. Vaughn joins in this conversa-
tion and begins teasing the girls, adding on to what the teacher says. In doing this, he prolongs this side conversation in class and engages in a playful way.

We now consider both of the classroom episodes with respect to the three features we have highlighted.

Access to the domain. In this mathematics class, the format of the teacher and students’ discussion of problem solutions is routine, as it is in many others. This format supports students’ access to particular skills in geometry, which, although important for situations in which students would be asked to recall the formula to find the equation of a line given two points, are not tied to a broader context where these skills are meaningful. For example, in Episode B the teacher’s questions to Kevin as he lays out his solution elicit explanations of how rather than why he proceeded in a certain way (Turns 1, 7, 19, and 23). Kevin’s responses to these questions—primarily plugging in the correct values to find the slope—reinforce the procedural focus. There is a series of exchanges (Turns 19–24) in which the teacher asks Kevin about his decision to use different forms of a line at different times in his solution path. Kevin’s terse responses, which the teacher accepts, leave little opportunity for her gauge Kevin’s reasoning around these decisions or provide this kind of insight to other students.

Understanding slope is one of the more difficult concepts for students in high school geometry (and algebra), due to the fact that their learning of equations for a line is often not grounded in an understanding of how different forms of a line are connected and relate back to concepts of slope. There are number of challenging topics around slope that are touched upon in this excerpt, such as what it means for a line to be represented by two points, how to select a particular form of a line over another, or what in reality it means to have a zero slope. However, these topics do not get taken up in a way that combines them together to build a generative representation of slope. Thus, the relation between parts and whole, or the subskills the students are learning and the kinds of problems that they will be applied to, are less clear.

Similarly, in Episode C the discussion revolves around recalling procedures in a stepwise fashion. Although the teacher’s question in Turn 2, “So Vaughn, w is the geometric mean between the section of the hypotenuse closest to x, and the whole hypotenuse, which is x + y?” is a statement about the relationship of the geometric mean to right triangles, Vaughn interprets it as a request to produce a formula. When Vaughn can’t recall how to set up the cross-products, the teacher gives him a hint: “Equals something over w” (Turn 6). This type of questioning supports a guessing game wherein the goal is to fill in the blank rather than to deduce why a certain value makes sense geometrically. Vaughn successfully figures out the correct value, but it is unclear whether he understands the underlying mathematical principle.
A similar type of interaction occurs when the teacher turns back to him and tries to explain that, “the x appears twice if it’s the geometric mean. In this case, the w is the geometric mean so w appears twice” (Turn 8). Here, the teacher creates an example of the situation with a different set of numbers (where x is the geometric mean), hoping that Vaughn will apply it to the current situation. The example appeals not to Vaughn’s understanding of the situation but to his ability to transfer procedures from one scenario to the next. Another key moment in the transcript, when the teacher asks for the name of the triangle and one student says it’s equilateral instead of right, suggests that the properties of the right triangle that create the geometric mean are not guiding students’ work.

What is also interesting about this transcript is that although Vaughn repeatedly disengages mentally from the classroom mathematical activity (Turns 1, 13–18), he attempts repeatedly to reengage himself back into the mathematical activity through the teacher and his peers (Turns 1, 3–5) to get the help that he needs (Turns 7 and 9). In fact, we would argue that his statement in Turn 9, “Wait, I don’t get this,” is a bid for the task at hand to make sense to him and could pose a potential risk around public exposure of incompetence. However, Vaughn is willing to take this risk as he attempts to create within the class a structure that will facilitate his learning—one-on-one help sessions with the teacher and other students.

The disconnect between the specific skills students are learning in mathematics class and the domain of geometry is also evident in Kevin’s responses to the question “Are you a good math student?”

Kevin: I guess I’m a good student. I do my homework, I turn it in on time, I don’t skip class.

Q: Do you think your grades adequately reflect your ability to learn?
Kevin: Yeah. Because if you, if your grades are high like an A or something, that means you understand it, and it’s easier for you. And if it’s lower then that means that you’re not understanding it that well, so you need a little bit more help.

Q: What kind of math student are you?
Kevin: I’m a good math student, I guess. I try to answer as many questions as I can, try and help people if they don’t understand something.

