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Engaging First-year University Students in Research: Promise, Potentials, and Pitfalls

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Abstract

In 2014, the Undergraduate Research Initiative at the University of Saskatchewan implemented a pilot project to organize, support, and promote curriculum-based research experience as an integral aspect of participating first-year courses. The framework for the course-based initiative was the research arc; usually in groups, students in these classes would develop a research question, investigate it using discipline-appropriate methodologies, and disseminate the results. Nine classes (Agriculture, Animal Bioscience, Environmental Science, Women's and Gender Studies, Psychology, Kinesiology, and Interdisciplinary Studies) participated in this program pilot. There were four key agents in the program: faculty instructors, research coaches, students in participating first-year classes, and university administrative staff.

This preliminary evaluation of the pilot suggests that first-year undergraduate research experiences have potential to benefit the undergraduate student participants as well as the faculty and research coaches involved. The primary benefits that faculty reported experiencing included an increased interest in ways to engage learners, reexamination of and reflection on their teaching strategies, the pragmatic support of a research coach helping with their work load, and an invigoration of their research. The primary benefits to research coaches included enhancement of their professional skills, experience in lesson planning and facilitation, CV building, and an ideology shift in how to best facilitate learning for undergraduate students. The most prominent benefits for undergraduate students appeared to be that they gained a better idea about how researchers think and work, that they increased their understanding of how research works, and that their own research and professional skills had improved.

Early, bottom-up evaluation identified characteristics of implementation that appear to best facilitate achievement of the initiative's outcomes and identified the potential pitfall of imposing outcomes, from related but distinct initiatives, that may not be achievable or optimal in in the setting of first-year classes. The results of this evaluation suggest that rather than gaining clarity or focus, first-year students in course-based research experiences might gain awareness of their personal potential, of the potential of research, and of their career/educational options.

En 2014, l'Université de la Saskatchewan a mis en oeuvre un projet pilote, la Undergraduate Research Initiative (Initiative de recherche pour étudiants de premier cycle) dont l'objectif était d'organiser, de soutenir et de promouvoir l'expérience de recherche basée sur le programme de cours et faisant directement partie des cours de première année participants. Le cadre de cette initiative basée sur les cours était l'arc de recherche; habituellement divisés en groupes, les étudiants inscrits dans ces cours ont élaboré une question de recherche, l'ont examinée par le biais de méthodologies appropriées à la discipline et en ont diffusé les résultats. Neuf cours (agriculture, sciences biologiques animales, sciences de l'environnement, études sur les femmes et le genre, psychologie, kinésiologie et études interdisciplinaires) ont participé à ce programme pilote. Il y avait quatre agents clés dans le programme : les professeurs, les accompagnateurs de recherche, les étudiants inscrits dans les cours de première année participants et le personnel administratif de l'université.

Cette évaluation préliminaire du projet pilote suggère que les expériences de recherche en première année d'un programme de premier cycle peuvent potentiellement offrir des avantages aux étudiants de premier cycle qui y participent ainsi qu'aux professeurs et aux accompagnateurs de recherche. Les avantages principaux, selon les professeurs qui ont fait un rapport sur leur expérience, comprennent un plus grand intérêt dans les

manières d'engager les apprenants, le réexamen d'une réflexion sur leurs stratégies d'enseignement, le soutien pragmatique des accompagnateurs de recherche qui les aident avec leur charge de travail et une revitalisation de leur recherche. Les avantages principaux pour les accompagnateurs de recherche comprennent une amélioration de leurs compétences professionnelles, une expérience dans la planification et la facilitation des leçons, des expériences à ajouter à leur curriculum vitae et un changement idéologique concernant la meilleure manière de faciliter l'apprentissage des étudiants de premier cycle. Les avantages les plus importants pour les étudiants de premier cycle semblent être qu'ils ont acquis une meilleure compréhension de la manière dont les chercheurs pensent et travaillent et de la manière dont la recherche fonctionne, et que leurs propres recherches et leurs propres compétences professionnelles ont été améliorées.

L'évaluation préliminaire participative a identifié des caractéristiques de mise en oeuvre qui semblent faciliter au mieux l'atteinte des résultats de l'initiative et a identifié l'écueil potentiel d'imposer des résultats, à partir d'initiatives différentes mais connexes, qui risquent de ne pas être réalisables ou optimales dans le cadre de cours de première année. Les résultats de cette évaluation suggèrent que, plutôt que de gagner en clarté ou en focus, les étudiants de première année qui participent à des expériences de recherche basées sur les cours pourraient prendre conscience de leur potentiel personnel, du potentiel de la recherche et de leurs options de carrière ou scolaires.

The Undergraduate Research (UGR) Initiative is a joint venture between the offices of the Vice-Provost Teaching and Learning and the Vice-President Research at the University of Saskatchewan. The initiative's principal goal is to ensure every undergraduate student graduating from the University of Saskatchewan engages in a meaningful research, scholarly, or artistic experience. The initiative is supporting a culture of research at the university undergraduate level by expanding opportunities across disciplines and academic years, increasing visibility, and improving recognition. The UGR initiative co-funds, supports, and promotes undergraduate research experiences (UREs) which include opportunities such as summer research assistantships and course-based research as well as mechanisms for knowledge mobilization such as an undergraduate research journal.

UREs are associated with a variety of positive outcomes. Student participants typically experience personal and professional development, begin to think and work like researchers, hone academic skills, clarify and refine their career and educational pathways, and become better prepared for graduate school (Hunter, Laursen, & Seymour, 2007; Lopatto, 2009; Seymour, Hunter, Larsen, & Deantoni, 2004). The most common and familiar UREs typically follow the apprenticeship model, and involve students competing for placements, spending time in a research laboratory, and receiving one-on-one mentoring from a postdoc, graduate student, or faculty member (Linn, Palmer, Baranger, Gerard, & Stone, 2015). A newer and somewhat lesser-known type of URE is the course-based research experience (CURE), which provides research experiences for a class of students guided by an instructor often with the help of graduate students, and involve classes, credits, grades, and assignments (Linn et al., 2015).

The outcomes of CUREs are less established than those of the typical apprenticeship model UREs. Some studies of CUREs report student gains in research skills, self-efficacy, and intent to persist in their field (Corwin Auchincloss et al., 2014; Harrison, Dunbar, Ratmansky, Boyd, & Lopatto,, 2011; Jordan et al., 2014; Lopatto et al., 2008; Rowland, Lawrie, Behrendorff, & Gillam, 2012; Shaffer et al., 2010). CUREs have most frequently been implemented in science courses. The majority of the few published evaluations of CUREs (i.e., Corwin Auchincloss et al., 2014; Harrison et al., 2011; Jordan et al., 2014; Lopatto et al., 2008; Rowland et al., 2012; Shaffer et al., 2010) have been offshoots of the American CUREnet initiative funded by the National Science Foundation with the explicit purpose of "helping students understand core concepts in biology, develop core scientific competencies, and become active, contributing members of the scientific community" (CUREnet, 2015). Therefore, these few evaluations have focused on the outcomes of CUREs for science students, in science classes. Relatively less is known about the outcomes of CUREs for humanities or social science students. The evaluation reported in this remainder of this article can supplement the existing evidence for CUREs by reporting the outcomes of CUREs for students in the humanities and social sciences in addition to science students.

