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Exploring the Dynamics of Directed Studies Courses: Student, Instructor, and Administrator Perspectives

Glen Hvenegaard
University of Alberta, Augustana Campus, glen.hvenegaard@ualberta.ca
Anne-Marie L. Link
University of Alberta, Augustana Campus, alink@ualberta.ca
Sean E. Moore
University of Alberta, Augustana Campus, sean.moore@ualberta.ca
Janet C. Wesselius
University of Alberta, Augustana Campus, janet.wesselius@ualberta.ca

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Abstract
North American universities are encouraged to increase opportunities for undergraduate research experiences (UREs). To this end, many universities offer directed studies courses (DSCs) which are 1-2 semester long courses involving one-on-one instruction, with a focus on student-led independent research. Building on the understanding of dynamics generally related to UREs, this paper seeks to compare the motivations, benefits, and barriers specifically related to DSCs from student, instructor, and administrator perspectives. Based on a set of qualitative focus group discussions at a small undergraduate liberal arts institution, we present the similarities and differences in these perspectives and recommend a set of best practices for DSCs. All three groups reported motivations for engaging in a DSC that addressed working with a particular student or instructor, assistance with graduate school preparation, and meeting program requirements. In terms of perceived benefits of DSCs, both students and instructors indicated the mentoring relationship and practical outcomes arising from DSCs. Students recognized the benefits of developing research skills, but stressed the motivation and benefit of independent learning more than was found in other studies. Instructors focused on benefits of research engagement and relationship building. The major challenges to participating in DSCs were workload and time (all groups), unprepared students and lack of guidelines (instructors and administrators), and the oral presentation requirement and lack of information about DSCs (students). Based on these results, we suggest increased clarity in DSC expectations, consistent standards of quality, and promoting research processes common to the DSC's home discipline.

Les universités nord-américaines sont encouragées à augmenter les possibilités d'offrir des expériences de recherche au premier cycle (ERPM). À cette fin, un grand nombre d'universités offrent des cours d'études dirigées (CÉD) de 1 ou 2 trimestres qui impliquent un enseignement individuel où l'accent est mis sur la recherche indépendante menée par l'étudiant. Cet article est basé sur la compréhension de la dynamique généralement liée aux ERPM et tente de comparer les motivations, les avantages et les obstacles spécifiquement liées aux CÉD du point de vue des étudiants, des instructeurs et des administrateurs. Cette étude, basée sur un ensemble qualitatif de discussions de groupes dans une petite université d'arts libéraux de premier cycle, présente les similarités et les différences entre ces points de vue et recommande un ensemble de meilleures pratiques pour les CÉD. Les trois groupes ont rapporté que la motivation pour s'engager dans des CÉD impliquait le travail avec un étudiant ou un instructeur particulier, l'aide pour la préparation à l'entrée au deuxième cycle et le fait de répondre aux exigences des programmes. En ce qui concerne les avantages des CÉD, tant les étudiants que les instructeurs ont indiqué qu'ils avaient bénéficié de la relation de mentorat et des résultats pratiques des CÉD. Les étudiants ont reconnu qu'il y avait des avantages à développer des compétences en recherche, mais ils ont souligné que la motivation et les avantages de l'apprentissage indépendant étaient supérieurs que dans le cas des autres types d'études. Les instructeurs ont insisté sur les avantages de l'engagement en recherche et sur l'établissement de relations. Les défis principaux rencontrés quand on participe à des CÉD étaient la charge de travail et le temps (tous les groupes), les étudiants non préparés et l'absence de lignes directrices (instructeurs et administrateurs), ainsi que l'exigence d'une présentation orale et l'absence d'information sur les CÉD (étudiants). En fonction de ces résultats, nous suggérons une meilleure clarification de ce que l'on attend des CÉD, des normes de qualité constantes et la promotion des processus de recherche communs à l'établissement d'enseignement dans la discipline en question.

Keywords
Directed studies courses, motivations, benefits, challenges, students, instructors, administrators

Cover Page Footnote
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North American universities have been encouraged to increase opportunities for undergraduate research experiences (UREs) (Boyer, 1998) and are increasingly emphasizing UREs to achieve institutional goals of learning and research (Katkin, 2003; Merkel, 2003). UREs are provided in a variety of models (Millspaugh & Millenbah, 2004) and methods, including research internships, research assistantships, research-based courses, directed studies courses (DSCs), and in-class research assignments. The emphasis of this paper is on DSCs, which we define here as 1-2 semester long courses involving one-on-one instruction with a faculty mentor, and with a focus on student-led independent research. DSCs are also known as independent studies, directed readings, and honour's theses and can play a major role in UREs, especially at small private colleges (Scott, 1973) and undergraduate-only university campuses, as in the case of the present study.

A great deal of published research documents the positive outcomes associated with UREs (Russell, Hancock, & McCullough, 2007; Wayment & Dickson, 2008). In fact, Kuh (2008) refers to the URE as a high impact practice, because of what Lopatto (2010) describes as its significant ability to promote disciplinary skill improvement, knowledge acquisition, professional advancement, professional development, and personal development. Most research has focused on the actual and potential benefits of UREs for students; little of this research has examined barriers and motivations related to UREs. Moreover, there is very little research on motivations, benefits, and perceived challenges related to the sub-topic of DSCs (Katz, Sturz, Bodily, & Hernandez, 2006). Last, there exists little literature that explores the broader dynamics and expectations of DSCs in a way that compares student, instructor, and administrator perspectives. The present article contributes to the literature as it outlines the first findings of a study undertaken to examine the similarities and differences in these perspectives, and the resulting implications for policies and teaching practices related to DSCs.

Literature Review

Research on the specific DSC experience, as already noted, tends to be subsumed under more general studies dealing with the outcomes of various forms of UREs. Therefore, since the literature examining the learning dynamics of DSCs specifically is very limited, this review will first provide a general overview of the motivations, benefits, and challenges as discussed by the literature on UREs in general. Because benefits form by far the largest segment of these studies, these will be considered first.

Benefits of UREs, as they appear in the literature, can be grouped into several categories. One category focuses on the specific gains (e.g., skills in hypothesis testing and data collection) provided by the URE (e.g., Kardash, 2000). Another category focuses on broader personal and intellectual skills that can be developed through the URE (Hunter, Laursen, & Seymour, 2006; Lopatto, 2003; Seymour, Hunter, Laursen, & DeAntoni, 2004). A minority of research focuses on the ways in which a URE can affect the future decisions and career goals of undergraduate students (i.e., the pursuit of graduate school) (Hathaway, Nagda, & Gregerman, 2002; Lopatto, 2007).

