



Life Is a Lab: Developing a Communication Research Lab for Undergraduate and Graduate Education

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Abstract: Tips offered center on classroom discourse, curriculum choices, and potential assignments. In this article, we present tips for creating a thriving undergraduate and graduate communication research lab. Based on our experiences developing and co-directing the Communication and Social Robotics Labs (CSRLs), we offer 10 best practices for acquiring resources and recognition, building a strong lab community, and attaining faculty and student goals for scholarship and beyond. Our overarching approach is framed by Dewey's (1916) pragmatist educational metaphysic, which stresses student- and subject-centered learning, enlarging experiences, and the co-construction of meaning and knowledge. Although our labs are focused on human-machine communication (HMC), the strategies we present can be applied to any number of research contexts for both undergraduate and graduate education.

John Dewey (1916) argued that an education is a “reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience” (p. 76). This “reorganization” can take the form of many different teaching and learning techniques and strategies. As one way to add to the educational experience, we have implemented a lab method to foster greater community and scholarly engagement. Central to our philosophy is the notion that in important ways *life is a lab*, which means that the skills, experiences, and sensibilities gained through involvement with a formal lab are broadly transferable to our larger, life-long pursuits of determining what questions to ask, how to answer them, and how best to live and work with others. Our labs, the Communication and Social Robotics Labs (CSRLs; www.combotlabs.org), are a product of our desires to build a cross-institutional collaboration that enhances graduate, undergraduate, and faculty learning in the form of a lab community. The CSRLs are located at Western Michigan University and the

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University of Central Florida and are autonomous, but function in similar ways. The labs include both undergraduate and graduate student researchers who assist with faculty research and conduct their own research projects.

Broadly, our research focuses on the emergent context of human-machine communication (HMC; Edwards & Edwards, 2017; Edwards, Edwards, Spence, & Westerman, 2016; Spence, Westerman, Edwards, & Edwards, 2014). More specifically, our labs focus on the theory and practice of interpersonal interactions with digital interlocutors including artificially intelligent agents (e.g., spoken-dialogue systems, chat bots), embodied machine communicators (e.g., social robots), and technologically-augmented persons, as well as interpersonal communication in the context of virtual and augmented spaces. Our recent scholarship has examined people's expectations for, and communication behavior in, initial interactions with social robots, their information processing of machine-generated risk and crisis messages, and their perceptions of, and learning from, robot pedagogical agents.

Through engagement with the research process, students are encouraged to (a) participate in producing knowledge of the personal, relational, and social implications of communication between humans and machines, in historical, present-day, and anticipatory contexts and (b) develop competencies in communicating with and about machine partners. In this article, we offer 10 best practices on creating a student-centered research lab that provides experiential learning. Although our labs are focused on HMC and human-robot interaction (HRI), we believe these tips can be applied to any number of research contexts for both undergraduate and graduate education, including (but not limited to) family communication, health communication, organizational communication, new media, political communication, argumentation and advocacy.

Best Practice # 1: Develop Your Mission

Developing a mission for your lab will set the tone and guide your educational outcomes to be achieved. The CSRLs seek to advance the knowledge and practice of HMC, whereas other labs might instead be focused on communication privacy management, positive communication, leadership communication, communication culture and diversity, or a host of other research concentrations reflecting current faculty expertise, student interest, and institutional priorities. To advance our mission, our labs created the motto "Connect, Discover, and Create." We first want students to connect with not only each other in the lab, but also with students and faculty, alumni in related fields, and interested community members. We encourage students to invite visitors to the lab, to identify events in which the lab might participate, and to accept invitations to share our research results and practical applications with interested stakeholders. Doing so affords students with networking opportunities for careers and support structures. For instance, an undergraduate student representing the lab at a WMU recruiting event met the owner of a local virtual reality arcade and has subsequently been hired as manager.

Discovery occurs when students engage in the research process. Both undergraduate and graduate students help conduct experiments, read the latest published research articles, and develop questions and hypotheses to test in the lab. Critical to the mission of the lab is the ability for each student to create. Creation can take many forms, but we believe that students should be active in making something. Previous creative works have included designing a virtual reality demonstration, scripting and choreographing

performances for a robot, coding a message task for the lab's A.I., and developing a children's coloring page about robot communicators. For graduate students, creation more often takes the form of authoring or co-authoring research papers, crafting poster presentations, or making documentaries or films. The creation portion of the mission is tailored to the needs and talents of the students working in the lab at the time.

