Enhancing Short-term Undergraduate Research Experiences in Study Abroad: Curriculum Design and Mentor Development

Eric E. Hall, Ph.D., Elon University, ehall@elon.edu
Helen Walkington, Ph.D., Oxford Brookes University
Maureen Vandermaas-Peeler, Ph.D., Elon University
Jenny Olin Shanahan, Ph.D., Bridgewater State University
Rikke Kolbech Gudiksen, M.Sc., DIS – Study Abroad in Scandinavia
Margaret Mackenzie Zimmer, B.A., DIS – Study Abroad in Scandinavia

Introduction

Although there are many definitions of undergraduate research (UR), it is generally framed as scientific inquiry, creative activity, and/or scholarship with a faculty mentor who provides guidance and expertise (Kinkead, 2003). Beckman and Hensel (2009) identified a number of UR practices among institutions of higher education in the United States that vary along a continuum, including whether the research is student- or faculty-initiated, collaborative or individual, curriculum-based or co-curricular, and more. Jenkins and Healey (2010) noted that as universities worldwide embraced the growing focus on involving students in inquiry-based UR, they adapted many of these practices into their own systems and cultural frameworks and in the process, re-conceptualized teaching and discipline-based research relationships. According to Brew (2013), UR facilitates the intersection of research and teaching by emphasizing student engagement, participation, and inquiry. In high-quality UR experiences, faculty mentors scaffold inquiry-based learning experiences along a developmental trajectory in which students gradually gain research expertise and become members of scholarly, knowledge-building communities of practice (Hunter, Laursen, & Seymour, 2007; Vandermaas-Peeler, 2016; Vandermaas-Peeler, Miller, & Peeples, 2015; Wuetherick, Willison, & Shanahan, 2018). In addition to sharing disciplinary and professional expertise (i.e., instrumental processes of mentoring), excellent mentors also contribute to students' emotional and social development (i.e., psychosocial processes) in their guidance (Allen, Eby, O'Brien, & Lentz, 2008; Johnson, 2015; Lopatto, 2003). Higher education institutions must create supportive structures for mentors that fit the academic and cultural context. As shown in a recent Gallup poll of college alumni, high-quality mentoring matters not only for students' learning and well-being during their undergraduate educational experience but also post-graduation (Gallup, Inc., 2014; Johnson, Behling, Miller, & Vandermaas-Peeler, 2015).

The purpose of this paper is to review the benefits of mentored UR, particularly in the context of study abroad; present the curriculum design principles behind a study abroad program in Scandinavia in which students are afforded opportunities to participate in several different UR initiatives; and offer a framework of salient mentoring practices that can be used in the preparation and development of UR initiatives in study abroad programs.

Benefits of UR as a High-Impact Educational Practice

Kuh (2008) named UR one of the high-impact educational practices (HIPs) that were found to be especially beneficial for student engagement and success in analyses of the National Survey of Student Engagement (NSEE). Kuh and O'Donnell (2013) identified eight essential elements or quality indicators across the HIPs. They include: 1) performance expectations set at appropriately high levels, 2) significant investment of time and effort by the student over an extended period of time, 3) interactions with faculty and peers about substantive matters, 4) experiences with diversity, 5) frequent, timely, and constructive feedback, 6) periodic, structured opportunities to reflect and integrate learning, 7) opportunities to discover relevance of learning through real-world applications, and 8) public demonstration of competence. As Kuh and O'Donnell (2013) concluded, the essential features of each HIP must be defined in order to evaluate the quality of the experience, analyze the ways student characteristics may influence participation, learning and development, and assess the demands on institutional resources.

The reported benefits of participation in UR are widespread. When they participate in high-quality UR with a faculty mentor, students are engaged in real-world, complex problems that can deepen learning, strengthen self-awareness, and broaden perspective-taking abilities, among many other benefits (Brew, 2013; Johnson, 2015; Kuh, 2008). There is consensus that research and inquiry-based learning experiences foster higher order skills necessary for students' future work in a global economy (Palmer, Hunt, Neal, & Wuetherick, 2015). These gains depend in part on the students' developmental progression from novice to more experienced researchers. Novice student researchers report gaining basic instrumental skills, including data collection and research design. They also report some psychosocial gains such as confidence in conducting research and comfort in interacting with other researchers (Thiry, Weston, Laursen, & Hunter, 2012). With more experience, student researchers report higher-order cognitive gains such as critical analysis, interpretation, and problem-solving (Thiry et al., 2012). Students reported fewer gains at the end of a summer UR experience as compared with a yearlong experience, suggesting that duration is another key factor (Adedokun et al., 2014). Supportive relationships with mentors and the advantageous opportunities afforded by participation in UR are particularly beneficial for students from historically underserved groups (Shanahan, 2018).

In one multi-institutional study, students reported that their mentors of UR experiences played a critical role in shaping their professional and personal/cultural identities, as well as their goals for the future (Palmer, Hunt, Neal, & Wuetherick, 2018). Enhanced preparation for graduate studies and professional careers, and the rate of participation in postgraduate research opportunities, are also correlated with UR participation (Willison & O'Regan, 2007).

