Learning in an Urban and Regional Planning Practicum: The View from Educational Ethnography

ELIZABETH BAGLEY
University of Illinois at Urbana-Champaign, USA
ebagley@illinois.edu

DAVID WILLIAMSON SHAFFER
University of Wisconsin-Madison, USA
dws@education.wisc.edu

This paper examines how learning happened in an interactive studio setting using the theories and methods of educational ethnography. The study begins with a review of the education literature on the acquisition of professional education and identity, particularly epistemic frame theory. Using a case study approach, we examine students’ learning during a two-week period of a graduate urban planning studio during which the instructor faced resistance from the students about course direction. Using qualitative analyses and a new quantitative technique called epistemic network analysis, we describe the process by which students appropriated a particular community of practice. This paper offers a productive way of tracking how specific interactions within learning environments can lead to significant changes in cognitive development.

INTRODUCTION

21st Century problems require integrated approaches, combined methods, and synergism between specializations, and one profession at the forefront of addressing those interdisciplinary problems is urban and regional planning (Krizek & Levinson 2005). As we educate the next generation of
planners, two areas of pedagogy to critically examine include how teachers connect their expertise with their students’ expertise and how teachers assess the development of students’ thinking during a practicum or studio course.

Measuring learning in a practicum environment can be challenging, and a growing body of research suggests that a new method called epistemic network analysis (Shaffer et al. 2009) can inform our understanding of how professionals-in-training learn in a practicum environment. Measuring the changes in students’ ways of thinking over time has the potential to allow educators and researchers to explore emergent relationships between the teacher’s planning expertise and the students’ expertise.

This study explores a two-week period during graduate-level planning practicum at a large Midwestern university in the United States and aims to understand how one teacher developed students’ expertise during a point of student resistance. This paper uses qualitative analyses and a new quantitative method called epistemic network analysis to argue that by explicitly reflecting-on-action and addressing the students’ resistance before they rejected his process outright, the teacher created a space where the students could begin to adopt the way of thinking about the problem that he modeled.

THEORETICAL BACKGROUND

A major goal of educators is the creation of instructional contexts in which students appropriate, or adopt, a way of thinking as their own (Herrenkohl & Wertsch 1999). However, Bakhtin (1981) argues that ways of thinking are often not easily and smoothly appropriated and that although a student might start thinking in a new way, the student might do it with a feeling of resistance or even outright rejection. Wertsch (1998) argues that when such resistance grows sufficiently strong, the student may refuse to think in the new way altogether, but also noted that “it has become increasingly clear that interactional contexts involving resistance and rhetorical opposition may provide some of the most productive settings for developing mastery and appropriation” (p. 182).

Herrenkohl and Wertsch (1999) believe that one of the most effective ways to foster the appropriation of new ways of thinking is to coordinate these ways of thinking with opportunities for people to exercise their rights as a way of being responsible to their community. Similarly, Lave and Wenger (1991) argue that communities of people who share a common body of knowledge, a set of skills, a value system, and a set of decision-
making processes are *communities of practice*. A community of practice is a group of people who have defined a set of collective knowledge as a result of working together over time. In apprenticeship, newcomers to a community of practice learn through participating with others in the activities of that community (Lave & Wenger, 1991; Rogoff, 1990). Apprentices in a community of practice begin at the outskirts of the community, participating only at the margins. In order for them to move into a “fuller” sense of participation, they engage in the legitimate—meaningful and purposeful—practices of the community. But their participation is peripheral—because the new member is only asked to do a manageable (for them) portion of the larger practice. As apprentices develop in their learning, their participation becomes more legitimate and less peripheral, and they assume more responsibility during practice and move closer towards full participation in the community.

To clarify exactly what professionals must learn as they participate more fully in a community of practice, Shaffer’s epistemic frame theory (Shaffer, 2006) builds on Lave and Wenger’s work (1991), arguing that the grammar of a particular community of practice—such as a profession—is organized by a particular epistemic frame, which includes particular configurations of skills, knowledge, identities, values, and epistemologies appropriate for solving the problems of the profession. In defining the frame elements of a given professional culture, an epistemic frame articulates the ways of doing, knowing, being, caring, and warranting of a particular profession. According to Shaffer (2006), skills are the things that people within a profession do, knowledge is the understandings that people in the profession share, identity is the way that members of the profession see themselves, values are the beliefs that members of the profession hold, and epistemology is the warrants that justify actions or claims as legitimate within the profession. Put in more concrete terms, ecologists act like ecologists, identify themselves as ecologists, are interested in ecology, and know about complex, interdependent natural cycles, biotic and abiotic environmental features, and other technical domains. These skills, affiliations, habits, and understandings are made possible by looking at problems in a particular way: by thinking like an ecologist. The same is true for other professionals like urban planners, engineers, computer scientists, mathematicians, and science journalists, but for different ways of thinking and with different epistemic frames.

