

Exploring School-to-work Transitions through Reflective Journaling

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Exploring the Learning Experiences of Recent Engineering Graduates during the School-to-Work Transition

Introduction

The school-to-work transition is an important period for recent graduates. During the first 12 weeks of a new engineers' job, they encounter a wide range of unfamiliar challenges and experiences. Moving from student to professional, newcomers interact with peers, colleagues, clients, and supervisors in ways that often differ significantly from those typical within a university (Jonassen, Strobel, & Lee, 2006). While an engineering degree program is positioned as preparation for the professional workplace, researchers and practitioners note a critical misalignment across engineering school and engineering work. This misalignment arises, at least in part, from faculty and administrators' misunderstandings about professional engineering work (Stevens, Johri, & O'Connor, 2014; Trevelyan, 2011). As a result, recent engineering graduates can struggle to learn and adapt in their new organizational context.

From a situative perspective, however, such misalignments are not unexpected (Johri & Olds, 2011; Paretto, 2008). The situative perspective posits that learning – or any activity - is intimately tied to the context (Brown, Collins, & Duguid, 1989). The context both constrains and enables different kinds of learning. Importantly, context applies to not only the physical setting, but also the culture, time, people involved, goals, and related factors. For example, in a typical academic context, the goal is often acquiring knowledge to demonstrate proficiency for an evaluator (e.g., on a test or homework assignment). In contrast, at work, the goal of any particular activity might be to advance a project, finalize a design decision, improve profitability—or any number of goals in which knowledge is a tool, not a goal.

Given the differences across organizations, it is perhaps unsurprising that newcomer engineers are often reported as underprepared for the realities of contemporary practice (Anderson, Courter, McGlamery, Nathans-Kelly, & Nicometo, 2010; Stevens et al., 2014). Managers and supervisors describe engineers as lacking professional skills such as teamwork, communication, project management, and design (American Society of Mechanical Engineers, 2013). And newcomers' transition experiences can impact more distal outcomes such as job commitment, satisfaction, and performance—all contributors to larger organizational goals (Klemme Larson & Bell, 2013). Yet while we know this transition represents a period of substantial learning, we know relatively little about what that transition looks like and how engineers, specifically, perceive significant challenges (Korte, Brunhaver, & Sheppard, 2015). Thus, the purpose of the present research is to explore the experiences of recent engineering graduates throughout the first 12 weeks of their jobs to address the question, *What are the contexts in which newcomers describe salient learning experiences throughout the school-to-work transition?*

Framework

To answer this question, we leverage a framework initially proposed by Jacobs and Park (2009), which categorizes the contexts and conditions under which workplace learning can occur. Where many workplace learning theories made distinctions between formal and informal learning, Jacobs and Park (2009) illustrate the problems inherent in that binary and point out its conceptual and analytical limitations of the approach. For example, informal, unplanned learning can and

does take place inside what would be considered a formal training program, and theories which reduce workplace learning to a binary choice cannot always account for such variation. Consequently, they developed a more nuanced framework that provides more complex variations and thus more descriptive power when researching workplace learning.

Jacobs and Park (2009) propose a framework, shown in Table 1, which defines workplace learning along three different dimensions: 1) location, 2) degree of planning, and 3) facilitator role. First, location can be either on- or off-the-job. This criterion helps distinguish experience-based learning (e.g., learning through doing) from classroom or training environments. Second, learning events can be structured or unstructured, where structured learning occurs within some kind of planned system. Last, the facilitator may be either active or passive. It is active if the facilitator drives the learning experience (e.g., a software training program), but passive if the learner needs to reach out to the facilitator to acquire new information (e.g., asking a coworker a question about a work task).

