Reflections on the Learning Sciences

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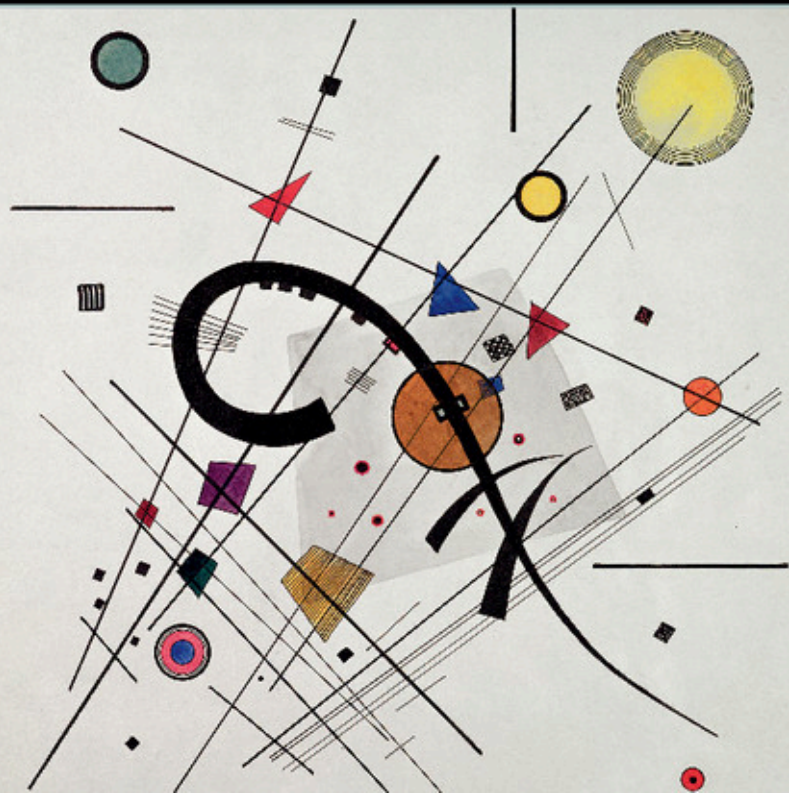
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Growing the Learning Sciences: Brand or Big Tent?

Implications for Graduate Education

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Abstract

The field of Learning Sciences (LS) grows out of a realization that the study of learning and behavior in complex settings demands powerful methodological approaches and theories that are not foregrounded in current disciplines. It orients scholars to a common object of study—*learning environments and educational practices*—across a broad range of disciplines and methodological traditions. The future capacity to carry out this program demands heavily on the effectiveness of its graduate education programs. Yet, significant divisions endemic to scientific research and to the culture of the university setting may hamper the success of the LS research program and the education of its next generation of scholars. Two fault lines relevant to LS are the divisions between basic and applied research, and discipline-specific silos versus multidisciplinary approaches to scholarship. It is in this context that the co-authors, each from different institutions and disciplinary perspectives, brought together scholars from LS graduate programs and research institutes from across the world to openly consider these challenges and the designs of established and nascent programs. Participants explored the challenges of developing interdisciplinary educational programs and discussed the trade-offs between adherence to a common core (maintaining an LS "brand") or a broadly inclusive model ("big

tent"). The discussion highlighted the pervasiveness of the fault lines, while also identifying ameliorating strategies that provide LS opportunities to successfully navigate polarizing issues within academe.

Keywords: basic and applied research, graduate education, learning sciences, multidisciplinarity, object of study.

The field of Learning Sciences (LS) grows out of a realization that the study of learning and behavior in complex settings demands powerful methodological approaches and theories that are not foregrounded in current member disciplines. The future capacity of LS to carry out its research and development mission relies heavily on the effectiveness of its associated graduate education programs. Yet, we argue that LS faces significant challenges – *fault lines*, in our terms – that are endemic to scientific research and to the culture of the university settings that house the current core research centers.

Fault lines are the institutional and disciplinary divisions that polarize the scholarly community and promote an "either–or" logic among its proponents and detractors. Historically in education, programs and disciplines often flow back and forth with the tide of current popularity that favors the benefits of one side or the other leading to a perpetual state of: identity crises, programmatic revisions, lack of disciplinary progress, cycles of rediscovery and retreading ideas, and marginalization within academe (Fenstermacher & Richardson, 1994). These fault lines stand to hamper the success of the LS research program and the education of its next generation of scholars.