The CURE Pilot Project

In 2014, the UGR initiative at the University of Saskatchewan implemented a pilot project to organize, support, and promote curriculum-based research experience as an integral aspect of participating first-year courses. The framework for the course-based initiative was the research arc; usually in groups, students in these classes would develop a research question, investigate it using discipline-appropriate methodologies, and disseminate the results. Nine classes (in Agriculture, Animal Bioscience, Environmental Science, Women's and Gender

Studies, Psychology, Kinesiology, and Interdisciplinary Studies) participated in this program pilot. There were four key agents in the program: faculty instructors, research coaches, students in participating first-year classes, and university administrative staff.

Faculty instructors. Faculty planned and implemented the target courses as well as structured the research experiences. At the outset of the pilot, potentially interested faculty were approached as individuals or departments once open invitations to participate were made available by administrators to Associate Deans of Research in targeted colleges. Collaborations ensued when, through a series of meetings, faculty expressed interest in offering research experiences which incorporated the tenants of the program (the research arc). These meetings involved the exchange of ideas and tailored curriculum redesign support. Faculty attended workshops, face-to-face events, and engaged in individual or small group consultations with UGR staff and other instructors in order to learn new research-based teaching and cooperative learning strategies, to explore ethical considerations, and to better understand and influence the UGR initiative's objectives and philosophies.

Research coaches. Graduate students and advanced undergraduate students were employed by the initiative as research coaches. They attended a training workshop covering an introduction to professional conduct, the university learning charter, the UGR initiative's goals and complementary programming, as well as facilitation, teamwork, and interpersonal skills. Research coaches also collaborated with the course instructor and the first-year students as the research experience was planned, carried out, and communicated. Some research coaches supplemented the initial curriculum-based research project design with additional resources and targeted support. They coached undergraduate students in completing the project and provided assistance in carrying out the opportunities for students to share their projects with classmates. Coaches answered student questions and guided and supported students regarding research processes. In some cases research coaches were involved with assessing student work and providing feedback.

Undergraduate students. Undergraduate students engaged in their course-based research experience. Under the direction of their faculty instructors and research coaches, students participated in the research experience, which involved contributing to a research question, investigating that question by collecting and/or analyzing data, and disseminating results.

UGR staff. The UGR staff from both the offices of the Vice-Provost Teaching and Learning and the Vice-President Research facilitated the entire process. They approached, recruited and trained research coaches, supported participating faculty, and coordinated and promoted the UGR initiative on campus and beyond.

The research experience was implemented differently in each class in order to meet faculty preferences and the needs of the course learning objectives. Some classes conducted in-class surveys, using students as the survey sample while other classes analyzed pre-existing, publically available data sets (e.g., climate data). Most classes were structured to have students work in groups, but in some instances students worked individually. Participating classes used the full range of qualitative, quantitative, and mixed methods in evolving the research component. A number of classes had researchers visit and explain their work as guest speakers, or went on fieldtrips to visit campus laboratories. In some cases students or groups shared their research findings with the whole class or their instructor(s) via reports or presentations, while others took part in public poster sessions to disseminate their discoveries. In some classes

students' research-based work was awarded grades according to quality while in other classes students received credit for participating in the project.

Theoretical Framework for the Evaluation

At the time of this evaluation, the UGR initiative was in its pilot phase. Thus, there was little official direction in terms of exactly which aspects of the initiative should be evaluated; there was simply a consensus that it should be evaluated. In order to create a framework for the evaluation, the UGR staff and graduate student evaluator reviewed previous research regarding outcomes of CUREs (e.g., Corwin Auchincloss et al., 2014; Harrison et al., 2011; Jordan et al., 2014; Lopatto et al., 2008; Rowland et al., 2012; Shaffer et al., 2010) and URE's (Hunter et al., 2007; Lopatto, 2009; Seymour et al., 2004). In addition to outcomes suggested by the research literature, the UGR staff identified a number of outcomes they individually expected the initiative would achieve. Results from the previous literature and the individual expectations of the UGR staff were combined into three logic models for the initiative: one focused on the undergraduate students (Figure 1); one focused on the research coaches (Figure 2); and one focused on the faculty instructors (Figure 3).

The logic models are graphic representations of the theoretical relationships between inputs, activities, and results of the initiative. They represent the hypothesized causal linkages between the activities the initiative engages in and the changes those activities are intended to produce. By combining findings from the literature and expectations from the UGR staff, the logic models provide a theoretical framework for what the initiative is supposed to achieve and, thus, what is evaluated in the remainder of this paper.

Scope and Type and Theoretical Approach of the Evaluation

In order to inform improvement for the initiative, the evaluation was focused on process and initial outcomes. The evaluation was largely formative, targeted on understanding organization and fidelity of implementation, the strengths and weaknesses of implementation, how implementation could be improved, and to gauge to what extent the initiative is on the right path to creating intended positive social change on campus. Thus, the evaluation took a bottom-up approach (Chen & Garbe, 2011). That is, rather than conducting an efficacy evaluation for an initiative that was still evolving, the evaluation focused on viability, and preliminary perceptions of effectiveness. This focus can be more useful in early stages of program development as it allows program decision-makers to make changes before finalizing an intervention. It is anticipated that if evidence is found for the viability and perceived effectiveness the UGR initiative, more rigorous evaluation methods can be invested in, in the future. The purpose of the evaluation at this stage is to see if the initiative holds promise and if there are potential pitfalls to avoid in future implementation. With this in mind, certain preliminary outcomes (from the logic models below) became the focus of the evaluation. The evaluation questions included:

| Inputs | Activities | Participants | Short-term outcomes | Intermediate outcomes | Long-term outcomes |

Faculty/ Instructor training:
Workshops
Face-to-face events
Individual consultations
(teaching strategies; cooperative learning; UGR resources, strategies, and goals)

Research coach training:
Workshops
Information sessions
(professional conduct; program goals; facilitation; teamwork; interpersonal skills)

Staff
Volunteers
Time
Money
Research
Materials
Equipment
Technology
Partners
Faculty

First-year, in class, curriculum based, undergraduate research experience

First-year undergraduate (UG) students

Increased clarity regarding course and discipline selection

Increased awareness of the university as a community of researchers and learners at all levels

Increased understanding of discipline

Increased understanding of the research process

Improvement in research & professional skills

Increased student engagement in learning

Increased clarity regarding career interests/interest in graduate studies

More UG students thinking and working like researchers

Students (non-traditional students, in particular) are more academically successful

Increased promotion of University

Increase in # of students that go on to graduate studies

Enhancement of University research culture

Students are better-prepared global citizens and experience increased career success

The University has an improved reputation (research/teaching/ student engagement)

Figure 1. Logic model of student outcomes.