Studies of the benefits of the URE generally point to mainly positive and very few negative perceptions by students, with most studies focussing on the former. Thus, for instance, in a study involving students at four liberal arts colleges, Seymour et al. (2004) concluded that students perceived the top three benefits as personal and professional gains, skill improvement, and "thinking and working like a scientist". This study did not extend to instructors or to issues

of motivations or challenges. Similarly, other studies (Craney, McKay, Mazzeo, Morris, Prigodich, & de Groot, 2011; Kazura & Tuttle, 2010) concluded that the URE is perceived by most students as beneficial for graduate school admission, professional and technical skill development, learning research procedures, data collection, writing, and presentation skills. Seymour et al. (2004) looked at a set of more broadly defined personal and professional skills (e.g., thinking and working like a scientist, gains in various skills, clarification/confirmation of career plans) that were perceived to be gained by undergraduates following their URE. Reported results were overwhelmingly positive, with 91% of all statements referencing gains from their experiences. Some studies, like the one conducted by Landrum and Nelsen (2002), consider both the hard skills and abilities that students gained having participated in a URE, as well as the growth of interpersonal skills. It is also important to note that many studies of UREs are focused on one department or discipline, often in the sciences. As an exception, Ishiyama (2002) examined social sciences and humanities students who completed UREs; these students reported significant gains in their ability to think analytically and logically, put ideas together, and learn on their own as a result of their UREs.

Studies that took into account the views of both students and instructors came to similar conclusions regarding a strong perception of benefits by both groups. Lei and Chuang (2009), for instance, noted that students listed major benefits including the improvement in organizational and management skills needed to succeed at a graduate level, the enhancement of creative thinking, and an increase in logical and analytical skills. Major benefits listed by supervisors included having assistance in research grant writing, manuscript writing, and enjoyment of the experience. Based on interviews with computer science faculty and students, Barker (2009) tested the thesis that the conditions under which students conduct research can influence students' overall positive perception of the URE. Results supported this thesis, demonstrating that specific institutional features can lead to increased admissions success to graduate school. These features included creating conditions in which students felt they were becoming members of an intellectual community or research culture, having a strong and positive relationship with a faculty mentor, and having that mentor scaffold the student throughout the research process, providing connections and information.

Some studies have focused specifically on faculty perspectives of student benefits from participating in UREs (Zydney, Bennett, Shahid, & Bauer, 2002), while others highlight student perceptions alone (Bauer & Bennett, 2003; Seymour et al., 2004); only a few have attempted to compare the two perspectives (Barker, 2009; Lei & Chuang, 2009). The limited scholarship that does explore the motivations of faculty mentors has in large part been the work of Potter, Abrams, Townson, and Williams (2009). In their study, the majority of faculty members interviewed felt overwhelmingly positive about their role as mentors. A high percentage of faculty mentors agreed or strongly agreed that their supervisory responsibilities motivated them to do research, with only a small number reporting that their responsibilities as an undergraduate research mentor hindered their ability to do research. As a result of their research collaborations, 71% of faculty either agreed or strongly agreed that they too learned from their students, and 56% agreed that the relationship helped them better relate to their students. The qualitative findings revealed similar trends for satisfaction of the mentors. However, because this survey did not include faculty members who chose not to supervise undergraduate research students, perceived challenges may not have been fully articulated.

In a unique comparative study, Kardash (2000) gave a list of 14 research skills to 57 undergraduate students and their faculty mentors. Students were asked to self-rate their ability to

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perform these skills at the beginning and end of their URE. Using the same scale, faculty mentors were also asked to rate the extent to which they felt that each student was able to perform each skill at the end of the URE. Students reported gains for all 14 skills. Interestingly, skills often considered at the heart of scientific thinking (e.g., identifying a specific question for investigation, translating the question into a workable hypothesis, designing a theoretical test of that hypothesis, and reforming the hypothesis on the basis of experimental results) displayed significantly less perceived improvement over the course of the URE than those that might be considered "softer" skills (e.g., the ability to orally communicate the results of research projects, observing and collecting data, relating results to the bigger picture in the research field and understanding contemporary concepts in field). Importantly, the assessment of ending skill level did not differ significantly between the undergraduate students and their mentors, indicating a general agreement in perceptions of URE outcomes (Kardash, 2000).

Challenges, when discussed in the literature, have tended to be considered from the faculty, rather than the student, position. Most commonly noted challenges to faculty members' participation in UREs have included the absence of compensation for undertaking such a responsibility and the time commitments needed (Potter et al., 2009). Lei and Chuang (2009) noted other perceived drawbacks for faculty, including the need for extensive student training in research students prior to the assistantship, insufficient funding, and unavailable or limited research space. For students, Wayment and Dickson (2008) identified five major challenges to a URE: lack of student awareness, unequal student access, poor curricular timing, lack of publicity and uneven access/incentives for faculty. Moreover, Lei and Chuang (2009) noted that time constraints as a major perceived drawback for students.

A fuller understanding of the broader dynamics of the URE requires that not only the benefits of directed undergraduate research be understood, but also the motivations and challenges that drive or limit these student/professor partnerships in the context of specific modes of the URE. The DSC provides a particular form of student/professor partnership, but is one that has not been adequately documented as a separate, although popular, form of the URE. Of those that have considered the DSC, Peterson (1974) found that instructors require greater time commitment per student than other types of undergraduate instruction, that they contribute more time in the form of personal interaction, and that they perceive students gain more from a DSC than with a typical course. Scott (1973) suggests that universities offer DSCs to support students' desires for independent learning, but that instructors view DSCs as an "extra burden" (p. 5), sometimes questioning students' capability for these courses, and also have concerns about these courses not being academic enough. Scott (1973) recognized several benefits of DSCs, including improvement of students' problem-solving skills, self-discipline, self-directed learning, as well as increased interaction between students and instructors. Lamdin and Worby (1976) suggest that DSCs serve several purposes, including fulfilling an instructor's desire to work in an academic specialty area, helping students meet program requirements, and enhancing a department's reputation in serving students, although they also recognize similar instructor constraints of workload. Katz et al. (2006) suggest that instructors are motivated to encourage future researchers, prepare students for graduate school, and develop a mentorship role with students.