It is in this context that the three coauthors, each from different institutions and disciplinary perspectives, brought together scholars from a range of LS graduate programs and research institutes to openly consider these

challenges, the designs of their programs, and the relations of their programs to the program designs and training practices used by others.

In this chapter, we delve into these challenges and report on the outcomes of these discussions. As background, it is useful to describe some of the major themes that we believe have contributed to the development of LS in its current form. First, LS follows the lead of the field of Cognitive Science by orienting toward an *object of study* and by welcoming scholars that engage in the principal study of that object regardless of their home discipline. Cognitive Science casts that object of study to be *cognition as computation* (Chalmers, 1993/2012). In comparison, Janet Kolodner's (1991a) editorial from the inaugural issue of the *Journal of the Learning Sciences* orients the newly emerging field of Learning Sciences as the investigation of "new ways of thinking about learning and teaching that will allow the cognitive sciences to have an impact on the practice of education" (p. 1). In this way, the object of study is crafted to be *the design of learning environments and practices* (p. 4) through multidisciplinary means, within a plethora of settings and technology-based resources, freeing itself from traditional disciplinary theoretical and methodological doctrine.

As a second theme, LS scholarship strives to overcome many of the challenges created by the division implicit in the modern university between research (creating foundational knowledge) and practice (applying knowledge

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to practical problems). It accomplishes this by adopting "use-inspired basic research" (Stokes, 1997) that simultaneously contributes to scholarly progress and practical impact.

Third, LS research reflects a deep dissatisfaction with the use of sterile, knowledge-lean "toy problems" (Kolodner, 1991b) and takes a skeptical view toward efforts to scale up interventions honed in contrived settings that neglect the social, cultural, and physical influences that characterize authentic situations and implementation efforts. To achieve both ecological validity and methodological rigor, LS often integrates research conducted from *systemic* perspectives, which matches investigations to the level of complexity for which application is ultimately intended, with *elemental* perspectives – such as control of variable studies (Nathan & Alibali, 2010). A "scale down" approach offers an alternative to scale up approaches by using authentic practices and settings to direct hypothesis-driven questions that contribute to the generalizability of the investigations while maintaining relevance of the findings to the natural phenomena of interest (Nathan & Sawyer, 2014).

Fourth, LS researchers embrace Simon's (1996) notion of the importance of "design sciences" as disciplines that study the nature of *artificial* entities – devices and systems whose functioning is determined by the goals and information imparted by the designer, and the nature of its use and users, as well

as the natural laws that describe the functioning of the internal systems in relation to the external environment in which they are situated. A design science follows what can be described as an *engineering ethos*, where there is a focus on "what ought to be," and the innovation processed needed to achieve these goals (Nathan & Sawyer, 2014). The engineering ethos complements the scientific ethos, which focuses on "what is," and the production of "reliable models and broad theories that describe, explain, and predict human behavior" (Nathan & Sawyer, forthcoming, p. 3). This focus drives the envisionment and development of new practices, objects, and environments in support of learning. Furthermore, through its own reflective turn (Schön, 1991), LS at times also studies the very design process that its practitioner-scholars employ, extending the scope of its object of study to include the field's own sociotechnical practices.

Taking these four themes together, LS offers a revolutionary approach to the study of learning behaviors and systems that produces both intellectual advancement and social impact. This synergy is a progressive effort to overcome the limitations of some traditional approaches to the study of learning by ameliorating longstanding *fault lines* within the scientific and university communities. The first fault line we identify is the division within the sciences that privileges basic research at the expense of the designed and applied. The second fault line divides discipline-specific silos from multidisciplinary research.

While the influences of these issues are generally recognized, their relevance to LS took on renewed importance when they arose as central issues in our facilitated discussion on the state of LS and its implications for graduate education. Consequently, awareness and amelioration of these fault lines are key considerations for the design of graduate programs that are charged with training the next generation of learning scientists.