Table 1: Initial categories of learning and example proposed by Jacobs and Park (2009, p. 144)

<i>Category</i>	<i>Location of learning</i>	<i>Degree of planning</i>	<i>Role of facilitator</i>	<i>Example from Jacobs and Park (2009)</i>
<i>A</i>	Off-the-job	Unstructured	Passive	Study leave, educational leave
<i>B</i>	Off-the-job	Unstructured	Active	(None provided)
<i>C</i>	Off-the-job	Structured	Passive	Self-directed learning
<i>D</i>	Off-the-job	Structured	Active	Web-based training, group-based classroom, corporate university
<i>E</i>	On-the-job	Unstructured	Passive	Casual coaching, ad hoc mentoring, job shadowing, learning while doing
<i>F</i>	On-the-job	Unstructured	Active	Unstructured on-the-job training
<i>G</i>	On-the-job	Structured	Passive	Action learning
<i>H</i>	On-the-job	Structured	Active	Structured on-the-job training, formal mentoring, formal coaching

Though this framework is included in scholarly discourse surrounding different theories of workplace learning, to date we have found no studies that use it empirically. Still, the descriptive dimensions appear to hold promise for characterizing newcomer engineers' workplace learning experiences. Given the complexities of engineering practice, the framework offers a useful way of accounting for the potentially wide range of learning interactions and experiences newcomers may engage in. As a result, the eight categories in Table 1 served as *a priori* descriptive codes for data analysis, as described in the next section.

Methods

The study presented here is part of a larger, multi-case study of the school-to-work transitions of newcomer mechanical engineers. Twelve participants participated in background interviews prior to graduation, responded weekly to reflective journal prompts that asked them to describe salient learning events during the first 12 weeks of their jobs, and then participated in final interviews at the end of the 12 weeks. Salient learning events are defined here as participants' responses to weekly journal prompts in which they described either their 1) most significant accomplishment, 2) most important learning or realization, or 3) biggest challenge of the week. In this study, we focus on the journal entries because they provided the concrete accounts of learning as it occurred, including concrete examples tied to particular events. Because little is known about the school-to-work transition for engineers, qualitative journaling provided an opportunity to explore the phenomenon in ways that offer the potential for new or unexpected findings (Yin, 2014). Further, the use of journals offers an economical approach to qualitative data collection over time and across locations.

Sample

In the Spring 2016 semester, 12 mechanical engineering seniors were recruited to participate in a longitudinal study of workplace learning. Mechanical engineering was selected for two key reasons. First, the dominant industry focus of mechanical engineering makes it a useful site for exploring the school-to-work transition of new graduates. Second, ME is one of the largest engineering fields nationally and the largest department at the study university, providing an opportunity to obtain a larger and more diverse sample. Table 2 summarizes participant demographics by race and gender. Given the potentially small number of potential participants in categories other than white male, race and gender are reported separately to protect participants' confidentiality. Overall, 5 out of 12 were non-White, 3 of which identified as male and 2 as female. Of the non-Hispanic/White participants, 6 identified as male and one as female. Given the relatively small sample size and nature of multi-case study research, attempts are not made to generalize to specific populations (beyond ME graduates).

Table 2: Participant demographic breakdown

Race/Ethnicity	Gender (M/F)	No. of Participants
Non-Hispanic White	(6/1)	7
Non-White	(3/2)	5

Table 3 summarizes company size, industry sector, and prior work experiences for each participant. Half entered large, multinational organizations in which they had had previous intern or co-op experiences, while three had work experiences with other employers and two had no prior work experience.

Table 3: Overview of participant workplace characteristics and experience

Pseudonym	Company Size	Industry	Prior Experience	With Current Employer?
Eric	Large	Aerospace	Co-op	No
Jimmy	Large	Aerospace	Co-op	No
John	Large	Manufacturing/Maintenance	Internship	Yes
Sheryl	Medium	Regulations?	Internship	No
Doc	Small	Consulting	None	N/A
Bonnie	Medium	Construction Management	Internship	Yes
George	Large	Manufacturing	Co-op	Yes
Slash	Large	Nuclear	None	N/A
Eddie	Large	HVAC	Co-op	No
Kurt	Medium	Maintenance Engineering	Internship	Yes
Stevie	Large	Automotive/Industrial	Co-op	Yes
David	Large	Aerospace	Internship	Yes

Data Collection

Journaling was used to capture salient learning experiences of twelve recent engineering graduates in various organizations across the US for the first twelve weeks of work. Each week, participants received a series of open-ended questions via email that asked them to reflect on their biggest challenge; most important thing learned; or most significant accomplishment of the past week, as well as prompts to elicit details about the experience, as illustrated in Figure 1.

