Operationalizing Identity: Studying changing selves in experimental learning environments

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ABSTRACT
This paper explores methodological questions in the study of identity through an examination and discussion of the empirical papers in this special issue. Particular attention is paid to the ways identity is operationalized in the study of how learning environments foster changes in students' sense of self. The paper concludes that identity is a difficult construct to study in the context of learning environments because it is simultaneously performative and subjective, and these dual aspects of identity may be best operationalized in an interactional view, in which identity is conceptualized as a set of relations between aspects of identity rather than as a state that can be coded directly in data on learning.

KEYWORDS
Identity; coding; measurement; modeling

1. Introduction

The articles in this special issue of the *Journal of Experimental Education* look at the concept of identity—and more specifically, whether and how students' identities change when they participate in experimental learning environments. This is an important and timely topic, not least because conceptions of identity, including those in the theoretical frameworks used in these articles, are becoming increasingly important in the study of learning as the goals of education move toward developing complex thinking, social, and communication skills. The articles themselves make a strong case for the centrality of identity in our conceptions of education, and I will simply take it as a shared view of the matter here.

These articles look at different kinds of identity formation, different settings for identity development and even different theories of identity. Looking across these explorations of identity formation, a reader comes away with a broad—though necessarily selective—view of the state of research on how technological interventions can and do shape young people's growing concepts of self. In short, I recommend reading these articles both for the quality of the specific contributions, but also for the way in which the editors of the special issue have provided a snapshot of the field.

In what follows—and in the spirit of a synthetic contribution to this issue—I pick up on a theme that runs through the articles, but is not a central focus of any one

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of them. Specifically, I use a methodological lens to look at and across these studies. Although I am a scholar who has himself studied identity formation in virtual learning environments (which is, of course, a statement of one of my identities), my concern here is less about the way these authors have *conceptualized* identity, than about the way they have *operationalized* the concept of identity that they use.

So as not to be coy, let me say from the start that my interest here is in operationalizing the concept of changing identities as a modeling problem: specifically, how we can take robust theories about the nature of identity and identity development and find systematic, empirical evidence for them in data from learning environments.

2. Perspectives on changing identities

A central challenge in any claim about student learning is maintaining *alignment* between the *activities in the world*, the *interpretation* of those activities, and the *claim being made*. Mislevy and Riconscente (2006), for example, describe *evidence centered design* (ECD) as a process by which the activities students do (a *task model*) provide information about what happened (an *evidence model*) and some assessment of what was learned (a *student model*). The central point of this approach to modeling learning environments is that these three components need to be consistent: one cannot make a claim about learning if the activities do not provide the kind of evidence needed for that claim. The task model must contain data *of the kind needed by* the evidence model to warrant that *some particular change* took place.

Thus, claims of identity development need an alignment between some *theory of identity*, a specific *learning environment* in which students' identities might change, and the *information about students' identities* that is collected. Not surprisingly, then, because the different studies in this special issue are looking at different learning environments, they use different theories of development.

For example, Barany and Foster (2020) look at processes of identity development in an online *affinity space*, which Gee and Hayes (2012) define as a loosely organized setting where people are connected by a shared passion or interest—in this case, a community discussion forum for players of an educational game, *Kerbal Space Program*, which includes discussions where players describe what they did in KSP; post in-game screenshots, fan art, and pictures of their in-game avatars; ask questions about the game; and answer questions asked by other players.

The theoretical framework for their analysis is *projective reflection*. Building on work by Markus and Nurius (1986) on *possible selves*, or an individual's images of potential future states—which might reflect hopes for the future or fears about what might come to pass—Foster and Shah (2016) define projective reflection as a process by which students explore possible selves by deliberately and intentionally trying out different roles in a game-based environment. Central to this process are the ways in which players reflect on how they see themselves in the past, present, or future. Thus Barany and Foster take as evidence for their analysis a longitudinal record of the forum posts from the two most central students, as defined by their centrality (betweenness, degree, and eigenvector) in the affinity space's social network.

