“Left to myself, I wouldn’t have done it”: Dagen H in mathematics education

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Abstract: This paper investigates how undergraduate mathematics students negotiate their identities within a collaborative problem-solving activity structured around assigned roles. Drawing on the metaphor of *Dagen H*—the day Sweden transitioned from left- to right-hand traffic—the study investigates what occurs when students are invited to engage in unfamiliar forms of mathematical participation. Students were assigned one of three roles—Narrator, Participant, or Specialist—each representing a different way of engaging in and talking about mathematics. By analyzing group-written reports alongside follow-up interviews, the study examines how students enact these roles and narrate their experiences. Findings highlight the interplay between role enactment and self-narration, showing how the role structure invites students to explore alternative ways of participating in mathematics and articulate who they might become within the discipline.

Keywords: Students’ identity, university mathematics, performativity, narrative

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1 Introduction

Shifts that require individuals to act in unfamiliar ways often trigger heightened awareness and reflexivity. Such a dynamic can be found in what happened during *Dagen H*—the “H Day”, from *Hogertrafik*, right-hand traffic in the Swedish language—which took place in Sweden when the country officially switched from driving on the left-hand side of the road to the right. On that day, the Swedish government introduced the change of direction in a complex, but carefully planned operation. The main concern was the risk of accidents, especially in the days immediately afterwards: such a radical change in the now automated practices of motorists inevitably exposed them to possible errors. Surprisingly, however, the following Monday saw significantly fewer accidents than the average for a typical September day (“Swedish motorists move”, 1967). As a metaphor, *Dagen H* describes the performance of an identity that appears unfamiliar, and yet–through the momentary suspension of habitual ways of being–capable of giving rise to a

successful performance.

In mathematics education, similar phenomena can occur when students are asked to engage in ways of doing mathematics that diverge from their usual practice or self-perceptions. One student in our study, reflecting on her experience in a role-based task, remarked: 'Left to myself, I wouldn't have done it.' This comment encapsulates the dissonance that can arise when individuals are invited to take on identities that feel unfamiliar, along with the reflective work this entails.

In this article we intend to explore the interplay between narrative identity (Sfard & Prusak, 2005; Sfard, 2019) and performative identity (Butler, 1988; 1993) observing how undergraduate mathematics students construct and negotiate their identities when asked to take on distinct roles—Narrator, Participant, and Specialist—within a collaborative problem-solving activity.

Although research in mathematics education has examined narrative identity and performative identity separately (see, e.g., Heyd-Metzuyanim & Sfard, 2012; Gholson & Martin, 2019), little empirical work explores how these two dimensions interact in the same learning activity and how such interaction is shaped by explicitly assigned roles. As previous studies have shown, role-based collaborative problem solving contributes to fostering undergraduate mathematics students' identity development processes (Miranda, 2023; Miranda et al., 2023; Albano et al., 2024).

Drawing on group-written reports and follow-up interviews we trace moments of tension, alignment, or rupture emerge between how students enact the roles and how they talk about themselves. Within these dynamics, we draw attention to what we call "*Dagen H moments*": episodes where the uptake of an unfamiliar role prompts intensified reflexivity and invites students to reconsider their place within mathematical activity.

2 Literature background

Since the late 20th century, identity in mathematics education has evolved into a broad affective construct that encompasses also attitudes and beliefs (Goldin et al., 2016; Heyd-Metzuyanim, 2017).

Drawing on socio-cultural perspectives, we adopt a view of identity as dynamic, socially constructed, and continuously shaped by context and interaction.

Socio-political approaches addressing mechanisms of subject construction have since expanded the field, producing multiple interconnected perspectives, each supported by specific theoretical foundations (Darragh, 2016).

This study explores the interplay between performative identity (Butler, 1988; 1993) and narrative identity (Sfard & Prusak, 2005; Sfard, 2019), which offer complementary insights for understanding identity construction in mathematics education.