Noting that researchers have called for more study of student and faculty dynamics in URE participation (Lopatto, 2003; Millspaugh & Millenbah, 2004), the purpose of this paper is to examine the motivations, benefits, and challenges of DSCs, as one type of URE, from student, instructor, and administrator perspectives in a single study. To investigate this research question,

we designed a qualitative focus group study to explore these three perspectives on DSCs. Based on the resulting analysis of similarities and differences in these perspectives, we recommend a set of best practices for these types of courses. This study is unique for several reasons. First, it encompasses many disciplines, rather than just one department or program. In particular, sciences, humanities, social sciences, and the fine arts are all represented in the study design and data collection. Second, the study is based on a small, liberal arts, undergraduate campus, rather than a large research-intensive university. Third, this study provides a Canadian context that is lacking in many past studies (Vajocski, 2010). Fourth, this study attempts to compare the perspectives of students, instructors, and administrators. McKenzie, O'Reilly, and Stephenson (1985) recognize the potential mismatch regarding independent study courses between professional educational aims and actual practice. Similarly, there may be mismatches or consistencies among students, instructors, and administrators regarding their role and expectations in DSCs. The role of administrators has not been examined in the past, but is important as this group facilitates institutional approaches to DSCs. This study seeks to understand better the dynamics of those relationships in order to improve the DSC experience for all involved.

Methods

Participants

Student, instructor, and administrator participants were drawn from the University of Alberta – Augustana Campus , which is an undergraduate liberal arts campus of approximately 1000 students. Since 2004, DSCs have become an increasingly popular option for students for gaining UREs at Augustana, with an average of 24 per semester between 2006 and 2011 (Harde & Haave, 2012). As the university's sole undergraduate-only campus, Augustana is dedicated to developing undergraduate teaching and research pedagogy, and it has increased opportunities and funding for students to engage in one-on-one mentorship with faculty in courses that either build on the faculty member's research or that develop new projects based on student interest and/or requirements.

We selected respondents from students, instructors, or administrators who had been involved in taking, instructing, or helping to administer DSCs since 2004 in one-on-one, third and fourth year courses, worth 3-6 credits. These respondents represented all disciplines found within each department on campus (i.e., Fine Arts, Humanities, Social Sciences, and Sciences). All courses were based on a research process involving the collection, analysis, and presentation of primary and/or secondary data. We used a snowball sampling method to select respondents to participate in focus group discussion. There are many advantages and disadvantages of using focus groups versus interviews (Krueger & Casey, 2009); we used focus groups to gather qualitative data on a variety of DSC issues relevant to students and instructors and in preparation for a later quantitative survey (Newing, 2011). The focus groups allowed us to interview a few respondents in a group setting with an opportunity for participant interaction and probing deeper into answers. In the fall of 2009, we conducted focus group discussions with three sets of students (nine in total, 2-4 discussants in each group), two of which included students who had just completed a DSC (we hoped these students would easily recall the benefits of their recent DSC experience) and one of which included students who were registered to take a DSC in the upcoming semester (we hoped these students would easily recall their motivations for taking a DSC). Students in both of these groups were generally third and fourth year students, balanced

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between genders, had relatively high grade point averages, and represented the breadth of disciplines offered at our campus. We conducted focus group discussions with two sets of instructors (eight in total, four in each group); these instructors represented a balance in gender, career stage, and disciplinary breadth. We also conducted individual interviews in person or online with four administrators, one Dean, two Associate Deans, and four Department Chairs. We used individual interviews for administrators because their timetables did not permit a group meeting. We received permission from our university's Research Ethics Board to convene focus groups and interview respondents.

Procedure

For each group, we used a similar set of questions and discussion points, worded appropriately for each group, supplemented with additional questions targeted to one group only (Table 1). For each focus group, the focal questions were posed to the group of participants and each participant was given unlimited time to provide a verbal response to the question.

Table 1
Questions for Focus Group Discussions with Students, Instructors and Administrators

Question	Students	Instructors	Administrators
1. (Warm up) How did the DSC work out for you?	Y	Y	
2. What were your motivations for taking/teaching DSCs? Why should students/instructors want to take/teach DSCs?	Y	Y	Y
3. Who first initiated the idea of the DSC, you or your instructor/student?	Y	Y	
4. What benefits did you receive from taking/teaching the DSC, if any?	Y	Y	
5. What unique opportunities did you have from taking/teaching the DSC?	Y	Y	
6. What challenges or barriers did you encounter while taking/teaching the DSC? What challenges or barriers do you see come up with student or instructor involvement in DSCs?	Y	Y	Y
7. What specific parts of the DSC worked well for you?	Y	Y	
8. What specific parts of the DSC did not work well for you?	Y	Y	
9. What recommendations do you have for students taking the DSC in the future?	Y	Y	
10. What recommendations do you have for instructors offering similar DSCs in the future?	Y	Y	
11. What roles should DSCs play in providing opportunities for undergraduate research?		Y	Y
12. Should DSCs contribute to the research goals of the instructor?		Y	Y

Some of the questions focused directly on the target variables of motivations (#2), benefits (#4), and challenges (#6). Other questions obtained information indirectly for motivations (#3), benefits (#1, 5, 7, 11, and 12), and challenges (#8, 9, and 10). Some questions dealt with ways to administer and improve DSCs (#9 and 10). Other questions sought information for more than one variable (#9 and 10). We made audio-recordings of all interviews and focus group discussions and then transcribed the resulting conversations into typewritten text summaries. Transcriptions were read by three research assistants, each of whom used annotations, memos, and coding (Newing, 2011) to categorize responses within each question and to summarize key themes related to the motivations, benefits, challenges, and other dynamics of DSCs. To test for the reliability of codes used to develop the themes, the authors of this paper also read the transcriptions to confirm or adjust the theme categories. These themes were then combined in a table to allow for comparison among students, instructors, and administrators.

Results

The results highlight key categories of responses for the target variables of motivations, benefits, and challenges, as perceived by students, instructors, and administrators. These results highlight the general categories of the responses qualitatively, without a quantitative comparison among those categories, and are not presented in any particular order. We provide a few representative quotations from respondents to provide context and to illustrate the breadth and depth of the categories. We also provide a generalized comparison of these variables among our respondent groups to highlight key differences and similarities.

