Chapter 14

A Commentary: Accounting-of and Accounting-for the Engagement of Teachers and Teaching

Peter Liljedahl

14.1 Introduction

In this commentary, I reflect on the chapters by De Simone; Khalil, Lake, and Johnson; and Montoro and Gil (this volume) and how they contribute to our understanding of *engagement* within mathematics education. However, to build a foundation for this reflection, I will first elaborate on the concept of engagement.

Within the context of mathematics education, the terms *engaged* and *engagement* are used both colloquially and theoretically. Colloquially, engagement is used either to refer to a person's participation in something (verb)—*she was engaged in a problem solving exercise*—or to refer to how a person participates in something (adjective)—*they were so engaged that I could not get their attention*. Although these two meanings stem from the same understanding of engagement as involvement the first use refers to the act of being occupied with something, while the second often refers to how that occupation is experienced—with affect and motivation. This is not to say that the first is devoid of experience, but rather that the focus is on the doing rather than the experience of the doing.

This distinction between the verb and adjective form of engagement also exists within mathematics education research wherein the empirical and theoretical pursuit is further bifurcated into a distinction between, what Mason (2002) refers to as, an *accounting-of* and *accounting-for*. That is, research on engagement has been split into a cataloguing of ways in which participants engage—an *accounting-of*—and explanations for why they engage in this way—an *accounting-for*. In what follows I first explore this bifurcation through the four theoretical lenses of *engagement structures* (Goldin, Epstein, & Schorr, 2007; Goldin, Epstein, Schorr, & Warner, 2011; Schorr & Goldin, 2008), *studenting* (Allan, 2017; Fenstermacher, 1986, 1994; Liljedahl & Allan, 2013a, b), *flow* (Csíkszentmihályi, 1990, 1996, 1998), and *forms*

P. Liljedahl (✉)
Simon Fraser University, Vancouver, Canada
e-mail: liljedahl@sfu.ca

of engagement (Alvarez, 2016; Remillard, 2012). Following this I introduce the three chapters that comprise this section of the book, again applying Mason's (2002) duality of accounting-of and accounting-for.

14.1.1 Engagement Structures

Engagement structures (Goldin et al., 2007, 2011; Schorr & Goldin, 2008) began as an accounting-of the differing ways in which students in a classroom setting engage (verb) with problem solving. Through close observation and careful coding nine behaviours emerged: *Get the Job Done*, *Look How Smart I Am*, *Check This Out*, *I'm Really into This*, *Don't Disrespect Me*, *Stay Out Of Trouble*, *It's Not Fair*, and *Let Me Teach You*.

These behaviours were accounted-for a collection of ten “simultaneously present and dynamically interacting” components (Goldin et al., 2007) that come together to form an engagement structure (Goldin et al., 2011). This structure sits at the intersection of the behavioural, affective, and social. The ten individual components that make up this “behavioral/affective/social constellation” (Goldin et al., 2011, p. 549). These ten components are:

1. Goal or motivating desire
2. Patterns of behaviour
3. Affective pathway
4. External expressions of affect
5. Meanings encoded by emotional feelings
6. Meta-affect pertaining to emotional states
7. Self-talk
8. Interactions with systems of beliefs or values
9. Interactions with longer-term traits, characteristics, and orientations
10. Interactions with strategies and heuristics (Goldin et al., 2011, p. 549).

The first seven of these components are based on the in-the-moment state of the student whereas the last three components are based on the more enduring traits of the students. Using these ten components to account-for the nine behaviours resulted in an in-depth understanding of what motivates each of the accounted-of behaviours.

- *Get the Job Done*—In this behaviour, the student's goal is to complete a mathematical task or activity assigned by the teacher and to fulfil the explicit or implicit obligation. The behaviour is a clear focus on carrying out the work.
- *Look How Smart I Am*—Here the student's goal is to impress their peers, teacher, or themselves with their mathematical ability, knowledge, or genius. This key marker of this behaviour is “showing off” by trying to produce a solution faster, or to produce a solution that is more correct, more efficient, or more elegant than others.