Performative identity, first developed within gender studies by Judith Butler (1988; 1993), sees identity being constructed through *performative acts*. In mathematics education research this notion has been taken up in various studies (see, e.g., Chronaki, 2011) which frame performative acts as both embodied and discursive practices through which individuals reproduce and challenge hegemonic discourse.

Complementary, narrative identity emphasizes the role of the stories individuals tell about themselves, shaping how they construct a sense of self within specific social contexts (Sfard, 2019). Sfard and Prusak (2005) define it as "*those narratives about individuals that are reifying, endorsable and significant*" (p.16, italics in original)–stories that reflect perceived traits, influence storyteller's actions, and carry emotional resonance (Sfard & Prusak, 2005; Sfard, 2019).

Undergraduate students in mathematics both perform expected institutional practices and construct identity narratives about who they are as members, or potential members, of the mathematical community shaping how they interpret experiences, successes, struggles, and sense of belonging. Thus, university context presents a unique set of dynamics that shape identity work, in which hegemonic discourse manifests through normative expectations regarding what it means to "do" or "be" mathematics.

Students typically enter university with pre-existing conceptions often shaped by prior educational experiences and reinforced by cultural representations (e.g., books, films) that convey a socially shared and legitimized image of the mathematician and their presumed traits.

However, the academic environment introduces a different epistemological and discursive framework that requires engagement with mathematics in more abstract and formalized ways. This entails the acquisition of a range of disciplinary practices, such as producing proofs, articulating problem-solving processes and adopting specialized registers. As previous studies have indicated, the shift from school- to

university-based conception of mathematics is frequently experienced as problematic, often generating affective tensions (Gueudet et al., 2016; Di Martino et al., 2023).

These practices are experienced not just as technical competences to be acquired, but as implicit criteria for membership within the mathematical community. In this sense, students may feel compelled to embody these qualities not only in their academic performances but also in their dispositions and orientations towards the discipline, thus responding to a system of expectations that governs what it means to be recognized as a "real mathematician" (Solomon, 2007; Gildehaus et al., 2024).

Here, such a system of expectations is interpreted as part of a broader hegemonic discourse aligned with the *ideology of certainty* in dominant representations of mathematics (Beccuti et al., 2024; Beccuti, 2025). This ideology posits mathematics as rigorous and precise, constructing normative identity models to which students are implicitly invited to conform. Undergraduate identity work thus emerges as a response to hegemonic discourse, shaping both their perceived access to the mathematical community and their engagement with the discipline.

Building on these complementary perspectives, this study aims to explore tensions and alignments between narrative and performative identities that emerge when undergraduate mathematics students engage in role-based collaborative problem-solving activities, and to examine how the assigned roles help bring these identity dynamics into focus.

3 Methodology

3.1 Participants and setting

This study took place in a second-year General Topology course within a mathematics degree program in southern Italy.

In order to explore the dialogic relationship between performance and self-narrative, we designed a mathematical problem-solving activity grounded in a performative view of identity (Butler, 1988; 1993), inviting students to embody particular ways of engaging in and speaking about mathematics as a means of making visible and reflectively engaging with the identity work involved in mathematical activity.

To this end, we introduced three roles—Narrator, Participant, and Specialist—inspired by the three voices often observed in mathematical problem-solving narratives (Liljedahl, 2007).

When narrating mathematical problem solving, the Narrator's voice recounts the events that led to the solution, often including non-mathematical details that provide useful context for the reader. Alongside this, the Participant's voice reflects emotional and cognitive experiences—uncertainty, intuition, reflection—conveying the internal perspective of those engaged in the problem-solving process. Finally, once a solution has been reached, the Specialist's voice presents and justify the reasoning within the framework of formal mathematical discourse, using appropriate terminology and conventions.