Motivations

Students. For students, motivations for participating in a DSC ranged from very practical to abstract concerns. Students reported that students and instructors initiated the course in equal proportions. The motivation category most identified by students was a desire to engage, research, experience, and relate to learning in a way that is different from a regular classroom situation. In particular, students wanted to engage in research processes, beyond the level (e.g., larger project, more detailed investigation) and opportunities (e.g., different methods and settings) that are available in typical courses. Some students wanted to be able to pursue an existing interest in a topic requiring deeper inquiry than would be allowed by a regular course. For example, based on a summer program at a field research center, one student was interested in pursuing a topic that was "research-based and more in the field." Other students were especially motivated by the opportunity to pursue research in line with that of a particular instructor with whom the student wanted to work. Another student said that he "was a research assistant last summer" and "was interested in the topic."

A second identified motivation category was the enhanced opportunity to work closely with an instructor. In the great majority of cases, the instructor was well-known to the student and students viewed the DSC as an opportunity to develop a deeper relationship with a mentor.

A third motivation category was the possibility of self-directed research and the independence offered by DSCs. For example, one student said "it's choosing something that I want to study and doing all the research about it myself. I find that very interesting." Another student said that she had a "particular [creative writing] story that I wanted to develop and there are not appropriate creative writing courses offered at that time." These students would be

responsible for finding the "good stuff" rather than having it presented to them. As one student put it, "you're taking a leadership role in your own studies."

The last two categories can be regarded in terms of institutional functions rather than solely student-generated motivations. A fourth motivation category related to decisions about, and preparation for, graduate school. One student indicated that participation in a DSC "will allow me to decide whether or not graduate school will be something I would like to undertake." Several students wanted to learn and develop research skills that would strengthen their applications for, and help them succeed at, graduate school. The students considering graduate school were well aware that a DSC would enhance a transcript, but also desired the DSC experience for its intrinsic opportunities and experiences. This is not unexpected of students who are looking to continue in advanced degree studies, and who have often already formed a relationship with instructors in their field.

A final motivational category was to fulfill program requirements when a regularly taught course was not available or feasible. In small faculties, courses might be offered in a bi-annual, rather than annual rotation, so that it is possible for students to find themselves having difficulty in accessing a required course. This is usually due to the fact that some students do not adhere strictly to the rotation schedule during their early undergraduate years (e.g., they may reduce their course loads or take a semester off) and therefore may find themselves in the position of having missed a course when it was originally offered and needing to wait until it is offered again. Students thus view the DSC as a substitute in this situation and this should be recognized as the main motivating factor, although only in relatively few cases.

Instructors. Instructor motivations for participating in a DSC fell into five categories and had some parallels with those of students. Instructors indicated that students initiated the course in about 75% of their DSCs. First, instructors wanted to help out students who had similar research interests. For example, one instructor offered DSC options to students for whom "there would be a good match" in research topics, existing research opportunities, and current skills and interests. Similarly, another instructor relished "the opportunity to talk to somebody in the field" about a particular research topic in a deep manner.

Second, DSCs provided an opportunity to facilitate and enhance an instructor's research through collaboration with students. For example, one instructor "suggests topics of personal interest" while another instructor requires that students "connect to something I'm doing research on" and "helps me get the research done."

Third, instructors desired an opportunity to work and build relationships with excellent students. In one instance, an instructor said that "I was really interested in doing it [a DSC] because I knew she was a really good student." Similarly, another instructor was willing to work with students who showed a strong interest or developed innovative ideas from previous courses. Specifically, that instructor needed students who were "hard working and motivated in order to motivate me."

Fourth, instructors provided DSC opportunities to help students prepare for graduate school. One instructor wanted to help students who are "seriously considering grad work", to give them "an opportunity to finesse their skills", and to help students "find out whether or not they like doing research".

Last, instructors sought to help students fulfill their program requirements with a DSC in lieu of another course. For example, one instructor, who taught in a discipline without a major and without enough regularly-taught courses to fulfill a minor, offered students DSCs to help

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them fulfil a minor in that discipline. Another instructor used a DSC to "test run" a course for potential offering in the future.

Administrators. Administrators had fairly similar perspectives about motivations as did students and instructors. Administrators thought that students should be motivated to take DSCs for several reasons. They indicated that students could prepare themselves for graduate studies and to develop research skills. One administrator reported that students in DSCs can enhance "their ability to work independently and be primarily self-directed." Students should also be motivated for the "challenge and fun of studying a particular topic in depth." Another administrator said that "ideally, this would be a far richer learning experience than what might be possible in a regular classroom course." Administrators also believed that students can benefit from the mentorship of a particular professor and mentor. They further pointed out that students can use DSCs to strengthen their programs, by adding variety to courses taken, adding a senior course to their program, and satisfying a requirement in a small discipline.

Administrators thought that instructors should be motivated to teach DSCs for many reasons as well. For example, administrators thought that instructors would have the opportunity to work with talented students and that instructors could use DSCs to help make progress on their own research. One administrator said the DSC "must serve both the student and the instructor. As supervising DSCs is voluntary, this work must be of some value to the professor's own topic of interest." They also reported that DSCs provide an opportunity to explore interesting projects, or "to go deeper into a subject." Administrators pointed out that instructors can use DSCs to provide students with research experience prior to graduate school and that teaching a DSC can support the instructor's degree program by enhancing student satisfaction and making the program more attractive.

Benefits

Students. Reports of perceived benefits were obtained from students and instructors, but not from administrators. Students who completed a DSC listed benefits in three primary categories. First, students indicated that they had developed a variety of research skills, and specifically identified experiences such as giving presentations, writing research papers, managing research material, using software, developing field skills, obtaining ethics approvals, synthesizing material from diverse sources, and developing a bibliography. Student comments noted "a big positive for me was being able to get out of the classroom and go into the field", that "hands-on experiences" were a benefit, and that "there are so many great opportunities from a DSC." Second, students learned to study independently, as indicated by one student: "instead of a professor deciding what you're going to study, you get to decide." Another student said that "you're taking a leadership role in your own studies." Third, students benefited from one-to-one mentorship. One student said that the time in the DSC helped to "deepen and broaden her relationship" with an instructor. Another student said that "you get to hang out with professors that you like." A few students tied those benefits into practical outcomes such as graduate school applications, publishing a paper, presenting at a conference, winning an award, and improving their resumés.

