Role, Goal, and Activity: A Framework for Characterizing Participation and Engagement in Project-Based Learning Environments

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Abstract: In this paper, we present a theoretical framework for examining the ways in which classroom context, in conjunction with individual student knowledge and beliefs, influences participation and engagement in project-based learning environments. An underlying design assumption of project-based curricula is that the goal and role motivate the learning of content, and that learning the content in pursuit of the goal leads to better content understanding. However, research to-date has not explored the extent to which the goal and role actually motivate student participation in practice. The framework we have developed is specifically designed for the analysis of project-based learning environments in that it explicitly considers the influence of student role- and goal-adoption on participation and engagement in project-based activities over time. We believe that this framework, as we continue to refine it, will prove useful for research on participation and engagement in project-based curricula. Specifically, such a framework will help with the identification and design of future lines of research, will facilitate comparison across diverse settings, and will provide a starting point for the integration of the results.

Introduction

In project-based curricula, in which students develop content understanding through the pursuit of authentic problems (Blumenfeld et al., 1991), learners are expected to take on a particular goal and role. The goal involves solving a problem (such as predicting temperature on a newly discovered planet, building a playground, or developing a Global Warming recommendation). The role embodies a particular way of interacting, and is sometimes explicit (scientific researcher, urban planner, or Global Warming Advisor) and sometimes implicit (i.e., "inquirer"). It is this goal and role that distinguish project-based curricula from other curricula, including sets of consecutive activities that share some of the more common characteristics of project-based curricula – such as the use of technology, working in groups, and hands-on experiments - yet are relatively disconnected from each other in that they are not tied to a role other that that of being a student or a goal other than that of achieving a particular set of learning objectives.

An underlying design assumption behind these curricula is that the goal and role will motivate the learning of content, and that learning the content in pursuit of the goal (which serves to "contextualize" instruction) will in turn lead to better content understanding (Blumenfeld et al., 1991, Edelson, 2001, Krajcik, 2001, Rivet, 2000). However, while the goal and role are intended to play a central part in motivating activities, and are in turn one of the reasons project-based learning environments potentially lead to deeper content understanding than do the more traditional, non-project-based learning environments, research to date has not explored the extent to which the project role and goal actually motivate student participation in practice. In fact, little research has been done on motivation in project-based learning environments at all; what research there is has focused primarily on the characteristics of individual problem-based activities that engage students, rather than on what goal students have, and what role they see themselves in, when they participate.

Our current line of research addresses that gap, through investigating the extent to which students adopt the role and goal in project-based curricula. Specifically, this work explores the research questions of:

1) How does the nature/degree of role- and goal-adoption vary among different students and across different activities?
2) What are the individual and contextual factors that influence the nature of role and goal adoption?
3) What are the ways in which role and goal adoption influence the nature of participation and engagement?

In this paper, we describe the theoretical framework we have created to guide our investigation and analysis of participation and engagement in project-based learning environments. In addition, we will describe the ways in which we believe this framework may prove useful to others in the field for building an understanding of such participation and engagement.

Theoretical Framework

Our theoretical framework represents our "working hypotheses" regarding the ways in which the curriculum in context, in conjunction with individual student knowledge and beliefs, influences goal adoption, role adoption, and participation and engagement in project-based curricula. We developed this framework to reflect our synthesis of existing motivation and project-based learning literature, and refined it based on preliminary results of a pilot study conducted in Spring 2003. This study was conducted in two 8th-grade science classrooms in urban middle schools. In one class, students participated in the "Struggle for Survival" life sciences curriculum, where students act as biologists who work to find out why Finches are dying on the Galapagos Islands. In the other class, students participated in the "Planetary Forecaster" curriculum, where students act as research scientists working to predict temperature on a newly discovered planet. Analysis to date has focused primarily on student interviews, which were conducted with 18 case-study students to explore the nature of student goal and role adoption and the explanations students give for why they did or did not adopt the goal and role.

The complete framework can be found at the end of this section (Figure 4); however, rather than present the complete framework at once, in this section we will build it gradually as we describe the hypotheses that are embedded in this framework.

The central hypothesis of our work is that **role adoption and goal adoption influence the nature of participation and engagement in activities.** Our framework considers role, goal and activity as separate dimensions of engagement, rather than taking a "one-dimensional" view of engagement in activity (see Figure 1).