Shah, Foster, Barany, Talafian, and Petrovich Jr (2020) also use projective reflection as a theoretical framework, in this case looking at students' participation in an educational game, rather than in a discussion forum around a game—and more specifically an educational game designed to put students in the role of urban planners. (By way of full disclosure, the game they used for the study was developed in collaboration

with my research group at the University of Wisconsin.) They provide integrated qualitative and quantitative analyses of two players, based on logfile data from the game recording student conversations with peers, as well as data from interviews before, during, and after the game.

Reilly, McGivney, Dede, and Grotzer (2020) also look at a virtual role-playing environment, *EcoXPT*, where students work as scientists to understand ecological problems in a pond. They refer to projective reflection in their theoretical framework, but the core conceptualization of identity is in terms of *science identity*, which they define as whether students "identify as a 'science person.'" They present both qualitative and quantitative analyses: the former based on Likert-scale survey items collected before and after the intervention, the latter on brief interviews conducted concurrently with the surveys. The survey items most relevant to their conceptualization of identity were a science self-perception sub scale of 4 questions taken from an analysis of student engagement in a biology course.

Glassman et al. (2020) look at blog posts from students who had access to learning materials in the virtual world *Second Life* as part of a course on learning. The theoretical framework is a concept of *epistemic identity*, which, building on the work of Erikson (1994) and Piaget (Gruber & Vonèche, 1977), looks at changes in students' epistemology as a critical component in identity development. Students, they argue, must have an approach to truth and knowledge—an epistemology—that lets them adjust to a quickly changing technological landscape while still maintaining a stable place in a society that may change more slowly.

In particular, they connect Erikson's concept of development though *identity crises* and Piaget's concept of broad and cross-domain *epistemic development*, suggesting that in *Second Life* students' "epistemic learning identity" developed through micro-rebellions against traditional modes of learning that created micro-identity crises. Their data is a combination of quantitative analysis to show that students' epistemologies changed during the course and qualitative analysis of blog posts to understand the underlying process of development through micro-epistemological-identification crises.

Finally, Greenhalgh (2020) turns to questions of moral identity development. Following Roseth (2016), they define *morality* in terms of students' ability to distinguish right from wrong and use that as a guide to how people should relate to one another. They combine this with a view of learning as a process of adopting roles within some *community of practice* (Lave & Wenger, 1991) arguing (following Gee and Shaffer, 2010, and others) that games are good venues for identity development because students can adopt and explore in-game roles. The specific context for their study is an analog role-playing game in which students respond to ethical dilemmas, and based on interviews where players described factors that influenced how they understood the ethical dimensions of the game, Greenhalgh looks at the features of the game that encouraged students to adopt different moral identities during gameplay.

Across these five studies, there are some clear differences, including forms of identity (scientific, epistemological, moral, professional), context (digital game, affinity space, virtual world, analog game), and data source (surveys, interviews, log files, observations, blog posts, discussion board posts). There are also important similarities, most notably in the conceptualization of identity development that underlies all the different theories, contexts, and research methods: that identity development takes place in a broadly sociocultural framework in which experimental learning environments give students an opportunity to *try on* roles within some community of practice in the world. Moreover, these articles assert that students do not have one single monolithic identity, but rather a collection of identit*ies*, whereby they can see themselves some-

times as a scientist, sometimes as a professional, sometimes as a person who follows moral principles, and so on.

There are also methodological similarities, in the sense that all of the articles have some qualitative component, in which data is coded and analyzed, and linked in some way with a quantitative analysis. And it is on this aspect of the articles that I would like to focus here: specifically, on the approaches these articles use—and challenges they face—in finding evidence for identity development.

3. Finding identity

3.1. On operationalization

These five studies all take steps to align claims about students' development, which come from their theoretical frameworks on identity, with the data they have collected from some learning context. To use the language of ECD, they are aligning their student model with their task model. But critically, there is another piece of alignment work that needs to be done to make valid claims about identity development (or, indeed, learning of any kind): there needs to be a mechanism for building a bridge between data and claim.