Although we tether the three directives of creation, discovery, and connection to our specific focus on HMC research, articulating a small set of general imperatives could work well in many research contexts to help prioritize certain activities that are at the heart of the knowledge-production enterprise. A lab mission will be most successful when it also aligns with the mission of the host institution. For example, WMU strives to be “discovery driven, learner centered, and globally engaged.” The ability to readily link our motto and mission to overarching university objectives has proven useful for garnering administrative support and for helping students understand how their efforts to realize the lab's mission also contribute to realizing the overall mission of their institution. Whatever your mission for your lab, it is important to have all students understand how they play a vital role in bringing it to life.

Best Practice #2: Build a Democratic Spirit

Because we believe in Dewey's (1916) pragmatist educational philosophy, we encourage and seek to build a democratic community in the lab. Dewey envisioned the educational context as a simplified version of democratic society, or a training ground for “a mode of associated living” based on “conjoint communicated experience” (p. 99). Modeling democratic forms of life can occur in many ways. Often, local community groups will ask the labs to conduct demonstrations of virtual reality and social robotics. These demonstrations can be time-consuming and utilize resources. Lab members discuss which groups to present to (and why) and build consensus on how to conduct the demonstrations. If there needs to be a policy change in the lab, we use a democratic spirit to guide these decisions (e.g., we use online polling systems to gather wide input and gauge the collective will). Because our lab is entirely voluntary, we want members to have a voice in how the lab functions and in the choices the lab makes. Relinquishing some control does not mean that faculty do not direct the lab, but that students have leadership in the day-to-day operation of their learning experiences. In this way, the aims of education belong to both student and faculty members.

Of course, not all decision-making and operations can emerge as a function of group deliberation. Often, student lab members are enrolled in independent study credit as part of their lab experience and so they must commit to working a certain number of hours per week, completing a series of research-related tasks, and delivering a final product. Likewise, when surveys or experiments are in session, members must be focused on their administration, sometimes to the exclusion of other lab activities. Furthermore, when conference or publication deadlines are approaching, teams must concentrate their efforts on meeting their targets for writing and submission. And, because academic research can sometimes span semesters or years, lab members may “inherit” some involvement with ongoing projects. Although the direction must be more top-down in these situations, we give weight to student priorities at all points when there is some flexibility in operations. Undergraduate students' opinions carry equal (often greater) weight in our labs because of the learner-centered approach we favor.

Best Practice #3: Embrace Experimentation

Ralph Waldo Emerson (1909) journaled that “All life is an experiment. The more experiments you make the better” (November 11, 1842). Our ways of doing things in the lab have changed a lot since we began in 2014, and this change is to be expected and welcomed. Many of our research projects employ experimental designs to answer questions about how people respond to the social machines that increasingly stand in for other people in communication contexts. We also have extended an orientation of experimentation—of choosing purposeful action and observing the consequences—to the everyday functioning of the lab. Many new processes and procedures have resulted from student-initiated experiments. For instance, a student interested in the science of motivation and achievement developed a “gamification” system to recognize and reward members’ efforts to connect, discover, and create. Another student implemented a lab intranet (Slack) to digitize and streamline research teams’ communication. Each year, we select a new “vision word” to guide our efforts and define our successes (in 2017, the vision word was “fearless”), and we later reflect together on how our priorities, outcomes, and achievements were shaped by that focus. The ability to pose significant questions, systematically test solutions, and form views and practices on the basis of empirical evidence will serve students well in professional, personal, and civic life. Thus, we follow Dewey (1916) in suggesting that “the aim of education is to enable individuals to continue their education—or that the object and reward of learning is continued capacity for growth” (p. 117).

Best Practice #4: Utilize Role Differentiation

Although your lab will most likely be focused on a particular context for research, there are many roles that students can fulfill to be part of the lab environment. Whereas all students in the CSRLs perform some tasks in common—completing ethics training for human subjects research, learning the research process, reviewing relevant literature, constructing experimental stimulus materials and surveys, handling research participants, and leading tours and technical demos [see boyd’s (2017) commentary on the importance of the latter]—they also take on specialized roles fitting their passions, talents, and skill-development goals. Role differentiation provides a chance for students to learn project-management skills and organizational concepts. We have students who are responsible for social media, film and photography, web development, technical writing, equipment operation, and development and alumni relations. A veteran student may serve as a lab supervisor who maintains equipment, handles scheduling, performs technical training, and answers questions. There are graduate project leaders who collaborate with and mentor more junior students on select projects and post-graduate fellows who continue to participate in lab activities after graduating from our programs. Creating a structure in the lab has allowed students in a variety of academic majors to participate and gain experience that will help them later in both school and careers, regardless of whether they focus on HMC. We have found that creating differentiated roles has allowed us to concentrate on the overall mission while building an experience that helps foster learning for many students.