- *Check This Out*—The underlying desire behind this behaviour is a potential payoff—intrinsic or extrinsic. The potentiality of this payoff is heavily predicated on the perceived value of what it is that the student is working on. The behaviour is punctuated by an increased attention to the task in pursuit of the payoff.
- *I'm Really into This*—This behaviour is expressed in situations where the student has entered into a state of deep engagement (Csíkszentmihályi, 1990). The goal that drives this behaviour is the desire to remain in this state, tuning out distractions, and seeking evolving complexities in the task as their ability increases. The physicality of this behaviour is one of focus, rapt interest, and enjoyment.
- *Don't Disrespect Me*—The motivating desire behind this behaviour is the preservation of the student's dignity, status, or sense of self-respect and well-being. The behaviour is observable as resistance to the challenge, defensiveness, face saving, and excessively charged discussions or arguments.
- *Stay Out Of Trouble*—In this case the student desires to avoid conflict or distress with peers or the teacher. They achieve this through avoidance and striving to not be noticed by others often prioritizing these goals addressing the mathematical task.
- *It's Not Fair*—The motivating desire behind this behaviour is to redress a perceived inequity and often occurs when the student perceives inequitable workload recognition from the teacher. The behaviour is focused on correcting this inequity rather than addressing the mathematical work itself.
- *Let Me Teach You*—In this behavior the student's behaviour is guided by the altruistic desire to help another student understand or solve the problem. The behaviour of helping other is punctuated by the satisfaction derived by being able to successfully help another student.

14.1.2 Studenting

Like with engagement structures, the work on studenting began with an accounting-of student behaviours in various learning situations. Fenstermacher (1986) first introduced the term studenting as the set of behaviours that help students learn.

The concept of studenting or pupiling is far and away the more parallel concept to that of teaching. Without students, we would not have the concept of teacher; without teachers, we would not have the concept of student. Here is a balanced ontologically dependent pair, coherently parallel to looking and finding, racing and winning. There are a range of activities connected with studenting that complement the activities of teaching. For example, teachers explain, describe, define, refer, correct, and encourage. Students recite, practice, seek assistance, review, check, locate sources, and access material. The teacher's task is to support R's desire to student and improve his capacity to do so. Whether and how much R learns from being a student is largely a function of how he students. (p. 39)

He later expanded this definition to also include the student behaviours that do not help them to learn.

[T]hings that students do such as ‘psyching out’ teachers, figuring out how to get certain grades, ‘beating the system’, dealing with boredom so that it is not obvious to teachers, negotiating the best deals on reading and writing assignments, threading the right line between curricular and extra-curricular activities, and determining what is likely to be on the test and what is not. (Fenstermacher, 1994, p. 1)

This notion of studenting was used by Liljedahl and Allan (2013a, b) to look closely at student engagement (verb) across a variety of more traditional mathematics classrooms and classroom activity settings—doing tasks in class, taking notes, homework, group work, review, and lecture. Results from this accounting-of student behaviours showed a disturbing trend towards the later of Fenstermacher’s definition. For example, while doing tasks in class Liljedahl and Allan (2013a) found that in some classes upwards of 80% of the students’ behaviours did not contribute to learning. These non-learning behaviours included slacking (not doing anything), stalling (avoiding doing anything), faking (pretending to work), and mimicking (mindlessly following routines). In the context of homework (2013b) they found that 70–80% of the studenting behaviour did not contribute to learning with the dominant non-learning studenting behaviours being cheating, not doing it, or getting help. This last behaviour was interesting because in each case it was shown that, for the most part, the help aided in getting the homework done, but not in furthering the learning. If the homework was marked there were more of these types of behaviours with all three behaviours being almost equally distributed. If the homework was not marked then cheating sharply decreased, getting help stayed about the same, and not doing the homework increased drastically with an overall slight decline in the non-learning studenting behaviour. In the context of note taking, Liljedahl and Allan found that over half of the students were not attending to what they were writing and, instead, just mindlessly copied what was on the boards. More troubling was the fact that over 90% of the students never looked back at their notes. These passive studenting behaviours around notes were, like the other examples, not at all conducive to learning.