Instructors. Instructors who participated in the focus groups perceived four main categories of benefits of DSCs. First, the DSC allowed for deeper engagement with existing or new research literature and questions. Instructors said that they "got to read a lot of good stuff" and were "kept up to date". Second, instructors were able to watch students develop as thinkers

and participate in the energy and excitement of the student's research process. For instructors, it was satisfying to see a "massive improvement" in student writing and to "watch students make discoveries and connections." Third, instructors enjoyed "seeing students through to the end." In some cases that meant the opportunity to co-author publications or co-present at conferences. Last, instructors enjoyed developing relationships with students. We did not ask administrators to provide input about benefits because only students and instructors could adequately assess that for any DSC experience.

Challenges

Students. We obtained information about challenges by asking questions regarding perceived negative outcomes, concerns, and drawbacks that occurred both before and during the DSC. Students identified three categories of challenges, listed here from the most common to least common. First, students found DSCs to be very time-consuming and difficult to integrate into their existing course load. Students indicated that a DSC involved "more work than a regular course" and "a lot of work and extensive research to do beforehand." Another student "didn't know how much work it was going to be." On the other hand, some students found the DSC refreshing in terms of the relaxed pace and special interest in the material. One student said that "I put a lot more time and effort into it because I was interested in the topics." Second, students viewed their presentation requirement as very intimidating and stressful (students at Augustana are generally required to present their research and findings at a student conference held at the end of each semester). Last, students indicated they possessed a lack of information about DSCs before enrolling in the course, with no standardized way to learn more about them.

Instructors. Instructors identified four main categories of challenges to DSCs. The most frequently mentioned challenge was a lack of time. Teaching DSCs at Augustana is beyond an instructor's normal workload; thus, instructors were concerned about taking time away from their other work-related duties. Some instructors reported more requests for DSCs than they had available time. A few instructors do not teach DSCs because of the time demand without remuneration or workload credit. Second, instructors indicated there were occasional interpersonal and communication problems with students, which sometimes led to missed deadlines or unmet expectations. Third, instructors felt there were greater challenges posed in DSCs by unprepared students. In some cases, this lack of preparation arose from a lack of guidelines for entrance to the course. In other cases, the concern arose from students failing to complete assigned tasks for the course. Fourth, instructors reported concerns that there was a lack of explicit standards and guidelines for DS courses. One instructor said that "I don't know what I as a professor am expected to do for a directed study." Occasionally, there were challenges related to a lack of equipment or appropriate software.

Administrators. Administrators thought that there were challenges for students related to academic ability and ability to work independently. Administrators thought that the challenges for instructors were primarily the time available within their workload and secondarily, the experience to properly define the scope of a project and provide appropriate assessment. For administrators, the key challenges were consistencies in assessment of DSCs and devising a fair system to address workload or compensation in teaching DSCs in the context of constrained budgets.

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Other Dynamics

We further explored perceptions of DSCs by asking instructors and administrators about the roles of DSCs in providing opportunities for undergraduate research. Instructors thought that DSCs provided a valuable research experience, similar to an honour's thesis, to satisfy student curiosity or in preparation for graduate school. One instructor called a DSC "the pinnacle of undergraduate research", and another said that "it really gives students the maximum opportunity at the undergraduate level to see what research is all about." Other instructors focused on student development, in terms of self-confidence, critical thinking, and research skills. Administrators emphasized the role of DSCs in leading students to successful applications to graduate school or connecting to research assistantships.

We asked whether DSCs should contribute to the research goals of instructors. The majority of instructors responded approvingly, but a few offered some hesitation. For those in support, it was important to link DSCs with personal research in order to provide adequate supervision and to be efficient with time. For those instructors who expressed opposition to linking DSCs to faculty research goals, it was felt that the focus of the DSC should be more on the needs of student and development of their independent thinking skills. The majority of administrators affirmed that DSCs should contribute to the instructor's research agenda because teaching DSCs involves a voluntary overload and should therefore benefit the instructor. Moreover, in order to adequately teach a DSC, administrators felt that the research topic should be within the instructor's area of expertise.

Comparing Perspectives

Table 2 summarizes the occurrence and non-occurrence of categories coded from the focus group discussions and interviews for motivations, benefits, and challenges among students, instructors, and administrators. There was agreement about motivations among all groups about the role that DSCs can play in linking particular instructors and students, preparing students for graduate school, and fulfilling program requirements. Students and administrators were both motivated about novel, engaged, and deep learning about a topic. Instructors and administrators recognized motivations to work with someone with shared research interests and the potential to help and instructor's research program. Both students and administrators were motivated by the potential for self-directed learning for students.

Regarding perceived benefits, both students and instructors recognized the mentoring relationship and practical outcomes arising from DSCs. Students recognized the benefits of developing research skills and learning independently, while instructors recognized the benefits of engaging with research topics and developing relationships (separate from the mentoring relationships).

All three groups recognized the challenges of workload and time constraints. Instructors and administrators recognized the challenge for instructors of unprepared students and these groups recognized the challenges posed by a lack of guidelines for students and instructors. Students noted the challenge of the presentation requirement and lack of information about DSCs, while instructors noted occasional interpersonal problems between students and instructors.

There was an important difference regarding expectations of access to DSCs. Students expected DSCs to be widely available, whereas faculty perceived DSCs as exceptions reserved for particular circumstances and students.

Table 2
Comparison of Motivations, Benefits, and Challenges for Participating in DSCs Among Students, Instructors, and Administrators

	Category	Students	Instructors	Administrators
Motivations	Novel, engaging, and deep learning about a topic	√		√
	Work with a particular instructor or student	√	√	√
	Self-directed approach	√		√
	Graduate school preparation (decisions, skills)	√	√	√
	Fulfill program requirements	√	√	√
	Work with someone with shared research interests		√	√
	Enhance overall research program		√	√
Benefits	Developed research skills	√		n/a
	Learned to study independently	√		n/a
	One-to-one mentorship, student development	√	√	n/a
	Practical outcomes (graduate school, publishing, presenting, awards)	√	√	n/a
	Engaged with research topics and literature		√	n/a
	Developed relationships		√	n/a
Challenges	Workload and time	√	√	√
	Presentation requirement	√		
	Lack of awareness and information	√		
	Interpersonal problems		√	
	Unprepared students		√	√
	Lack of guidelines		√	√

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Discussion

The goal of this study was not to determine relative support for various categories of responses of the target variables (motivations, benefits, and challenges) across all types of respondents. Instead, the primary goals were to identify the most common categories within the target variables, and to compare them among three key groups within the university (students, instructors, and administrators).