These roles were framed as performative acts in the sense described by Butler (1988; 1993): discursive and bodily enactments that both reproduce and question dominant norms of what it means to "do" and "be" mathematics. By embodying the voices of Narrator, Participant, and Specialist, students engage in practices that reflect dominant norms of mathematical activity—such as using a formal register—while also making visible the affective, reflective, and contextual dimensions often excluded from traditional representations of mathematical work. In this way, the roles do not merely describe different perspectives, but actively position students in a space where identity is constructed through action and language, offering opportunities to both align with and resist normative expectations.

Roles were randomly assigned via color (blue for Narrator, red for Participant, and green for Specialist) and students were randomly grouped in threes, each group containing one of each role, forming eight groups in total.

Students worked in a *Thinking Classroom* environment (Liljedahl, 2020), engaging with appropriately designed problems on vertical non-permanent whiteboards arranged along the walls of the classroom. Each group was assigned a topology problem designed to stimulate mathematical creativity, consisting of three tasks: the first two required the construction of examples satisfying a given definition under specific constraints; the third invited students to provide a characterization related to the investigated property.

Although roles were assigned at the outset, students freely interact with the problem and with one another without rigid role division during the problem-solving phase. Their role was primarily a lens for observation and reflection, which they were later asked to integrate into a written report.

This paper focuses on one group–Amelia, Clara and Bernardo (pseudonyms)–whose case exhibited a particularly striking manifestation of the phenomenon we refer to as "*Dagen H*".

3.2 Data collection

At the end of the activity, each group collaboratively wrote a report using a shared Google Document. Each member contributed in using their role's color and voice, thus making the latter recognizable within the text. The report becomes a multivoiced reconstruction of the problem-solving process blending contextual description, emotional engagement, and mathematical formalization.

This format allowed the report to be interpreted as a performative space in which students discursively enacted their roles and revealed how they positioned themselves within the mathematical activity and the group dynamic.

In addition, semi-structured group interviews were conducted a few days later, inspired by the Explicitation Interview (Vermersch, 1994). Questions addressed students' motivations for studying mathematics as well as their academic trajectories, aspirations and self-perceptions within the discipline, focusing on how students experienced and interpreted their role, and how it aligned or diverged from their usual ways of doing mathematics.

Conducted with all group members, the interview setting enabled a dialogic co-construction of meaning, shared memories, and moments of agreement or divergence—thus creating a collective narrative space shaped by interaction and negotiation.

Interviews were audio-recorded and transcribed, offering insights on students' identity narratives.

3.3 Method of analysis

This study adopts a qualitative, theory-driven thematic approach to analyze how undergraduate mathematics students tell stories about themselves and enact roles in collaborative problem solving. To this end, the two types of data were analysed through distinct but complementary interpretative lenses, grounded in the distinction between narrative identity (Sfard & Prusak, 2005; Sfard, 2019) and performative identity (Butler, 1988; 1993). Our aim is to trace how these two dimensions—narrative and performative—interact, reinforce, or challenge each other as mathematical activity unfolds.

In doing so, adopting a performative perspective, the written reports were treated as discursive performances in which identity was enacted through rhetorical choices, tone, and narrative structure. Although written retrospectively, these texts were analysed as situated performances, through which students constructed their role and identity in the task. This construction was shaped by content selection and sequencing, the use of affective or epistemic language, and how students made themselves present—or absent—in the shared narrative. Drawing on a performative view of identity (Butler, 1988; 1993), the analysis focused on textual features—verb choices, personal pronouns, rhetorical structure, and evaluative language—that signaled the enactment of one or more identity roles.

Adopting a narrative perspective, the interviews, designed to elicit biographical narratives and reflections on the activity, were examined primarily as instances of narrative self-construction. In these conversations, students retrospectively constructed and articulated who they are—or aspire to be—as learners and doers of mathematics. Drawing on a narrative perspective on identity (Sfard & Prusak, 2005; Sfard, 2019), the analysis sought to trace recurring motifs, identity positions, and self-descriptive patterns across accounts, with attention to how students portrayed their relationship with mathematics, their perceived role in the task, and their imagined future selves.

It is worth noting that in the Italian university system many mathematics undergraduates already envision teaching as a potential career, even though bachelor's programs usually do not include any pre-service training courses.