Graduate Education in LS

It is within this context that thirty scholars gathered for a workshop at International Conference of the Learning Sciences (ICLS 2010) in Chicago to discuss their LS graduate programs, their visions of the field, and the future of LS. Participants came with the explicit goal of sharing stories, strategies, and questions across generational, geographic, and disciplinary lines.

  LS graduate programs play a constitutive role in the future of the field. The workshop organizers thought it would be valuable for LS educators to engage in a discussion of the theoretical and practical assumptions underlying their teaching and mentorship, as well as the design of the LS programs with which they are affiliated. As the workshop organizers, the authors had the sense that existing LS research centers and graduate programs (see Appendix C)

address the different research perspectives and philosophical tensions in a variety of ways, but have had few, if any, focused opportunities to consider their own programs in terms of a common set of dimensions, pose direct questions to members of other programs, or to relate their own graduate programs to the theories and practices used by others. Furthermore, those in nascent LS programs, it was thought, could benefit greatly from the ideas, successes, and failures of more established programs. In like fashion, those interested in establishing new programs might be able to share theoretical, programmatic, and institutional ideas and aspirations that might help to reform and reinvigorate more established programs.

Our primary goal for the workshop was to bring together dedicated scholars who were invested in the future of LS education to share their views, aims, approaches, successes, and failures as they consider what it means to provide graduate education in LS. As we, the organizers, reflected initially on the development and widespread growth of the field of LS, several questions took on importance: Does LS have a common core? Should it? What are the ramifications of a common core for LS graduate programs? As a way to explore these and related questions, all participants reviewed common and varied approaches to LS graduate education from established, newly formed, and recently proposed programs; explored the challenges of developing interdisciplinary educational

programs; and discussed the trade-offs between adherence to a common core (maintaining an LS "brand") or a broadly inclusive model ("big tent"). These broad questions served as seeds for group discussion within a larger itinerary of interaction (Appendix A) during two initial small-group activities and a culminating whole-group activity.

For the first activity we grouped participants based on the type of LS program they hailed from (for a list of attendees and their institutional affiliations see Appendix B):

- *Stand-alones* were programs that serve as autonomous degree-granting units, such as the Learning Sciences program at Northwestern University or the Munich Center of the Learning Sciences at LMU (Ludwig-Maximilians-Universität München), and were further distinguished by their international or US locations.

- *Embedded programs* were those that confer LS as an area of specialization from within a broader degree granting department, such as the Learning Sciences program within the Educational Psychology Department at the University of Wisconsin-Madison.

- *Start-ups* were programs that were in the planning stages or very recently formed, such as in the School of Education at the University of Colorado at Boulder.

- *Non-degree-granting institutions*, such as industry and research centers such as SRI International, or governmental agencies, such as the National Science Foundation were also represented. For the purposes of this workshop these participants were asked to join any other group of their choosing.

In these initial groups, participants were asked to generate questions to those in the other groups. Specifically, we charged group members to consider "What do you want to know from others that would help your institution foster growth in LS?" For the second activity, participants were regrouped across the original lines in a "jigsaw" fashion. In these new groups, participants were asked to "Generate a response to the question, 'Is LS a brand or big tent?'" and to consider these additional aspects: "Are there common pillars [across all programs]? Is there a canon? What is/is not LS?" For the final, breakout session all participants were asked to recap their discussions and insights and to share thoughts about next steps. Here we review, in turn, the questions, responses, and insights that emerged from these activities. We then revisit some of these ideas within a framework that seeks to situate the goals of LS graduate education in a broader context.

Group Questions: What Can We Learn from Other Groups?

Table 9.1 shows a summary of the list of questions that were generated by each group. Although the questions are far reaching, some clear themes emerged. In one way or another, through program descriptions, specifications of courses, or characterizations of the outcomes of research, all of the groups wanted more information about how to define LS. In addition, many wanted input on delineating the canon, in terms of core courses, common readings, and research methods. Most groups wanted to know how to initiate new graduates of their programs into the current LS community, taking them beyond the knowledge that is explicated published papers. Program designers and leaders were all also concerned with future career placements of their graduates.

Table 9.1.
List of questions generated by group.