All professional communities of practice face the challenge of “how to teach the complex ensemble of analytic thinking, skillful practice, and wise judgment upon which each profession rests” (Sullivan, 1995). Schön
(1987) argues that for most professions this complex ensemble is developed in practicum experiences. In these cognitive apprenticeships, expert mentors offer scaffolded problem solving opportunities, model professional practice, allow students to explore the professional domain, and perhaps most importantly, invite them to participate in conversations to reflect on their work (Collins, Brown, & Holm, 1991; Collins, Brown, & Newman, 1987). Through these reflective discussions, mentors model how to think and work like professionals in a domain. According to Schön (1987), the goal of the professional practicum is to bind such action and reflection together to produce the professional expertise that is particular to the profession, referred to as reflection-on-action. The process of explicit reflection-on-action allows one to look back on a completed task or process to consider the implications and consequences of actions.

Experienced mentors use reflection-on-action as a way to model the epistemic frame of a profession. For novices, iterative cycles of action and explicit reflection-on-action with peers and mentors bind together the elements of the epistemic frame—the skills, knowledge, values, identity, and epistemology—that an individual takes on as a member of a community of practice. This way of thinking forms the epistemic frame of the community, which, once appropriated, can be used when an individual approaches a situation from the point of view of a member of the community of practice (Shaffer 2004; 2005; 2006).

Although it is possible, and often quite important, to analyze how well students and others have appropriated a new way of thinking, such analyses can be quite limited in that they do not consider all of the complexities in the relationship between students and the new way of thinking (Wertsch 1998). Research on expertise has shown that while experts possess more knowledge of a domain than novices, the quantity of knowledge is not the factor that differentiates them from novices (Bédard & Chi, 2006). Rather, it is the organization of the knowledge that makes them different. Therefore, in order to more accurately measure appropriation, we need a metric that considers the “complex ensemble of analytic thinking, skillful practice, and wise judgment upon which each profession rests” (Sullivan, 1995).

In this paper, we argue that measuring appropriation in a practicum setting requires analysis of the process over time to see if there are instances of resistance that inhibit the appropriation of the epistemetic frame. One way to analyze those components is through an epistemography, an analysis of the structure of a professional practicum through the lens of epistemic frames where one can examine the kinds of action and reflection-on-action that develop the epistemic frame of a profession (Hatfield 2008; Shaffer 2005). An
epistemography allows one to see learning principles at work and to recognize some features of the practicum as more essential than others in developing the professional epistemic frame. However, as Wertsch noted, the relationships between students and their use of new ways of thinking are complex, and traditional quantitative methods do not account for the complexities.

Because a community of practice, like urban planners, has an epistemic frame, we can look at what urban planners say and do in their work, find the relevant skills, knowledge, identity, values, and epistemology, and create a model of the way planners think about problems. According to Gee & Shaffer (2010), we can create a model that describes what it means “to solve problems the way a planner does.” Thus, the degree to which students appropriate a teacher’s epistemic frame can be measured by exploring ways in which particular qualitative characteristics of their discourse are representative of professional thinking. One way to qualitatively categorize professional characteristics of discourse is to use epistemic frame theory.

The kinds of professional understanding (or epistemic frames) that a practicum develops are complex and difficult to measure because the epistemic frame elements are not merely a collection of disconnected skills and knowledge. Rather, central to epistemic frame theory is its explicit focus on the linkages between epistemic frame elements (Shaffer et al. 2009). For example, skills are always linked to some form of knowledge, values, identity, and epistemology (and each of the other elements are, in turn, associated with all the others). However, to further complicate matters, the elements are not always linked to the same ones, or in the same ways. Thus, Shaffer (2010) argues that modeling the structure of the links between epistemic frame elements can be used to measure the quality of discourse in a practicum setting.

The structure of the links between epistemic frame elements in qualitative data can be modeled using an emerging technique called Epistemic Network Analysis (ENA). ENA is used to quantify epistemic frames (Shaffer, et al. 2009) by adapting social network analysis framework to instead map sociocognitive elements (e.g. skills, knowledge, etc.). The ability to quantify the state of an epistemic frame at a given point enables educators and researchers to compare epistemic frames in diverse social circumstances (e.g. different individuals, groups of individuals, or individuals) over time (Bagley & Shaffer 2009; Nash & Shaffer 2010).

This study extends the ideas of Wertsch, Schön, and Shaffer by examining the relationships between appropriation, resistance, reflection-on-action, and epistemic frames in a professional planning practicum. The aim of this
study was to uncover the learning process within a graduate urban planning practicum. In particular, we investigate how one teacher communicated his urban planning epistemic frame in the face of resistance, describing the students’ initial resistance to the teacher’s frame, the teacher’s explicit reflection-on-action, and the students’ ultimate appropriation of the teacher’s frame. We use epistemic network analysis to examine the teacher’s role in the students’ epistemic frame development by tracking how specific features and events in the practicum led to significant changes in frame development. In this paper, we argue that epistemic network analysis can provide a computational model of the extent to which participants appropriate the ways of knowing, being, talking, and acting that characterize a particular community of practice. In closing, we discuss how the results of this study could contribute to the design of reflective learning environments and experiences.

THE ETHNOGRAPHIC STUDY OF THE PRACTICUM URBAN AND REGIONAL PLANNING 912

The main goal of this ethnographic study was to explore the learning processes experienced by the 20 graduate students in the 3-credit practicum course, Urban and Regional Planning (URPL) 912. URPL 912, a prerequisite to entering the professional field of planning, met approximately 3 hours each week for 14 weeks. The teacher during the semester under study was a professional planner with 34 years of planning experience across the United States. According to his syllabus, the course was designed to help prospective professional planners understand what is involved in the design and execution of complex planning projects. . . . [and focus] on the skills needed to succeed in planning practice, including work programming, gathering specific information needed to prepare a plan for a small area, working as part of a team, and making presentations.