This quote confirms some of the aspects of competence for Kevin—to answer questions, to help others, to go to class, and to do homework. Although he doesn’t identify particular skills or subskills, he does argue that grades matter as an indicator of competence because they mean that the person understands the content. For Kevin, as is illustrated in this excerpt, being able to answer the teacher’s questions often means that the person also grasps the concepts embedded within them. However, for Vaughn and many other students, getting a zero in the denominator when finding slope is not a meaningful outcome (Turns 51–59). Even Kevin, who is the
first to respond with the correct term of “undefined slope” (Turn 54), does not know how to represent a line with undefined slope on a graph (Turns 56 and 59).

**Integral roles.** The activity structures in this mathematics classroom afforded a range of ways of participating. However, the tacit roles that got organized within these structures left the students with limited access to the mathematical practices. There was a lot of space to be marginal, as the most prevalent role for students (that of sitting and listening to the teacher lecture or hold one-on-one conversations) often didn’t require them to do much. For instance, while the students were working in groups on this task, the teacher did not hold students accountable for the ideas of other members in their group, nor did she pose questions to the groups to stimulate conversation within them. Thus, it fell to her to respond quickly when students got lost to sustain their engagement in the activity. In contrast to in basketball, the students’ roles in the mathematics classroom were heavily mediated by the teacher’s decision of whether to take up their ideas.

For instance, the role that Kevin takes up is that of the competent student—rather than that of an authentic, productive participant. He is highly involved in the exchange with the teacher and participates in a back-and-forth conversation with her in which he answers questions she poses to the class (Turns 1, 12, 14, and 16). Later, the teacher invites other students to participate when Kevin again tries to take the floor. No one volunteers, and Kevin argues, “They don’t mind” (Turns 29–30). The class doesn’t object to this overtly, but the teacher calls on Liz to give her solution. Later a pause in the students’ participation provides an opportunity for Kevin to get involved again in the question asking and answering through the end of that problem.

Similarly, in Episode C Vaughn attempts to take up a role as a competent student but is less successful. He moves in and out of participating in the mathematics, seeking help when he gets stuck. For Vaughn, the IRE nature of classroom interaction and the focus on appropriate procedures for solving problems leave him little space to participate in the mathematics, much less to understand the relation between the concepts they are learning and the concepts in the domain.

These episodes illustrate how particular roles for students are constructed in the classroom interaction. As we’ve mentioned previously, one explicit role for students in these classroom is to explain their procedures by giving “right” answers when probed by the teacher’s questions. Kevin takes up this role, as he repeatedly keeps himself directly involved in the problem solving, responding to the teacher’s questions and taking pride in his right answers. There is also an aspect of speed involved in this role. This is illustrated when the two other students in this episode lose their turn in the conversation when they can’t answer the teacher’s questions quickly enough before Kevin does. Vaughn is less able to take up the role of giving right answers, yet the participation structures leave him few other ways to legitimately participate.
The highly constrained nature of available roles in this high school math class was evident in the teacher’s comments on Kevin’s role in her class:

Kevin is like, I mean, I have trouble with him sometimes, but he’s so wonderful, he’s such a rewarding student to teach. He’s so motivated. Once in a while there are some attitude issues, just like you have to let other people talk, or like you can’t just walk out of the room whenever you want to and not tell me where you are going. But he is so great. He’s like the model student in a lot of ways ... he’s so interested in learning, so excited, he comes to class ready to go. I mean. He’s never like, “This is stupid.” Other students say that all the time, but even if it’s dry and boring, he’s like, “I’m gonna take my notes, I’m gonna learn this.” He’s not too dependent, he asks questions when he needs to, he shows his work, if you ask him to do something, he’ll usually do it. He’s amazing.

The teacher lauds Kevin’s engagement as being aligned with her sense of the role of a competent student in general but expresses dismay that he leaves the room without permission and dominates the conversation. Her response (constrained by the structure of interaction and norms in the classroom) illustrates the narrow range of acceptable behavior in the role of competent students. Furthermore, only one student at a time can be so verbally engaged in classroom activity at one time. The role of the other students while Kevin enacts this role is vague and undefined. The tacit assumption seems to be that they will learn something (or at least refine their thinking) by following along in the conversation. However, we observed that many students in this class were not held accountable in this way (by themselves or by the teacher) and would take notes or simply zone out during these sessions. This reveals a potential inherent conflict in the ways in which the classroom offers opportunities for competence in that no more than a few students could be so highly competent around the mathematics at any one time. However, for Kevin the strategy of continual high engagement and holding himself accountable for such engagement seems to support his full participation and sense of competence (to both himself, the teacher, and peers). The same tension is evident in the episode with Vaughn, in that he is not recognized as displaying competence, though he attempts to take up a competent student role.