UR and Global Learning

Kuh (2008) asserted that each undergraduate should participate in at least two HIPs over the course of their education. However, much less is known about the impact of combining HIPs, such as conducting UR in international contexts. Banks and Gutiérrez (2017) suggested potential synergies between participation in UR and global learning experiences. Both HIPs require students to think flexibly as they explore new experiences and environments and encounter the inherent uncertainties in the process of discovery. In research in some fields, often in the social sciences, for example, students gain appreciation for diverse cultural and social environments and encounter challenges related to racial, ethnic, and gender inequalities (Banks & Gutiérrez, 2017). It is clear that engagement beyond the classroom is essential for developing intercultural competence through real-world interactions (Deardorff & Arasaratnam-Smith, 2017). Research suggests that intercultural knowledge and understanding are most likely to develop when students are actively engaged with diverse communities (Engberg, 2013; Hovland, 2014). A recent study examined U.S. college students' perceptions of their engagement and learning after studying abroad for a semester in

Denmark (Vandermaas-Peeler, Duncan-Bendix, & Biehl, 2018). All students participated in a course focusing on children and adolescents in Scandinavian contexts, a semester-long practicum experience in a Danish educational institution, and two course-embedded travel experiences within and outside of Denmark. Students reported that they developed knowledge and understanding of themselves and established strong relationships with the host community. Their responses provided evidence that they worked to make meaning of their observations throughout the semester. The practicum and study tour experiences provided ample opportunities for global learning; many students reported that they gained knowledge about diversity and considered issues from the perspectives of local and global communities.

Thus, there is an anticipated set of gains for students pursuing inquiry-based learning experiences in global contexts such as during study abroad. There may also be unique challenges with regard to conducting UR in international settings, including vague university and program guidelines for conducting UR, uncertainty about country-specific guidelines for Institutional Review Board (IRB) procedures and ethics, finding mentors in advance, and integrating their UR experiences into the home campus, to name but a few (for one review, see Streitwieser & Sobania, 2008). For field-based research programs in international contexts, Houlihan (2007) emphasized the critical importance of advanced preparation in terms of cultural sensitivity, language studies, and disciplinary knowledge. The skill-building needed to succeed in the research experience should be beneficial not only for the UR experience abroad but also for future academic and professional careers (Houlihan, 2007).

Research Abroad – Principles for Designing an Undergraduate Research Project within the Curriculum

DIS–Study Abroad in Scandinavia is a non-profit study abroad foundation established in Denmark in 1959, with locations in Copenhagen and Stockholm. DIS provides semester, academic year, and summer programs taught in English, for upper-division undergraduate students from North American colleges and universities. DIS has experience in experimental learning components, such as field studies throughout Copenhagen and Stockholm, practicums, studios, guest lectures, skill-building workshops, case studies, and faculty-led study tours across Europe. Providing research opportunities further supports the ambition to have high-impact learning experiences at the core of the curriculum.

Initial research opportunities in academic programs (the 6-credit Science Research Practicum in Science & Health and the 3-credit Cognitive Neuroscience Lab in Psychology) offered individual students pre-defined research topics and the chance to connect with a DIS faculty member to pursue an independent research project (see Appendix A for more information about these offerings). Aware of the strong focus on research in undergraduate education in partner universities, this provided support for developing students' ability to pursue these types of learning experiences while abroad. A research experience fosters not only insights and skills relevant to studies and jobs, but also an understanding of the characteristics and importance of the research process – the role and value of research to society – that is essential for engaged citizenship.

Throughout 2017, DIS has worked to make research a higher priority, both in student offerings as well as for faculty funding. Developing a new research opportunity (the 3-credit Research Assistant course) came out of a desire to provide more students with deep learning opportunities while at the same time supporting faculty in developing professionally and strengthening the academic richness of our curriculum. Faculty can now apply for longer-term research funding and have the option of serving as mentors for the Research Assistant course during part of their project.

The Research Assistant Course – A New Opportunity at DIS

Starting in fall of 2018, DIS will give students the opportunity to join a research project carried out by a DIS faculty member. The DIS Research Assistant course is a semester course where 1-2 students

take part in a topical ongoing research project, in close cooperation with a mentor. Projects range across disciplines, such as environmental science, gender studies, human rights, humanities, pre-medicine/health, public health, and sustainability. Students have weekly check-ins with their mentor and participate in several workshops with the other research assistant students throughout the semester.

Close Collaboration between Mentor and Student
To give the students an opportunity to form a close working relationship with their mentor, each project has only one or two students involved as research assistants. By joining an ongoing research project, students have the opportunity to go into depth on a part of the research process, such as data collection or data analysis. There is an emphasis on teaching the students about the nature of research, including when things do not go as planned.

The mentor plans the individual research assistants' tasks in advance of the semester. Assignments associated with the course vary for each research project but always include a reflection component and a final product. Each mentor will plan how the research assistant can present the work. It may be at a DIS research workshop, to an expert panel, or as part of a conference, depending on the discipline and what particular part of the research process the student has been involved in.

In addition to giving the students a high-impact learning experience, the research initiative also presents a unique opportunity for faculty to chase academic interests, collaborate with partners, and interact with students in a different context. Besides continued professional growth and development by embarking on a research project, the chance to develop as a mentor offers a different relationship with students from teaching a class. Conversations with faculty have shown this to be a crucial motivator. As remarked by Claudia Carrerra-Augustenborg, a DIS faculty in psychology, "Mentoring is where you ask questions, teaching is where you supply answers."

Key Features of the Research Assistant Course

As part of developing a new research opportunity for DIS students, we were considering various formats and variations to maximize the students learning opportunity within the one semester they spend at DIS. We learned the following during our initial discussions with students and faculty related to implementing this new program:

Keep Focus
Interdisciplinary work is a trademark of the DIS model. Therefore, it was natural to explore ways to include an interdisciplinary component to the research experience. However, it would clearly be a challenge for the individual student to combine the breadth of working across disciplines with the deep diving of doing research, particularly within the one semester framework.