Group	Questions Posed to Others
Stand-Alone Group: International	1. Which courses are fundamental for teaching LS? 2. What is the breadth of methods that students in LS programs should learn? 3. Whom do the grad programs serve (and how many come form overseas)? 4. What will the professions be of the people studying in those programs – professors, researchers, teachers,

Group	Questions Posed to Others
	and people working in design industries?
	5. How do we do justice to all the strands that contribute to the LS (We find that much of the promise of LS is in the generality of design and being in Pasteur's quadrant)?
	6. In what disciplinary program(s) do you have a home?
Stand-Alone Group: USA	*Questions directed at Start-up group:*
	1. What is the field of LS to you?
	2. Why are you creating an LS program? What is the perceived advantage in doing so?
	3. What are your nodes of strength? What do you think is your critical mass?
	4. What is your current student profile?
	5. What is your current program identification and how will you address issues with your faculty's identification with LS in the future?
	Questions directed at International Stand-Alone group:
	1. What are the job possibilities in your context?
	2. What is your funding situation and how much does it influence your research?
	Questions directed at Embedded group:
	1. Are you happy to be embedded in a department? What are the pros and cons?
	2. What is your identity in your institution and

Group	Questions Posed to Others
	department?
	3. How do you differentiate your LS efforts with near peers?
	4. What is your size and how do you measure it?
	5. Are all of your LS faculty co-located?
	Question directed at National Science Foundation:
	1. Is there only one Learning Sciences?
Start-up Group	1. How do you define an LS program internally and externally?
	2. Internally: As you define your program within your institution, how do you come to agree on what that looks like and what that means?
	3. Externally: How is it situated in the larger community of LS? How it is defined so you can create a program that does fit into that context?
	4. Share your origin stories of the LS programs.
	5. What makes a graduate from your program competitive for faculty positions in LS or for other (career) trajectories?
	6. What would make a graduate from a new LS program attractive in job searches for your established programs?

Group	Questions Posed to Others
Embedded Programs	*Questions directed at established stand-alone programs:* 1. What is the core content or set of courses in you LS program? 2. If you pared it down to a concentration of three or four courses what would they be? *Questions directed to all the groups:* 1. In what ways is LS inter-, multi-, trans-disciplinary, and how does that affect the way that we talk should about graduate programs in LS? 2. What are the varieties of career trajectories for graduate students in LS and how do we prepare them adequately for some career diversity? 3. How does your grad program ensure impact on practice as well as knowledge generation/doing research? 4. How do we initiate grad students into (not just the knowledge but) the community of practice of LS? 5. What roles do our journals and conferences play in graduate education? 6. Is there tension between growing LS as a field versus a sense of LS as a community? 7. Related to tenure and promotion: Can you articulate for grad students and faculty what LS research is, and LS's values regarding dissemination (articles, conference papers, on-line journals, chapters, books, etc.)?

Responses: Tapping Deep Wells of Knowledge, Drawing More Questions

Group discussions touched on many areas, and despite the presence of focal questions, they often brought in topics that reached across questions. Responses could loosely be organized into seven categories, with a variable number of responses recorded, as shown in the parentheses: Origin stories (five); defining Learning Sciences as a field and explaining it to colleagues (nine); graduate programs and core courses (three); funding (three); why one would start an LS program (two); branding (two); and new areas to emerge in LS (four). Groups also formed questions of their own as part of their responses, in an effort to convey nuances such as the uncertainty of a claim, or even to challenge a claim they themselves were making.

One of the most generative questions came when the members of the Start-up group – those just forming or just proposing their programs – asked veteran LS scholars to share their "origin stories." Though specific LS stories were only briefly shared, this led to a discussion of the need to preserve the many stories that abound across the 2o or so programs that were in place throughout the world during the time of the workshop (see Appendix C). We

revisit this along with several other topics in the Recommendations section later in this chapter.

Questions about defining LS provoked the greatest number of responses, with particular input from senior scholars in the international and USA Stand-Alone groups. Central to the responses were themes that addressed research connected to practice, the importance of design, and multidisciplinarity. One cross-cutting characteristic of the responses was the prevalence of jurisdictional discourse that focused on the scholars and forms of research that were regarded as in and outside of LS, with particular attention to the boundaries LS shares with the fields of Cognitive Science, Curriculum & Instruction (C&I), and Educational Psychology.