Inputs	Activities	Participants	Short-term outcomes	Intermediate outcomes	Long-term outcomes

Faculty/ Instructor training:
Workshops
Face-to-face events
Individual consultations (teaching strategies; cooperative learning; UGR resources, strategies, and goals)

Research coach training:
Workshops
Information sessions (professional conduct; program goals; facilitation; teamwork; interpersonal skills)

Staff
Volunteers
Time
Money
Research
Materials
Equipment
Technology
Partners
Faculty

First-year, in class, curriculum based, undergraduate research experience

Research coaches
(Upper-level UG and graduate students)

Increased awareness of the university as a community of researchers and learners at all levels

Improvement in research & professional skills

Engagement in scholarship of teaching and learning

Increased awareness of alternative pedagogical practices

Increased awareness of the connection between research and teaching

Research coaches are more academically successful

Increased integration of research and teaching in future practice

Increased application of alternative pedagogical practices in future practice

Students (non-traditional students, in particular) are more academically successful

Enhancement of University research culture

Research coaches have increased employability in academic and related fields

The University has an improved reputation (research/teaching/student engagement)

Figure 2. Logic model of research coach outcomes.

Inputs	Activities	Participants	Short-term outcomes	Intermediate outcomes	Long-term outcomes

Faculty/ Instructor training:
Workshops
Face-to-face events
Individual consultations (teaching strategies; cooperative learning; UGR resources, strategies, and goals)

Staff
Volunteers
Time
Money
Research
Materials
Equipment
Technology
Partners
Faculty

First-year, in class, curriculum based, undergraduate research experience

Research coach training:
Workshops
Information sessions (professional conduct; program goals; facilitation; teamwork; interpersonal skills)

Faculty/ Instructors

Increased awareness of alternative pedagogical practices

Increased awareness of the university as a community of researchers and learners at all levels

Increased awareness of the connection between research and teaching

Reinvigoration in research

Increase in range of research conducted by faculty

Increased application of alternative pedagogical practices outside the UGR initiative

Increased integration of research and teaching outside the UGR initiative

Increased engagement of students in faculty research

Increased faculty research productivity

Increase in value granted to range of research types

Students (non-traditional students, in particular) are more academically successful

The University has an improved reputation (research/teaching/ student experience)

Enhancement of University research culture

Figure 3. Logic model of faculty/instructor outcomes.

Students

1. Do students have increased academic clarity?
- clarity about which courses to take in the future
- clarity about which field of study in which to major
- clarity about their career interests
- clarity about their interest in graduate studies

2. Do students have increased awareness of the course's discipline and its research process?

3. Have students' professional skills improved?

4. Are students more engaged in learning?

5. Are students beginning to identify as student researchers?
- Do they have in increased understanding of how researchers think and work?
- Are they beginning to perceive themselves as researchers?
- Are they beginning to see they have a role in research on campus?

Research Coaches

6. Are research coaches benefitting from their experience?
- Are their professional skills improving?

Faculty/Instructors

7. Are faculty/instructors benefitting from their experience?
- Are they learning new teaching methods?

8. Do they see teaching and research as more connected?

9. Are they more invigorated about research?

Program Implementation

10. Are there aspects of implementation that seem to best facilitate achievement of the initiative's expected outcomes?

The evaluation was conducted using an "inclusive evaluation" (Mertens, 1999) approach and involved three primary participant groups – the faculty instructors, the research coaches, and the students – occupying a range of power positions on the University of Saskatchewan campus. The inclusive evaluation approach focused on supporting each participant group being heard rather than emphasizing one voice at the expense of another. As well as promoting equity on campus, this approach enhanced the quality and relevance of the evaluation by attempting to capture all the important perspectives on the implementation and outcomes of the initiative, rather than overstating the views of those in possession of more influence and power.

Method

The evaluation involved a combination of qualitative and quantitative methods to accommodate the aforementioned theoretical approach. Surveys, interviews, and focus groups were conducted in order to triangulate data sources with regards to issues of implementation and

outcome achievement. Utilizing a variety of quantitative and qualitative measures enhances the extent to which we can be confident in the evaluation's conclusions and recommendations. All data collection occurred under the considerations of ethical research conduct as outlined in the Government of Canada's Tri-Council Ethical Guidelines, however, the project was considered strictly program evaluation, and thus exempt from ethics review by the University of Saskatchewan Behavioral Research Ethics Board.

Surveys

Self-administered, in-person surveys were conducted to evaluate implementation, organization, and outcomes of the pilot as outlined in the logic models. Three surveys were conducted: (1) surveys of faculty (N= 10; 100%); (2) surveys of research coaches (N = 14; 100%); and (3) surveys of students (N = 622; 58%). Surveys were kept at minimal length to encourage participation. Student surveys were conducted in-class, using OpScan or "bubble" response sheets, excluding two classes for which the instructors were unable to provide class-time for the survey and chose to have an online survey available for their students to fill out in their own time. The OpScan sheets allowed for quick responses and facilitated data entry and summary. The in-class delivery led to higher response rates than the online survey as very few students from the classes with the online survey option completed it (zero from one class of 28 and only six of 72 students from the other). The natural and social sciences and humanities were fairly well represented in the survey responses from the students (Agriculture n = 151; Animal bioscience n = 81; Environmental science n = 20; Interdisciplinary studies n = 11; Kinesiology n = 101; Psychology n = 200; Women's and gender studies n = 58). The student survey (see appendix A) consisted of 23 items assessing students' perception of the research experience's implementation (e.g., "I thought the research experience was adequately organized") and potential benefits to them as participants (e.g., "I think I have an increased understanding of how research works because of the research experience"). Response options depicting a five-point scale from "Strongly Disagree" to "Strongly Agree" were available.

Faculty instructor and research coach surveys were in-person, pen and paper surveys and conducted at the outset of the interviews and focus groups with these two groups. The research coach survey (see appendix B) consisted of 26 items assessing participants' perception of the program's implementation (e.g., "Overall, I was satisfied with how the UGR experience was implemented in class"); potential benefits for themselves (e.g., "The research coach experience helped me develop my professional skills, including critical thinking, problem solving, and interpersonal skills); and their perception of benefits experienced by the participating undergraduate students who they supported or instructed (e.g., "I believe the undergraduate students are more engaged in learning as a result of the in-class research experience"). The instructor survey (see appendix C) consisted of 32 items that were designed to evaluate faculty perception of implementation and potential benefits for them (e.g., "I feel more invigorated about research as a result of the experience), for the research coaches with whom they worked (e.g., I believe the research coaches will have increased employability in academic or related fields as a result of participating as a research coach"), and for the undergraduate students they were teaching (e.g., "I think the undergraduate students began to understand they have a role in research on campus"). The instructor and research coach surveys also had response options on a five-point scale ranging from "Strongly Disagree" to "Strongly Agree". The surveys were developed by the graduate student evaluator in conjunction with representatives from the offices

of the Vice-Provost Teaching and Learning and the Vice-President Research and adhered to best practices with regards to survey design (see Dillman, Smyth, & Melani, 2011).

The three surveys were designed to triangulate the perceptions of each of the participant groups as much as possible to obtain a balance of views on the evaluation questions. For instance, from the evaluation question listed above of "Do students have increased academic clarity (about their career interests)?" emerged the survey item for the undergraduates: "I have a better idea about what I would like to pursue (or not pursue) as a career because of the research experience" and one survey item for research coaches and faculty instructors: "I think the research experience provided the undergraduate students increased clarity regarding their career interests." Each group was also asked to respond to additional items that were only relevant to their group.