Opportunities for self-expression. In general, the mathematics classroom offered fewer and more constrained opportunities for students to express themselves. The limited opportunities for self-expression in these classrooms comes into clear view in both of the episodes presented. In Episode B, Kevin finds a way to minimally express himself through constant verbal interaction with the teacher, but the expression is limited to the classroom norms around finding appropriate procedures. In Episode C, Vaughn picks up on and extends a social conversation (something that he often did), seemingly to maintain an engagement and to bring
play into the classroom. The teacher reprimands the girls sitting near him for eating in class (Turn 12), which Vaughn treats as an opportunity to tease and pay attention to the girls (Turns 13, 15, and 18). To some degree it also diffuses the situation by treating the girl’s infraction with lightness and humor, which is consistent with an earlier portrayal of him as a “preacher” who is always “sticking up for somebody else” (from the coach’s interview). This propensity to insert social conversation into the classroom was something his teacher commented on in an interview:

Vaughn, I love Vaughn. He’s such a joyous, like a joyful person. I have so much respect for him. He’s such an incredible kid. Vaughn. A lot of the time I look at him in class and I actually don’t know if he’s absorbing anything. Because he’ll be like looking over somewhere else when everything is on the board and I’ll ask him if heard, or if he understood and he’ll be like, “Yeah, I’m listening.” But I don’t know. Like I think he’s very smart, but I think his mind wanders and he has a lot of trouble focusing. And then he’ll start talking about something else. And it’s interesting, so you have something interesting to say, “Stop it stop it.” (to stay focused on the lesson). Umm, hmmm. He learns best when he decides he’s gonna learn, I think it’s more from him … cause, I’ve sat with him alone before, and he just wants to get it done and he doesn’t want to listen to what I’m saying. His mind is somewhere else but he’s writing stuff down. But I’ve also seen him be more focused in class and be more focused one on one. So for him I think it’s more his own decision.

Here, the teacher recognizes Vaughn’s unique self and expression of self in the joy he brings to other people. At the same time, she also recognizes how she is requiring him to shut this aspect of self down during class in order to maintain focus. She frames her observation of him, that “his mind wanders and he has a lot of trouble focusing” as a choice that he makes to become disengaged. As we described in the introductory paragraphs of this article, though, engagement entails both a type of, and an interest in, participation. To make the geometry class engaging for him, Vaughn drew upon his repertoire of interpersonal strengths and helped to create a friendly, relaxed, more inclusive classroom culture. An alternative interpretation of the decisions Vaughn made around his engagement in this classroom is to view his social banter as a means to create a more intrinsically motivating mathematics learning environment.

Overall, these transcripts seem to indicate that both Kevin and Vaughn attempted to participate in classroom activity in such a way as bring something of themselves to their interactions. Kevin tried to maintain constant interaction with the teacher, and Vaughn tried to insert play and teasing into classroom interactions. However, these attempts were only marginally successful, and ultimately there were few ways to express themselves in the math classroom.

What might these patterns mean for the practice-linked identities that the students are constructing in math class? Although both students attempted to con-
struct practice-linked identities as competent students in math class, both fell short of this goal in different ways. Ultimately, the activity and participation structures in this high school math classroom constrained deep, authentic engagement and thus did not support strong practice-linked identities for Kevin or Vaughn. Although Kevin did maintain extended participation, which to some extent did reflect his skills and proclivities, the barriers to the meanings of the math inhibited his full engagement and, thus, his practice-linked identity. For Vaughn, his attempts to insert himself (in the form of teasing and play) into the math classroom were treated with the clear expectation that those ways of interacting were not appropriate in that setting. Like for Kevin, this resulted in an underdeveloped practice-linked identity in the math classroom and the maintenance of a separation between his sense of self and the practice of high school math.

We have explored specific instances of participation in school math and basketball for Vaughn and Kevin and have illustrated key differences between contexts in the extent to which they have access to the domain, opportunities to take on integral roles, and opportunities for self-expression. Now we would like to think about participation in these practices more broadly and explore general patterns across multiple episodes.