Authenticity
When we talked to focus groups of current research students at DIS, we found that their feedback emphasized the importance of being part of a "real", funded research project. This was also of importance to our faculty's motivation. This pointed to a format that allowed faculty to introduce the norms and traditions of the discipline to the student by working closely together on the research

tasks of that particular semester, and experiencing the realities of research with the challenges and unpredictability that comes with it.

Ownership
The fact that students are involved as research assistants only for a semester-long portion of the project, student ownership of the research project is not the same as a long-term undergraduate research project. However, to the extent possible, faculty will carve out an area each semester where students get ownership.

Reflection
An important part of the Research Assistant course are the assignments and discussions that ask students to capture what they have learned from the research assistant experience and to reflect on how they could use it in the future. This includes lifting the research experience out of the general study abroad experience and helping students gain the awareness and vocabulary to articulate its value.

Ensuring Faculty Benefits
The Research Assistant concept presents a unique opportunity for our faculty to chase academic interests, collaborate concretely with partners, and interact with students in a different context. Besides continued growth and development by embarking on a research project, the opportunity to develop as a mentor offers a different relationship with students compared to teaching a class. Conversations with faculty have shown this to be a crucial motivator. The use of both students and faculty in the design of curriculum projects has been found to be beneficial (Albilehi, Han, & Desmidt, 2013; Bovill, Morss, & Bulley, 2009).

Utilization of the Ten Salient Undergraduate-Research Mentoring Practices in Planning
One framework which focuses on best practice in UR mentoring is based on a literature review over two decades to identify ten salient mentoring practices specific to undergraduate research mentoring (Shanahan, Ackley-Holbrook, Hall, Stewart, & Walkington, 2015). This framework has been applied to DIS to showcase the preparation and implementation of the research assistant program and its efficacy in designing research initiatives involving UR mentorship in new contexts. These practices can be used as a means for mentors to plan how they will mentor students in UR. The 10 practices are as follows: (1) Do strategic pre-planning to respond to students' varying needs and abilities; (2) Set clear and well-scaffolded expectations; (3) Teach the technical skills and research methods of the discipline; (4) Balance rigorous expectations with emotional support and appropriate personal interest in students; (5) Build community among members of the research team; (6) Dedicate time to one-on-one, hands-on mentoring; (7) Increase student ownership of the research over time; (8) Support students' professional development through networking and explaining disciplinary norms; (9) Create intentional, laddered opportunities for peers and "near peers" to mentor each other; and (10) Encourage students to share their findings and provide guidance on how to do so effectively.

This framework of practices provides a clear pedagogy for mentored research indicating the need for time in planning, careful design, tailoring to individual student needs, and the closeness of working that students might expect as they gradually take on more responsibility for the research over time. The challenge for study abroad programs is therefore being able to develop these practices in a relative short time frame. Table 1 provides a series of questions to guide the planning of a new program such as the DIS Research abroad course.

Previous research has shown that it is the quality of mentoring that is important for positive experiences to happen for both the mentor and the student (Ishiyama, 2007; Mekolichick & Gibbs,

2012). For a description of the salient practices, see Appendix B. It is also available on this website: www.centerforengagedlearning.org/salientpractices.

In an effort to help DIS faculty plan for their mentorship in these RA positions, workshops were held to introduce the faculty to the 10 salient practices and for them to reflect on which practices that they had already done and viewed as strengths and also to think about which practices they viewed as challenges or would be challenges in this context. Previous research has found that faculty mentors feel that they have done the following six of the ten practices well: setting clear expectations, teaching technical skills, balancing rigorous expectations with emotional support, hands-on mentoring, increasing student ownership, and encouraging dissemination, but viewed three of them as particularly challenging: strategic pre-planning, community building, and creating opportunities to mentor (Walkington, Hall, Shanahan, Ackley, & Stewart, 2018). In the same study (Walkington et al., 2018), supporting networking was not judged as particularly challenging or done notably well.

Table 1

Reflection Questions Adapted from Shanahan et al. (2016) and Walkington et al. (2018)

A. Before you start

1. What are some things you do to plan an undergraduate research project?
2. How can you address variability in students' preparation, motivation, and skills?
3. How could you prepare/orient students to work with you and manage their need for one-on-one time with you?
4. Have you thought of creating learning contracts or even a syllabus for your research students? Can you plan the scaffolded development of skills in advance and set interim deadlines?

B. Learning about research

1. How will you orient students to the critical technical skills, methods, and techniques of your discipline?
2. How could you manage the varying expectations of the mentor–mentee relationship with different types of students?
3. How will you organize multiple student research experiences and/or coordinate a research team?
4. Can you encourage a sense of community among research team members, including social and interpersonal team development?
5. Are there effective ways in which peers and near-peers can mentor other students?
6. What are some ways to help students gain ownership of their projects?

C. Research dissemination

1. How can you support the professional development of your research students?
2. How might you help undergraduates network with colleagues in their field?
3. How will you support students to get the most from disciplinary/multidisciplinary/ local/institutional/national/international conferences and meetings?
4. In what other ways could you help students disseminate their work?
5. How could you support students' writing development?
6. What will you find most challenging when supporting students' research dissemination?