Think about your experiences over the past week. Your answers do not necessarily need to be related to events that occurred during official work hours, but should be related to your experience transitioning from school-to-work.

1. What was your biggest challenge this week?
2. What made it so challenging?
3. How did you approach this challenge?
4. Did anyone else play a role or help you with this challenge?
5. What would you do differently next time?
6. How do you see this relating to your undergraduate experiences?

Figure 1: Example reflective journal prompt for significant challenge

Emails were sent each week at 3:30 pm using a browser plugin to maintain consistency in timing. Importantly, email offered the ability to follow up with participants to ask for clarification and probing if needed.

Table 4 summarizes the number of journal responses by participant. Overall, out of a possible 144 journal responses (12 participants for 12 weeks), 129 journal prompts were completed and returned (~90%), with all but one participant returning at least 9 out of 12 and all but three returning at least 11.

Table 4: Journal response rate by participant

Pseudonym	Journal Responses	Response Rate
Eric	9	75%
Jimmy	12	100%
John	12	100%
Sheryl	12	100%
Doc	12	100%
Bonnie	11	92%
George	11	92%
Slash	12	100%
Eddie	12	100%
Kurt	12	100%
Stevie	9	75%
David	5	42%
Total	129	90%

Data Analysis

Journal entries were coded following Miles, Huberman, and Saldaña (2014), using the framework proposed by Jacobs and Park (2009) as the basis of an *a priori* descriptive codebook. However, because the framework has currently only been employed to advance discussions of theory, we developed ways to account for various workplace learning settings not clearly addressed by the framework itself. For example, Jacobs and Park (2009) did not provide a scenario for off-the-job/unstructured/active learning, though (as discussed below) such scenarios can and do create spaces for workplace learning. Moreover, the examples they provided are largely idealized and do not account for the full range of experiences newcomer engineers encounter. Thus, analysis included working recursively through the data, literature, and examples to develop operational definitions of each variable. We deconstructed the examples provided by Jacobs and Park (2009) to develop functional criteria that could be applied to journal entries to determine the location, structure, and role of facilitator(s) within each entry, as described below.

Determining location of learning

Jacobs and Park (2009) define on-the-job as learning that occurs “near or at the actual work setting,” but also emphasize experienced-based learning in on-the-job settings. As a result, the criterion for determining the location of the learning is given by the following statement.

- The learner is engaging in a task aligned with their routine job responsibilities.

If the statement is true, the learning event is considered on-the-job.

Determining the degree of planning (structure)

Jacobs and Park (2009) describe events as structured when learning occurs as “a result of a systems approach” (p. 144). But in practice, this criterion is ambiguous. For instance, formal mentoring is described as a structured activity, whereas casual mentoring is considered unstructured, but neither formal nor casual are clearly defined, and even an encounter with an assigned mentor could be either a planned formal meeting or a casual encounter in a hallway. We thus developed three criteria to categorize events as structured or unstructured:

- The event was planned or scheduled ahead of time.
- The facilitator or teacher was acting in fulfillment of a broader organizational role (e.g., a mentor or supervisor) or there is a larger organizational structure that enable the activity (e.g., group training or certification exams).
- The interaction or event was intentionally designed to teach something to the newcomer.

These criteria are consistent with the original definitions, but allow for serendipitous (i.e., unstructured) learning to occur *within* more formal, structured contexts. If any two criteria are met, we categorized the event as “structured.” This flexibility was particularly important in considering mentoring, and the criteria allow us to differentiate between, for example, structured mentoring interactions (e.g. planned meetings) and unstructured ad hoc interactions.