Interviews and Focus Groups

Interviews and focus groups were conducted to evaluate implementation, organization, and preliminary outcomes of the initiative. Faculty (N = 10; 100%) and research coaches (N = 14; 100%) participated in interviews and focus groups. Some participated in interviews while others engaged in focus groups, and this was based on scheduling, availability, and the extent to which individuals may have had common experiences. Interviews and focus groups were approximately 45 minutes to an hour, face-to-face, and semi-structured. Interviews were recorded and transcribed verbatim with transcripts thematically analyzed (Braun & Clarke, 2006) to target responses that provided insight into the evaluation questions. After becoming familiar with the transcripts through several pre-reads, the phase of generating initial codes began. In this stage, features of the data that were meaningful in regard to evaluation questions were noted through line-by-line coding. Once all codes were generated, they were organized into initial themes and subthemes and the way they addressed the evaluation questions was explored. The next stage involved reviewing themes and their associated codes to ensure that each theme aided in telling a story about the data in relation to the evaluation questions. In making decision rules as to what "counted" as a theme, prevalence was considered, as well as whether it captured something important in relation to the evaluation questions (Braun & Clark, 2006).

Interviews and focus groups with the undergraduate students were also included in the initial evaluation plan. Unfortunately, no students responded to the invitation to participate. The interviews and focus groups were scheduled during an exam period, and this may have contributed to low response rates.

The interview/focus group guides for the research coaches (see appendix D) and faculty instructors (see appendix E) were designed to triangulate with and supplement the survey responses. For instance, in the surveys, research coaches and instructors were asked the extent to which they agreed that research coaches benefitted by participating in the initiative, while in the interviews and focus groups they were asked in what ways they thought that participating in the initiative might contribute to their success. The surveys focused on perceptions of *if* implementation went according to plan and *if* they perceived outcomes to be achieved. The interviews and focus groups focused on how and why outcomes occurred and how implementation could be improved. The interviews and focus groups allowed for spontaneous and unanticipated responses, while the surveys included only closed-ended items.

Results

Undergraduate Students

Academic clarity. It was expected that students would develop increased clarity about what courses they may have become interested in taking subsequently, and also what resulting discipline they may have become interested in pursuing. The theory of change underlying these outcomes is that students would get a better understanding of a discipline from the research experience, and get a better idea of their level of interest in courses with a substantial research component. Further, it was postulated that students might get a better idea of their potential interest in pursuing graduate studies or what career they may have become interested in. On average students' survey responses suggested they were unwilling to agree that as a result of the course-based research experience they had a better idea of what courses they would like to take in the future, what they would like to major in, what field they would like to pursue, or if they were interested in graduate studies. In their survey responses instructors and research coaches were similarly skeptical about correlating the research experience to students' clarity about these issues. Instructors were more consistent in their responses than research coaches whose responses greatly varied (see Figures 4, 5, 6, and 7).
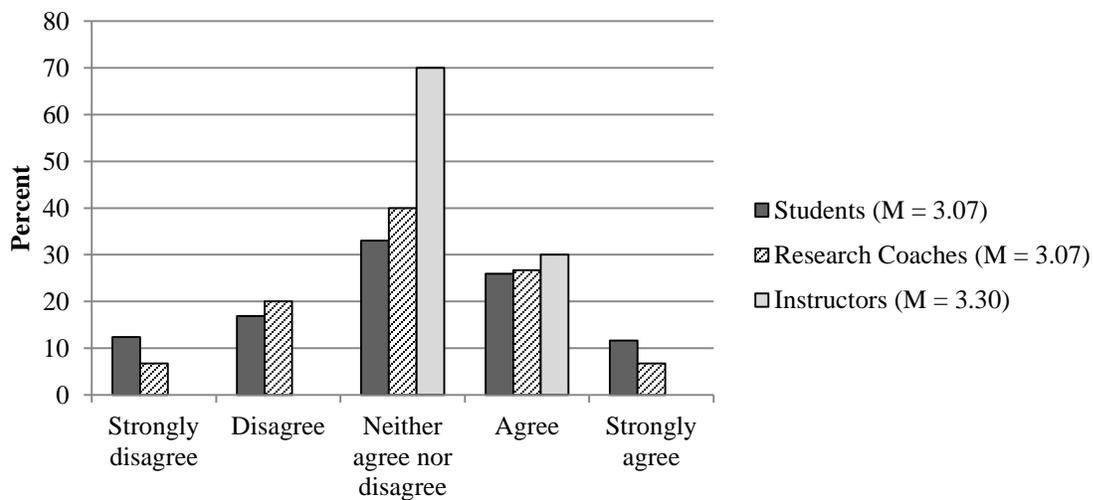
Figure 4. Increased clarity about future courses.
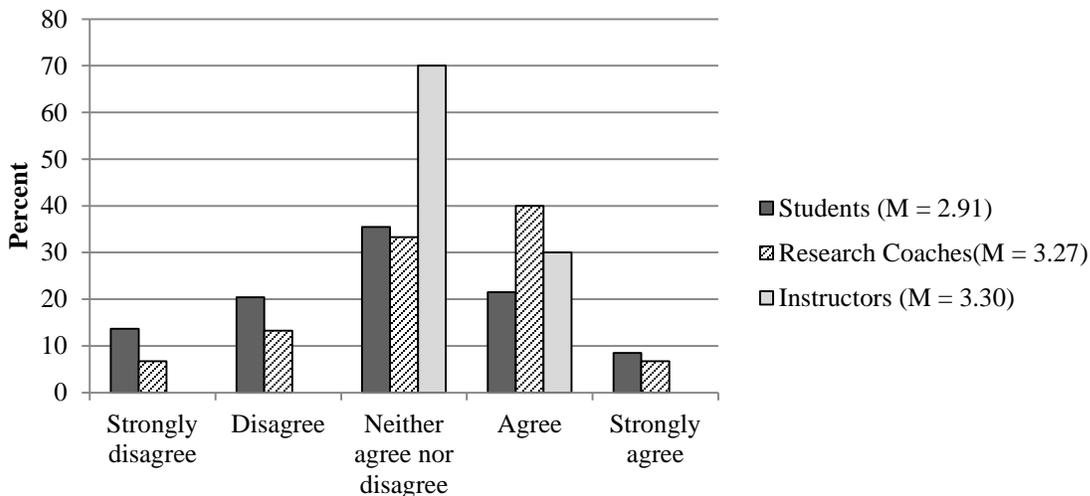
Figure 5. Increased clarity about major.
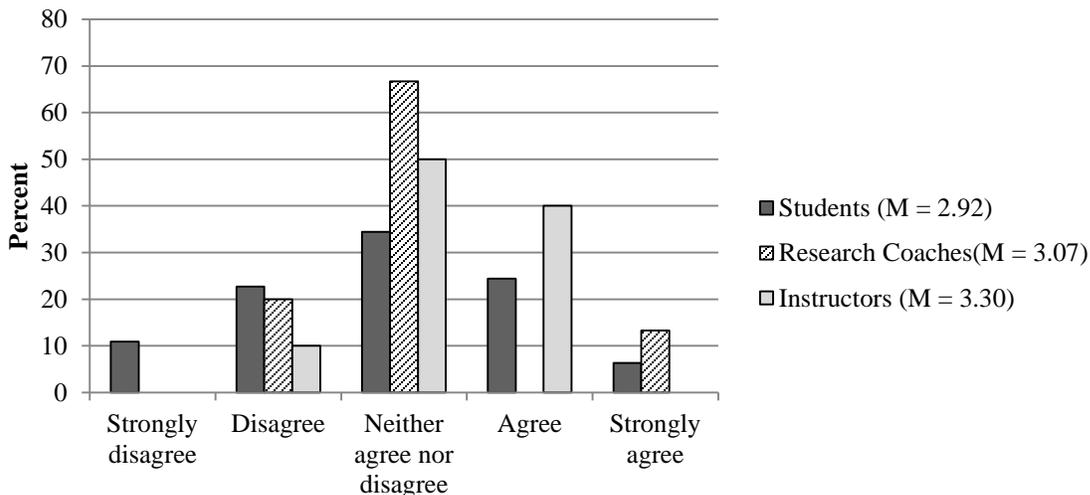
Figure 6. Increased clarity about career interests.
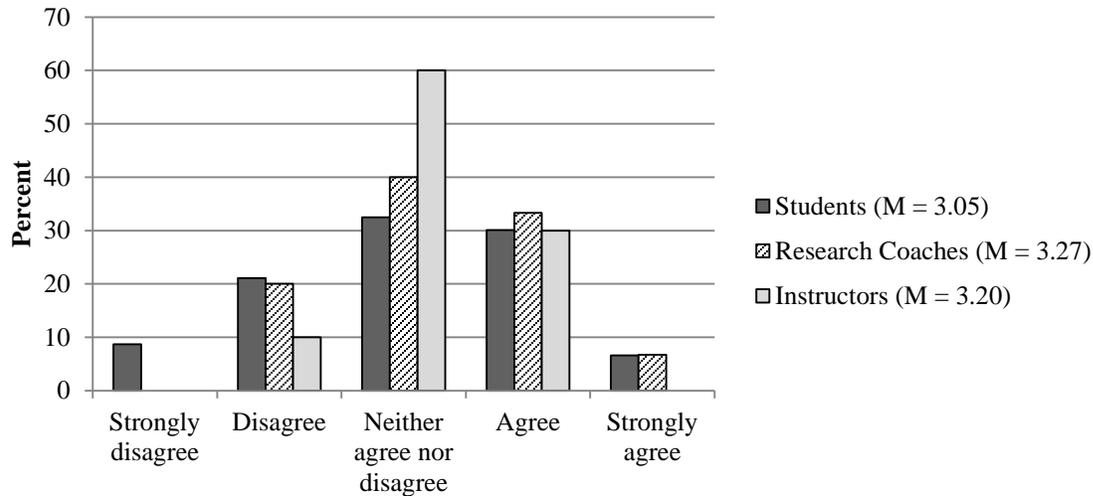
Figure 7. Increased clarity about interest in graduate studies.