General Description of Activities and Participation Structures in High School Basketball

In basketball, there were several types of activity and ways of participating available to players. Basketball practices and games consisted of five main types of activity. They included warm up and conditioning, practice of basic skills, practice or learning of partial plays, practice games, and discussion (about roles, strategies, or logistics or to enhance or shift motivation). Players participated in actual games at least once a week during the season, which included debriefs and time outs. The flow of activities at practice sessions was such that players began with simple drills and basic skills and built up to game practice. The majority of the time was spent on game practice, which was directly modeled on actual game play, and which incorporated particular skills and plays practiced that day.

Positions were critical to the sport in many ways, and all players were assigned one of five positions: point guard, off guard, forward, power forward, or center. Each position had a particular set of responsibilities, skills, and tasks associated with it. In basketball, all members of the team were required to actively participate in all aspects of activities most of the time. There were two exceptions to this. One exception was actual and practice games, where second-string players sometimes sat on the bench while first-string players played. Another exception was when players’ activities were differentiated by position, for instance when guards may have been practicing ball handling while centers practiced shots from under the basket.
For players of all positions, participation in basketball took many forms and included doing drills, seeking and giving help and feedback to other players, seeking and receiving help from the coach, calling game plays, and displaying enthusiasm or frustration. Activity structures required that players simultaneously be leaders and followers, and although there was high degree of autonomy in much of their activity (e.g., in games players made many key decisions and in practice athletes were often led by other players), there was also a high amount of support for the making of those decisions.

Thus, in basketball, players had opportunities to take up integral roles, access to the domain, and opportunities for expression support engagement. That is, players were supported in having access to a sense of the domain as a whole and the skills that made up that domain because the structure of daily practices and games made clear the relation between the skills they were learning, how those skills became a part of learned moves, and how those moves supported optimal play in games. The assignment to integral roles held them accountable for learning a particular set of skills and gave them a unique job on the team that they were accountable for learning (and a high-stakes assessment—the game). As players enacted these roles, opportunities for self-expression and to feel valued also became available, in that the roles players were assigned were chosen for them to be aligned with their proclivities and in that norms of social interaction in play and games allowed for play and creative expression.

General Description of Participation Structures in High School Math Classrooms

In school math, the types of activity, frequency of activity, and the ways of participating may be quite familiar. Although there can obviously be tremendous variation in how teaching and learning gets done in math classes, the classes we observed were fairly traditional in structure—they consisted primarily of lecture and problem solving as a whole class, with students taking turns being called on to contribute to the discussion. The teachers in these classrooms stood out, however, in that they were concerned with both respecting students and building a relationship with them. The school personnel built various support structures for students and drew on their relationships with them to advance student learning and achievement.

The mathematics classes we observed were made up of five main activities: the going over of homework as a class, explanation of new concepts, in-class problems, talk that reflected either classroom processes (tests, logistics, grading) or students’ futures (college and jobs), and tests. The activities were arranged to build a sense of consistency from the previous day’s lesson, to students’ work outside of class, and finally to the topic of the day. However, connections between mathemat-
ics ideas and topics were not often made explicit to students, because the tasks themselves were compartmentalized into sections that often did not culminate in a broader problem to bring them together. Two of the primary activities in the math classrooms did not necessarily include the active involvement of students. Instead, teachers talked for the majority of the time, both when going over the homework problems and when explaining new concepts or ideas.

Students could participate in a variety of ways in classroom activities. In a given moment of classroom activity, students could be answering or asking questions, writing notes, solving problems (either on paper or in their heads), listening, or being off task. For the most part, the participation structures required simply that students sit quietly and listen—either to the teacher or, less often, to one of their classmates explaining a concept—during most of the class period. Paying attention could not easily be enforced because sitting and listening are not necessarily distinguishable from sitting and daydreaming. The most common way for students to verbally engage in the classroom activity was by answering the teacher’s questions—either by volunteering or by teacher elicitation. This often took the form of a public explanation or solution. Thus, students could help construct the ongoing activity and dialogue, albeit in limited ways. At times, students could be more active in their involvement. They could ask the teacher questions about homework or concepts they did not understand. They could also seek and receive help in solving problems—seeking help from the teacher or from their classmates, and offering help to students who seemed to be struggling. Although the classes we observed enforced classroom norms and rules for on-task behavior, students often found ways to quietly drift off or engage in off-task chatting or joking about the weekend in a kind of subtext or counterscript.