Determining the role of the facilitator

The role of the facilitator can be either active or passive. Facilitators are active when they provide information without specific prompting by the newcomers themselves (e.g., corporate training). They are passive when the newcomer is directing the learning and engaging other parties as needed (e.g. by asking questions or seeking advice). Importantly, Jacobs and Park (2009) define a “facilitator” as any other actor involved in the learning event. For example, many journal entries cited interactions with coworkers as learning events. While the coworker may not be credentialed in a formal sense or trained as a teacher, they nonetheless often facilitated participants’ self-reported learning events. We used two criteria to identify the facilitator role:

- Another person was involved.
- The facilitator either drove the interactions or engaged in a balanced exchange with the learning (e.g., team settings, casual conversation).

Limitations

Several limitations guide the interpretation and transferability of the findings. First the participants in my study were recruited during the middle of the spring semester prior to graduation and needed to have secured employment prior to distributing the screening survey. This approach limited the population in important ways: most had prior work experience (i.e., co-ops or internships), and it is likely that even those who did not, by virtue of having secured employment *before* graduation, were potentially higher performing (e.g. higher grades, more ambitious or focused, richer professional networks).

Second, the journal prompts captured only one experience or event per week. Consequently, other salient learning events throughout the week are not evident in the current data set. Thus, these results do not represent the only learning that newcomers experienced, or even their predominant mode of learning during the study period. Instead, the findings provide a useful way of understanding the kinds of learning that occurred broadly and, equally important, the learning the participants perceived as *most significant* event each week.

Lastly, there is a limitation in the methodology itself. By asking participants to reflect on their week—an activity they might not have done on their own—we changed the way they experienced their school-to-work transitions. In many cases, the effect was positive on participants and was a minimal burden, but the fact that participants knew they would have to recall and reflect on an important learning event each week changed the ways in which they perceived their workplace learning and arguably made them more aware of learning altogether.

Trustworthiness

To establish trustworthiness and credibility, we followed recommendations by Creswell (2012) for ensuring validity and reliability. First, the defining criteria were presented to various members of the research team to ensure face validity (i.e., do the criteria appear useful for distinguishing one code from another?). After the criteria were finalized, another researcher reviewed journal entries within each category to ensure the internal consistency of each context code. Lastly, journal entries were coded by another independent researcher and results were compared across coders. In all phases, disagreements and discrepancies were argued to consensus and codes were refined.

Results

Participants reported learning events across all eight categories of the workplace learning framework proposed by Jacobs and Park (2009). Given the relatively sparse use of the framework in empirical and observational settings, this section provides detailed descriptions and examples of each category, along with an indication of the number of times each category occurred across the 129 weekly journal entries.

A – Off-the-job/Unstructured/Passive. (20 out of 129)

This category describes activities that do not occur as part of the work responsibilities, that have no evidence of structure or planning, and in which the facilitator plays a passive role. These events often had little to do with workplace learning, but instead included events such as Sheryl buying a car, John learning to paying bills, or Slash learning how to manage a personal schedule. Given that the journal prompt asked participants to describe their biggest challenge or accomplishment, without constraining the event to work, the emergence of such learning highlights the complexity of the school-to-work transition and serve as an important reminder that workplace learning is not the only salient facet of this transition. (Note in an updated work by Lutz (2017), this category is divided according workplace and non-workplace learning to enhance analytical clarity.)

B – Off-the-job/Unstructured/Active. (6 out of 129)

These experiences occurred outside of work contexts and had no evidence of formal planning or intentional teaching. But instead of limited involvement of a facilitator, other individuals played active roles in the learning experiences. Though rare, journal entries from this category described events such as socializing with coworkers outside of typical work hours, navigating relationships with friends and partners (who might also be transitioning), or working with others on personal hobbies or activities. For example, Eric described an important learning experience related to a social event at a local waterpark organized by his employer. Such events were not necessarily related to workplace learning, but participants perceived them as salient learning experiences in their school-to-work transition.

C – Off-the-job/Structured/Passive. (3 out of 129)

Events in this category focused on experiences during onboarding. They were off-the-job in that participants were not engaging in work-related tasks and the information was not bound to the location or context – for example, Sheryl described a challenge which involved remaining patient throughout the onboarding process because “there were a lot of forms to fill out. They sent most of them to the new hires ahead of time. However, out of 117 new hires, several of them did not have the forms or had issues filling out the forms.” These interactions were scheduled and designed to provide newcomers with information about their job, the company, or other topics the organization deems relevant. These experiences were passive, self-paced, and completed independently. Notably, however, such events were the least frequently reported, with only three entries in this category.