4 Data analysis

Focusing on a single group, this section examines the three roles through a dual analytical lens of narrative and performative identity.

By comparing how students talk about who they are and how they enact roles in writing, we explore tensions and alignments between these dimensions. Moments of discontinuity–metaphorically framed as *Dagen H* phenomena–reveal the fluid and situated nature of identity in mathematical learning, shaped by dominant disciplinary discourses and institutional expectations.

4.1 The Narrator

4.1.1 The interview

> Here in mathematics, when we study, we cannot limit ourselves to using the language of the Narrator (Amelia)

Amelia describes her previous educational experience as rich in positive encounters with mathematics. She reports having consistently achieved good results in the subject and describes herself as 'good at math'.

Among the meaningful experiences she recalls is her classmates asking her, prior to written tests, to explain specific topics. Notably, she associates the ability to explain a concept clearly—and to effectively convey it to others—as evidence of having truly understood it.

She presents herself as attentive to the emotions of those around her and, for this reason, identifies more closely with the role of the Participant, which she sees as more aligned with her self-image.

> It was really the type of language to be used in the text [that made me feel in the role of Narrator] (Amelia)

In enacting her role, she deliberately chose to adopt a colloquial tone, describing her written text as a 'storyline' of the problem-solving process. However, during the interview, she positions the role of the Narrator as secondary to that of the Specialist.

She aspires to become a teacher capable of conveying mathematical content in an accessible, informal way, while maintaining a human-centered approach. In this sense, she views the Narrator as consistent with the kind of teacher she hopes to become.

Although she considers the Narrator essential for effectively communicating mathematical ideas—and thus central to the professional identity she aims to construct—she also perceives this role as secondary within the academic discourse of mathematics, acknowledging the influence of dominant narratives that marginalize the Narrator's position.

4.1.2 The report

The group structured their report by organizing the problem-solving process according to the individual tasks that comprised the activity. In each section, the

order they followed was: Narrator, Specialist, and Participant.

Within the report, Amelia describes the development of the activity using the first-person plural, thus adopting a collective perspective. The tone is concise, and the language is predominantly colloquial, though it frequently incorporates technical terminology.

Notably, the Narrator's voice always appears at the beginning of each task section, expressed through brief introductory passages that never reappear later in the narrative. By intervening only at the outset—and only at the initial stage of the problem-solving process—the narrative seems confined to an opening function.

4.1.3 Comparative reading

Analysing Amelia's narratives and performances, an implicit hierarchy becomes apparent in her account. Although she identifies with the Narrator, she positions it as secondary to the role of the Specialist. This reveals a tension between her personal sense of identity and her perception of what is valued or legitimized within the mathematical community.

Despite this, her role enactment demonstrates a notable degree of agency. She makes a conscious linguistic choice, adopting a tone that is both colloquial and technically precise, incorporating elements typically associated with the Specialist. This overlap indicates the potential of the role as a space within which to "play" with the elements that characterise it.

At the same time, a deeper tension emerges: the Narrator's voice appears only at the beginning of each section of the report, confined to a brief, introductory function. This limited presence may signal the internalization of hegemonic discourses surrounding mathematical communication—discourses that implicitly define what counts as legitimate mathematical expression and shape expectations about tone, structure, and authority. In this light, the marginal position of the Narrator may reflect broader normative pressures that influence how Amelia believes mathematical texts should be composed, even in spaces that invite narrative and reflection.

4.2 The Participant

4.2.1 The interview

> My role wasn't really natural…Left to myself, I wouldn't have done it (Clara)

Clara describes having developed a positive relationship with mathematics during her school years, largely due to the influence of a teacher she remembers for his friendly and approachable demeanor toward the class.

Like Amelia, she recalls moments of satisfaction linked to successfully explaining a topic to her classmates, interpreting this ability to convey understanding as evidence of having mastered the content herself.