We argue that although the ways of participating in the mathematics classrooms did include opportunities for active involvement, for the most part students were expected to be followers, which required relatively passive engagement. As well, the activities did not necessarily entail that students maintain a focus on the ongoing mathematics work.

These participation structures had implications for students’ access to understanding the domain, ability to take on integral roles, and opportunities for expression and sense of competence. In general, these participation structures created obstacles for some students (but not others) to have a sense of how the parts and the wholes of the math fit together. Such connections were often implied through the sequential nature of the curriculum. There were a few integral roles available, but those that best supported learning (e.g., asking questions and proposing solutions) were not available to more than one or two students at a time. Similarly, opportunities for self-expression in the math class often took the form of counterscript and were explicitly discouraged or ignored by the teachers as being off task.
DISCUSSION

We explored the nature of participation and engagement on a high school basketball team and in several high school mathematics classrooms (of which the geometry class we discussed was one). Specifically, we argue that three aspects of these practices—access to the domain, opportunities for taking up integral roles, and opportunities for self-expression and unique contribution—are critical to understanding differences in engagement and have implications for students’ and players’ practice-linked identities and learning.

Findings illustrate that the practice of basketball afforded deep engagement for all of the players across multiple dimensions. Specifically, through access to the domain, players could develop a sense of the game at its core and how the skills and practice moves they honed were related to their and the team’s success during game play. Immediate feedback and coaching on specific actions linked the consequences of students’ participation to their development as players and to the bigger picture as well. This ability to frame parts in terms of a whole or an emerging trajectory afforded a broad conceptual understanding of the sport, as well as greater mastery of it. Players also had opportunities to take up important roles that mattered for the whole group, thus positioning their participation as central to both individual and group progress. Though the roles were static, having been predefined historically and remade locally as players observed peers, mentors, and stars perform them, they were flexible enough to allow players to insert and assert their style and proclivities within them. Having opportunities to express oneself and make a unique contribution within these roles, players felt valued for who they are and saw themselves as having the capacity for growth in multiple dimensions.

In contrast, the school math classrooms that we studied offered less access to the domain, fewer opportunities to take up integral roles, and less opportunity to express oneself (without being considered off task) and thus afforded less consistent engagement. Mathematics instruction was also broken down into skills and subskills, but students did not often have the opportunity to learn how formulas or procedures were related to one another and to broader concepts. Discussions were narrowly focused on preparing students for the upcoming homework, quiz, or test. Students often resorted to grades, or their ability to answer the teacher’s questions (both distal measures of their understanding of the domain) to assess what they learned. (This would be akin to basketball players relying solely on the coach’s feedback or on game scores to judge their play.) Though there were no official roles in the math classrooms, students fell predictably into patterns of being the explainer (e.g., Kevin) or the listener (e.g., Vaughn), with the latter being more likely to be characterized by shallow engagement.

We contend that these differences in engagement are linked to differences in the practice-linked identities students expressed in basketball and school math, as the participation structures in basketball better afforded players developing a close
connection with the practice and alignment between basketball and who they were. We characterize practice-linked identities as reflecting both the contours of a practice and the particular ways in which an individual integrates these into the person he or she is becoming. For example, both Kevin and Vaughn perceived basketball as a primary means of expressing parts of themselves that mattered to them; in other words, they displayed strong practice-linked identities. For Vaughn, the off-guard position was an art form that allowed him to manifest power and aggression in the game, while at the same time infusing the team with energy and a positive outlook. For Keith, playing the center position demanded that he keep his head together to notice opportunities that arose to take the ball to the net (especially rebounds), which was well aligned with his tendency to push forward through obstacles to make progress. The mathematics classroom also afforded this type of persistent focus, but neither Keith nor Vaughn developed strong practice-linked identities there. Kevin’s connection with mathematics was less about learning and doing math and more about being a model student and getting good grades, which we argue is due to a barrier between students’ interactions with mathematics and the inner workings of it. Vaughn simply failed to find ways to insert himself productively into the mathematics (as there was little space for him to do so) and remained marginal to classroom mathematical discussions. He viewed participation in math as necessary to be eligible for graduation and college but didn’t see himself reflected there.