In an ECD framework, this bridge is the evidence model. In particular, the evidence model has two components: a *probability component* and an *evaluation component*. My purpose here is not to delve into the depths of the ECD framework, but briefly: the probability component is some mechanism for taking evidence about students' actions and using it to make a claim about students' learning. It is called a *probability* component because Mislevy and Riconscente (2006) are writing mostly about formal, quantitative assessments, which view claims about learning as statements about the likelihood that something is true based on some set of information about the student. For example, the likelihood that one of the students in Glassman et al. (2020) changed their epistemic identity based on the number of times they express a CRITICAL PERSPECTIVE. The evaluation component, in turn, is some mechanism that takes raw data (in Glassman et al., blog posts) and identifies the relevant information for the probability component—for example, that a student is taking a CRITICAL PERSPECTIVE at some point in time.

Although the terminology is different, the same process is true of all data analysis, whether qualitative or quantitative.

Qualitative researchers are familiar with the concept of *coding*: that is, of identifying themes, constructs, or types of events in data. There is nothing particularly magical about this. A researcher chooses some facet of the data that they want to study—which could come from prior theory or from the data in a grounded approach (Glaser & Strauss, 1967). Then they have to decide what, in the data at hand, will qualify as evidence of that facet. For example, Glassman et al. identifies the construct of CRITICAL PERSPECTIVE, and takes as evidence for it any time the student "compares and/or contrasts ideas presented in the response before coming to a conclusion." Places in the data where students are taking a CRITICAL PERSPECTIVE are then (in Glassman et al.) counted and compared, although in other papers in this issue (e.g., Barany and Foster; Greenhalgh; Reilly et al.; Shah et al.) the constructs are also—sometimes only—analyzed qualitatively.[1]

[1]To be clear: Glassman et al. do provide qualitative analysis, but not using the constructs in their coding scheme.

This process of constructing a bridge between theory (grounded or *a priori*) and data is described in the field of *quantitative ethnography* (Shaffer, 2017) as *operationalization*. The work of operationalization takes place in what is otherwise known as the"methods section" of a paper: the part of the research that shows how theoretical ideas are manifest in the world—and specifically in the world of the data at hand.

Thus, central to any analysis of identity (or identity development) is some particular way in which the construct of identity itself is operationalized.

3.2. Operationalizations of identity

Working within the projective reflection framework, Barany and Foster (2020) and Shah et al. (2020) operationalize identity using a four-part coding scheme:[2]

(1) KNOWLEDGE AND GAME/TECHNICAL LITERACY: describing changes in knowledge; correct use of new knowledge in discussion
(2) INTERESTS AND VALUING: affirming personal interest, valuing or relevance of a topic or behavior; affirming the value or relevance of a topic or behavior for the community
(3) SELF-ORGANIZATION AND SELF-CONTROL: modifying behavior based on peer feedback; describing goal setting and strategies for success
(4) SELF-PERCEPTIONS AND SELF-DEFINITIONS: reflections on how players see themselves in past, present, or future

Of these four constructs, only three refer to the self (INTERESTS AND VALUING include affirming *personal* interest), but it is possible for a student to exhibit KNOWLEDGE AND GAME/TECHINCAL LITERACY, INTERESTS AND VALUING, and SELF-ORGANIZATION AND SELF-CONTROL without it reflecting on their SELF-PERCEPTIONS AND SELF-DEFINITIONS.

For example, Shah et al. (2020) describe one student who:

(1) could accurately describe the work of urban planners ("they collect data about the places around us and get important people to change it and actually take in consideration how in the future we could probably change it more") [KNOWLEDGE AND GAME/TECHINCAL LITERACY];
(2) claimed that it is "a useful thing to do" and something of personal interest (the city he was planning in the experimental learning environment was "not a pretty site to live in quite frankly, and I think that should change") [INTERESTS AND VALUING]; and
(3) showed good organizational skills (he "sought technical guidance from classmates" and "spent more time than his peers" working on the project") [SELF-ORGANIZATION AND SELF-CONTROL]

Throughout the experience, though, the student claimed they wanted to "be a cook, mainly because it's fun and it's my passion" [SELF-PERCEPTIONS AND SELF-DEFINITIONS].

To be clear, this is not a critique of the coding scheme or of Barany and Foster (2020) and Shah et al. (2020). Rather, my point is that three of their constructs can be interpreted absent any reference to identity. (I will return to the topic of whether they *should* be interpreted that way in a moment.) More to the point, one could say more or less the same thing about the other articles in this issue a well.