In the course, 20 graduate students in the URPL Master’s program prepared a site plan for a developing area of approximately 3,000 acres on the northeast edge of Madison, Wisconsin. In the syllabus, the teacher wrote that he expected the students to “read the landscape” and to expand on the city’s draft neighborhood plan for the area. Class sessions included teacher lectures, class discussion, visits by professional planners, teamwork, student presentations, and feedback on presentations.

To prepare the site plan, each student participated in two different teams over the 14 weeks. Students worked in their initial teams in Weeks
2–5 and in their final teams in Weeks 6–14. During the initial weeks, teams gathered background information on the site and were organized around topics such as infrastructure, existing plans, and transportation. During the final weeks, teams worked on the plans for specific areas within the site. For example, one team was responsible for the open space component of the site plan whereas a second team designed the Burke Station node in the northwest corner of the site. During Week 14, the students presented their site plans to city officials and urban planning professionals, including URPL faculty members.

At the beginning of the first class session, the professor introduced the researcher and asked her to explain her interest in the course. The students and the professor were given voluntary consent letters and forms.

Data Collection and Analysis

This study’s goal was to observe students learning to become planners through participation in a practicum. To capture interactions between the expert teacher and the novice students, we focused on the communication between the teacher and the students during presentation feedback sessions. Presentation feedback sessions were occasions for the teacher and the students to offer feedback on information that teams collected and for the teacher to explicitly reflect-on-action. Those sessions occurred in four classes during the semester (Weeks 4, 5, 11, 13). We analyzed data from the presentation feedback in Weeks 4 and 5 because the feedback given during those weeks focused on the information needed to create successful site plans. (Feedback given in Weeks 11 and 13 focused more on the logistics of preparing for the final presentations.) The specific activities in Weeks 4 and 5 are outlined in more detail in the Results section.

Data were collected in several ways. During each class session and team meeting, the researcher sat silently in the back row and digitally recorded the interactions and supplemented the audio data with field notes. Recordings were transcribed to provide a detailed record of interactions, and field notes were used to capture meaningful nonverbal aspects of the context and to supplement the transcripts.

The data were segmented into interactive units defined as strips of activity with a consistent interactional structure and topical focus. For example, if the class started discussing the capacity of a proposed wastewater treatment plant and then switched to discussing the location of bike and pedestrian paths, the switch in discourse topic would indicate two separate
interactive units. If an interactive unit represented more than one category, it was coded\(^1\) for all applicable codes.

Within each interactive unit, the students’ comments were coded cumulatively instead of individually in order to compare the students’ cumulative frame to the teacher’s frame. We used the teacher’s epistemic frame in Week 4 as the comparative model for the students’ cumulative epistemic frame in both Weeks 4 and 5 for two reasons. First, we were interested in seeing if the epistemic frame the teacher used during Week 4 influenced the students’ epistemic frame in Week 5. Second, after giving the initial lecture in Week 5, the teacher did not contribute as much as in Week 4. To measure the teacher’s contribution in Weeks 4 and 5, we coded interactive units for the presence of the teacher’s comments.

The segmented interactive units were coded for the presence of resistance to determine whether students were resisting the teacher’s epistemic frame\(^2\). Data were coded for resisting the teacher’s frame when students discussed or explicitly referred to their conception of how the process should progress in a way that was contrary to the teacher’s conception of how the process should move forward. In this excerpt, for example, a student asserted his idea about how he thought the process should proceed:

I sort of got the sense that they [the city staff] want us to deliver to them a set of policy recommendations and other higher level stuff to help them move this process along rather than [delivering] our own design.

The segmented interactive units were coded for the presence of reflection-on-action to determine whether the teacher explicitly reflected-on-action. Data were coded for this action when the teacher looked back on a completed task or process to consider the implications and consequences of actions, as in this example:

I’m just saying that when you look at the land use pattern, based on uses like that quarry, there’s real limitations on residential in a large part of the area. You have to think about, what are you going to do on the north end where squeezing residential in is not so obvious or so easy?.

\(^1\) The primary author coded all data, and the second author coded a representative sub-sample of the data to ensure inter-rater reliability.

\(^2\) While we agree that learning to be a professional is not only about assimilating an expert’s point of view and indeed involves learning to be a critical professional, for the purposes of this study, we coded students’ responses for the presence of resistance when their comments were directly in conflict with the teacher’s comments. If we had gathered different data (e.g. one-on-one interviews), we may have learned that the students’ resistance surfaced because students entered the practicum with a very different set of expectations from what the teacher was providing.
. . Maybe this needs to be a place with a real employment center instead of just [being] a bedroom community. I’m not saying that you don’t have residential, and I’m not even saying you necessarily start in one place or the other, but I’m saying that it’s gotta be in the thought process here.