While in the research coach and faculty focus groups and interviews there was general consensus around students having gained clarity about what types of courses they might be interested in taking in the future, skepticism persisted regarding whether students would have obtained any clarity regarding graduate studies or career paths. Interestingly, there was a common impression that the research exposure in the first-year research experience might make students less hesitant to take certain courses in the future, especially lab courses or research methods courses. For instance, one faculty member commented:

> I think what we did was we eliminated methodology and survey phobia. Those students may take our methodology course because they were exposed to this. Many of our students would not have even thought of taking that course [before this experience].

In terms of career interests, faculty suggested in the interviews and focus groups that it might not have provided clarity as much as awareness of more career options or possibilities. Faculty described how, traditionally, in certain departments, the majority of first-year students have a one-track mind regarding their future careers. For instance, that an abundance of students in first-year animal bioscience typically have plans to become veterinarians or that many first-year kinesiology students assume they will become physiotherapists. Instructors were pleased to report that the research experience provided the students increased awareness of other careers opportunities related to the field: "it kind of broadened their horizons a bit"; "…you could see that there were so many interests in that class and I think projects like that allow students to explore career paths…."

Finally, a few faculty expressed concern over the idea of clarity being a goal of the initiative and suggested that increased awareness of options and possibilities, in general, would be a more appropriate goal. Faculty described an undergraduate degree as an ideal time for students to explore their options: "the more varied the experience can be for them, the more different kinds of research experiences they can have, from my point of view, is better." Faculty with this perspective outlined how the first year research experience can help to expose students to a number of ways to think about the world and how learning to consider multiple perspectives will be more beneficial than picking a single field (i.e., perspective) early on because the

workplace more than ever requires adaptability.

In sum, students did not agree that they experienced any clarity regarding their future plans due to the research experience. Further, faculty advised that rather that clarity, which might suggest a narrowing of focus, at the first-year undergraduate level, the initiative might do well to encourage students to broaden their considerations of a variety of course and career options.

Awareness of discipline. It was hypothesized that through the research experience students would gain an increased understanding of the discipline that was the focus of their course, and of the research process in that discipline. One teaching strategy intended to increase disciplinary awareness was to expose students to tools and methodologies of the discipline. For social sciences, this might be survey or interview methodology, while for agriculture or environmental science, students this might be taking soil samples. This strategy was expected to increase awareness of the discipline by allowing students to experience the types of work that a researcher in their field engages in on a regular basis. Although responses covered the full range of available options, undergraduate students, on average, marginally agreed that they had a greater understanding of their discipline a result of the research experience (see Figure 8).
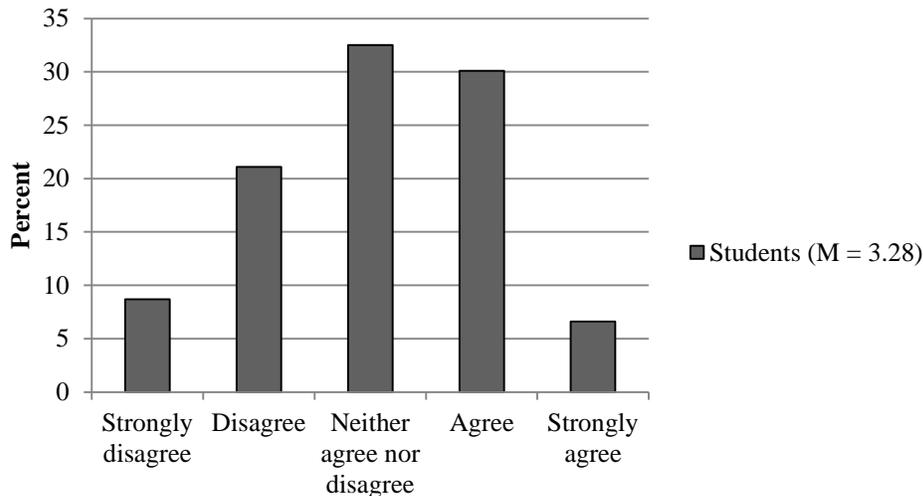
Figure 8. Increased awareness of discipline.