It is immediately apparent, and consistent with the existing literature, that DSCs are rated favourably by students, instructors, and administrators. All groups focussed on the essence of the research process, that is, the practice of engaging more deeply with a research problem or interest than is normally allowed in regular course work undertaken with larger groups of students. Another significant common opinion was that DSCs were a useful way to fulfill degree requirements when regular courses are not available but needed for specific requirements.

The most commonly identified motivations for students to participate in a DSC were novel and deep learning, self-directed learning, learning with a particular supervisor, graduate school preparation, and fulfilling program requirements. Other studies have suggested similar motivations, whether for UREs in general (Waite & Davis, 2006), or DSCs in particular (Lamdin & Worby, 1976; Katz et al., 2006). The unique difference in this study was that students identified self-directed learning as a motivation more than instructors; students appreciated the more independent nature of DSCs than other types of UREs (Scott, 1973). We speculate that the reason for this discrepancy is that other studies, focusing on research internships or honour's thesis projects, may have had more direction from the instructor.

The most commonly identified motivations for instructors were working with particular students, graduate school preparation, fulfilling program requirements, working with someone with shared interests, and enhancing one's research program. Other studies have found similar motivations, in terms of helping students reach their career goals (Kremer & Bringle, 1990; Kinkel & Henke, 2006; Lopatto, 2007) and to support the instructor's research program (Millspaugh & Millenbah, 2004). Instructors were less motivated by encouragement from their university (Zydney et al., 2002).

Students identified the key benefits of DSCs as research skills, independent study, mentorship, and practical career-oriented outcomes. This list is similar to a summary of student-identified benefits of UREs, as outlined by Lopatto (2006, 2007, 2010): research skills (e.g., research design, data collection and analysis, information literacy, and communication), professional advancement (e.g., publication, relationships with peers and mentors, and being part of a learning community), and personal development (e.g., self-confidence, independence, and accomplishment). Other research has identified similar patterns for enhancing expertise, in terms of technical skills (e.g., critical thinking, data collection), interpersonal benefits (e.g., relationship with a professor), clarification of career plans, and career/graduate school preparation (Landrum & Nelsen, 2002; Seymour et al., 2004). The patterns held true for benefits of UREs in non-scientific disciplines, even though Ishiyama (2002) reported that the key benefits for social science and humanities students were enhancement of analytical and logical thinking, putting ideas together, and independent learning. Many other studies indicate that UREs influence the careers of students, especially leading to a desire to apply for graduate studies (Hathaway, Nagda, & Gregerman, 2002) and to succeed in those programs (Nnadozie, Ishiyama, & Chon, 2001). Falconer and Holcomb (2008) suggested that students value relationships with

mentors and personal development more than specific learning; however, the current study was not designed to test for that relationship.

Instructors identified the key perceived benefits for students (e.g., mentorship, practical outcomes) and for themselves (e.g., engagement with research topics and literature, relationships with students). This is consistent with other research of instructor perspectives; for example, Potter et al., (2009) found that instructors had positive attitudes toward UREs, especially regarding their role as mentors and in motivating instructors to do research.

The primary challenges for students participating in DSCs were time constraints, the presentation requirement, and lack of awareness and information. The primary challenges for instructors were time constraints, occasional interpersonal problems, unprepared students, and lack of guidelines. Many of these challenges were similar to those found in studies of UREs. For example, the key challenges to participate in UREs identified by students and instructors at Northern Arizona University were a lack of student awareness and publicity, unequal student access, poor curricular timing, and uneven incentives for instructors (Wayment & Dickson, 2008). For many instructors, the challenges included lack of financial support, lack of time, and uncertainty about whether undergraduates can effectively help with research (Millspaugh & Millenbah, 2004).

Many studies have examined either student or instructor perceptions of UREs, but very few have offered perspectives of administrators. Moreover, only a few compare viewpoints among these groups. It is important to understand administrators' viewpoints because they are able to promote DSCs and address challenges at an institution. In this study, there was agreement among students, instructors, and administrators about roles that DSCs can play in linking particular students and instructors, graduate school preparation, and program requirements. Students and administrators were both motivated about novel, engaged, and deep learning about a topic. Both instructors and administrators had motivations for developing instructors' research programs. In the only relevant study found on comparable motivations, Stefani, Tariq, Heylings, and Butcher (1997) examined the purposes of an honour's thesis. They found, instructors focused on personal transferable skills (e.g., planning, problem-solving, presentation) and project-specific skills (e.g., field study skills, numeracy), whereas students focused on the same project-specific skills (laboratory work), along with career advancement (graduate school requirement, work experience) and fulfilling requirements of a degree. In addition, Lamdin and Worby (1976) noted that DSCs can help instructors work deeply on a desired research topic, help students meet program requirements, and enhance a department's reputation.

Regarding perceived benefits, students and instructors gained from the mentoring relationship and practical outcomes arising from DSCs. Students recognized the benefits of developing research skills and learning independently, while instructors recognized the benefits of engaging with research topics and developing relationships (in addition to the mentoring relationships). Four studies of UREs in general provide some context for our findings. First, Hunter, Laursen, & Seymour, (2006) found considerable agreement between students and instructors about student benefits from UREs; however, instructors framed those benefits as part of professional socialization, and students framed those benefits as personal and intellectual development. Second, Lopatto (2003) found that both students and instructors mentioned career plans, in depth learning, research skills, and relationships. However, instructors rated the benefits of communication and literature reviews higher than students. Similarly, students rated career-oriented benefits (e.g., enhance credentials, clarify career path) higher than faculty rated those same benefits. Third, Lei and Chuang (2009) found that both students and instructors recognized

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benefits in the following areas: graduate school or research-based career, thinking skills, excitement about research, and publishing or presenting. Moreover, students focused on technical skills and interpersonal skills, whereas instructors focused on research methods, interacting with students, and receiving help from students. Fourth, Kardash (2000) found that students and instructors gave highest ratings to the same five skills (observing and collecting data, interpreting data, communication, independent thinking) and both groups gave lower ratings to the same three skills (identifying research question, forming a hypothesis, designing tests)

In the current study, all three groups noted workload and time constraints as challenges to participating in DSCs. Other challenges identified included unprepared students and lack of guidelines (instructors and administrators), the presentation requirement and lack of information about DSCs (students), and occasional interpersonal problems between students and instructors (instructors). These results complement the only available study for comparison, conducted by Lei and Chuang (2009), which focused on the perceived costs of a URE assistantship. They found that both students and instructors noted low student maturation, motivations, topic and research interest and commitment, and research skill level. Instructors added challenges related to time for research training, workplace dynamics, and insufficient research space and funding. Students added challenges related to time constraints and financial costs. Clearly the workload and time constraints stand out as the key challenges (Lamdin & Worby, 1976).