The segmented interactive units were also coded for different skills, knowledge, values, and epistemologies of a planning epistemic frame. Though segmented interactive units were coded for identity, the identity component of the epistemic frame is beyond the scope of this paper. The skills, knowledge, values, and epistemology frame elements were broken into sub-elements in order to see a more complete picture of which specific sub-elements differed between the students’ and the teacher’s epistemic frames. The coded segments were aggregated into a database of interactive units showing the presence of the teacher comments, student resistance, teacher reflection-on-action, and teacher and student epistemic frame elements. The relationships among these different components were then analyzed using epistemic network analysis to identify salient themes. Definitions for each sub-element and examples of how each category was used in this analysis are found in the subsections following.

### Table 1

Coding scheme including the code label, description, and example for the eight codes used to code the teacher and student presentation feedback sessions.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Example</th>
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<tbody>
<tr>
<td>S/L: Skill of reading a landscape</td>
<td>Discussing or explicitly referring to using the landscape to inform the planning process</td>
<td>I [think] that it’s very important that we step back and say, “How does this landscape speak to us?” rather than letting someone else give it to us.</td>
</tr>
<tr>
<td>S/A: Skill of suggesting alternatives</td>
<td>Discussing or explicitly referring to a specific strategy or an alternative way to approach creating a plan</td>
<td>Shoehorning residential onto the north end won’t work. Let’s see if we can put some jobs up there so that the people who live further south, where it’s easier to do residential development, have a place to go that’s a mile away, or a mile and a half away, instead of coming down to Madison. With that, make it a more sustainable community. If you go back to your fundamental rules of sustainability, you can pull that off.</td>
</tr>
<tr>
<td>S/QA: Skill of questioning assumptions</td>
<td>Discussing or explicitly referring to the assumptions made in student analyses</td>
<td>You guys all have to make some recommendations, but I don’t want us to go into this without making sure that we are comfortable with the assumptions they [the city staff] are operating under. . . I’m not comfortable with all of the assumptions they are operating under, and I think that their assumptions are no longer evidence-based.</td>
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Table 1 continued

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<th>Code</th>
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<tr>
<td><strong>K/AI: Knowledge of additional information</strong></td>
<td>Discussing or explicitly referring to specific information that might be useful in creating the site plan</td>
<td>This is what we think is important to identify: Property values and who owns it [the property] to see if there’s any correlation there. Target areas for potential development areas, etc., that we’ll hopefully be working on today. Looking into changes in zoning with different incentives for developers, transfer of development rights. Existing view shed protection. We went out there, and we didn’t really come across any.</td>
</tr>
<tr>
<td><strong>K/P: Knowledge of past process</strong></td>
<td>Discussing or explicitly referring to the process used by the City of Madison to create a plan for the same redevelopment area</td>
<td>We saw a map of what they [the city staff] have in mind, and they already have land uses plotted out. They are presenting that to the mayor in the next few weeks. In that land use map, they have mixed-use housing and TODs [transit-oriented developments] and lower density housing, and the majority of it is also going to be lower density acreage.</td>
</tr>
<tr>
<td><strong>V/PI: Value of serving the public interest</strong></td>
<td>Discussing or explicitly referring to considering the needs of people affected by the planning process</td>
<td>The developer has to be involved in this association. It’s not optional. They have to be part of the deal, and you are going to have to figure out what the City of Madison would say to one or more private landowners.</td>
</tr>
<tr>
<td><strong>E/SD: Epistemic statement about stakeholders’ desires</strong></td>
<td>Justifying decisions based on how he/she thought a particular stakeholder group would respond.</td>
<td>Businesses that might be developing through the university or incubator or something. They are going to need production and assembly facilities. They are going to need distribution facilities. And that might not be stuff they can get either on campus or in that incubator. This might be an ideal spot for them.</td>
</tr>
<tr>
<td><strong>E/UF: Epistemic statement about principles of good urban form</strong></td>
<td>Justifying decisions based on the principles of good urban form</td>
<td>The city is planning the East Wash build-out in terms of employment . . . which means that it would have to put itself on the periphery because of the land loss. They could have an office near their production facilities. We see that as a potential benefit.</td>
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**Epistemic Network Analysis**

In order to explore emergent relationships between the teacher’s planning expertise and the students’ expertise, we used epistemic network analysis to examine the presentation feedback sessions during Weeks 4 and 5. Specifically, we calculated the relative centrality of each epistemic frame sub-element in order to compare the cumulative students’ frame in Weeks 4
and 5 to the teacher’s modeled frame in Week 4. Because epistemic frames consist of elements linked together with some elements more central than others, calculating the relative centrality exposed which frame elements were farther from or closer to the center of the epistemic network (relative centrality values closer to 100). In addition, because relative centrality is a cumulative measure of the changes in centrality to the epistemic network graph, using only the final time slice of relative centrality offered the most accurate picture of the students’ cumulative frame development during the weeks studied.

The relative centrality of each node was calculated by taking the square root of the sum of squares of the node’s associations with its neighbors, expressed as a percentage of the weight of the heaviest node in the network. For details on the computations involved in epistemic network analysis, see Shaffer et al. (2009).