In term of research process, instructors substantially agreed that the participating students gained an increased understanding as a result of the course-based research experience. Research coaches also agreed with this statement, but with more variation in responses. Undergraduate students' responses were similar to those of the research coaches, demonstrating more modest agreement with this outcome statement (see Figure 9).
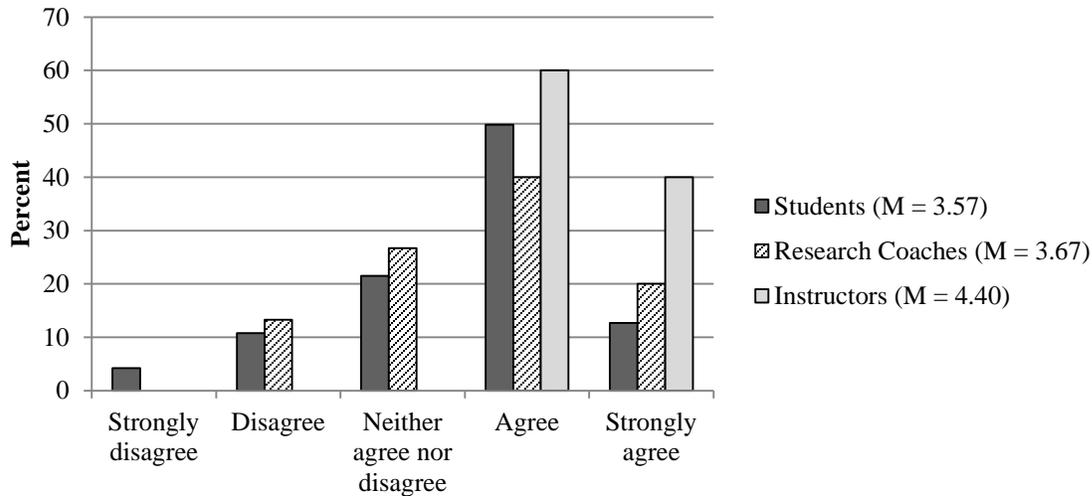
Figure 9. Increased understanding of research process.

In the focus groups and interviews, some instructors and research coaches expressed certainty that the students gained an understanding of the research process in their discipline. These assertions were usually tied to specific examples of how the research process was carried out in their labs or the class proper. They suggested that it would virtually be impossible for students to have not gained this knowledge, as it was the entire focus of the experience.

Other faculty suggested that rather than a firm grasp of exactly what research entails, the students may have gained an understanding of the potential research holds. They described how they did not want students to finish their class believing they were experts in research, but that the students would leave understanding that they had just touched the surface of what research is and what it can accomplish.

Finally, many believed the experience was a pleasant introduction into what can often be a daunting area. They suggested that this was an interesting, engaging, and fun experience for the students that contrasts with the typically anxiety-provoking reputation of research-heavy courses. They also described how participating in the research experience would make students not only more informed about conducting research, but also informed participants and consumers of research.

Skills development. It was anticipated that students' professional skills (e.g., working in groups, critical thinking, presentations skills, problem solving) would improve as a result of participating in the research experience. The expectation was that since students would have to exercise these skills throughout the experience, these skills would begin to develop or progress. Students, on average, slightly agreed that their professional skills had improved as a result of the initiative. Research coaches' perceptions of students' professional skills improvement was similar to that of the students, while instructors' perceptions expressed greater confidence (see Figure 10).
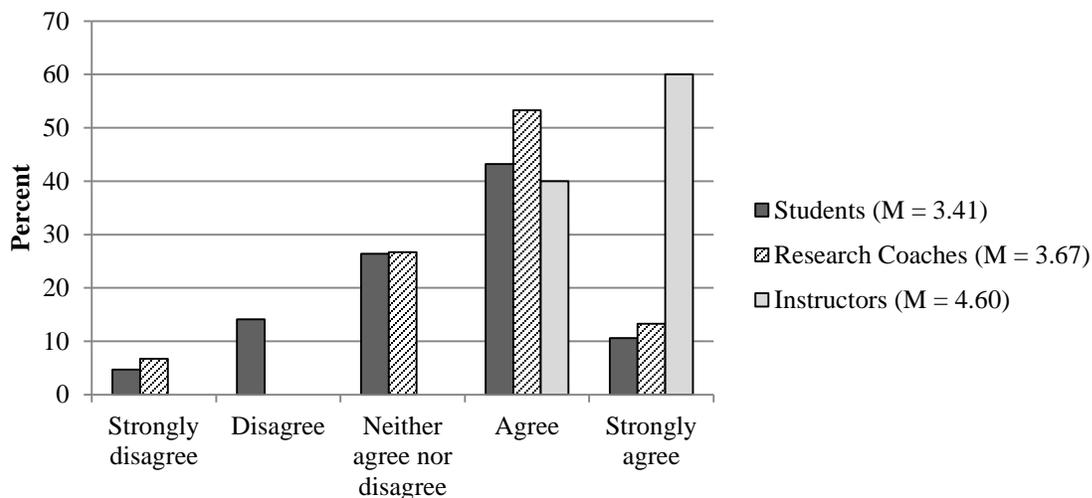
Figure 10. Improved professional skills.

In the interviews and focus groups, some research coaches and instructors suggested that it was the experience with presentations that enhanced students' professional skills. Some viewed the main benefit for undergraduate students as the improvement in practical research skills such as conducting literature reviews, writing, and understanding the sources of and process of research. Finally, the instructors and research coaches reported that gains in students' professional skills were largely related to learning to work in a group. What processes occurred in the group work for the undergraduate students, and how, in turn, the results lead to improved professional skills were explained. One faculty member described the course-based research experience as a fairly unique opportunity for students to gain these types of professional skills:

> [they learned] problem solving, team work, following instructions, interacting with people, absolutely! I think all of that just feeds into professional skills that, quite frankly, I don't think all first year students gain if they don't become engaged in these types of class experiences.

Student engagement. In part, the staff and university administration launched the UGR initiative in course-based undergraduate research experiences for first-year students with the goal of increasing student engagement in learning. On the whole in the surveys, students marginally agreed that the research experience caused them to feel more engaged in learning about the class's subject matter. Research coaches' survey responses demonstrated more overall agreement that first-year students were more engaged in learning as a result of the research experience, while instructors' agreement was even more consistent and enthusiastic (see Figure 11).
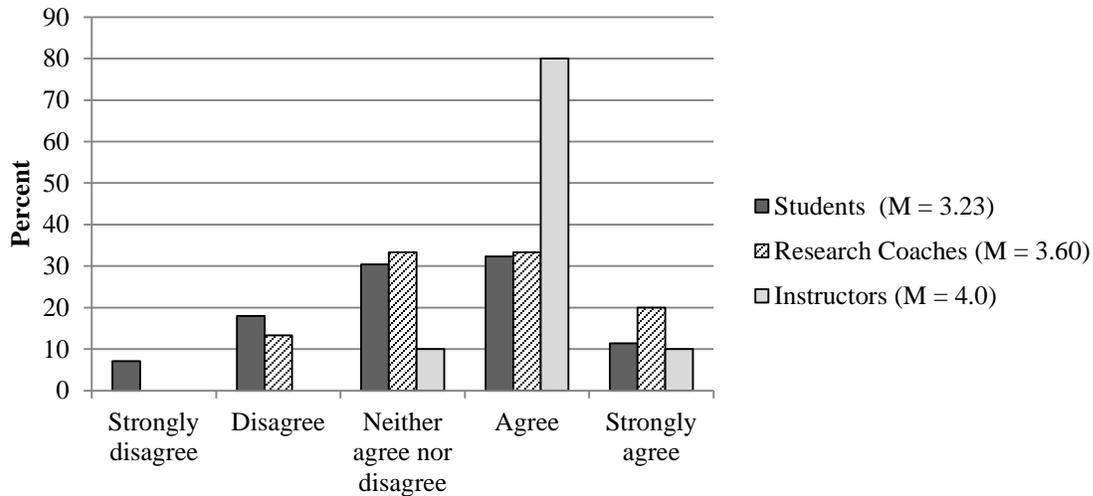
Figure 11. Increased engagement in learning.