During these workshops, some interesting findings emerged around the potential use of the salient practices not only to address some of the perceived challenges of the mentors, but also to clarify and

rethink their existing good practices. First, many of the participants felt confident in their ability to do strategic pre-planning. Some of this came from previous experience, but also could be a result of them engaging in this workshop a year prior to the implementation of the program. This ensures adequate time to plan. Second, many of the faculty felt comfortable with setting clear and scaffolded expectations for their research students because they have been able to do it previously. However, concern about being able to do this without knowing the students well in advance was evident, particularly with regard to matching expectations to particular student abilities. Third, while this is not directly related to any of the 10 salient practices – but likely related to the previous point – there was some concern expressed about the selection and recruitment of participants. These research assistants will be selected through an application and interview process; the mentors were concerned that they would be able to select the "right" or appropriate person to help move the research projects forward and have the necessary skills for the project success or be able to teach those skills (practice 3). Fourth, many indicated concern about the possibility for increasing the student's sense of ownership of the research over a relatively short time frame.

What Can Be Done to Help Mentors and Students at DIS Have Successful Experiences?
Below we will discuss ways in which practices may be able to help inform UR mentoring to ensure successful experiences for both mentors and students.

Tips for Recruitment and Selection of Research Assistants

One of the keys to the success of any research project is the selection of appropriate personnel. In this scenario, the importance of choosing the right people is even more important because of the short time frame the students will be working on the project. This will be more difficult because the mentor will not have previous experience working with these students through class or other interactions. It may be further complicated by the fact that the needs of the project may change from semester to semester depending on what is crucial for the project. A recent article interviewed award-winning mentors who described the importance of students from underrepresented populations and "average" students benefiting most from UR, challenging the perception that research is only suited to A grade students (Shanahan, Walkington, Ackley, Hall, & Stewart, 2017). For these projects to be successful, it is important for students to be passionate about the project as opposed to just looking for another check box for activities completed.

Finding ways to assess and evaluate student suitability for a particular project might include interviews, perhaps through Skype if they are not yet "in country", or by asking them to write a short account of their motivations to work on a specific project. Finding out about previous experience with particular methods is also an important activity. If the project is likely to involve a lot of teamwork, students need to be willing to work with others, rather than adopting a lone scholar model, so this can also be checked during the recruitment process.

Use of Technology for Pre-Planning and Post-Experience Participating

Shanahan et al. (2017) describe the potential positive and negative uses of technology in UR mentoring. With the ease of communication through online communication software such as Skype, it would be possible to not only "meet" with research students prior to arrival to DIS, but also post-experience. The meetings could be used to help students prepare and learn what to expect from their mentors. In this pre-planning phase, mentors could share important articles and resources about the project to help get them up to speed before stepping on campus and starting as a research assistant. Additionally, these same technologies could be used to help keep the students involved following their semester at DIS, if they would like to continue to be involved in the project. Since research dissemination may take place sometime after the project ends, keeping in touch online may be useful for ongoing writing collaborations for instance.

Strengths of a Research Group Model

Utilizing a research group model can help with peer support. Mentors should not be afraid of longitudinal research allowing students to start projects where others have left off, rather than starting afresh, particularly when time on the project is restricted to a semester or a short placement. Many real-world research problems are being tackled by teams from different disciplines and members of the research team may come and go. Therefore, having projects which mirror these features are to be encouraged to provide a level of authenticity. Not all students have to pose new research questions. In fact, posing research questions is one of the most challenging research skills to develop (Walkington et al., 2011) and takes time to refine. Allowing students to jump on and jump off ongoing research projects might thus be a means of optimizing their research experience. Developing projects which allow for collaboration and small discrete mini-projects/subquestions within to allow students to develop a sense of ownership can provide faculty members with longitudinal research and large data sets for their own publication, at the same time as smaller dissemination opportunities for students. One example of this idea is the book *An Element of Controversy: The life of Chlorine in Science, Medicine, Technology and War*, co-created by academic chemist Hasok Chang and several successive cohorts of undergraduate students (Chang, 2005, 2009).

Other benefits of the research group model include research teams being used for peer-mentoring where members of the groups utilize their strengths in the project and help teach their peers skills or give feedback based on their own previous knowledge and expertise. This links back to practices 5 and 9, deemed the most challenging to faculty (Walkington et al., 2018).

Creating Legacy from Research Projects

One means of creating legacy for research projects is to utilize research dissemination formats that can be stored digitally in an online repository, to make them searchable and *discoverable*. Journals (Walkington, 2008, 2012) and conferences (Hill & Walkington, 2016; Kneale, Edwards-Jones, Walkington, & Hill, 2016; Walkington, Hill, & Kneale, 2017) are suitable formal opportunities for student research dissemination, but a whole variety of other formats (making *publication* in the broadest sense accessible within relatively short time frames) also exist, such as blog posts, 3-minute-thesis style presentations to camera that can be stored as YouTube clips and housed in a web repository, recorded debates, digital records of exhibitions, group presentations, and interactive pdf's and posters. An example of this approach comes from Oxford Brookes University in England which uses a dedicated section of the institutional research repository for student research (The *Get Published!* Student Research Collection).

Build Community among Scholars

The students who will be engaged in the research projects will be adjusting to a new environment because they are studying abroad and entering a potentially very different research environment from what they are used to in the United States. While they will be working in research teams, attempting to build a community across research projects may be beneficial in helping provide social support for research assistants through the research process, and their global education experience. These communities can be developed by having common sessions where students learn about the basic tenets of research and research ethics, but they should also encourage the students to talk about their research projects, learning how to develop "elevator" speeches to explain what they are doing. Finally, using these group sessions to reflect on what they have learned and how this can be articulated in future personal statements and interviews could also be beneficial.