Allan (2017) did a detailed accounting-for these studenting behaviours using the theoretical framework of Leont’ev’s (1978) activity theory. Her results were varied and detailed but can be summarized nicely in her analysis of two students who, from the outside, seemed to exhibited the same behaviours, but for very different reasons. While the first student had a primary motive of learning and a secondary motive of getting a good grade, the second student had the reverse—a primary motive of getting a good grade and a secondary motive of learning. Although subtle, this difference in motives made a world of difference in how they engaged in various classroom activities. Although invisible to an outside observer the main difference was that the motive of learning manifest itself as continuous engagement, while a primary motive of getting a good grade resulted in discrete engagement. Only a close accounting-for was able to reveal these nuanced differences in the accounted-of behaviours.

14.1.3 *Flow*

In the early 1970s Mihály Csíkszentmihályi (1990, 1996, 1998) became interested in studying the optimal experience—that moment where we are so focused and so absorbed in an activity that we lose all track of time, we are un-distractible, and we are consumed by the enjoyment of the activity.

... a state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it. (Csíkszentmihályi, 1990, p. 4)

In his pursuit to understand the optimal experience, Csíkszentmihályi (1990, 1996, 1998) studied a population of people he thought most likely to experience this phenomenon—musicians, artists, mathematicians, scientists, and athletes. Out of this research emerged an accounting-of the elements common to every such optimal experience (Csíkszentmihályi, 1990):

1. There are clear goals every step of the way.
2. There is immediate feedback to one's actions.
3. There is a balance between challenges and skills.
4. Action and awareness are merged.
5. Distractions are excluded from consciousness.
6. There is no worry of failure.
7. Self-consciousness disappears.
8. The sense of time becomes distorted.
9. The activity becomes an end in itself.

While the last six elements on this list are characteristics of the internal experience of the doer, the first three elements can be seen as characteristics existing in the environment of the activity and crucial to occasioning of the optimal experience—the third of which became the central focus of Csíkszentmihályi's (1990, 1996, 1998) work.

Csíkszentmihályi's (1990, 1996, 1998) analysis of the optimal experience comes into sharp focus when accounting-for the consequences of having an imbalance in this system. For example, if the challenge of the activity far exceeds a person's ability they are likely to experience a feeling of anxiety or frustration. Conversely, if their ability far exceeds the challenge offered by the activity they are apt to become bored. When there is a balance in this system a state of, what Csíkszentmihályi refers to as, *flow* is created (see Fig. 14.1). Flow is, in brief, the term Csíkszentmihályi (1990, 1996, 1998) used to encapsulate the essence of optimal experience and the nine aforementioned elements into a single emotional-cognitive construct.

Thinking about flow as existing in that balance between skill and challenge (see Fig. 14.1), however, obfuscates the fact that this is not a static relationship. Flow is not a collection of fixed ability-challenge pairings wherein the difference between skill and challenge are within some acceptable range. Flow is, in fact, a dynamic process (see Fig. 14.2). As students engage in an activity their skills improve. In

Fig. 14.1 Graphical representation of the balance between challenge and skill (Csíkszentmihályi, 1990, 1996, 1998)

Fig. 14.2 Graphical representation of the balance between challenge and skill as a dynamic process (Liljedahl, 2018)

order for these students to stay in flow the challenge of the task must similarly increase (Liljedahl, 2016, 2018).

However, this theory of flow did not always match up with the data Csíkszentmihályi (1998) was analyzing. In particular, he found that a balance of challenge and skill did not always produce flow and became “a frustrating puzzle in an otherwise fruitful research program” (Csíkszentmihályi & Csíkszentmihályi, 1988, p. 260). Massimini and Carli (1988) eventually found that flow only occurred if there was a balance between challenge and skill and when both of these were in an elevated state. Otherwise it would produce apathy (see Fig. 14.3). This realization eventually led to an even more nuanced model (see Fig. 14.4) involving eight distinct states resulting from different challenge-skill ratios (Massimini, Csíkszentmihályi, & Carli, 1987).