[2]The definitions here are from Barany and Foster (2020); Shah et al. (2020) does not provide any.

Glassman et al. (2020) has four main constructs (each with multiple levels of sub-construct): LEVEL OF COMPLEXITY, LEVEL OF CERTAINTY, SOURCE OF KNOWLEDGE, and JUSTIFICATION OF KNOWLEDGE. Only one of the sub-constructs, SOURCE OF KNOWLEDGE[SELF-REFLECTION] refers to the *self*, though not in terms of the student's own sense of self. Rather, the construct refers to times when the student "responds by reflecting on provided information in light of existing knowledge and experiences and attempts to construct new possibilities." Greenhalgh (2020) again has four constructs, but all refer to characteristics of the game the students were engaged in: ENVIRONMENTAL CONSTRAINTS, FORMAL CONSTRAINTS, GOALS, and GAMING CONTEXT.

Reilly et al. (2020) look at identity both through a survey with a "science self-perception" scale and with qualitative data coded for STUDENT AGENCY, MOTIVATION AND INTEREST, and IDENTIFYING AS SCIENTISTS. Only one of these constructs (IDENTIFYING AS SCIENTISTS) is used to draw conclusions about student's sense of self, in a section titled: "Students are more likely to say they are good at science than they want to do science."

In other words, across all five studies, there are very small number of constructs that refer to students' own sense of self, which perhaps seems surprising in a special issue on learning and identity.

3.3. Identity as interaction

The articles in this issue, broadly speaking, frame identity in sociocutural terms (as do I in my own work), building on Erikson (1994), Gee (1999), Lave and Wenger (1991), Shaffer (2007) and others. These views are *sociocultural* in the sense that they see an individual's identity as *manifest* in some kind of activity that is *situated* in some broader cultural context—as Gee puts it, identity involves being a particular kind of *who-doing-what-within-a-[D]iscourse*, where by [D]iscourse Gee (2001) means a way of "talking, listening, writing, reading, acting, interacting, believing, valuing, and feeling (and using various objects, symbols, images, tools, and technologies)." A [D]iscourse in this sense is the kind of *doing-what* that people from some community of practice engage in.

In this view, identity is simultaneously both *subjective* and *performative*: it means both seeing oneself as a *who* within some kind of [D]iscourse *and* acting like the kind of *who* that belongs in some community. Or, in Gee's terms, understanding oneself as the kind of *who* that produces [d]iscourse (the things people actually say and do) that is consistent with some [D]iscourse (the kinds of things some group of people says and does).[3]

This poses a particular challenge for scholars of identity—or, anyway, scholars who want to find empirical evidence of identity. Because [d]iscourse is a cultural artifact, elements of [d]iscourse always invoke some combination of skills, knowledge, values, and decision-making processes—as well as the identity or identities associated with them. That is, anything we say or do (any performance) marks us as the kind of person who makes some set of assumptions, interprets a situation in particular ways, and decides on certain kinds of actions. So to make claims about a person's identity, we have to understand the ways of knowing, doing, thinking, and being that their actions signify.[4] In this sense, *everything someone does* is a manifestation of one of

[3]The typographic convention of referring to things that people say in the world as [d]iscourse with a small [d] and the patterns of [d]iscourse in a community as [D]iscourse with a capital [D] is confusing, but widely used in discourse analysis.

[4]For more on the argument in this section of the paper, see also Shaffer (2012), from which some of these

their identities, and each of these five explorations of identity operationalizes different aspects of [d]iscourse to take as markers for identity.

Put another way, elements of [d]iscourse are always interpreted in terms of a larger [D]iscourse. A display of skills invokes some particular identity. Any value statement requires knowledge of the context and its relevant features. Any decision is conditioned on the skills, knowledge, values and identity of the community. In fact, one might argue that it is impossible to distinguish aspects of an identity in isolation. What does it mean to use a skill, or to know something, "on its own," independent of any values or sense of self?