Best Practice #5: Learn to Find and Ask for Resources

When we started the CSRLs, we had a budget of zero dollars, so we learned quickly to find resources in ways that could support the lab mission. In fact, we paid for the first two robots with our own money. In our experience, students have been an incredible resource to find means of obtaining equipment. In the beginning, we did not have a humanoid robot suitable for research studies. One of our students took it upon herself to remedy this situation. She posted to a robotics development community asking if anyone would be willing to donate an expensive robot to our lab. Four months later, because of her efforts, a gently-used humanoid robot arrived at the lab free of charge. Another student with interests in communication development and grant-writing made a project of identifying and compiling a list of all the funding opportunities and deadlines internal to our university. Your lab may be funded generously from the beginning, or it may start with little to no budget. However, we have found that this resource issue has not made much of a difference (and we work with expensive equipment). Fortunately, we now have funding for many of the projects we do in the labs. Demonstrating to both administration and donors that your lab can do good work and help students with limited resources shows your lab as a worthy recipient of any future funding.

Do not be scared to conduct initial fundraising on your own as many deans and department chairs fundraise to support the needs of the college and units. Before doing so, it is important to check with various offices and understand the policies at your own university, but know that with each success in publication or community event, alumni are more likely to become enthusiastic and supportive. Ensure that you are able to articulate the mission to potential donors and even consider naming rights to your lab spaces. One of our lab alumni received a grant from a local area Chamber of Commerce to purchase a robot. Again, with more success will come increased opportunities and other types of external funding opportunities will manifest. Navigating donor interactions, funder expectations, and legal and ethical obligations associated with fundraising and accepting gifts can be made smoother by developing and maintaining strong relationships with your university's alumni and development officers.

Best Practice #6: Collaborate Deeply and Broadly

For many communication scholars, research and education are inherently collaborative endeavors. The work-life and social landscapes awaiting college graduates also emphasize and reward cooperation and teamwork (Beaton, 2017). As co-directors of the CSRL, the three of us frequently design, conduct, present, and publish our research together. CSRL faculty affiliates at other institutions—Ken Lachlan (University of Connecticut), Tim Sellnow (University of Central Florida), and David Westerman (North Dakota State University)—also regularly collaborate on projects of mutual interest. Many of these research projects also include one or more student authors. This collaboration gives all of our lab students access to talented scholars and research opportunities they would not otherwise have at their home universities. Many students develop connections that will later prove useful for graduate education or employment opportunities in the field. For example, recent graduates have continued their communication study under the direction of faculty affiliates at other institutions. Cross-institution collaborations also allow smaller, more modestly-funded labs to build their intellectual capital and reputations.

We also have learned the value of collaborating across academic disciplines. At WMU, for instance, we partnered with University Libraries to deploy and test a telepresence robot librarian, with Extended University Programming (EUP) to build an artificially intelligent pedagogical agent (an AI teaching assistant) and with the Bronson School of Nursing to explore ways to integrate virtual reality applications into nurse education. Currently, we are working with the University of Illinois Chicago's Engineering Design Team to build a social robot. Each of these partnerships allowed students with specialized interests to be part of projects they found meaningful and to develop skills highly beneficial to their career goals. Some of these collaborations (and others like them) have resulted in student employment opportunities. For instance, both the EUP and University Libraries extended paid positions to undergraduate lab members to continue related work. These projects also brought visibility and recognition to the lab by disseminating research to different scholarly communities.

Best Practice #7: Promote on Social Media and to the University Community

It often is against faculty nature to promote their work or lab. We often struggle with this, too. However, promoting the lab has had payoffs that we could never have imagined. Our labs post HMC-related articles on both Facebook and Twitter. We share lab members' scholarly publications and those publications emerging from similar labs. These posts have led to many research opportunities. Within the university community, promotion has been an important element for helping our students build connections. For example, our development offices have arranged meetings with alumni that often result in students obtaining internships or employment. Other faculty and administration have learned of the labs' research and have sought collaboration and advice. We have discovered that promoting the work of the labs and that of the students has led to more opportunities for research and education. Additionally, if you create a social media management position for students within your lab, they will be able to use this work experience to build their career skills.

Other simple ways to promote the lab include providing the website and a graphic in the signature of e-mails, sponsoring academic and community events, and making a practice of including the lab in biographical statements. We also sponsor events as the CSRL with other organizations. For example, we have co-sponsored a pre-conference and a post-conference at the 2016, 2017, and 2018 annual meetings of the International Communication Association. In sponsoring these events, students are given more administrative and collaborative experience along with opportunities to network, which they may not have had otherwise. Students have been placed in graduate programs due in part to their involvement in activities sponsored or co-sponsored by the lab. The lab also has sponsored events for children to learn computer programming skills, and for educational events at retirement homes and local schools. Although engaging in promotional activities may at first feel self-congratulatory, we have found that the student members are the primary beneficiaries of these efforts. When alumni of the lab list their experiences and affiliation on resumes, vitas, or in interviews, evaluators often appreciate a healthy digital presence that demonstrates the lab's legitimacy, focus, and vitality.