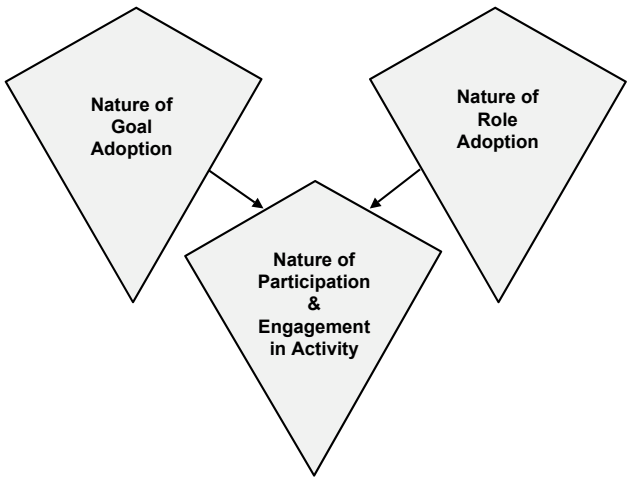

Figure 1. Role, goal, and activity and separate dimensions of engagement

In the framework, we use the word "nature" to encompass both degree and quality of role and goal adoption, as what it means to adopt the goal and role may differ from student to student or from situation to

situation. For example, regarding the role, in some cases students may adopt the role by *actively pretending* to be in that role (say, that of a scientist), while in other cases, students may be considered to have adopted the role when they simply *feel* that they are in that role (that is, they "feel like a scientist"). With goal, some students may think of the goal frequently while they are doing an activity, yet not genuinely care about achieving it; other students may think of the goal rarely, yet genuinely care about achieving it – both of these may be considered instances of goal adoption. These differences in the nature of role and goal adoption may have meaningful implications regarding the factors that lead to them and their impact on participation and engagement.

We also hypothesize that **"expectation of success" and "subjective task value" influence goal adoption, role adoption, and activity engagement (see Figure 2).** We derived this hypotheses based on Eccles' Expectancy-Value Model (Eccles, 1983), which describes the factors that determine an individual student's choices in achievement-related situations. We believe that the decision to adopt a role or goal can be considered as an achievement-related choice, and that Eccles' model is therefore especially appropriate for exploring our research questions. Eccles' model considers a student's expectation of success at a task, in conjunction with the task's subjective value, as primary influencers on that student's achievement-related choices. "Subjective task value" includes intrinsic value (enjoyment or subjective interest), utility value (the extent to which a task relates to current and future goals), attainment task value (the personal importance of doing well on the task), and cost (negative aspects of engaging in the task, such as performance anxiety, fear of both failure and success, and the cost of having to forego other choices in order to make this one). While Eccles' model considers the development over time of task-specific beliefs that in turn influence student performance, persistence, and task choice, we are not focusing on the long-term development of such beliefs with this current study; rather, we are focusing on the aspects of Eccles' model that describe the ways in which these beliefs influence students' achievement-related choices.

In addition to "expectation of success" and "subjective task value", we hypothesize that **"fit with context" influences goal adoption, role adoption, and activity engagement (see Figure 2).** "Fit with context" refers to the extent to which, from the student's perspective, the goal, role and activity (as aspects