In the focus groups and interviews, research coaches and faculty suggested that a variety of factors explained why the students may have been more engaged as a result of the initiative. In a number of classes, the research data were collected from the class members themselves, and some instructors suggested that this led the students to be more interested in class than they might have otherwise been. Instructors believed the students were excited to learn about what their peers thought about certain issues, and that the anonymous nature of the surveys allowed for more honest responses than would have been accomplished with a class discussion.

Some classes participated in a poster session at the end of the term. A number of professors suggested that the research project and corresponding poster presentation resulted in more engagement and pride than would have resulted from a standard assignment, such as a term paper. One instructor specifically mentioned, "I think they became very proud of their poster and their topic. Whereas in previous years, I don't think they really felt any connection to any term paper."

Some instructors suggested that the freedom to choose their own research topic was key to engagement, and that this led students to be more excited than if they had completed an assignment on a pre-set topic. One instructor mentioned that levels of engagement were maintained with the research project, because it added variety to their pedagogical practices with the class.

Identification as student-researchers. Another goal of the research experience was for students to have an increased understanding of how researchers think and work, and in turn to begin thinking and working like researchers. As a group, the students moderately agreed in their surveys that they had a better idea of how researchers think and work as a result of their research experience (see Figure 12).
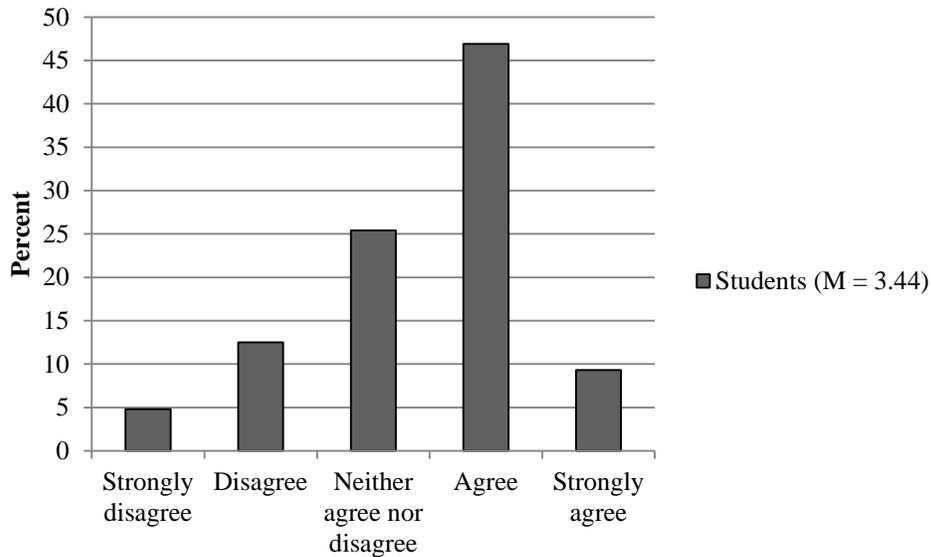
Figure 12. Better idea of how researchers think and work.

Although students believed they gained a slightly greater understanding of how researchers think and work, they were marginally less likely to agree to feeling they could personally think and work more like researchers since the research experience (see Figure 13).
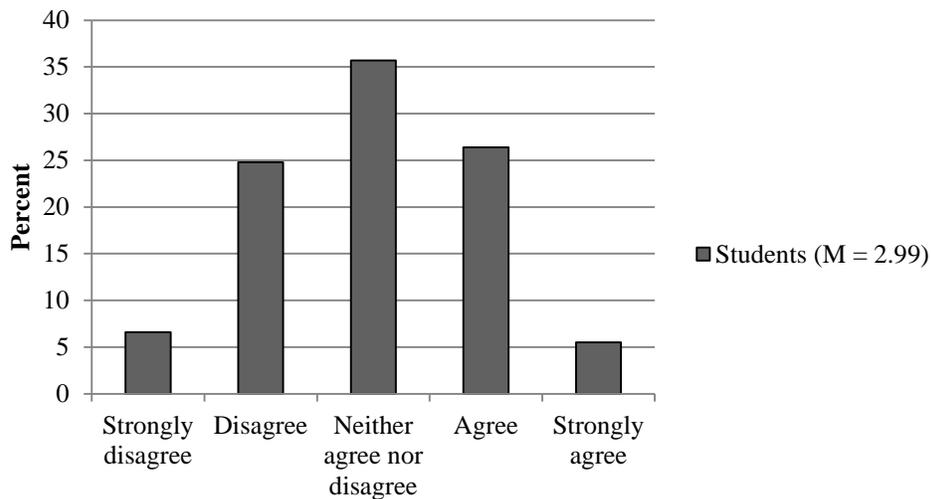

Figure 13. Personally think and work more like researcher.

Research coaches and instructors however, subscribed to the belief that the students had begun to understand they have a role in research on campus (see Figure 14).
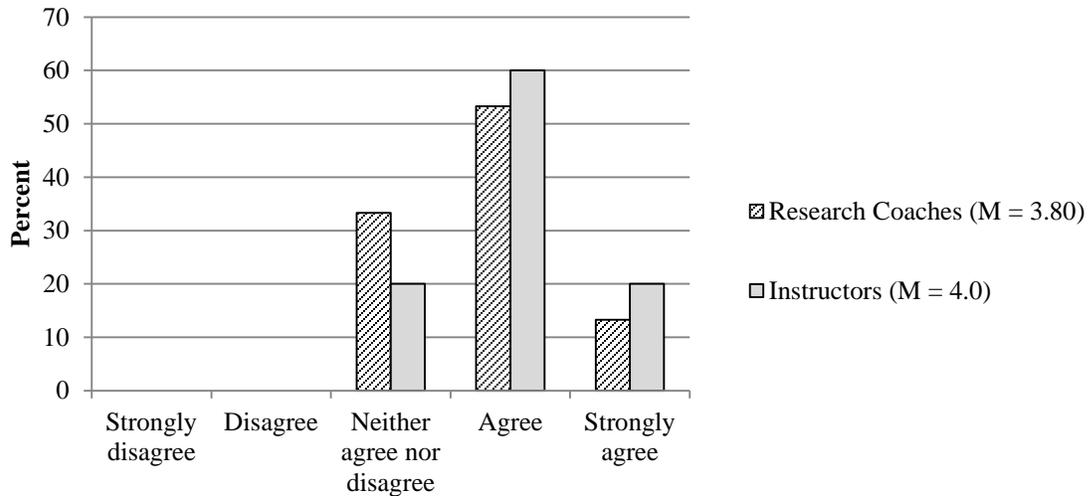
Figure 14. Role in research on campus.