Development of Mentors

While many of the benefits that have been discussed in this paper have focused on the benefits the students will accrue, there are some distinct benefits that the mentors may gain as well. Since DIS is

primarily focused on the teaching of undergraduate students, these research assistant positions may be beneficial for faculty to develop an academic identity as a scholar. Quigley (2011) points out that the academic identity not only differs from person to person, but also shifts at time for faculty. Having the opportunity to explore new areas might help increase the satisfaction of faculty. Another avenue that this UR mentorship may allow is for faculty members to increase their research productivity. This benefit has been demonstrated in previous research (Hall, Walkington, Shanahan, Ackley, & Stewart, 2018; Laursen, Hunter, Seymour, Thiry, & Melton, 2010) where faculty reported increased productivity as a result of what they did.

A final recommendation that may help DIS and the mentor deepen the UR experience may be for faculty at DIS to partner with faculty at universities and colleges in the U.S. on research projects. This could be faculty solely working together and possibly co-mentoring research assistants at DIS or it could be faculty in the U.S. sending an UR student to DIS to work on a research project. Through making research, teaching, and faculty development synergistic, there are multiple benefits that co-mentoring of UR can have for faculty and students, such as promoting greater dialogue about mentoring and research perspectives, blending of the traditional roles of the faculty member (e.g., teaching, scholarship, and service), serving as a catalyst for faculty development as well as student growth, and translating skills for bridging disciplines and techniques to solve problems (Ketcham, Hall, Fitz-Gibbons, & Walkington, 2018; Ketcham, Hall, & Miller, 2017).

Conclusions

In this article, we highlighted some of the instrumental and psychosocial benefits of mentored UR as a HIP, particularly when combined with study abroad. We outlined the 10 salient practices from the research literature in a way that can be applied to study abroad programs, providing a questioning framework to guide curriculum design. The salient practices can be utilized to anticipate challenges to mentoring of ongoing research projects during study abroad programs. Several initiatives in development at DIS were included as an example of implementing undergraduate research in a global context. Specifically, this article offered guidelines related to conducting high quality research in a short time frame which include: starting early through the recruitment and selection of research students, using technology to aid in brokering relationships as well as pre-planning, utilizing a research group model to help provide a supportive environment for students, building a community among scholars, creating legacy for the research projects, and facilitating mentor development. Utilizing the 10 salient practices as a guiding framework can be considered a high-impact pedagogy that maximizes the synergies between participation in UR and global learning experiences. Future directions for DIS may include evaluation of the effectiveness of the curriculum design outlined here and may also consider the professional growth and empowerment for the faculty involved (Albilehi et al., 2013). Ways of meaningfully engaging students in the curriculum design process also provide food for thought (Bovill et al., 2009).

References

Adedokun, O. A., Parker, L. C., Childress, A., Burgess, W., Adams, R., Agnew, C. R., … Teegarden, D. (2014). Effect of time on perceived gains from an undergraduate research program. *CBE Life Sciences Education*, *13*(1), 139–148.

Albilehi, R., Han, J. Y., & Desmidt, H. (2013). Curriculum development 101: Lessons learned from a curriculum-design project. *CATESOL Journal*, *24*(1), 187–197.

Allen, T. D., Eby, L. T., O'Brien, K. E., & Lentz, E. (2008). The state of mentoring research: A qualitative review of current research methods and future research implications. *Journal of Vocational Behavior*, *73*(3), 343–357.

Banks, J. E., & Gutiérrez, J. J. (2017). Undergraduate research in international settings: Synergies in stacked high-impact practices. *CUR Quarterly*, *37*(3), 18–26.

Beckman, M., & Hensel, N. (2009). Making explicit the implicit: Defining undergraduate research. *CUR Quarterly*, *29*(4), 40–44.

Bovill, C., Morss, K., & Bulley, C. J. (2009). Should students participate in curriculum design? Discussion arising from a first year curriculum design project and a literature review. *Pedagogic Research in Maximising Education*, *3*(2), 17–26.

Brew, A. (2013). Understanding the scope of undergraduate research: A framework for curricular and pedagogical decision-making. *Higher Education*, *66*(5), 603–618.

Chang, H. (2005). Turning an undergraduate class into a professional research community. *Teaching in Higher Education*, *10*(3), 387–394.

Chang, H. (2009). Chlorine: undergraduate research on an element of controversy. *Journal of Chemical Education*, *86*(4), 418.

Deardorff, D. K., & Arasaratnam-Smith, L. A. (2017). Intercultural competence in higher education: International approaches, assessment and application. New York, NY: Routledge.

Engberg, M. E. (2013). The influence of study away experiences on global perspective-taking. *Journal of College Student Development*, *54*(5), 466–480.

Gallup, Inc. (2014). *Life in college matters for life after college*. Retrieved February 23, 2018, from http://news.gallup.com/poll/168848/life-college-matters-life-college.aspx

Hall, E. E., Walkington, H., Shanahan, J. O., Ackley, E., & Stewart, K. A. (2018). Mentor perspectives on the place of undergraduate research mentoring in academic identity and career development: An analysis of award winning mentors. *International Journal for Academic Development*, *23*(1), 15–27.

Hill, J., & Walkington, H. (2016). Developing graduate attributes through participation in undergraduate research conferences. *Journal of Geography in Higher Education*, *40*(2), 222–237.

Houlihan, P. (2007). Supporting undergraduates in conducting field-based research: A perspective from on-site faculty and staff. *Frontiers: The Interdisciplinary Journal of Study Abroad*, *12*, ix–xvi.

Hovland, K. (2014). *Global learning: Defining, designing, demonstrating*. American Association of Colleges and Universities. Retrieved from https://www.aacu.org/sites/default/files/files/Global/global_learning_2014.pdf

Hunter, A.-B., Laursen, S. L., & Seymour, E. (2007). Becoming a scientist: The role of undergraduate research in students' cognitive, personal, and professional development. *Science Education*, *91*(1), 36–74.