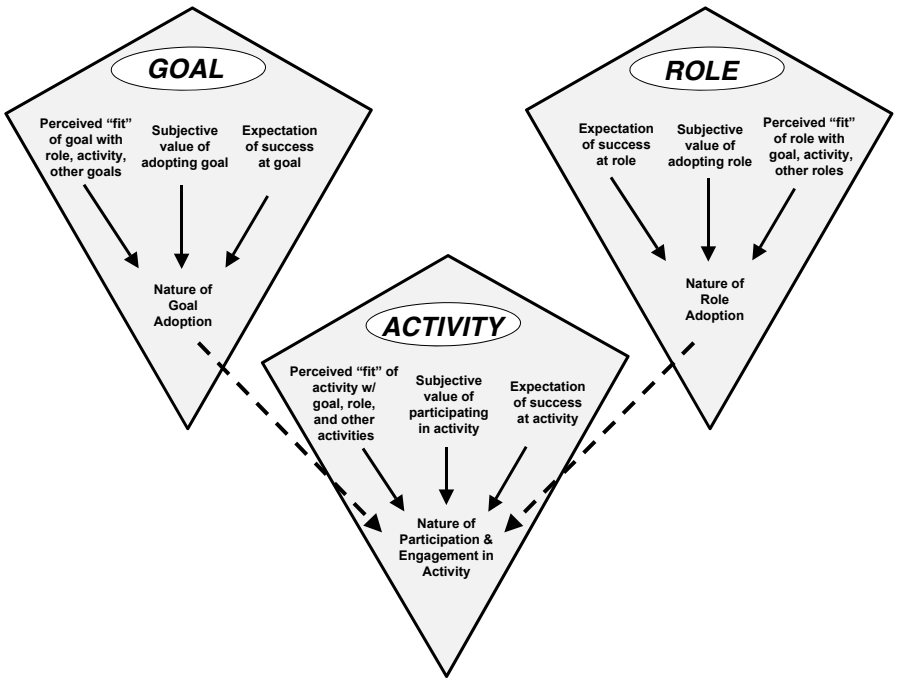

Figure 2. Influence of fit with context, expectation of success, and subjective task value on goal adoption, role adoption, and activity participation and engagement.

of the context) are consistent with each other. We added this element to the framework as a result of our pilot interviews, in which student explanations for why they did or did not adopt a particular role indicated that they were more likely to adopt that role if they felt that the goal they were pursuing, the activity they were engaged in, and any additional roles they were expected to take on "fit" (rather than conflicted) with their understanding of what the role entailed.

Regarding context, our model explicitly addresses the potential ways in which **students' interactions with the "curriculum-in-context" impact their perceptions of the goal, role, and activity (see Figure 3)**. Curriculum-in-context refers to the goal, role and activities as they are represented in the artifacts, teacher talk/actions, and peer talk/actions. This curriculum-in-context (in conjunction with a student's prior knowledge) determines the student's perception of the goal, role, and activity, which in turn influences the subjective task value, expectation of success, and fit with context for that goal, role and activity.

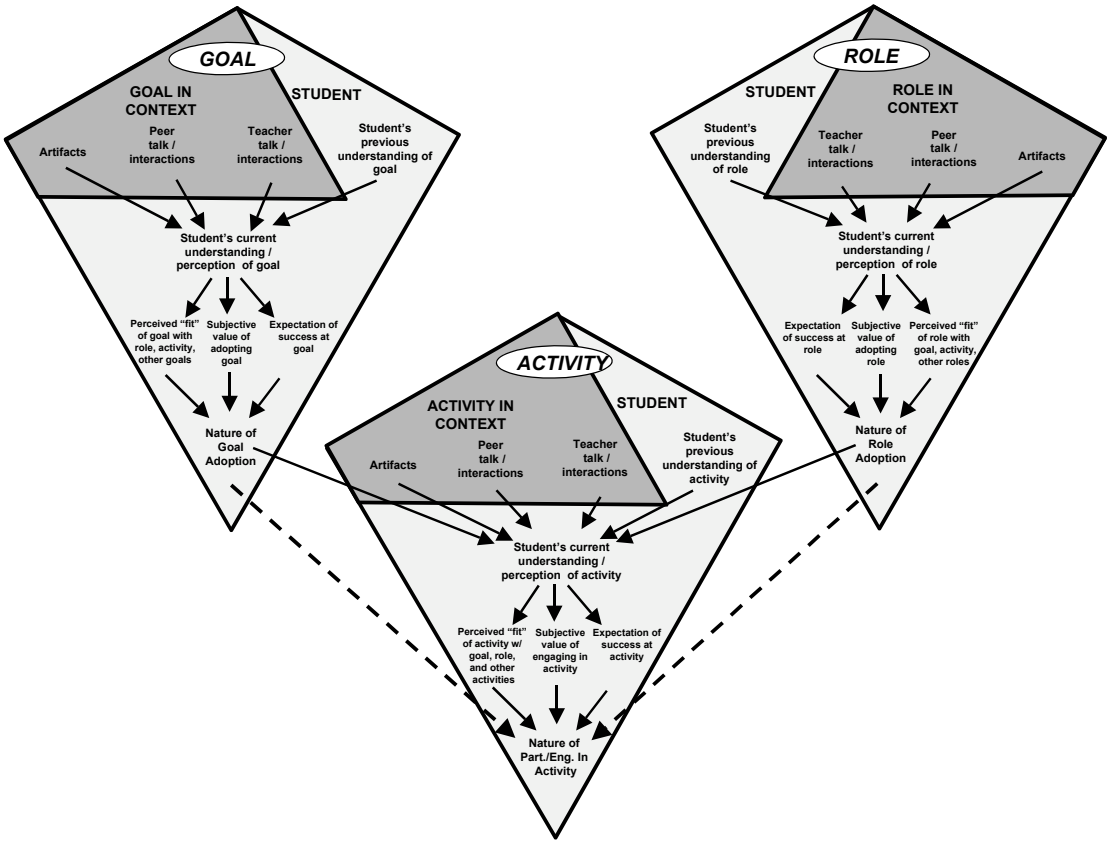

Figure 3. Impact of "curriculum-in-context" on participation and engagement.