A central theme in defining LS was the connection of basic research in LS to instructional practice (a topic shared with C&I) and disciplinary and professional practice. *Pasteur's quadrant* (Stokes, 1997) was frequently invoked in this topic, with multiple groups aligning goals of the LS with Stokes' notion of "use-inspired research." Several comments addressed the importance of the social impact of research, particularly when prescribing evidence-based and principle-based approaches to teaching and learning practices and to the design of new learning tools and resources intended to meet the needs of historically underperforming and underserved populations. It was noted that one particular

way LS has evolved during its relatively short existence is that it now embraces issues addressing the need for equity and social justice within educational settings. A senior scholar who agreed with this shifting agenda openly asked, "Are we coming to a new core?", raising the prospect that any attempts to stipulate a definitive canon for LS early in the twenty-first century may be premature.

The importance of design was also raised as a defining facet of LS. Respondents clarified how design in LS differed from design in traditional C&I departments because of the focus on the design of the learning environment and the focus on the design process itself, in contrast to a more traditional focus in C&I departments on the creation of educational tasks and materials. Design-based research (DBR) was also held up as a central contribution of LS. Some participants used this as an opportunity to liken LS to engineering disciplines. Others reflected on the current plurality of DBR methods as a way of framing it as "an *approach* … for generating coherence for our understanding of learning" rather than a specific method.

Related to defining LS is the challenge of explaining LS to colleagues who are in closely related fields. Some participants acknowledged the challenge of distinguishing LS from disciplinary based programs of research, such as science education or educational technology. Participants pointed to the interest in the

field for studying learning in out-of-school and workplace settings as a way to demarcate LS from traditional fields of study within Schools of Education.

Discussions of programs, core courses and training competitive graduates centered on identifying who is served by these programs and the career paths that are likely to be taken by LS graduates. Professors, researchers, teachers, and people working in special design industries were all put forth as beneficiaries of LS graduate programs. Participants in existing LS programs discussed programmatic trade-offs between flexibility and required courses and identified research experiences in multiple research methods as important to graduate training.

The topic of funding led to accounts of student funding mechanisms in many international graduate programs. Research agendas in some countries (e.g., Germany) are highly influenced by the funding agencies. In some countries, students are directly funded by the advisor's grants, making a direct tie between funders and student training. In other parts of the world, such as Australia, the money goes to the students, so a kind of "free market" applies as students "shop" with their funding for their advisors and research experiences.

Participants in the Start-up group were asked why they wanted to form an LS program. Though there was much discussion, there were only two direct responses. One participant pointed out that her educational psychology program

was not following traditional lines so the faculty had a difficult time attracting

students whose interests matched the research being conducted. The other

participant raised questions about how to build consensus and form lasting, joint

programs when scholars who each identify with different aspects of the LS

program are drawn together. This points to the broader discussion of *Brand or*

Big Tent that dominated the final, whole group session.

The Field of Learning Sciences: Brand or Big Tent

An early version of the *Brand or Big Tent* issue made its way into the small-group

discussions. According to the workshop participants, there is clearly a need for

community building and for including students in the existing network of LS

scholars. There appeared to be a bias toward inclusion of additional disciplinary

viewpoints and research methods, suggesting that the *Big Tent* model had broad

acceptance among participants, especially when considering affiliates from

underrepresented countries and institutions.

Some participants pointed out that LS as a label is being used in a variety

of ways, making it difficult for students (and even LS scholars!) to know what

common, programmatic aspects they will encounter during their graduate

experiences. For example, we learned that there are new programs emerging

that call themselves "Learning Sciences" even though they have no members who are interested in the official journals or conferences of the International Society of the Learning Sciences, or in membership in the Society; and they share little of the philosophical foundations of "use-inspired basic research." When asked why researchers and administrators would "re-brand" a program as LS, some remarked that it might be for strategic reasons, such as to increase recruitment and enrollment, improve marketability of their graduates, and attract outside funding. As an example of funding incentives, someone noted that the National Science Foundation Climate Change Education Partnership (CCEP) proposal required senior project members who were "climate scientists, experts in the learning sciences, and practitioners from within formal or informal education venues" (National Science Foundation, 2010).