At the same time, she characterizes herself as less inclined to reflect on the emotional dimensions when engaging in mathematical activity—an attitude that appears to reflect an internalization of dominant academic discourses, in which such aspects are implicitly insufficiently legitimized.

> When I study I never make these considerations, I usually just study, understand, I don't think about how I feel about what I am studying, I just study and understand it (Clara)
> Why? (Interviewer)
> What advantage would it have? (Clara)

When explaining mathematical ideas, she tends to adopt a simple and informal register, which leads her to feel an affinity with the role of the Narrator.

Her aspiration to become a teacher is rooted in the desire to communicate knowledge in a clear and accessible way. Nevertheless, when she envisions her future professional identity, she aligns more closely with the role of the Participant, suggesting a view of teaching grounded in interaction and the co-construction of meaning.

4.2.2 The report

In her section of the report, Clara adopts a fluent and personal style of expression, marked by a strong emphasis on emotional experience.

She offers detailed accounts of the affective dimensions of the activity, demonstrating not only a heightened sensitivity to emotional dynamics but also a reflective capacity to trace their origins.

Like Amelia, she adopts a collective perspective, consistently referring to the group as a cohesive unit. This orientation constructs an image of a Participant who is actively engaged, reflective, and fully present in the unfolding of the activity.

4.2.3 Comparative reading

Clara’s case reveals a marked discontinuity between her self-narrative and her

observed performance. While she describes herself as someone who typically does not engage with the emotional or relational dimensions of mathematical activity, her performance in the Participant role is marked by precisely those features: emotional insight, relational awareness, and deep affective involvement.

This tension can be productively understood through the lens of the *Dagen H* metaphor introduced in the opening section: just as, in 1967, Swedish drivers were suddenly required to switch to the opposite side of the road, being asked to enact behaviors that feel unfamiliar can lead to a heightened state of vigilance and self-monitoring. When students are invited to perform traits they do not perceive as their own, their actions often become more deliberate and regulated: they engage in ongoing self-checks to ensure alignment with the expectations of the role.

In this sense, the misalignment between the assigned role and the perceived self does not necessarily hinder performance; rather, it can prompt an intense cognitive and affective engagement.

The *Dagen H* metaphor helps illuminate this phenomenon as a condition in which identity is momentarily suspended in favor of performative coherence—a coherence that demands attention, effort, and reflexivity.

4.3 The Specialist

4.3.1 The interview

Bernardo reports a positive emotional relationship with mathematics, framing his experience with the discipline in affective terms. He conceives of mathematics as both rigorous and creative—a domain in which personal expression is not only possible but meaningful.

> In writing the report, at least my case it was quite easy to figure out [what I had to do] because there was the presentation of the idea, there was the intuition behind it, and you simply had to, in quotes, make it more rigorous…elegant, so to speak (Bernardo)

Among the three roles, he identifies most strongly with the Specialist, describing it as ‘easier to define’ and seemingly inherent to the discipline itself. This sense of alignment makes the Specialist feel particularly natural to him.

Notably, Bernardo interprets the three roles in processual terms: he associates the Narrator with the generation of ideas, the Participant with intuitive exploration, and the Specialist with the phase of formalization.

At the end of his academic journey, he envisions himself as someone capable of explaining mathematical concepts with clarity, combining rigor with a human dimension.

Within this perspective, the Specialist aligns with his future self-image, yet he does not reduce his identity to that role alone. Rather, he presents an integrated vision in which all three roles contribute to a more complete and authentic enactment of what it means to do and communicate mathematics.

4.3.2 The report

In the written report, Bernardo adopts an impersonal tone, marked by neutral and detached language.

He consistently favors the use of technical terminology, though he does not engage in formal justification or elaborate on the reasoning behind the mathematical steps.

The presence of the group is implied rather than explicitly referenced, suggesting an effort to lend objectivity and generality to the account by minimizing subjective or collective markers.

4.3.3 Comparative reading

In Bernardo's case, the use of specialized and neutral language reflects a strong alignment with the role of the Specialist. No evident tensions emerge between his narrative identity and his performance, suggesting a high degree of coherence.