Finally, we hypothesize that **the nature of role adoption, goal adoption and participation and engagement change over time based on students' ongoing experiences with the curriculum (see Figure 4 for complete framework).** Figure 3 above represents the influence of the curriculum-in-context, in conjunction with a student's knowledge and beliefs, on participation and engagement *at a given point in time* in the curriculum. However, project-based curricula often span days or weeks, and the extent to which students are engaged in the goal, role, and activities can change from day to day (or, for that matter, from moment to moment). Student participation and engagement on any given day cannot be fully understood independent of what has transpired on previous days, in that what students know and feel regarding the role, goal, and activity is shaped in part by their previous experiences with the project role, goal, and activities. Figure 4 reflects the cumulative effect of a student's experiences within the curriculum on role adoption, goal adoption, and student participation and engagement.

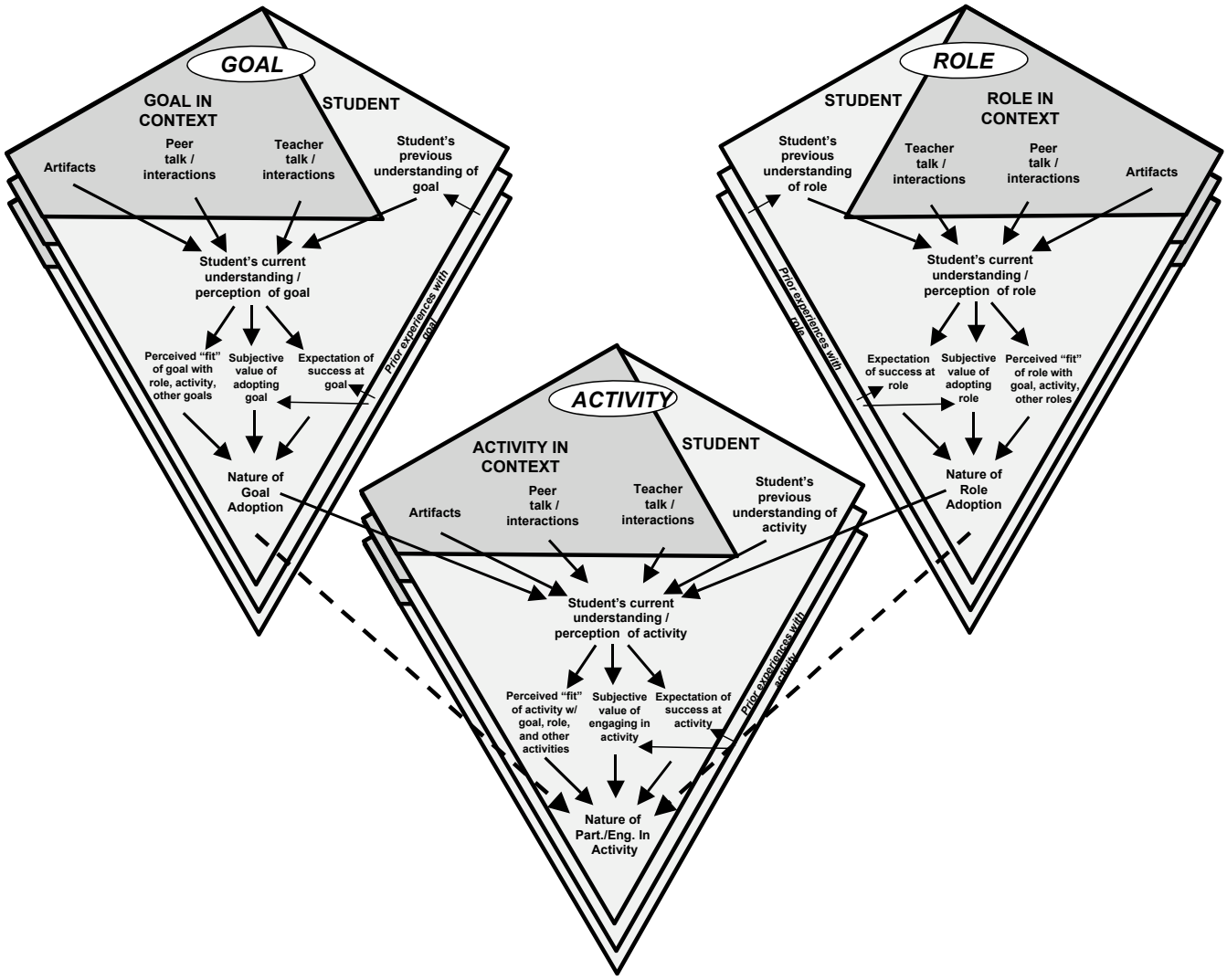

Figure 4. Influence of student role- and goal-adoption on participation and engagement in project-based activities over time.

Overall, our model focuses on students' perceptions of themselves and the learning environment, and on the influence of such perceptions on students' conscious choices (to adopt a role or goal or participate in the activity). We acknowledge that one's actions are not always fully motivated by conscious, rational choice. However, we do believe an examination of students' perceptions and conscious choices will contribute significantly to our understanding of student participation and engagement in project-based leaning environments.

Applications of the Framework

We have used this framework to guide the design of a larger scale study, currently underway, in which we are investigating student role- and goal- adoption in two 7th-grade science classrooms. In this current study, students are participating in the "What Will Survive" life sciences curriculum, in which students first take on the role of task force members who pursue the goal of ridding the Great Lakes of the sea lamprey, and then play the role of scientists who pursue the goal of finding out why Finches are dying on the Galapagos Islands. Data collection for this study primarily consists of:

- Pre-surveys to explore students' knowledge and beliefs that, according to the framework, may influence role and goal adoption (this includes their science-related beliefs and attitudes and the extent to which they are focused on performance goals vs. mastery goals).
- Daily "mini-surveys" to examine the relationships among the high-level elements that, according to our framework, affect participation and engagement. Such elements include the extent to which students adopted

the role and goal, their expectation of success for the activity, and the subjective task value of the activity (specifically, the extent to which they enjoyed the activity and the perceived usefulness of the activity). These mini-surveys will also allow us to explore the patterns over time for these elements.