Fault Lines and LS Amelioration Strategies

The responses generated during the small-group activities addressed a wide array of topics of importance to the field of LS and its long-term growth. The discussions also touched on key *fault lines* that LS must straddle. We believe that these fault lines are important for the future growth of LS research and LS

graduate education. In this section we address these issues and what we identify

as *amelioration strategies* that LS programs have used to assuage them.

Generally, these amelioration strategies reconceptualize life along the fault lines

by shifting them from the "either–or" paradigm to a "both–and" model of

resolution.

Fault Line 1: Basic and Applied Research

- Donald Stokes (1997) describes the historical influences that

  contributed to a dichotomy in the natural sciences between basic

  and applied research, and the fault line it created. The effect, in the

  aftermath of World War II, was to privilege basic research that

  played to the traditions of "perfect forms" and "fundamental

  knowledge" in higher education. Basic research came to dominate

  the academe in terms of importance, prestige, and ever higher

  funding levels for "big science."

- This fault line was evident in several places in our group

  discussions. For example, LS is sometimes defined by its deviations

  from Cognitive Science rather than on its own merits (e.g.,

  Kolodner, 2004). The focus on societal impact and rejection of an

  exclusive inquiry of knowledge for knowledge's sake is one way

this fault line is apparent. The LS amelioration strategy was also

prominent through the invocation of Stokes' notion of use-inspired

basic science Stokes argues for abandoning the one-dimensional,

basic-applied dichotomy and reconceptualizing it into quadrants

that distributes research across two dimensions: the quest for

fundamental understanding, on one dimension; and considerations

of use, on the other.

By many accounts of the workshop participants, LS comfortably fits into

Pasteur's quadrant, that portion that addresses fundamental understanding *and*

practical use. This conceptualization reframes the basic-applied dichotomy and

ameliorates this fault line by guiding basic research toward practical needs in the

real world, thereby creating both fundamental understanding and societal

impact. This type of research is challenging because it must work through the

maze of complexity that is at the interface between the purity of idealized

phenomena and the messiness of authentic practices and settings. Consequently,

use-inspired basic science reciprocally influences and is influenced by the

theories, methods, and ideas from basic and applied science.

Furthermore, the *both–and* amelioration strategy of use-inspired basic

science requires investigators to maintain high standards for the methodological

rigor of basic research while overcoming its sterility in changing practice; and at

the same time maintaining the relevance of applied research while overcoming challenges to its generalizability to other settings. One of the clear outcomes of the workshop is that understanding how the fault line of basic and applied research is reframed through use-inspired basic research is central to an effective LS graduate education.

Fault Line 2: Multidisciplinary Research and Disciplinary Silos

- A second fault line is formed between communities of scholars that focus on substantive questions or discipline-specific inquiry. The former brings a synergy that is meant to provide novel insights in research and development, while the latter enables depth of focus, a prescribed canon, and powerful research methods – all elements that are highly valued in academe.

This fault line was evident in several aspects of the group discussions. For example, some participants voiced discipline-specific concerns for rigor, the need to distinguish their work from other scholarly contributions to education research, and the call that "we need to have specifics." The discussion included the hiring and tenure process, which reminded participants that silo research is favored in the academy, especially among junior scholars. Another point was

raised that problem-based centers may go away once the problem is solved or no longer in vogue, while departments persevere because of their programmatic roles and disciplinary affiliations. From the multidisciplinary side of the fault line there was a rejection of the doctrine that "privileges structure over purpose" and the identification of "enduring problems." There was an appreciation of community ownership of lines of inquiry and that "not everyone has to do everything." Proponents of multidisciplinarity pointed to the value of "methodological pluralism," for both the research and training experiences.

The discussion of the LS amelioration of this fault line was also evident in a number of ways. The very framing of the LS program of research, with its regard for authenticity and impact, necessarily invites a multidisciplinary approach. This was made clear when a senior scholar remarked on the value of collaboration with technology designers in industry to advance our understanding of learning with contemporary digital media. We also saw caution from one participant that each LS researcher need not carry out the entire program, but will often be part of a team of researchers from multiple disciplines.