Thus, identity is *interactional*, in the sense that it is an interaction between... well, between things like: KNOWLEDGE AND TECHNICAL LITERACY, INTERESTS AND VALUING, SELF-ORGANIZATION AND SELF-CONTROL, and SELF-PERCEPTIONS AND SELF-DEFINITIONS; or LEVEL OF COMPLEXITY, LEVEL OF CERTAINTY, SOURCE OF KNOWLEDGE, and JUSTIFICATION OF KNOWLEDGE; or AGENCY, MOTIVATION AND INTEREST, and IDENTIFYING AS SCIENTISTS.

It is therefore, perhaps, not surprising that Reilly et al. (2020) conclude that: "students described their science identities as a nuanced combination of their skills and abilities, interests, and career aspirations. They also more generally discussed being good at science through the skills, ways of thinking, and passions required by someone who is a good scientist."

Quite so.

From this perspective, then, although only a few of the constructs in these studies refer explicitly to students' sense of self, they are all constituent components in understanding the forms of identity that the authors are investigating.

However, if identity is interactional, then analyses of identity need to make those interactions explicit, and Shah et al. (2020) are notable in this respect for using visualizations (based on a quantitative ethnographic analysis of their data) to show how the structure of those interactions—and thus the configuration of students' identities—change over time. Other quantitative techniques can be used to make similar assertions, and whether or not quantification is used, the most convincing way to make the interactional construction of identity visible is by including qualitative analyses, as the papers in this special issue do.

All of that having been said, there is a reason that in my summaries above I singled out the constructs that *do* involve expressions of students' own sense of self. Quite simply, although the sociocultural nature of identity formation means that we can take a student's actions as indicative of some identity (or at any rate, consistent with one), that is very much not the same thing as knowing that *the student takes them that way as well*. Identity is performative in the sense that it is something that we as researchers (and others) can see, but it is not *only* performative. It is also subjective, meaning that it is also held in the view of the learning subject.

Indeed, there is a big difference between a student who acts like a scientist but does not realize that they are doing so, and a student who acts like a scientist because that is how they see themselves—just as there is a big difference between a student who is acting like a bully but does not realize it, and one who knows they are a bully and acts like one anyway.

In other words, analyses of students' identity in the context of learning—meaning both the influence of students' identities on their learning and the development of those identities—need to be operationalized in terms of the *interaction* of a constellation of

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ideas are taken.

constructs including both the things students say and do *and* statements and actions that reveal the students' own sense of who they are and how the see themselves.

4. Discussion

In other work (see, e.g., Shaffer, 2017), I have argued that empirical research is *operationalization all the way down*: that is, the quality of one's conclusions depends on how theoretical constructs are made manifest in data.[5] When, as Mislevy and Riconscente (2006) suggest, constructs, coding, and context are all aligned, the claims we make are warranted. If not, then we get GOGI: Garbage Operationalization, Garbage Interpretation.

What we can see across the papers in this special issue is that, regardless of the specific theoretical framework being used, from a sociocultural perspective the challenge in operationalizing identity is threefold. First, identity is simultaneously performative and subjective: it is a set of *things someone does* that we as researchers can perceive and the way the learning subjects *understand themselves* relative to those actions.

Second, identity is a construct that emerges from a set of *things someone does* that are themselves a complex interweaving of skills, knowledge, values, and epistemology. In order to analyze identity as an interactional phenomenon, we have to be able to find both the threads that make up the warp and weft of how people understand themselves and the process by which such weaving is accomplished.

Third, this loom-work is inherently *microgenetic*, in the sense that changes in identity are rarely sudden and complete reconfigurations of a sense of self relative to the [D]iscourse of some community. Like other forms of weaving, it takes place over time, action by unfolding action, in the broad curriculum of students' lives.

As we see across the studies in this issue, such microgenetic analysis requires using qualitative or quantitative perspectives that account for the interactional nature of identity—and ideally approaches that can integrate and unify qualitative and quantitative perspectives to make claims about identity and learning.

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[5]There is a(n apocryphal) story from Geertz (1973) about a culture that sees the world as perched on the back of an elephant, which is standing on a turtle. When an informant is asked what the turtle is standing on, the reply is: "From there it is turtles all the way down."

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