Best Practice #8: Enjoy Diversity

The lab is a place where students from different backgrounds and different universities work together towards a goal. We say “enjoy diversity” rather than “embrace diversity” because we really believe that the diverse perspectives, positionalities, and backgrounds of individuals associated with the lab are something to enjoy. We seek to develop a lab community that includes and reflects the diverse complexion of the larger communities of which we are part in terms of sex, gender, race and ethnicity, (dis)ability, sexual orientation, and internationalism. The standpoints and voices of underrepresented groups have been particularly important for problematizing aspects of machine design, message scripting, norms of use, and accessibility that have important personal and social implications for human-machine communication. Excellent discussions among diverse lab members have resulted in a focus on culture, race, or gender in several of our recent research projects. In fact, research conceptualization, design, and interpretation is where such diversity is most useful and provides our strongest outcomes.

We also encourage and celebrate diversity in terms of lab members’ strengths and expertise. Part of this encouragement and celebration relates to members’ varying levels of education (e.g., undergraduate, graduate, or faculty) and their academic field backgrounds (e.g., communication, marketing, computer science, engineering), but we also celebrate differences in personal talents and resources. At the beginning of each semester, new students complete a strengths finder assessment to identify areas in which they excel and find joy. Whereas some students may be brilliant strategists, others are gifted networkers, natural organizers, or voracious learners. Students share their results with one another and talk together about the kinds of contributions each person is most able and eager to offer the lab. As directors, we consult students’ (and our own) top five strengths when assigning projects and when deciding who might be added to each team to promote the best function of the whole. In this way, understanding and appreciating diversity in members’ strengths has been especially useful in creating differentiated roles.

Best Practice #9: Let Students Take Initiative

Much of the work in which we allow students to participate relates directly to courses in their undergraduate or graduate curriculum, such as communication research methods. After a student has been involved in administering one or two studies in the lab, much of what they learned in their research methods courses seems less abstract and more practical. Following several months observing and assisting with others’ ongoing projects, students begin to put the pieces of the scientific method together and engage in higher-order questioning. This time is perfect to engage students about communication phenomena they believe should be investigated and communication questions they would like to try to answer. A great way we begin this conversation is by asking students to find gaps in the literature, or to create their own questions that then can be answered as part of a current study. Then, we encourage students to write support for their proposed questions and articulate for the team how their research aims fit into a larger investigation. We ask them to integrate things they learned from previous courses (e.g., theories of communication, scholarly writing conventions, and principles of communication research design) into their project proposals.

After the first draft, we provide feedback and together discuss the best ways to integrate relevant measures into an ongoing research design, reach the desired population, maximize validity, and comply with principles of ethical research conduct. It is through this guided process that we begin to encourage students to take initiative to be a larger part of the scholarly endeavor. We have found that after students have taken a larger role in a study, they often start to propose their own research and ask permission to use the lab resources to conduct their own experiments. Through this process, we try to capture Dewey's principle of growth through "ordered richness," or the idea that the most educational of experiences emerge from the affective, cognitive, and imaginative capabilities developed in shared, self-directed activities (Eldridge, 1998). When students demonstrate initiative for knowledge production, not only is it encouraging and rewarding, but also it results in student-authored papers and student-created installations that allow administrators and community members to see immediate and practical value in supporting the lab as an instructional resource.

Best Practice #10: Think About and Plan for the Future

Students either self-select to work in the lab (meaning they approach us) or we recruit them based on interaction and their course performance. In the first conversation before students are formally invited to become lab members, we encourage them to share with us their goals (not only employment goals, but also what kind of life they want to lead and what kind of personal abilities they want to develop). This conversation of sharing is different for students at first because many simply see college as a tool for obtaining a career, but working in the lab can provide skills that benefit them beyond employment. We carefully consider how best to craft a lab experience that serves students' larger personal development aims by aligning their specific areas of responsibility with their learning objectives. We also talk often about our hopes and plans for the future of the lab: the kind of scholarly contributions we hope to make, the resources and structures we will need to achieve our goals, the potential "vision words" that will meaningfully shape the next year's experiences, and the developments in human-machine communication that will demand our attention.

Conclusion

Although many scientific, artistic, and technical academic disciplines have long employed laboratory methods to enrich student education, there are relatively few communication programs that have structured student learning in this way. We believe communication labs are an excellent way to provide students with close collaboration opportunities and hands-on experience, especially in the areas of communication study involving technological knowledge and practice. These past few years spent growing and developing the labs have been among the most fun and rewarding of our professional lives. We often say that we learn as much from our students as they do from us. They are true partners in inquiry and we wish to thank them all—graduate and undergraduate, past and present—for being a part of this wonderful experiment.

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