These comments echo the LS amelioration strategy in addressing this fault line where Cognitive Science has been a valuable role model. By defining a field according to an object of study, as described earlier, one embraces what Von Eckardt (2001) refers to as a *holist conception of multidisciplinarity.* The holist

conception of multidisciplinarity judges "a field [as] multidisciplinary if it is characteristic of the field that multiple disciplines contribute to the execution of its research program" (p. 454). In contrast, a *localist* conception of multidisciplinarity is where the "individual research efforts of its scientists are, typically multidisciplinary" (p. 454). Although there is no banner declaring the object of study for LS, we have taken it as *the design of learning environments and practices*, drawing on Kolodner's (1991a) first editorial. By adopting the Cognitive Science strategy of defining itself in terms of an object of study and the implicit, holist conception of multidisciplinarity, LS reaps the benefits of multidisciplinary research; while at the same time, it maintains the focus and legitimacy of a more traditional discipline. A holist approach adds credibility for new and groundbreaking research that might not be accepted in the traditional discipline, while creating a community of scholars intent on pursuing similar work. The discussion also included the point that the object of study of LS is not set in stone, but rather the field is, as one participant described it, "emergent" and that foci can evolve, arise, and depart over time.

Discussion and Recommendations

The Development of the Field of Learning Sciences: Brand or Big Tent?

There was rich discussion on the *Brand or Big Tent* question; but, in a highly uncharacteristic fashion for academics, it was difficult to find anyone taking a hard line on either the *Brand* or *Big Tent* position. Branding of LS seems to be imposed in some ways from outside, as funding agencies call for LS experts as project team leaders. As LS programs proliferate, some programs have adopted the LS label without regard to the history, themes, or community membership that characterizes the field as we have described it. The LS community is also, by its nature, a highly inclusive one, and this is reflected in the varied scholarly pursuits within its scope. Yet there is also a suggestion that branding can be of value, particularly for students entering the field, as it may help them to opt in or out with more certainty, and to focus their early training experiences.

Recommendations

Several recommendations came out of this workshop. First, there was a general sense of the inherent value of members of different LS groups meeting to discuss

their graduate programs and visions for the field. This was reflected, in part, in the lively discussions and the positive participant evaluations of the workshop. Although online resources certainly can support and document these exchanges, we recommend that there be a standing workshop at future meetings of the Society to allow for these exchanges to take place face to face as well.

The recognition of the value of preserving the origin stories received wide support. We suggest that ISLS consider an organized effort to collect these and preserve them for the general membership. One scenario offered at the workshop is to involve senior graduate students in scheduled interviews with program founders. This has the added benefit of supporting professional development and community involvement of our most junior members.

Finally, we found merit in reflecting on the themes within LS that have arisen since the inaugural address that Janet Kolodner presented twenty years ago. Learning, broadly conceived, is still an engaging topic, commanding a truly multidisciplinary research program that spans the continuum of time scales of human behavior (Nathan & Alibali, 2010). Some of the original themes of the role of technology and the importance of studies of authentic tasks in real-world settings have resonated across a generation of scholars, and this, if anything, has grown in influence within the field. Other themes, such as studies of teaching, still remain relevant, though they seem to occupy a less central place in the

literature. New topics, such as social justice and embodiment, are gaining influence that is reshaping LS. This reflection shows how LS has blossomed into a vibrant and influential field. Ironically, one of its greatest near-term challenges will be how LS manages to communicate and preserve its identity and maintain a focused object of study in the face of proliferation among scholars who are divested from the Society. Periodic opportunities to review the central themes of LS and to track the inevitable fault lines will help guide this growth for the next generation of learning scientists.

In addition to those recommendations for ways to support the future health and well-being of LS that emerged during the workshop, we identify two related recommendations. Our first recommendation follows from the fault line between basic and applied research. The emphasis on performing use-inspired basic research places demands on graduate training that may not be supported by graduate students' home institutions. We suggest that the Society provide opportunities for such additional forms of training, perhaps by promoting internships within and outside of LS programs that will provide the rich set of knowledge and skills to successfully plan and implement impactful, evidence-based interventions, and study their effects on learners and practitioners. An additional recommendation follows from the second fault line between disciplinary and multidisciplinary research. Many LS graduates will benefit from

postdoctoral training opportunities that build on and expand their methodological training. Recognition of this as part of the professional development process within LS graduate programs will enhance the capabilities of new graduates and the responsiveness of the programs to the needs of our students and the field more broadly.