It is not necessarily surprising that the three features of the practice that are important for students’ engagement are also linked to the development of practice-linked identities. To draw on Wenger’s (1988) theory of identity, access is key to becoming a participant in a community of practice. It is fundamentally tied to learning, which is characterized by increasing competence at the activities of the community. The type of access also matters. Access focused on the development of skills and procedures without understanding the particular meanings of these within the context of the community restricts knowledge of what it means to participate (e.g., solve novel problems, build relationships, etc.) in the community.

Similarly, roles provide particular avenues into a community through which individuals can tailor their participation and are recognized for their specific contributions. Roles that are integral to the practice structure a sense of accountability and commitment to the community such that one understands how what one does affects others. This finding is aligned with the literature on distributed cognition and problem solving, which recognizes that the way in which people solve problems in the world is spread out among other individuals, tools, and structures (Hutchins, 1995, 1997).

The pliability of the roles in basketball is also consistent with Wenger’s argument that negotiability is key to having a sense of control and ownership within a community. Negotiability entails having the opportunity to make, adapt, and resist meanings in a community, and we argue, to reposition oneself in it. Individual
quirks, characteristics, and sense of humor are not tangential to the practice but rather a central part of it, representing the details of how individuals make the practice their own.

Our focus on practice-linked identities in this article, rather than simply on affordances for learning, is important. In our view, the concept of practice-linked identities allows a way to understand the intrapersonal dimensions of learning and to capture the ways that learning settings can support or fail to support not just the acquisition of skills and knowledge but a deep sense of connection with participants. This connection is more than just membership or belonging. In this way, participation in learning settings extends beyond learning (though learning is certainly critical) to the very definition of who one is and who one is in the process of becoming through participation.

These findings must be considered in light of the limitations of the study. One could argue that the comparison of math class to basketball is unjustified given that students’ participation in basketball is voluntary and thus self-selecting. However, to be a member of the basketball team at this school required significant commitment on the part of the students, and all players did not participate equally in practices or in games. In other words, basketball was also composed of roles for players that were less central than others (e.g., junior varsity players), but the learning trajectory to more competent playing was made explicit to students as they watched high-level players perform skills and interact with one another. Thus, part of becoming a basketball player involved hard work, practice, and discipline, which, although not guaranteeing a top spot in the lineup, were recognized as important contributions to the team.

Another potential limitation of this study is the small number of participants and our relatively short-term evaluation of them. Furthermore, we documented the structures of mathematics and basketball in only one school that is somewhat unique in its small student enrollment and close relationships between the students and staff. Local settings vary tremendously, and some basketball teams are more like math classrooms and vice versa. Thus, we are not making an argument about basketball and mathematics classrooms everywhere, but rather about the nature of activity settings that support engagement (and thus practice-linked identities and learning) in a variety of ways.

What might be the implications of this research? We are not advocating in this article that mathematics classrooms be organized around the practices of basketball. In fact, the notion that elements can be extracted from one practice and reproduced in another context misses the point we are making—namely, that these practices constitute and are constituted by structures of activity that are in themselves guided by structural, material, and ideological constraints. What we are advocating, instead, is that it is valuable to examine how the features of a particular context reflect assumptions about what it means to be a participant in a community, and thus the kinds of relationships that individuals can develop in it in regard to both
the practice and other members. This study contrasted aspects of the practices of basketball and school mathematics and ways they are taken up by participants in order to highlight the features that promote participation in the former versus those that constrain participation in the latter. Through this comparison we illustrate that for students to develop deep engagement in learning settings, it may be important to ensure that they have access to the knowledge that makes up the domain and an understanding of the relation between skills, subskills, and activities. It may also be important to think about both the cognitive and social roles students can take up and ways to structure those roles so that they are central to practice. Finally, it may be useful to open up spaces in which individuals can express themselves (through teasing, laughter, and decision making) and make a unique and valued contribution to the practice as a whole.

In general, this study contributes to the growing body of research on the relation between learning contexts, the opportunities for learning that emerge for different students within these contexts, and the relation of these opportunities to students’ developing identities both in the setting and more broadly. In particular, the study captures how some school mathematics and basketball practices are structured such that they can promote or hinder individual engagement and can constrain or open up opportunities for the development of practice-linked identities and learning.

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