RESULTS

Results of data analysis are described in the following subsections. First, we identify and describe the interactive units in which the students resisted the teacher during Weeks 4 and 5. Next, we identify and describe the interactive units in which the teacher reflected-on-action during Weeks 4 and 5. Last, we describe the students’ appropriation of the teacher’s epistemic frame in Weeks 4 and Weeks 5 using epistemic network analysis.

Student Resistance

At the beginning of the semester, the graduate students worked in teams to gather information about the redevelopment site. During the first class session, they learned that although the City of Madison had been working on a plan for the site for three years, city staff had not yet presented their plan to the mayor. Also, in contrast to previous practicum courses, the students were not going to be working as consultants for the city; rather, they would be expected to “read the landscape” and expand on the city’s draft neighborhood plan for the area. The students continued to learn about the site through the teacher, guest speakers from the City of Madison planning department, out-of-class site visits, meetings with city officials, and targeted Internet research. The teams were expected to present their initial findings during Week 4 and their more specific findings during Week 5.
While presenting and giving feedback during Week 4, the students referred to the approach the City of Madison was using for the redevelopment site. When the teacher suggested alternative approaches that were contrary to the city’s approach, the students resisted his suggestions. Overall, in Week 4, 3 of the 11 segmented interactive units in the presentation feedback activity were coded for the students resisting the teacher’s ideas, accounting for 54% of the time when both the students and the teacher were talking about the same topic. The dark segments within the presentation feedback section of Figure 1 represent interactive units when the students resisted the teacher. Though the entire segment is shaded, the students were not necessarily resisting the teacher during the entire segment. The activities (guest speaker and presentations) shown in lighter shades on the figure occurred during the Week 4 class session but were not segmented into interactive units or coded for resistance.

Figure 1. Student resistance to teacher, Week 4. Three main activities occurred during the 2.5-hour class period: guest speaker (83 min), presentations (30 min), and presentation feedback (37 min). The dark segments within the presentation feedback section represent interactive units when the students resisted the teacher’s ideas (19 min). Note. Only feedback activity was coded for resistance.

For example, when the teacher suggested that the students look into community land trusts as potential models of a community governance organization, one student resisted the teacher’s approach by appealing instead to the city’s approach:

We sort of came out of the meeting with the understanding that they [the city staff] worked hard on this for a number of years and thought long and
hard about the physical layout of the area. It seems like they are looking more for us to plug in the gaps in terms of government concerns, issues like policy, how will they implement the ideas they’ve come up with, rather than us coming up with a design saying this is what we think it’s going to look like because, frankly, there’s no way that you could do all of the research that’s needed to do that in a semester. I sort of got the sense that they want us to deliver to them a set of policy recommendations and other higher level stuff to help them move this process along rather than deliver our own design.

In other words, the student was resisting the teacher’s approach to the planning problem and advocating for continuing to use the city’s approach—an approach that he felt would produce results that related to the work the city staff had already accomplished and help move the city process along.

In contrast, in Week 5, the students did not resist the teacher’s suggestions in any of the seven segmented interactive units in the presentation feedback activity when both the students and the teacher were talking about the same topic. In Figure 2 as in Figure 1, the activities that occurred during the class session are shown in lighter shades (teacher lecture, presentations, and teamwork) but were not segmented into interactive units or coded for resistance.

![Figure 2](image)

**Figure 2.** Student resistance to teacher, Week 5. Four main activities occurred during the 2.55-hour class period: teacher lecture (25 min), presentations (26 min), presentation feedback (22 min), and teamwork (80 min). The dark segments within the presentation feedback section represent interactive units; however, in Week 5, students did not resist the teacher’s ideas during presentation feedback. *Note.* Only feedback activity was coded for resistance.
Teacher Reflection-on-Action

During the presentation feedback activities, the teacher often explicitly reflected on the students’ findings, gave suggestions for additional information they could gather, and shared anecdotes about the similarity of the problems they were facing to problems he had faced in previous projects. In Week 4, 11 of the 12 total segmented interactive units were coded for the presence of the teacher’s comments, and 8 of the 11 segments during which the teacher spoke were coded for his reflecting-on-action (shown in yellow in Figure 3). Though the entire segment is shaded, the teacher was not necessarily reflecting-on-action during the entire segment.

**Figure 3.** Teacher reflection-on-action, Week 4. Three main activities occurred during the 2.5-hour class period: guest speaker (83 min), presentations (30 min), and presentation feedback (37 min). The yellow segments within the presentation feedback activity represent segments when the teacher reflected-on-action (32 min). *Note.* Only feedback activity was coded for teacher reflection-on-action.

For example, after one of the teams presented the information they had gathered about the city’s population projections for the site, the teacher reflected on their action by considering the implications and consequences that the information had for the recommendations they would make in their final site plans:

> What you’re saying is that it seems pretty comfortable. Then . . . we will talk about what that implies for traffic and other things and how those projections might change. If that’s going to be what affects what we’re able to propose and not propose, and if we really think those 30,000 people need to fit in there, then the question is, how do we do that? . . .
How many jobs does it take to sustain 30,000 people? . . . I’m thinking as I let this area kind of settle in on me that I sense that the city was thinking about it starting with residential and then adding everything else on, and as I think about the land use pattern out there and so on, I’m not sure that’s necessarily the place to start. It would be interesting to know whether jobs are projected to grow proportionally with population in Dane County and [what] any projections you can find about what job growth, employment growth look like. Because . . . one of the things that would make a big difference about what we have to plan for in this area is whether or not there are jobs there and you can have some jobs/housing balance right in that area. . . . There’s the possibility of having three or four thousand jobs out there. That can make a really big difference in the land use plan out there.