Csíkszentmihályi’s (1990, 1996, 1998) notion of the optimal experience and the resulting framework of flow is one of the only ways in which we can account-for the adjective form of engagement.

Fig. 14.3 The four-channel model of flow (Massimini & Carli, 1988)

Fig. 14.4 Visual representation of the eight states of the challenge-skills ratio (Massimini et al., 1987)

14.1.4 Modes of Engagement

Drawing on Ellsworth's (1997) work on film study and Rosenblatt's (1982, 1980) theory of transactions, Remillard (2012) developed a model of how textual resource developers position their audience and their resource, and how teachers, in turn, interact with that resource. This theory begins with the *mode of address*, which is about positioning the reader in a particular way so as to know how to initiate the interaction between the reader and the resource. This is followed by the *forms of address*, which are the particular looks and formats embedded in the resource that manifest the mode of address. A reader will interact with this resource through a particular stance called a *mode of engagement*. This stance, in turn, guides the *forms of engagement*, which are the various ways in which the reader engages with the resource and what they look for.

Looking at Remillard's (2012) theory through the lens of Mason's (2002) accounting-of and accounting-for, the idea that the authors of textual resources position the reader and that the reader brings a stance to their interaction with the resource is an accounting-of the fact that both the production of a resource and how that resource is utilized is guided by goals and volitions and that in order for the inter-

action between author and reader to begin some assumptions about these goals and volitions needs to be made. The modes and forms of the address of the resource and the modes and forms of the engagement of the reader are an accounting-for the ways in which these assumptions manifest themselves.

Alvarez (2016) extended and re-purposed Remillard's (2012) theory to both account-of and account-for the interaction between a professional developer and a group of teachers. In this regard, the modes of address referred to the ways in which the professional developer positioned the teachers and the forms of address referred to the different pedagogical approaches the professional developer used with the teachers. From the other side, the modes of engagement were the stances that the teachers brought to the experience and the forms of engagement were the different ways in which the teachers engaged in the professional development sessions. In this sense, the notion of engagement (verb) in both Remillard's (2012) theory and Alvarez's (2016) re-purposing is different in nature than in the aforementioned three theories in that engagement is not the primary goal of this framework, but rather a by-product of the efforts to account-for the interaction between a textual resource and its reader.

14.2 Engagement of Teachers and Teaching

Although situated within a broad set of contexts, the aforementioned theories of engagement, can be appropriated for use within the specific context of the teaching and learning of mathematics. In what follows, I summarize the ways in which the authors of the three chapters that comprise this section of the book have done so and draw attention to how their work is both an accounting-of and -for engagement. Although each of these chapters are, ostensibly, about understanding engagement, each of the results also makes a contribution to our understanding of how to create engagement. Further, although each chapter is explicitly about teachers, two of the chapters also offer us subtly insights into the engagement of the learner. In my summary I try to pull out these more elusive aspects of the contributions.

14.2.1 Teachers' Classroom Engagement Structures: A Comparative Study of a Novice US and an Experienced UK Mathematics Teacher

To begin with Khalil, Lake, and Johnson co-opt the framework of engagement structures (Goldin et al., 2007, 2011; Schorr & Goldin, 2008), developed and used to account-of and -for student engagement (verb), to do both an accounting-of and an accounting-for teachers' engagement (verb). This novel application of the framework, coupled with the notion of learning trajectories (Desimone, 2009), enables

the authors to account-for the in-the-moment affect of two teachers and eventually reveals that the teacher' in-the-moment behaviours may mirror their students' in-the-moment behaviours and underpins the teachers' emotional needs.

There are three implications emerging from this research. First, and foremost, the framework of engagement structures (Goldin et al., 2007, 2011; Schorr & Goldin, 2008) can be used to "connect teachers' prior 'in-the-moment' behaviour as mathematics learners with their 'in-the-moment' behaviour as mathematics teachers" (Khalil, Lake, & Johnson, this volume). Further, this framework can be used as a lens to connect their affective and motivational domains to these same behaviours—both past and present. Finally, and moving beyond the framework as a tool for the accounting-for teachers behaviour, the framework of engagement structures can be used to actively help in teachers' affective development and to connect their emotional development to their behaviours in-the-moment and across their overarching learning trajectory as teachers.