D – Off-the-job/Structured/Active. (12 out of 129)

Events in this category most closely resemble typical classroom environments. That is, the activities were separated from the actual work tasks, were structured to teach newcomers new skills and information, and the facilitators provided information unprompted and without specific responses by the learners. Here, participants described activities like corporate training. For example, in week 3, Sheryl described an experience in which a small group instructor provided training about the language and vocabulary needed for her job. Similarly, Stevie, who spent her entire 12-week journaling period in a corporate training program, often discussed significant learning in terms of performance on exams or quizzes about the training material. Given conceptions regarding the typical kinds of spaces designated for learning (i.e., a formal classroom setting), it is perhaps surprising that only 12 out of 129 journal entries described events in this category.

E – On-the-job/Unstructured/Passive. (55 out of 129)

By far the most frequently reported events were those which took place on the job, which lacked evidence of a coherent structure, and in which newcomers engaged facilitators only as needed. These represent activities that took place during the course of everyday work duties, where participants were driving their own learning. Journal entries in this category describe a wide range of experiences as participants learned what their job was, how to do it, who to consult for help, and other key elements of organizational culture. For example, Doc, in his first journal entry, described his biggest challenge as “getting used to the dynamic of being a consultant.” Because his office was fairly small and without formal onboarding procedures, he approached

this challenge by “finding projects people were working on, learning about the [field] permits, regulations and equipment that applied to it.” Throughout this experience, Doc largely self-directed his learning, observing and questioning colleagues and consulting resources as needed.

Similarly, George, in his fourth week, wrote, “The most important thing I learned this week was to always follow up with people as a project manager.” George had scheduled a crew to work over a weekend, but realized at the last minute that access to the building was limited those days. He reached out to various operators and managers and eventually gained access in time for the scheduled work, but the event helped him realize the importance of reviewing and confirming plans as a project manager. While no clear trends regarding content emerged across these experiences, the journal entries typically described experience in which newcomers need to actively reach out to managers, supervisors, or coworkers in order to accomplish a task.

F – On-the-job/Unstructured/Active. (18 out of 129)

This category focused on learning that occurred during the execution of work-related tasks, without planning or formal relationships, but with deliberate teaching by a facilitator. Entries in this category are distinguished by the fact that the facilitators worked closely and intentionally with newcomers to help them complete a work task. Importantly, facilitators were not necessarily formal teachers; instead, participants often described learning from interactions with a coworker who helped them solve a particular problem. Kurt described an event in which he “learned to communicate well with shop personnel as well as other engineers” by working across the two groups. When asked who helped him learn to communicate, he noted,

[E]veryone I've had to talk with along the way has [helped me communicate across groups]. My whole group I work in also has as well as my planning supervisor. They've just helped me see the full picture of the valve from each prospective. [How did they help?] One will show me how hard it is on the shop to get the job done, one will show me the cost and time delay in ordering the part. Everyone has just given me a different view. [Kurt, journal entry, week 4]

Many of the experiences in this category reflected a balanced interaction between learner and facilitator in organic conversations. For instance, Eddie described an accomplishment in which he worked cooperatively with “the guy in the cubicle next to [him]” to complete a particular project. Like category E, events in category F represent “learning through doing,” in which the goal was not learning, but rather completing the task. The critical difference is in the facilitator role; in category F, other members of the organization actively contribute to the experience and intentionally teach the newcomer to do something.