- In-depth student interviews to further explore the nature of student goal and role adoption, the explanations students give for why they did or did not adopt the goal and role, and the nature of their participation and engagement in activities.
- Classroom observation to gather data on the role, goal, and activity in context (that is, the role, goal and activities embedded in artifacts, teacher talk, and peer interactions), as well as apparent student engagement/participation.

We will refine our working hypotheses, and in turn our framework, based on the results of this current study, and believe that this framework, as we continue to refine it, will prove useful for continuing research on participation and engagement in project-based curricula. First, this model will facilitate comparison between curricula, as well as the comparison of findings from other enactments of the same curricula across multiple classrooms. This will allow us to look for broader, or more "generalizable", answers to our questions regarding participation and engagement in curricular contexts. Second, in addition to providing us with a high-level representation of the elements and relationships involved in answering our current research questions, we believe that this framework can act as a starting point for the generation of additional questions/issues regarding participation and engagement in project-based curricula; exploring these additional questions will allow us to further refine and elaborate upon the framework and better understand its applicability/usefulness. Examples of questions raised by the framework include:

- **How does the actual make-up of the factors that affect role adoption, goal adoption, and participation and engagement vary across students and situations?** For example, in pilot interviews, students emphasize different aspects of the role-context fit in describing how this influenced their adoption of the role of scientist. Some students describe the match (or lack thereof) between the role of scientist and the *type of activity* (i.e., they were doing experiments so they felt like scientists), while other students emphasized the disconnect between the role of scientist and the *purpose/goal* of what they were doing (i.e, they didn't feel like scientists because they were learning something that was already "out there", whereas scientists come up with their own theories). As another example, regarding the "subjective value" of adopting a role or goal, some students may want to take on the role or goal because it is something they have always been interested in or because it sounds fun to them; other students may want to take on the role or goal simply because they want to get a good grade in the class. These differences in the make-up of the factors such as role-context fit and subjective task value may lead to quantitative and qualitative differences in role adoption, goal adoption, and participation and engagement in the activity.