By reflecting-on-action, the teacher specifically pushed the students to question the city’s assumptions and to consider how the population projections would affect traffic, jobs, and the overall development trajectory. By explicitly questioning the city’s assumptions and offering suggestions about how to deal with multiple possibilities, the teacher spoke directly to the students’ resistance in Week 4 and strengthened the case for having the students use his approach rather than the city’s approach.

In contrast to Week 4, in Week 5 the class started with a teacher lecture. During his lecture, the teacher explicitly addressed the students’ resistance from Week 4. He reflected on the actions the students took in Week 4 and referred to his experience as a planner in order to address the students’ anxiety about using his approach instead of the city’s more familiar approach:

Every planning process has to go through a period where people say . . . “I don’t know what the answers are, and if I jump to conclusions now, I’m going to . . . come up with a project that doesn’t work.” . . . And at some point, as you gain experience, you will find that this uncertainty is no longer anxiety, it’s just the way that projects go. And the reason we have a planning process, the reason that we teach ourselves this process is that we know that we’re going to have to go through a period of time when we’re gathering information, and you all have been doing, as near as I can tell, a fine job of collecting the information. I was pleased with what I heard in class last Friday, and I expect to, based on what I have seen, be totally pleased with what you are doing today. So, just let me reassure you that we are on course, that we are doing what needs to be done at this point in the game. And that in this experience, that the main thing, or one of the main things, that you should get out of this is some sense of the pace. And the slowest part of the process is to gather the information, get familiar with the site, let it speak to you, and then once you’ve spent that time,
you can sit down at your keyboard, or you can pick up your marker, and you’ll know what to do. . . . I know that you’re anxious, you’re trying to imagine what the final product will look like . . . . We’re not here to learn how to produce documents. That’s something that every planner in the end acquires some skill at because it’s how you report your work. But what we’re here to learn about is how to think about a piece of the landscape and what might happen there.

Specifically, the teacher suggested that taking time to gather information early in the process would have positive implications for the final site plan. To address their anxieties, he encouragingly reflected on the work the students completed in Week 4, told them he was expecting to be pleased in Week 5, and assured them that although they were at a slow part in the process, they were on course. To attend to the students’ concern that his approach would not relate to the work the city had already accomplished, the teacher suggested that the students

Let this piece of land speak to us . . . . If we try to decide what it’s going to look like before then, what you’re going to end up with is exactly what you don’t want to end up with, which is something that doesn’t relate.

Following the teacher’s lecture, the students presented the information they had gathered about the site and gave feedback on the information presented. During feedback, 8 of the 14 total segments were coded for the presence of teacher comments. In one of these eight segments, the teacher was the only person speaking, and two of the segments were coded for teacher reflection-on-action (shown in yellow in Figure 4). Though the entire segment is shaded, the teacher was not necessarily reflecting-on-action during the entire segment.
Figure 4. Teacher reflection-on-action, Week 5. Four main activities occurred in the 2.55-hour class period: teacher lecture (25 min), presentations (26 min), presentation feedback (22 min), and teamwork (80 min). The yellow segments within the lecture and presentation feedback sections represent segments when the teacher reflected-on-action (6 min). Note. Only feedback activity was coded for teacher reflection-on-action.

During the presentation feedback in Week 5, a student asked about the city’s assumptions, and the teacher reflected-on-action by explicitly considering the implications and consequences that this information had for the recommendations they could make in their final site plans:

We’re simply taking the city’s word. That’s what they anticipate. You found that the total growth was 48,000, so 30,000 is a darn big share of that, but on the other hand, where else can Madison grow geographically? There are a bunch of infill areas that presumably a bunch of those people will go to . . . . One of the questions, although it’s not a particularly simple one, is, Are the town planners correct in saying that they think they need to accommodate 30,000 people here? Are there other locations, presumably infill locations that could absorb more of that? . . . If fewer people show up, you just do less development. We’ll be fine if we’ve set a good pattern in place.

These data suggest that by explicitly reflecting-on-action and addressing the students’ resistance before they rejected his process outright, the teacher created a space where the students could begin to appropriate the epistemic frame he had modeled in Week 4.
Students’ Appropriation of the Teacher’s Epistemic Frame, Week 5

In this section, discussion details changes in student appropriation of the teacher’s epistemic frame during the presentation feedback sessions from Week 4 to Week 5 by looking at major elements of the epistemic frames, using epistemic network analysis.

By separating the epistemic frame elements into sub-elements, a more complete picture emerged about which sub-elements became more or less central to the students’ epistemic frame from Week 4 to Week 5 (see Table 2). Relative centrality values closer to 100 indicate that the sub-element was more central in the epistemic frame, whereas values closer to zero indicate that the sub-element was less central to the epistemic frame. For example, V/PI, S/QA, S/L, K/AI, and E/UF were the most central sub-elements in the teacher’s epistemic frame. In contrast, the most central sub-elements in the students’ epistemic frame were V/PI, E/SD, and K/P.