Conclusions

Healey (2005) suggests that the links between teaching and research are context driven, and depend on how these terms are conceptualized. There are many ways in which teaching and research can be connected (and evaluated by those involved), and this study focused on the unique case of DSCs. In particular, this study sought to identify the most common motivations, perceived benefits, and challenges associated with UREs, and to compare these variables among students, instructors, and administrators. DSCs appear to meet important teaching, research, and institutional needs for students, instructors, and administrators. DSCs are able to integrate teaching and research in order to meet the goals of students and researchers. This is especially important for students and instructors working at undergraduate only university campuses.

All three groups reported motivations for engaging in a DSC that addressed working with a particular student or instructor, assistance with graduate school preparation, and meeting program requirements. Such motivations were consistent with studies of other types of UREs. This study was different in that students and administrators indicated motivations for self-directed learning, given that DSCs promote that kind of pedagogy (Katz et al., 2006; Lamdin & Worby, 1976), as opposed to more supervisor-directed learning associated with other types of UREs such as summer research assistantships and internships. However, even though instructors did not indicate self-directed learning as a motivation, they must inform students about this pedagogy, and students must accept this approach to teaching (Brew & McCormick, 1979).

In terms of perceived benefits of DSCs, both students and instructors indicated the mentoring relationship and practical outcomes arising from DSCs. Similar to other studies of UREs, students recognized the benefits of developing research skills, but stressed the benefit of independent learning more than was found in other studies. Instructors focused on benefits of research engagement and relationship building. The major challenges to participating in DSCs

were workload and time (all groups), unprepared students and lack of guidelines (instructors and administrators), and the presentation requirement and lack of information about DSCs (students).

Given the fairly small sample size, readers should be careful about generalizing these results. Despite corroboration among three research assistants and the principal investigator, the categories of responses for the major variables were subject to some interpretation. These results represent perspectives from an undergraduate only campus (with little access to graduate students), which may be different from perspectives from a campus offering graduate programs. Both types of campus will view research conducted by undergraduate students differently. Similarly, given that the study was based in a liberal arts environment, students were often, but not always, majoring in the discipline of the DSC.

Based on our results, institutions that offer DSCs might consider several improvements (Katz et al., 2006; Moore, Hvenegaard, Link, & Wesselius, 2012; Peterson, 1974; Scott, 1973). First, universities should make guidelines available for both students and instructors to enhance awareness, clarify expectations, increase preparedness, promote consistency in delivery, and possibly improve satisfaction. Second, instructors and instructors should discuss expectations and concerns before the course starts in an attempt to clarify goals; both groups should re-visit those goals regularly throughout the course. Third, they should identify deadlines and standards of quality for assessment (Sanders, 1984). Last, instructors who have taught DSCs before should explain their unique characteristics and benefits to potential and current students in such courses and share appropriate teaching techniques in these courses with other instructors. This sharing might even take place in instructor mentoring programs or teaching-related courses for graduate students, some of whom will be teaching in universities later on (Boyle & Boice, 1998). Overall, Barker (2009) has noted that student benefits from an URE are most likely to result from teaching situations involving a true research mentor (i.e., an instructor willing to take their obligations seriously in terms of time and energy).

Future research should seek to determine the relative proportion of responses among motivations, benefits, and challenges through a systematic survey. Furthermore, researchers should use questions that provide results that are directly comparable among students, instructors, and administrators. Long-term research that tracks benefits and changing perceptions over time would be especially valuable. The over-arching goal of this study was to aid students, instructors and administrators in making decisions about DSCs and their implementation.

References

Barker, L. (2009). Student and faculty perceptions of undergraduate research experiences in computing. *ACM Transactions on Computing Education, 9*(1), 1-28. http://dx.doi.org/10.1145/1513593.1513598

Bauer, K. W., & Bennett, J. S. (2003). Alumni perceptions used to assess undergraduate research experience. *The Journal of Higher Education, 74*(2), 210-230. http://dx.doi.org/10.1353/jhe.2003.0011

Boyer, E. L. (1998). *The Boyer Commission on educating undergraduates in the research university, reinventing undergraduate education: A Blueprint for America's research universities*. New York, NY: Stony Brook.

Boyle, P., & Boice, B. (1998). Systematic mentoring for new faculty teachers and graduate teaching assistants. *Innovative Higher Education, 22*(3), 157-179. http://dx.doi.org/10.1353/jhe.2003.0011

DOI: http://dx.doi.org/10.5206/cjsotl-rcacea.2013.2.5

Brew, A., & McCormick, B. (1979). Student learning and an independent study course. *Higher Education, 8*(4), 429-441. http://dx.doi.org/10.1007/BF01680531

Craney, C., McKay, T., Mazzeo, A., Morris, J., Prigodich, C., & de Groot, R. (2011). Cross-discipline perceptions of the undergraduate research experience. *Journal of Higher Education, 82*(1), 92-113. http://dx.doi.org/10.1353/jhe.2011.0000

Falconer, J., & Holcomb, D. (2008). Understanding undergraduate research experiences from the student perspective: A phenomenological study of a summer student research program. *College Student Journal, 42*(3), 869-878.

Harde, R., & Haave, N. (2012). Wider horizons: Fostering a culture of undergraduate research. *Collected Essays on Learning and Teaching*, *5*, 39-43.

Hathaway, R. S., Nagda, B. A., & Gregerman, S. R. (2002). The relationship of undergraduate research participation to graduate and professional education pursuit: An empirical study. *Journal of College Student Development, 43*(5), 614-631.

Healey, M. (2005). Linking research and teaching to benefit student learning. *Journal of Geography in Higher Education, 29*(2), 183-201. http://dx.doi.org/10.1080/03098260500130387

Hunter, A., Laursen, S. L., & Seymour, E. (2006). Becoming a scientist: The role of undergraduate research in students' cognitive, personal and professional development. *Science Education, 91*(1), 36-74. http://dx.doi.org/10.1002/sce.20173

Ishiyama, J. (2002). Does early participation in undergraduate research benefit social science and humanities students? *Journal of College Students, 36*(3), 380-386.