G – On-the-job/Structured/Passive. (4 out of 129)

The second least common category were experiences that happened through work, had structure, but required the newcomer to engage facilitators. Jacobs and Park (2009) cite only “Action learning” as an example, but provide no details and limited discussion—perhaps because it is so rare in workplace learning. In this data set, George’s first experience leading a meeting with overseas colleagues illustrates the category. Because this was his first time leading a meeting with counterparts who spoke a different language, he “tried [his] best to have an effective meeting by using key terms and talking very slowly.” However, he noted that his efforts were not

always successful and as a result, “a couple team members in [his] group rephrased some of [his] questions and statements because they are used to having meetings with our counterparts.” The meeting was part of their normal work (on-the-job), and George was intentionally given leadership to help him build his skills (structured), but the facilitators (i.e., the coworkers in the meeting) stepped back and allow the newcomer to take charge of the meeting with no direct instruction (passive). While these interactions are decidedly uncommon for newcomers, they nonetheless appear to contribute to employee socialization and potential to contribute to the organization in the future.

H – On-the-job/Structured/Active. (11 out of 129)

Finally, category H describes events that occurred during work (or through completing a work task), had structure and were planned, and involved an active facilitator. Most common were interactions with formal mentors and coaches. As part of their onboarding process, many participants were assigned formal mentors with whom they met regularly. During these meetings, facilitators discussed various aspects of the transition process and provided guidance to support positive progress and work performance. Sheryl, for example, described a meeting with her supervisor about her performance in which she learned “[n]ot to worry too much about production in the beginning, rather, do a good job at what I’m working on.” Before the meeting, Sheryl’s stress over production was causing her to rush her work and sacrifice quality. During her meeting, Sheryl’s supervisor explained that the organization understands that new hires will not be able to—and are not necessarily expected to—meet the same production quotas as more senior members; instead, she encouraged her to focus on improving the quality of her work.

In other cases, newcomers engaged in unstructured on-the-job training, where they observed more experienced individuals at work. Stevie, for example, described her “OJT” where she “basically shadowed a [person in the position she was being trained for] to get a better understanding of what the day-to-day job will be like.” But in addition to shadowing, her host took time to explain the work and quiz her on material she would need to know for her upcoming training exams. Learning experiences in category H, then, capture structured interactions with mentors or facilitators who provide targeted direction for newcomers’ professional development.

Summary of Analysis

As the results suggest, the framework proposed by Jacobs and Park (2009) provides a useful means for describing newcomers’ workplace learning. However, while most participants reported a wide range of learning contexts throughout their first 12 weeks, the most salient learning events took place in on-the-job and without clear evidence of structure or systems approaches, as summarized in Table 5.

Table 5: Summary of workplace learning by category.

Category	Total
A - Off/US/P	20
B - Off/US/A	6
C - Off/S/P	3
D - Off/S/A	12
E - On/US/P	55
F - On/US/A	18
G - On/S/P	4
H - On/S/A	11
Total	129

As noted earlier, however, the data do not suggest that newcomers' learning experiences are *predominantly* unstructured and on-the-job, but rather that these experiences are the ones our participants considered most important or salient.

Discussion and Implications

This study presents a novel approach to exploring newcomer engineers' self-described learning events as they make their way through the school-to-work transition. As noted, newcomer engineers in this study described a wide range of workplace learning contexts throughout their transitions, and most often identified instances which took place on-the-job and in which there was little to no evidence of inherent structure or planning. These findings point to a number of implications for future research and development—both in the use of reflective journals as an approach for promoting newcomer acclimation during the school-to-work transition and in our understanding of workplace learning for new engineers.

Utility of reflective journaling

First, our results point to the usefulness of journaling as a data collection approach. Engineering educators and stakeholders note the importance of a smooth school-to-work transition (Sheppard, Matusovich, Atman, Streveler, & Miller, 2011), but collecting data during this time period can be challenging in terms of time, resources, and organizational access. Reflective journaling allowed us to capture salient learning experiences of twelve participants across the country during the first twelve weeks of their school-to-work transition. Given the richness of responses combined with the efficiency of the method, it may prove useful for researchers exploring additional engineering contexts that might otherwise be difficult to directly observe.