In Week 5, instead of having a strong central core consisting of V/PI, E/SD, and K/P, the students exhibited a new configuration of their epistemic frame that looked more like the teacher’s, with sub-elements such as S/L, S/A, K/AI, and E/UF increasing in centrality. The order of centrality of frame elements also changed from Week 4 to Week 5.

### Table 2
Relative Centrality Calculations for Sub-Elements of the Teacher’s Epistemic Frame in Week 4 and the Students’ Cumulative Epistemic Frame in Weeks 4 and 5

<table>
<thead>
<tr>
<th>Sub-element</th>
<th>“Owner” of epistemic frame</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S/L</td>
</tr>
<tr>
<td>Students (cumulative): Week 4</td>
<td>0</td>
</tr>
<tr>
<td>Students (cumulative): Week 5</td>
<td>55.47</td>
</tr>
<tr>
<td>Teacher: Week 4</td>
<td>96.30</td>
</tr>
</tbody>
</table>

*Note.* Higher values (max = 100) indicate greater centrality to the particular epistemic frame. S/L = skill of reading a landscape; S/A = skill of suggesting alternatives; S/QA = skill of questioning assumptions; K/AI = knowledge of additional information; K/P = knowledge of past process; V/PI = value of serving the public interest; E/SD = epistemic statement about stakeholders’ desires; E/UF = epistemic statement about principles of good urban form.
According to Shaffer et al. (2009), the relative centrality of a node within a network represents the extent to which the node is or is not part of the dense central core of the network. Thus, although some of the sub-elements became more central to the students’ epistemic frame, the relative centrality values of the sub-elements in the students’ frame in Week 5 were consistently lower than the teacher’s. Presumably, the teacher had higher relative centrality values for frame elements in Week 4 because his 34 years of planning experience necessitated that his epistemic frame start out more richly interconnected than the students’ epistemic frame. Therefore, the “looseness” of the students’ cumulative epistemic frame may be due to the students’ beginning to appropriate the sub-elements. Because the dense core is central to the strength of the epistemic frame, however, their epistemic frame will likely strengthen over time.

**Skills.** In Week 4, S/L and S/QA were central skill sub-elements in the teacher’s epistemic frame (see Table 2 and Figure 5). In contrast, the students did not use S/L, and S/QA and S/A were not central to their cumulative epistemic frame. These data suggest that in Week 4 the teacher was mobilizing a different set of planning skills than the students were.

In Week 5, the students followed the teacher’s model and appropriated a new skill, S/L, which became more central to their epistemic frame (see Table 2 and Figure 5). The students’ use of S/A surpassed the teacher’s model in Week 5, suggesting that the students moved away from relying on the city’s assumptions and began suggesting multiple alternatives. The students did not show a significant change in the use of S/QA from Week 4 to Week 5.

![Figure 5](image-url)

Figure 5. Relative centralities of three skill sub-elements—S/A (skill of suggesting alternatives), S/L (skill of reading a landscape), and S/QA (skill of questioning assumptions)—for the students in Weeks 4 and 5 and the teacher in Week 4. Note. Teacher data are taken from Week 4, but are repeated in Week 5 for comparative purposes.
**Knowledge.** In Week 4, K/AI was a central knowledge sub-element in the teacher’s frame, but not in the students’ frame (see Table 2 and Figure 6). But K/P, a sub-element the teacher did not use, was the most central knowledge sub-element for the students. These data suggest that although the teacher was mobilizing his knowledge about what additional information might be important to gather, the students were relying on their knowledge about the city’s past approach and were resisting alternative approaches.

The students followed the teacher’s model as K/AI became more central and K/P less central to their epistemic frame from Week 4 to Week 5 (see Table 2 and Figure 6). These results suggest that the students were no longer resisting the teacher and relying on their own knowledge about the city’s approach (K/P). Instead, they began suggesting alternative approaches to the site redevelopment (K/AI).

![Graph showing relative centralities of K/AI and K/P for students and teachers](image)

**Figure 6.** Relative centralities of two knowledge sub-elements—K/AI (knowledge of additional information) and K/P (knowledge of past process)—for the students in Weeks 4 and 5 and the teacher in Week 4. Note. Teacher data are taken from Week 4, but are repeated in Week 5 for comparative purposes.

**Values.** The one values sub-element—V/PI—was central in both students’ cumulative and teacher’s epistemic frames and is, therefore, not of interest in this discussion.

**Epistemology.** E/UF was a central sub-element for the teacher’s epistemic frame in Week 4 (see Table 2 and Figure 7). In contrast, although E/UF was not a central sub-element for the students’ epistemic frame, E/SD (epistemic statements about stakeholders’ desires) was a central sub-element for their epistemic frame in Week 4.
The students followed the teacher’s model as E/UF became more central to their epistemic frame in Week 5 (see Table 2 and, Figure 7). E/SD became less central to their epistemic frame from Week 4 to Week 5. These results suggest that instead of appealing to the stakeholders’ desires (E/SD) as their main justification technique, the students started referring more to the principles of good urban form (E/UF) and thus had a more balanced epistemology that reflected the teacher’s frame.