Kardash, C. M. (2000). Evaluation of an undergraduate research experience: Perceptions of undergraduate interns and their faculty mentors. *Journal of Educational Psychology, 92*(1), 191-201. http://dx.doi.org/10.1037/0022-0663.92.1.191

Katkin, W. (2003). The Boyer commission report and its impact on undergraduate research. *New Directions for Teaching & Learning, 93*, 19-38. http://dx.doi.org/10.1002/tl.86

Katz, J. S., Sturz, B. R., Bodily, K. D., & Hernandez, M. (2006). Independent study: A conceptual framework. In W. Buskist & S. F. Davis (Eds.), *Handbook of the teaching of psychology* (pp. 131-136). Malden, MA: Blackwell. http://dx.doi.org/10.1002/9780470754924.ch22

Kazura, K., & Tuttle, H. (2010). Research based learning approach: Students' perspective of skills obtained. *Journal of Instructional Psychology, 37*(3), 210-215.

Kinkel, D. H., & Henke, S. E. (2006). Impact of undergraduate research on academic performance, educational planning, and career development. *Journal of Natural Resources and Life Sciences Education, 35*, 194-201.

Kremer, J. F., & Bringle, R. G. (1990). The effects of an intensive research experience on the careers of talented undergraduates. *Journal of Research and Development in Education, 24*, 1-5.

Krueger, R. A., & Casey, M. A. (2009). *Focus groups: A practical guide for applied research*. Thousand Oaks, CA: Sage.

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities.

Lamdin, L., & Worby, D. (1976). Across the desk: Teaching through independent study. *Alternative Higher Education, 1*(1), 61-67. http://dx.doi.org/10.1007/BF01080040

Landrum, R. E., & Nelsen, L. R. (2002). The undergraduate research assistantship: An analysis of the benefits. *Teaching of Psychology, 29*(1), 15-19. http://dx.doi.org/10.1207/S15328023TOP2901_04

Lei, S., & Chuang, N. (2009). Undergraduate research assistantship: A comparison of benefits and costs from faculty and students' perspectives. *Education, 130*(2), 232-240.

Lopatto, D. (2003). The essential features of undergraduate research. *Council on Undergraduate Research Quarterly, 24*, 139-142.

Lopatto, D. (2006). Undergraduate research as a catalyst for liberal learning. *Peer Review, 8*(1), 22-25.

Lopatto, D. (2007). Undergraduate research experiences support science career decisions and active learning. *Life Sciences Education, 6*, 297-306. http://dx.doi.org/10.1187/cbe.07-06-0039

Lopatto, D. (2010). Undergraduate research as a high-impact student experience. *Peer Review, 12*(2), 27-30.

McKenzie, J., O'Reilly, D., & Stephenson, J. (1985). Independent study and professional education. *Studies in Higher Education, 10*(2), 187-197. http://dx.doi.org/10.1080/03075078512331378599

Merkel, C. A. (2003). Undergraduate research at the research universities. *New Directions for Teaching and Learning*, *93*, 39-53. http://dx.doi.org/10.1002/tl.87

Millspaugh, J. J., & Millenbah, K. F. (2004). Value and structure of research experiences for undergraduate wildlife students. *Wildlife Society Bulletin, 32*(4), 1185-1194. http://dx.doi.org/10.2193/0091-7648(2004)032[1185:VASORE]2.0.CO;2

Moore, S., Hvenegaard, G., Link, A.-M., & Wesselius, J. (2012). Undergraduate research experiences through independent study courses. *The Teaching Professor*, *26*(4), 6.

Newing, H. (2011). *Conducting research in conservation: Social science methods and practice*. New York: Routledge.

Nnadozie, E., Ishiyama, J., & Chon, N. (2001). Undergraduate research internships and graduate school success. *Journal of College Student Development, 42*(2), 145-156.

Peterson, N. A. (1974). Directed study: How instructors see it. University of Minneapolis Center for Educational Development. *Comment, 18*, 1-6.

Potter, S. J., Abrams, E., Townson, L., & Williams, J. E. (2009). Mentoring undergraduate researchers: Faculty mentors' perceptions of the challenges and benefits of the research relationship. *Journal of College Teaching & Learning, 6*(6), 17-30.

Russell, S. H., Hancock, M. P., & McCullough, J. (2007). Benefits of undergraduate research experiences. *Science, 316*, 548-549. http://dx.doi.org/10.1126/science.1140384

Sanders, D. (1984). Managing and evaluating students in a directed project course. *ACM SIGCSE Bulletin, 16*(1), 15-25. http://dx.doi.org/10.1145/952980.808616

Scott, R. A. (1973). Independent study in the undergraduate college. Paper presented at the Cornell University-New York Hospital School of Nursing Faculty Forum on Independent Study, December 3, 1973.

Seymour, E., Hunter, A., Laursen, S. L., & Deantoni, T. (2004). Establishing the benefits of research experiences for undergraduates in sciences: First findings from a three-year study. *Science Education, 88*, 493-534. http://dx.doi.org/10.1002/sce.10131

DOI: http://dx.doi.org/10.5206/cjsotl-rcacea.2013.2.5

Stefani, L. A. J., Tariq, V.-N., Heylings, D. J. A., & Butcher, A. C. (1997). A comparison of tutor and student conceptions of undergraduate research project work. *Assessment & Evaluation in Higher Education, 22*(3), 271-288. http://dx.doi.org/10.1080/0260293970220302

Vajocski, S. (2010). From the international desk: A Canadian perspective on undergraduate research. *Council of Undergraduate Research Quarterly, 31*(2), 41-46.

Waite, S., & Davis, B. (2006). Developing undergraduate research skills in a faculty of education: Motivation through collaboration. *Higher Education Research and Development, 25*(4), 403. http://dx.doi.org/10.1080/07294360600947426

Wayment, H. A., & Dickson, K. L. (2008). Increasing student participation in undergraduate research benefits students, faculty, and department. *Teaching of Psychology, 35*, 194-197. http://dx.doi.org/10.1080/00986280802189213

Zydney, A. L., Bennett, J. S., Shahid, A., & Bauer, K. W. (2002). Impact of undergraduate research experience in engineering. *Journal of Engineering Education, 91*(2), 151-157. http://dx.doi.org/10.1002/j.2168-9830.2002.tb00687.x