However, this apparent consistency may conceal a lack of critical reflection on the role itself. Unlike the Participant, the Specialist draws heavily on features already legitimized by the hegemonic discourse of mathematics, and this high level of institutionalization may have enabled a more automatic enactment, carried out with reduced agency and less engagement with the role's defining features.

This contrast can be insightfully interpreted through the *Dagen H* metaphor introduced earlier.

While Clara's unfamiliarity with the Participant prompted a heightened state of self-monitoring to ensure performative coherence, Bernardo's familiarity with the Specialist identity seems to have encouraged a more spontaneous and unexamined performance.

Much like in the original *Dagen H* scenario, when individuals are asked to perform traits that do not feel like their own, they become more attentive and

deliberate in their actions. Conversely, when the role feels familiar, they tend to act automatically, trusting that their behavior will naturally align with expectations. Bernardo's case exemplifies this latter condition, where coherence may result not from conscious alignment, but from the uncritical adoption of a culturally dominant identity.

5 Discussion and conclusions

University mathematics, entailing a stronger emphasis on formalism and abstract reasoning (Gueudet et al., 2016; Di Martino et al., 2023), introduces a new set of dynamics and criteria that act as a system of implicit norms shaping students' mathematical participation.

This system of implicit norms, within which university mathematics students construct their identities, reflects the notion of *figured worlds* (Holland et al., 1998). From this perspective, the "world of university mathematics" can be understood as a culturally situated space in which certain identities and practices–such as the rigorous formalist–are more legitimized than others.

This lens helps interpret Amelia, Clara and Bernardo's perceptions of the roles: an implicit hierarchy emerges, evident in Amelia's initial marginalization in the report, in Clara's difficulty legitimizing attention to her emotional experience, and in Bernardo's reflection describing the Specialist role as "more defined," perceived and enacted as a stylized repetition of normalized practices.

Clara's case deserves particular attention. Through a narrative approach, our analysis suggests that the academic *figured world* shapes her sense of legitimacy in embodying certain ways of engaging with mathematics. Yet, using a performative lens, her role enactment reveals a rupture with this framework that we interpreted through the metaphor of *Dagen H*.

Here, the role explicit invitation to focus on affective dimension enables a form of agency, legitimizing an alternative way of participating in mathematical activity.

From this view, the roles offer a space of agency authorizing students to explore new forms of participation within the academic community, including attention to dimensions often marginalized in academic mathematics. Thus, the *Dagen H* phenomenon becomes a lens to examine the boundaries between hegemonic discourse and individual agency.

It may not be coincidental that the *Dagen H* phenomenon emerged in the case of the Participant because this role seems to problematize hegemonic views of the

mathematician and of mathematical activity. By inviting negotiation between personal engagement, affectivity, and institutional expectations, it becomes a potential site of tension, where cracks in the hegemonic discourse become visible.

A possible limitation of this study concerns the use of group rather than individual interviews to explore participants' narrative identities. This choice aimed to foster interactions that could elicit significant moment, such as memories and positions taken during the experience. Group interviews, however, may leave less room for individual voices, even if they also open up alternative spaces for expression through interaction.

Finally, students' envisioning of their future, albeit differently, reveals a tension between their enacted identity and their narrated future-self. This suggests that the experience offered a space of agency where students could glimpse the kind of identity they wish to construct. As a future development of this study, we aim to explore this dynamic more deeply investigating how, and to what extent, moments of identity reflection contribute to making a future identity thinkable and narratable, and which elements facilitate or hinder its emergence.

This study examined a single group of students within a specific course and institutional context, which necessarily limits the scope of the findings. While this allows for a fine-grained exploration of identity dynamics, it also raises questions about how these dynamics might unfold in different settings and with a larger number of participants.

We plan to extend this investigation to more diverse contexts and adopt longitudinal perspectives to deepen our understanding of identity processes within university mathematics education.

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