**Figure 7.** Relative centralities of two epistemology sub-elements—E/SD (epistemic statement of stakeholders’ desires) and E/UF (epistemic statement of good urban form)—for the students in Weeks 4 and 5 and the teacher in Week 4. *Note.* Teacher data are taken from Week 4, but are repeated in Week 5 for comparative purposes.

These results suggest that through explicit reflection-on-action, the teacher addressed the students’ resistance, facilitating their appropriation of his epistemic frame.

**DISCUSSION**

The aim of this study was to uncover the learning process within a graduate urban planning practicum, and the results described in this paper suggest that the learning process involved one teacher communicating his urban planning epistemic frame in the face of resistance, the students’ initial resistance to the teacher’s frame, the teacher’s explicit reflection-on-action, and the students’ ultimate appropriation of the teacher’s frame. Thus, this study shows that through explicit reflection-on-action, the teacher addressed
the students’ resistance, facilitating their appropriation of his epistemic frame. Further, those changes were highlighted by using epistemic network analysis to examine the teacher’s role in the students’ epistemic frame development by tracking how specific features and events in the practicum led to significant changes in frame development.

For educators facing resistant students, this study offers a process through which students may begin to appropriate the ways of thinking intended by the teacher. Specifically, this study shows that resistance can play a productive role in the process of appropriation, as suggested by Wertsch (1998). In examining Weeks 4 and 5, for example, the results of this study show that the students’ resistance subsided and suggest that the bridge between the students’ resisting and not resisting was the teacher’s lecture. The teacher’s lecture was essentially an explicit reflection on the different frames held by the teacher and the students and provided a map of the professional vision of the planning practice. It seems unlikely, however, that his lecture immediately helped the students understand the epistemic frame of planners in a new light and enabled them to put their new knowledge into practice in their presentation feedback. Therefore, the students must have started appropriating aspects of the teacher’s epistemic frame in Week 4, despite their resistance.

For educators interested in incorporating reflection into their teaching, these results suggest that the kind of reflective mentoring in professional practicum settings that Schön (1983; 1987) and Shaffer (2004; 2006) have described accomplishes the task of helping students appropriate a new frame in the face of resistance. Specifically, the results of this study indicate that identifying practicum activities that evoke evidence of certain aspects of an epistemic frame provides valuable information for designing effective practicum environments and learning environments in general. For example, educators might consider including iterative cycles of action and reflection-on-action, which may facilitate appropriation. Since the analysis of the course data in this study was completed after the course finished, educators could gather similar types of data by asking their students to reflect-on-action in writing. The educator could then use the written records to assess and track the development of the students’ epistemic frames.

This study also offers educators a computational model of the extent to which students appropriate the ways of knowing, being, talking, and acting that characterize a particular community of practice. In particular, epistemic network analysis can be a productive way of tracking how specific interactions within learning environments lead to significant changes in cognitive development. The differences between the students’ and the teacher’s rela-
tative centrality values suggest that epistemic network analysis can be useful in group comparisons and experimental studies of interventions. Thus, epistemic network analysis offers a powerful set of techniques for formatively analyzing the ways of thinking that result in practicum experiences.

The study presented is, of course, limited. First, the ethnographic nature of this study necessarily means that any conclusions are limited to what one group of students and their teacher did in the context of one practicum. Furthermore, my presence in the setting inevitably had implications and consequences for what took place. However, “consequential presence” often linked to reactive effects (that is, the effects of my participation on how members may talk and behave), should not be seen as “contaminating” what was observed and learned. Rather, these effects are the very source of that learning and observation (Clarke 1975, p. 99).

Second, this study did not control for students’ prior urban planning epistemic frame. Since the practicum was offered at the beginning of the students’ second year of a Master’s degree, students likely started the practicum with fairly robust epistemic frames. Thus, some of the students’ appropriation may have been falsely attributed to the teacher.

Third, in this particular practicum, values (based on the sole sub-element value of serving the public interest) was already a central frame element for both the students and the teacher, so rather than focusing on the development of professional values, the teacher and students focused on justifying their decisions and using domain-specific knowledge and skills to make and support their justifications in Weeks 4 and 5.

Epistemic network analysis also presents its own set of limitations. Shaffer et al. (2009) have asserted that “the evolution of the epistemic network graph depends partly on the specific point in the practicum, the practicum conditions the students experience (some situations may be more likely to evoke statements of values, for example, or identities), and the changing nature of the students’ actual epistemic network as it develops through these experiences.” Thus, by focusing solely on the relative centrality values at the end of Weeks 4 and 5, this study tells only part of the story. Further research can examine the frame development at additional time points and under a range of practicum conditions, look at more specific subcategories of the epistemic frame elements, and examine the degree to which individual students appropriate the teacher’s frame. Future work can also use epistemic network analysis to examine the causal connections between a teacher’s explicit reflection-on-action and the students’ appropriation of his or her epistemic frame. In addition, while hand coding classroom data is beyond most teachers’ capabilities, in the near future, it may be possible to use natural
language processing to parse and code student data. For example, a teacher might ask her students to write reflection responses online. She could then use an automatic coder to parse and code the student data in order to track their epistemic frame development. Thus, as argued above, epistemic network analysis could become a tool for teachers to use to analyze the development of their students’ thinking.

References