Ishiyama, J. (2007). Expectations and perceptions of undergraduate research mentoring: Comparing first generation, low income white/Caucasian and African American students. *College Student Journal*, *41*(3), 540–549.

Jenkins, A., & Healey, M. (2010). Undergraduate research and international initiatives to link teaching and research. *CUR Quarterly*, *30*(3), 36–42.

Johnson, W. B. (2015). *On being a mentor: A guide for higher education faculty* (2nd ed.). New York, NY: Routledge.

Johnson, W. B., Behling, L. L., Miller, P., & Vandermaas-Peeler, M. (2015). Undergraduate research mentoring: Obstacles and opportunities. *Mentoring & Tutoring: Partnership in Learning*, *23*(5), 441–453.

Ketcham, C. J., Hall, E. E., Fitz-Gibbons, H., & Walkington, H. (2018). Co-mentoring in undergraduate research: A faculty development perspective. In M. Vandermaas-Peeler, P. C. Miller, & J. Moore (Eds.), *Excellence in mentoring undergraduate research*. Washington, D.C.: Council for Undergraduate Research.

Ketcham, C. J., Hall, E. E., & Miller, P. C. (2017). Co-mentoring undergraduate research: Student, faculty and institutional perspectives. *Perspectives on Undergraduate Research and Mentoring*, *6*(1), 1–13.

Kinkead, J. (2003). Learning through inquiry: An overview of undergraduate research. *New Directions for Teaching and Learning*, *2003*(93), 5–18.

Kneale, P., Edwards-Jones, A., Walkington, H., & Hill, J. (2016). Evaluating undergraduate research conferences as vehicles for novice researcher development. *International Journal for Researcher Development*, *7*(2), 159–177.

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Retrieved from https://www.aacu.org/publications-research/publications/high-impact-educational-practices-what-they-are-who-has-access-0

Kuh, G. D., & O'Donnell, K. (2013). *Ensuring quality and taking high-impact practices to scale*. Washington, D.C.: Association of American Colleges and Universities.

Laursen, S., Hunter, A.-B., Seymour, E., Thiry, H., & Melton, G. (2010). Undergraduate research in the sciences: Engaging students in real science. San Fransico, CA: Jossey-Bass.

Lopatto, D. (2003). The essential features of undergraduate research. *CUR Quarterly*, *23*(3), 139–142.

Mekolichick, J., & Gibbs, M. K. (2012). Understanding college generational status in the undergraduate research mentored relationship. *CUR Quarterly*, *33*(2), 40–46.

Palmer, R., Hunt, A., Neal, M., & Wuetherick, B. (2018). Mentored undergraduate research: An investigation of students' perceptions of its impact on identity development. In M. Vandermaas-Peeler, P. C. Miller, & J. Moore (Eds.), *Excellence in mentoring undergraduate research*. Washington, D.C.: Council for Undergraduate Research.

Palmer, R. J., Hunt, A. N., Neal, M., & Wuetherick, B. (2015). Mentoring, undergraduate research, and identity development: A conceptual review and research agenda. *Mentoring and Tutoring: Partnership in Learning*, *23*(5), 411–426.

Quigley, S. A. (2011). Academic identity: A modern perspective. *Educate*, *11*(1), 20–30.

Shanahan, J. O. (2018). Mentoring strategies that support underrepresented students in undergraduate research. In M. Vandermaas-Peeler, P. C. Miller, & J. Moore (Eds.), *Excellence in mentoring undergraduate research*. Washington, D.C.: Council for Undergraduate Research.

Shanahan, J. O., Ackley-Holbrook, E., Hall, E., Stewart, K., & Walkington, H. (2015). Ten salient practices of undergraduate research mentors: A review of the literature. *Mentoring and Tutoring: Partnership in Learning*, *23*(5), 359–376.

Shanahan, J. O., Walkington, H., Ackley, E., Hall, E. E., & Stewart, K. A. (2017). Award-winning mentors see democratization as the future of undergraduate research. *CUR Quarterly*, *37*(4), 4–11.

Streitwieser, B., & Sobania, N. (2008). Overseeing study abroad research: Challenges, responsibilities, and the institutional review board. *Frontiers: The Interdisciplinary Journal of Study Abroad*, *16*, 1–16.

Thiry, H., Weston, T. J., Laursen, S. L., & Hunter, A.-B. (2012). The benefits of multi-year research experiences: Differences in novice and experienced students' reported gains from undergraduate research. *CBE Life Sciences Education*, *11*(3), 260–272.

Vandermaas-Peeler, M. (2016). Mentoring undergraduate research: Student and faculty participation in communities of practice. *Transformative Dialogues: Teaching & Learning Journal*, *9*(1), 1-10.

Vandermaas-Peeler, M., Duncan-Bendix, J., & Biehl, M. S. (2018). "I have a better sense of how interconnected the world is": Student perceptions of learning and global engagement during study abroad. *Frontiers: The Interdisciplinary Journal of Study Abroad*, *30*(2), 117–135.

Vandermaas-Peeler, M., Miller, P. C., & Peeples, T. (2015). "Mentoring is sharing the excitement of discovery": Faculty perceptions of undergraduate research mentoring. *Mentoring and Tutoring: Partnership in Learning*, *23*(5), 377–393.

Walkington, H. (2008). Geoverse: Piloting a national e-journal of undergraduate research in geography. *Planet*, 20(1), 41–46.

Walkington, H. (2012). Developing dialogic learning space: The case of online undergraduate research journals. *Journal of Geography in Higher Education*, *36*(4), 547–562.