The novel appropriation of the engagement structures framework (Goldin et al., 2007, 2011; Schorr & Goldin, 2008) coupled with an explicit desire to not only understand teacher behaviour, but also to change their behaviour brings to the fore the importance of explicitly linking teachers' practice to their past experiences as a learner and teacher with the in-the-moment emotions. Khalil, Lake, and Johnson have done an exceptional job of theorizing this complex confluence and actualizing it as both research and intervention.

14.2.2 Exploring Flow in Pre-service Primary Teachers Doing Measurement Tasks

Montoro and Gil chapter sits at this same intersection between research and intervention with their dual intention of trying to provide pre-service primary teachers flow experiences (Csíkszentmihályi, 1990, 1996, 1998) while at the same time looking closely at the elements present when these experiences occur. Mobilizing the theory of flow (Csíkszentmihályi, 1990, 1996, 1998) within a mixed-method approach, the authors were able to account-for the difference in the flow experiences of 230 participants and to hypothesize a way towards creating engaging (adjective) experiences for this population of learners. The methodological approach used in this paper is both rigorous and illuminating, giving us a much needed glimpse into the occasioning of flow.

The authors begin their work by looking closely at the participants' enjoyment and concentration on each of five measurement tasks. Exploratory and confirmatory factor analysis reveals that 70% of the participants experienced elements of flow in tasks 1, 2, 3, and 5, with only 50% having the same experience with task 4. A cursory analysis of the five tasks reveals that, while all the tasks are situated in the context of measurement, only task 4 has a problem solving focus. The authors conjecture that this results in an imbalance between the challenge of the task and the ability of

the doer (see Fig. 14.1) and results in a decrease in the occasioning of flow. This is confirmed through video analysis of one group of pre-service teachers working on these tasks.

This video analysis further illuminates, not only why task 4 does not promote flow to the same extent as the other four tasks, but also why the other four tasks do. Drawing heavily on flow's dimension of balancing challenges and skills (Csíkszentmihályi, 1990, 1996, 1998), Medina and Caudra's analysis reveals the importance of tasks being easy to begin and that an early entry proves to be vital to ensuring that flow is initiated. Even if the initial entry proves to be incorrect it is more fruitful for occasioning flow than to begin correctly with something difficult. This result contradicts Massimini et al. (1987) who predicted that low challenge would produce apathy (see Fig. 14.4). However, the result is in line with Csíkszentmihályi's earlier work and offers us a more nuance understanding of how to engage (adjective) not only pre-service elementary teachers in particular, but also learners in general.

14.2.3 The Intertwinement of Rationality and Emotions in the Mathematics Teaching: A Case Study

Finally, De Simone looks at one teacher, Carla, and her engagement (verb) while teaching. Although not drawing on the aforementioned theories of engagement, she does account-for Carla's decision-making process through the joint and intertwined theories of rationality (Habermas, 1982, 1998) and affect (Brown & Reid, 2006). De Simone argues that with only "the pure rationality à la Habermas, [she] could only have described the decisions of the teacher, without *accounting-for* [my emphasis] their underlying reasons". To get at the reasons she needed emotions—more specifically, emotional orientation (Brown & Reid, 2006) and its resultant and visible emotionality—to see the expectations in Carla's decision-making. In so doing, De Simone makes a powerful contribution to our understanding of the interplay between teacher knowledge and teacher practice—something that is often overlooked in our rush to improve teaching.

Although her work is descriptive in nature, De Simone offers us a means to think about how her results can be used to improve teacher decision-making. Whereas emotions and emotionality are situated and fleeting, the rationality is grounded and can be "prepared *a priori*". Although not the topic of this chapter, De Simone's methodological use of emotionality gives us insight into the reciprocal relationship between teacher and student in the decision-making process. Whereas Carla's emotionality signaled her intentions to the researcher, it also signaled these same intentions to the students—helping to inform their own decision-making process within the classroom.

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