In addition, our results highlight journaling as a potential onboarding tool. Journaling has been used in the past as a way to monitor and assess professional development in disciplines outside engineering (Bolin, Khramtsova, & Saarnio, 2005; Loo & Thorpe, 2002), and reflective practice is increasingly important in engineering education (Turns, Sattler, Yasuhara, Borgford-Parnell, & Atman, 2014). Consequently, at weeks 7 and 12 and during follow-up interviews, participants were asked about the impacts of the journal on the way they viewed their school-to-work transition. They described journaling as a way to help them think more critically about their experiences each week. They noted that completing the journals made them think more often about the connections between school and work and how prepared they felt, and thus sensitized them to subsequent challenges and learning events. Journaling thus appeared to positively affect newcomers' metacognition and self-regulation during this time, helping them reflect on their learning and improve their strategies for future success. These preliminary findings point to the need for future work.

Validation of workplace learning framework

Our findings also support the validity of the framework proposed by Jacobs and Park (2009). While the framework has been referenced widely in discussions of workplace learning theory (Callahan, 2010; Jeon & Kim, 2012; Manuti, Pastore, Scardigno, Giancaspro, & Morciano, 2015) applications in empirical settings are more limited to date. Thus, this work provides empirical support for the framework as a descriptive tool. It enabled us to group interactions and events described by participants in ways that generated coherent categories of experience. For example, journal entries in category A (Off/US/P) generally described events in which newcomers were learning things unrelated to their job or the tasks needed to perform it competently. Entries in category D (Off/S/A) often described situations in which participants were being taught codified knowledge about their role or the organization. Next steps in this work will focus on the intersections of context and the content. For example, do experiences in category D tend to achieve different learning than those in category E? Or, similarly, does the degree of planning or involvement of the facilitator influence the skills gained from the experience?

In addition to providing empirical support for the framework broadly, our findings extend prior work by providing richer, more nuanced descriptions of each category in the context of engineering. We not only added to the range of experiences within each category, we also developed more explicit criteria for each category. We particularly noted the relative lack of clarity around *Degree of Planning*. Using a recursive approach that synthesized prior literature, examples provided by Jacobs and Park (2009), and our data, we operationalized a "systems approach" and developed systematic criteria to discern evidence of structure or planning.

Salience of workplace learning contexts

Finally, as

Table 5 shows, newcomers overwhelmingly focused on events that were both on-the-job and unstructured. This finding is especially noteworthy when we consider current educational contexts. One can imagine that if we applied this framework to typical classroom environments, these experiences are predominantly off-the-job, structured, and active (Marra, Rodgers, Shen, & Bogue, 2012). While the differences in themselves are not problematic, they point to a need to examine both the ways in which learning context might influence transfer (Barnett & Ceci, 2002) and how curricula might support students in building the skills needed to learn in less structured, more self-directed contexts. At the same time, the findings suggest that employers might also consider how to help newcomers develop the necessary learning skills and how to engage not only trained facilitators, but work teams broadly in supporting such learning.

Importantly, situative and sociocultural learning theories emphasize the role of context and social interaction on personal development (i.e., learning) and point to an important note about transfer between contexts (Lave & Wegner, 1991). As a result, we caution against using our findings to suggest that educators should simply provide more experiences that “look like” on-the-job, unstructured learning. Instead, we recommend that practitioners work to help students understand the range of learning experiences and approaches useful for navigating the various environments in which they might find themselves throughout their careers in engineering.

Conclusion

As newcomer engineers make the school-to-work transition, they engage in a wide range of learning experiences both on- and off-the-job. Our findings from recent mechanical engineering graduates speaks to this diversity, but also highlights the ways in which newcomers most often described salient experiences as being on-the-job and unstructured. Based on the analysis presented here, we offer both practical and theoretical recommendations. First, our findings point to the utility of the reflective journaling process as a means for newcomers to develop self-directed learning and metacognitive skills during onboarding. Second, we suggest further research exploring the intersections of learning context with learning content, and the ways in which we might leverage our deeper understanding of the school-to-work transition to enhance learning across both academic and industrial settings.

A final note concerning this work is that it was part of a larger, ongoing project in which the research and analytic approaches were iterative and evolutionary. As a result, an expanded and updated version of the present results are available in (Lutz, 2017). Importantly, the meaning of codes remained the same, but definitions were modified to enhance precision and criteria were refined to further enhance clarity.

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