Walkington, H. (2015). *Students as researchers: Supporting undergraduate research in the disciplines in higher education*. York, United Kingdom.: The Higher Education Academy.

Walkington, H., Griffin, A. L., Keys-Mathews, L., Metoyer, S. K., Miller, W. E., Baker, R., & France, D. (2011). Embedding research-based learning early in the undergraduate geography curriculum. *Journal of Geography in Higher Education*, *35*(3), 315–330.

Walkington, H., Hall, E., Shanahan, J. O., Ackley, E., & Stewart, K. (2018). Striving for excellence in undergraduate research mentoring: The challenges and approaches to ten salient practices. In M. Vandermaas-Peeler, P. C. Miller, & J. Moore (Eds.), *Excellence in mentoring undergraduate research*. Washington, D.C.: Council for Undergraduate Research.

Walkington, H., Hill, J., & Kneale, P. E. (2017). Reciprocal elucidation: a student-led pedagogy in multidisciplinary undergraduate research conferences. *Higher Education Research and Development*, *36*(2), 416–429.

Willison, J., & O'Regan, K. (2007). Commonly known, commonly not known, totally unknown: A framework for students becoming researchers. *Higher Education Research & Development*, *26*(4), 393–409.

Wuetherick, B., Willison, J. W., & Shanahan, J. O. (2018). Mentored undergraduate research at scale: Undergraduate research in the curriculum and as pedagogy. In M. Vandermaas-Peeler, P. C. Miller, & J. Moore (Eds.), *Excellence in mentoring undergraduate research*. Washington, D.C.: Council for Undergraduate Research.

Appendix A Other Research Opportunities at DIS

The Science Research Practicum

The Science Research Practicum (SRP) is a 6-credit, 4-month long, 15-20 hour per week practicum where students match with a mentor to undertake research at a Copenhagen-based research institution. Students are matched based on an application process which asks students to express their academic experiences and interest and requests a letter of recommendation from professor and/or supervisor. Often the student can choose between a set of research aspects and tasks that the mentor has pre-defined, depending on research group and specialization. Opportunities include clinical, neuroscience, public health, chemistry, and physics-related research. Students report enjoying exposure to the MD/PhD job track, having a researcher as a mentor, taking personal responsibility for one's project, and developing cultural communication and team-building, collaborative skills. In some cases, students continue their supervisee-supervisor relationship post practicum, collaborate to publish a paper, and continue conversations about their project or to discuss their career path through mentorship.

Skill-Based Workshops

SRP students attend three workshops together throughout the semester to meet and focus on specific research-related skills. This allows for students to check-in as a community and learn skills together that they can then take back to their individual research projects and mentors for further development.

1. Scientific Writing Skills (Referencing, Literature Searches, and More)

2. Is This Result True? The Analysis of Data (Focuses on the concepts of bias, chance and confounding)
3. The Research Process (Includes a review of best advices when producing posters, abstracts, and research paper)

Integrating SRP into the Study Abroad Experience
DIS considers the students' placement for their DIS housing location, when possible. Their schedule is coordinated with their other DIS courses so that they have two days a week of uninterrupted time for lab and other research tasks.

While students connect with their supervisors before coming to campus, a staff member with disciplinary knowledge works in a coordinator role to help handle communication, timelines and deadlines, workshop meetings, check-ins, and assignments with students. We have found that in a study abroad setting where the research institution is not located with the study abroad organization (as opposed to a student campus with faculty), these are essential tasks for the research process that need to be handled especially if a mentor does not have the time.

Outcomes
Students keep a research journal throughout the semester as well as produce a paper at the end of the semester. While the paper is not written with the intent of publishing, some students have gone on to co-author an article with the mentor within the various projects. SRP students create a research poster and present at an end-of-semester symposium at DIS.

Challenges
Students must adjust to both a new international lab group as well as life in a new country. The transportation time between locations (i.e., school, lab, and home) can vary. The labs are only available during "working hours", compared to student campuses where labs are available 24/7.

The Cognitive Neuroscience of Consciousness Lab

The Cognitive Neuroscience of Consciousness Lab is a 3-credit, 4-month long lab course with sixteen students who undergo an entire research cycle using the class lab facilities. The faculty splits the students into four research groups and provides them with a general topic to investigate, but they must themselves conduct a literature review, build an experiment, run a pilot, analyze the pilot, modify the experiment paradigm, conduct the experiment, and undergo an analysis. A faculty assistant helps students with statistical work during this process.

Research Group Setting
Students conduct their lab in groups of four. Together, the class holds weekly research meetings where the groups present their current work, discuss any challenges that have come up, and ask and answer questions. They submit peer evaluations throughout the semester to keep motivated and ensure that the workload is equal among group members. All tasks and deadlines are coordinated within the group by the group's project leader (a group-elected student).

Students take the lab course in tandem with a core course at DIS (i.e., their main course while abroad, which includes a travel component). This provides the opportunity for faculty to engage in network sharing and developing a personal interest in students that a thirty-person lab in itself would not have.

Faculty in psychology at DIS Claudia Carrerra-Augustenborg highlights the benefit of the lab as a research space created out of an open mindset about research that rebuffs the "significant results" focus. This highlights the importance to faculty of providing an authentic research process over and

above the outcomes (Brew, 2013; Walkington, 2015). As she comments, "Research that has not come up with statistically significant results is still important research. I don't believe anything can go wrong when it comes to data – there is only good research and poor research (e.g., not controlled for variables, sloppy lab procedures, etc.)."

Outcomes
Students produce a final research paper in APA style, create a research poster, and present their findings at an end-of-semester symposium at DIS. Some students have continued to present at undergraduate conferences.