- **Which aspects of context are most salient in influencing students' perceptions of the expected role and goal?** It is likely that artifacts, teacher talk, and peer talk may all point to different expected roles and goals. For example, in our pilot study, students were introduced to their role (that of scientific researcher) and goal (that of predicting temperature on a fictional, newly-discovered planet) in a letter from an International Space Agency. In interviews, students' specifically mentioned this artifact as causing them to feel like real scientists charged with doing something important. Students continued to receive similar memos throughout the curriculum. However, while an intent (from the designers' perspective) of these additional memos was to help keep students in the role and focused on the goal, students did not mention these on-going memos as influencing their perceptions of the role and goal. Rather, it seemed that other aspects of the context (such as the way the teacher addressed them or the relative roles of their peers in group activities) kept them in the role of students focused on the goal of simply getting through the task at hand. Therefore, the ways in which the different aspects of context work together (or against each other) in influencing students' perceptions of the role and goal (and in turn their perceptions of fit with context, their desire to take on the role, and their expectations of success) will be worth exploring in greater detail, as such an understanding can help designers and curriculum implementers know where to invest their effort in creating learning environments that actively engage students.

- **What is the nature of the relationships *between* the factors that affect student adoption of the role and goal (and in turn engagement and participation in the activity)**? While we hypothesize that a student's expectation of success in a role/goal, the subjective value of adopting the role/goal, and the perceived "fit" of

the role/goal with context all influence that students' adoption of the role/goal, the relative influence of each one of these factors on role/goal adoption may vary. For example, in our pilot study, there was a particular set of activities in which most students said they did not feel like a scientist for reasons related to fit of the role with the context (i.e., they said they were working with data someone else collected rather than collecting their own data, or they were working on a problem someone else had solved rather than generating new knowledge, or they were doing the same thing everyone else in the class was doing rather than working on their own problem). However, one student in particular said he thought of himself as a scientist during those activities; this was the one student in the class who planned on being a scientist when he grew up and therefore really *wanted* to play the role of scientist. So, it seems that where students are very interested in playing the role of scientist (and thus subjective task value is high), they may not require as great a degree of role-context fit, while students who are less interested initially in playing the role of scientist may require a greater fit between role and context in order to adopt that role.

- **What are the implications (regarding the factors that lead to role/goal adoption and the relationship of such adoption to participation and engagement) of differences in the *type* of role and goal adoption?** Earlier in this paper, we described role adoption as potentially encompassing both "pretending to be" and "feeling like" a particular role, and goal adoption as potentially encompassing both "thinking of" and "caring about" a particular goal (there may be other aspects of role and goal adoption as well). The factors that have the greatest influence on role and goal adoption may be different depending upon the nature of such adoption. For example, with role, "feeling like" that role may be most influenced by fit with context, while "pretending to be" may be most influenced by subjective task value (this was potentially happening in the previous example, where the student who wanted to be a scientist when he grew up "thought of himself" as a scientist during the activities, yet students did not "feel like" scientists when what they were doing did not match their perception of the role of a scientist). The relationship between these variations in the nature of role adoption and the nature of engagement and participation in activities may be different as well. For example, "pretending to be" may influence one's more deliberate decisions regarding how to participate (in that one who is pretending to be, say, a scientist, may choose actions based on what one thinks a scientist would do, even above and beyond what is required by the teacher), while "feeling like a scientist" may have a greater influence on the affective component of engagement (perhaps students feel better about themselves and the activity when they feel like scientists).

- **What (additional) relationships exist between role adoption, goal adoption, and participation in the activity**? Our current work (as reflected in our research questions and the framework) focuses the premise that students can choose to adopt the role or goal (based on their individual knowledge and beliefs and their perception of the curricular context), and that such role or goal adoption in turn affects their participation in an activity. However, it is likely that the direction of the relationship between role, goal, and activity goes the other way as well, in that participation in an activity may cause students to take on the role or goal as a result of that participation. Ultimately, it may be that a role can act as a hook into the activity (though not necessarily the only hook), and that participation in the activity leads to further "taking on" of the role, which leads to continued participation, etc. In addition, the relationship between role adoption and goal adoption may be worth exploring further; caring about the goal may cause one to be more interested in taking on the role, and adopting a role may cause one to be more interested in pursuing a particular goal.

While our current study will allow us to shed some light on the questions described here, we believe that future research must continue to investigate these questions if we are to develop an understanding of participation and engagement in project-based curricula. Ultimately, the understanding evolving from the pursuit of such questions will allow us to design engaging learning environments that better-promote student learning.

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