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Appendix A

Agenda for ICLS Workshop "Growing the Learning Sciences: Brand or Big Tent"

Who	Time	Activity	Materials Needed
MJN	9:00	**Welcome**	No materials
MJN	9–9:30	**Ice Breaker** (30 minutes) Introduce yourself Ask others "Yes-or-No" questions to help you name the prominent scholar whose name tag is on your back	Two name tags per person: Real tag on chest "Guess-Me" tag on back
NR	9:30–11:15	**Small Group Activity 1** Question Generation	Arrange in groups (A B C D)
NR	9:30–10:00	Question generation: two or three questions 1.What do you want to know from others that would help your institution foster growth in LS? Examples 1.How do/should we recruit and admit grad students? 2.What are/will be the core program requirements? 3.What are the essential structural (theoretical) characteristics?	Big paper and pens Note takers
NR	10–10:20	4.Pose questions to other groups who generate answers in small groups To answer, pick two or three questions	
	10:20–10:35	** BREAK **	
NR	10:35–11:15	Groups share answers with whole group.	
KH	11:15–12	**Small Group Activity 2** Generate a response to the question, "Is LS a brand or a big tent?" 1.Are there common pillars? 2.Is there a canon?	New group arrangements (1 2 3 4 on tags) Big paper and pens Note takers

		3.What is/is not LS?	
KH	12–12:30	**Whole Group**	Note takers
		1.Discuss "Brand or Big Tent?"	
		2.To group: What are next steps?	

Appendix B

Participant Arrangement for Small-Group Activity 1

Start-ups = New LS programs in the works

- Ryan Baker (Worcester Polytechnic Institute)

- Frank Fischer (Universität München)

- Christine Greenhow (University of Maryland)

- Diane Jass Ketelhut (Temple University)

- Susan Jurow (University of Colorado)

- Martin Packer (Dusquesne University)

- William Sandoval (UCLA)

- Ruth Wylie (Carnegie Mellon)

Stand-alone = LS program is on its own. Two subroups: International and United States

International

- Shaaron Ainsworth (University of Nottingham)

- Michael J. Jacobson (University of Sydney)

- Matthias Nückles (Universität Freiburg)

- Peter Reimann (University of Sydney)

- Nikol Rummel (Universität Ruhr-Universität Bochum)

United States

- Ken Hay (Indiana University)

- Roy Pea (Stanford)

- David N. Rapp (Northwestern)

- Mimi Recker (Utah State)

- Brian J. Reiser (Northwestern)

- Paulo Blikstein (Stanford)

Within-group = LS is part of a larger department.

- Dor Abrahamson (Berkeley)

- Philip Bell (University of Washington)

- Cynthia Carter Ching (University of California-Davis)

- Ton de Jong (University of Twente)

- Janet Kolodner (Georgia Tech)

- Mitchell J. Nathan (University of Wisconsin)

- Naomi Miyake (Chukyo University)

Non-degree-granting institutions

- Katerine Bielaczyc (National Institute of Education, Singapore)

- Jeremy Roschelle (SRI International)

- Joan Straumanis (National Science Foundation)

Appendix C

Graduate Programs in the Learning Sciences at the Time of the 2010 Workshop

Carnegie Mellon Human Computer Interaction Institute

Georgia Institute of Technology

Indiana University

Ludwig-Maximilians–Universitäts München

National Institute of Education of Singapore Learning Sciences Lab

New York University

Northwestern University

Open University of the Netherlands

Pennsylvania State University

Rutgers University

Stanford University

Teachers College, Columbia University

University of California, Berkeley

University of California, Los Angeles

University of Illinois, Chicago

University of Memphis

University of Michigan – Learning Technologies

University of Nottingham, United Kingdom

University of Pittsburgh – Learning Sciences and Policy Program

University of Washington, Seattle – Learning Sciences Graduate Program

University of Wisconsin, Madison Learning Sciences Program

Vanderbilt University

Virginia Tech