Challenges
Consciousness can be a tough topic. There is a fair amount of academic content students might not understand when they start. Working in independent groups means students must themselves learn to deal with any issues that arise from working together.

Appendix B Explanation of 10 Salient Practices

The first salient practice, ***strategic pre-planning to respond to students' varying needs and abilities***, requires investing time early in the research process for project selection and for outlining and communicating a plan. Mentors need to consider the wide variability in different students' preparation and motivation for research, as well as their distinct skills and predilections. By devoting time to such early planning, mentors may set more achievable goals and timelines appropriately customized for particular groups of students. They may find they need to scale back some of their research expectations when working with undergraduates. That said, the other side of the issue is also frequently true. Student-researchers are oftentimes more ready and able to conduct authentic scholarly work than faculty give them credit for. A carefully thought-out stage of planning is essential for realistic estimations of what can be accomplished in a particular set of time.

Setting clear and well scaffolded expectations, the second salient practice, issues from the first. Effective mentors of undergraduate research understand that their students' needs for guidance and skill development will fluctuate at different points of the research process, both in response to the trajectory of the project and to students' development over time. Typically students need the strongest support early on, so mentors are wise to invest time and effort in secure scaffolds at the outset, gradually giving students more independence. Many mentors of undergraduate research outline expectations, timelines, and interim deadlines in written learning contracts or research syllabi similar to what they create for courses.

The third practice, ***to teach technical skills and research methods,*** is intended to introduce students to the expectations of conducting scholarly work in the discipline. Mentors are encouraged to guide students through the steps and processes that support the goals of the project, such as the protocols for the lab, studio, or archives, or how to use library databases or particular software platforms. Throughout the research process, mentors should emphasize the importance of relevant ethical standards and safety procedures.

One of the most valuable sets of mentoring practices is balancing rigorous expectations with emotional support and appropriate personal interest in students. This fourth salient practice is about ***providing positive yet constructive feedback to undergraduate researchers and remaining approachable in order to minimize students' anxiety and bolster their confidence***. Finding the right balance between professional or skills-based direction, and a more affective or relational focus, depends on each student's needs. Research by Ishiyama (2007) and Mekolichick and Gibbs (2012), in particular, found that first-generation students reported different expectations of their mentors

than did students with family legacies of higher education, and that underrepresented minority students expressed different mentoring needs than did students in majority groups. Awareness of students' identities and degrees of experience in scholarly work may help faculty understand each student's unique mentoring needs.

The fifth salient practice is ***to build community among groups of undergraduate researchers and mentors***, including faculty, graduate students, postdoctoral fellows, and any other members of the research team. Mentors can help develop trusting interpersonal relationships on a research team through intentional team development, such as engaging in common interests that are not necessarily research-related. A sense of community among a group of researchers, as well as broader skill development, can also be facilitated by peer- and near-peer mentoring, in which more advanced students teach research skills to students who are newer to research. Peer mentoring allows students to develop their own pedagogy as well as improve their own research competency.

Dedicating time to one-on-one, hands-on mentoring is the sixth practice. Research suggests that personalized guidance and advice are key to minimizing students' false assumptions about their abilities and progress. Although time-consuming, the value of hands-on mentoring experiences with students cannot be overestimated.

The seventh salient practice of mentoring undergraduate research is ***to increase student ownership of the research over time.*** One way to help undergraduates build a sense of accountability is to explain to them on a regular basis how their seemingly routine or insignificant tasks relate to larger goals of the project. As students progress in their skills and understanding, successful faculty mentors allow them to take ownership of particular aspects of the project; most students will rise to the occasion and demonstrate increasing responsibility. Likewise, mentors who welcome student opinions and feedback about the work, and who convey patience with and openness to undergraduate researchers' concerns, may foster a sense of shared ownership and engagement in the work.

Supporting students' professional development through networking and explaining norms of the discipline is the eighth practice. Shanahan et al. (2015) identified multiple examples in the literature of the value of mentors providing networking opportunities for undergraduate researchers by introducing them to colleagues on campus and around the world, especially at conferences, but also via email introductions. In student self-reports about their undergraduate research experiences, they have often said that networking opportunities in informal environments were even more meaningful than presenting their research at conferences.

The ninth salient practice is about ***creating what are often termed "laddered" opportunities for students to learn mentoring skills and to teach aspects of the research process to their peers and near-peers (e.g., graduate students teaching undergraduates)***. The practice of encouraging more experienced students to mentor those who are newer to research benefits both the mentors and mentees. The peer mentors not only acquire mentoring skills, but may also more deeply internalize the lessons they are imparting to their mentees. Peer mentoring also serves a quite pragmatic purpose in making it possible to bring more undergraduates into scholarly opportunities. Faculty mentors who model the characteristics of both successful research and successful mentorship –and who make explicit what they are doing – may be able to rely on their students to carry on those practices. Laddered research teams can more readily address different learning styles and competencies, as not everyone needs to be at the same point of knowledge at the same time.

Encouraging students to share their findings and providing guidance on how to do so effectively in oral and poster presentations and in writing, comprise the tenth and final salient practice of

undergraduate research mentoring. Mentors should be looking for avenues for dissemination of student work, as sharing what has been learned is essential to student understanding of what it means to be a scholar. Faculty can have students present their work to peers in their classes and/or campus symposia, to experts at professional meetings, and/or to members of the broader community. There is no better way for students to develop oral and written communication skills than to practice presenting. Mentors who take their students to conferences instill a clear sense of how scholars communicate. According to students across diverse demographic groups, the most important thing their mentor did for them was to take them to a conference.