In the focus groups and interviews, instructors and research coaches were reluctant to wholeheartedly agree that undergraduate students were beginning to identify as researchers. However, coaches and faculty suggested that the experience provided the students with a sense of their potential to be researchers, or at least a sense of agency in terms of their research interests and future research activities.

Research Coaches

Research coaches were upper level undergraduate students and graduate students. Accordingly, the extent to which they had prior experiences similar to research coaching (e.g., teaching, assisting with teaching, marking) varied substantially form research coach to research coach. Thus the degree to which this was a unique skill building experience for individuals may have varied by research coach. Overall, research coaches indicated in the surveys that they felt that they benefited through their experience as a research coach ($M = 4.29$, $SD = .61$). They also agreed that they benefitted from working closely with a faculty member or team of research coaches ($M = 4.0$, $SD = 1.13$). In particular, research coaches indicated that they felt the experience helped them develop their professional skills (i.e., critical thinking, problem solving, interpersonal skills). Instructors also believed the research coaches' professional skills improved as a result of their role (see Figure 15).
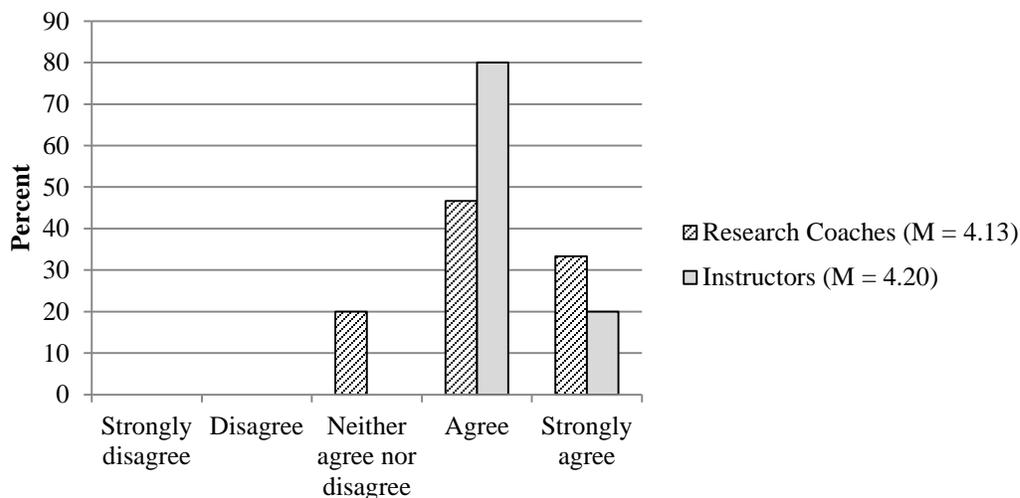
Figure 15. Improved professional skills.

On average in the surveys, research coaches also agreed that they learned new teaching methods during their time fulfilling this role (M = 3.6, SD = 1.40), and that they see research and teaching as more connected as a result of the initiative (M = 3.80, SD = 1.08). For both these items, however, there was a full range of responses (range 1.0 - 5.0) indicating some research coaches strongly disagreed with these statements while other strongly agreed.

In the focus groups and interviews, research coaches indicated that their professional skills improved in number of ways from participating in the initiative. One research coach said:

> [I]t goes back to cv building and building those skills, because if you're planning on doing any sort of graduate degree, it doesn't matter what the discipline is, chances are these are things you're going to have to do…If you're doing your PhD you're probably going to be responsible for or teaching a class. So learning how to give good critical feedback, deal with students, things like that. I think it is super beneficial!

Some research coaches suggested that the experience in lesson planning was a benefit to them. Many mentioned that experience leading research instruction and mentoring was valuable for building their curriculum vitae. They suggested that learning how to give critical feedback and explain difficult concept to students was a primary benefit. One coach noted:

> [B]ecoming comfortable in front of a classroom, more comfortable working with students, getting a better understanding of what research entails myself… and how to explain it to the students, that was definitely a big one [benefit], was how to explain things to students that are not understanding.

A more senior student mentioned that working with the research experience was simply another opportunity to build mentoring skills, but still a valuable one. Many research coaches mentioned that the experience with facilitation and leading discussions was a great opportunity that allowed them to become more comfortable in preparation of teaching roles. Finally, one research coach explicitly mentioned benefitting from being exposed to the idea of a research coach in contrast to

their previous conceptions around being a teaching assistant. They reported that the slight shift in ideology between the two roles was welcome. One coach said:

> [I]t is a little bit of a better way, a more interactive way to think about what you're trying to teach them…trying to get away from this 'guy behind a pulpit' [role], just putting stuff on the board so they can record it… The change in ideology, the change in mindset was kind of nice.

Instructors echoed the belief that the experience was beneficial for the research coaches in terms of their professional skills. Many instructors agreed that the experience in front of a class is invaluable. Further, they suggested that depending on the research coach, giving them autonomy was also a beneficial experience because it engendered critical thinking about how to lead a class.

Faculty Instructors

More than either of the other participant groups, faculty strongly agreed that they benefitted from their time with the initiative ($M = 4.60$, $SD = .52$, range 4.0 - 5.0). In their survey responses, faculty agreed strongly that they learned new teaching methods and approaches during their time with the initiative ($M = 4.4$, $SD = .7$, range 3.0 - 5.0), that because of the initiative they see teaching and research as more connected ($M = 3.70$, $SD = 1.16$, range 2.0 - 5.0), and that because of participating they are more invigorated about research ($M = 3.90$, $SD = .79$, range 3.0 - 5.0). Instructors described a number of ways that participating in the initiative benefitted them. For some, the benefits were more for the class than for themselves individually.

The benefits instructors reported were often related to the initiative inviting them to think more about why they are choosing certain pedagogical activities for certain courses. A few instructors reported that implementing a research experience for their students made them more interested in pedagogical engagement strategies generally and for non-traditional learners specifically. For instance, one instructor said, "I think it's increased my interest in different ways to engage students in the classroom, especially students that are less comfortable with an academic tradition."

Some faculty noted that they benefitted from a refreshed mindset as a result of the UGR initiative, and that the experience made them rethink and question their assumptions about teaching this class. One faculty member specifically stated, "It made me reflect on the way I teach, the way I could teach, different modalities, different methodologies, and different strategies."

Program Implementation

Overall, instructors were quite satisfied with how the research experience was implemented ($M = 4.1$, $SD = .57$), and this was rather consistent across instructors (range 3.0 - 5.0). Research coaches ($M = 3.6$, $SD = 1.18$) and students ($M = 3.6$, $SD = 1.05$) were also generally satisfied with how the research experience was implemented in class. Some common themes in classes that appeared to demonstrate the most success with outcomes and satisfaction with process included:

- A collaborative and supportive relationship between the instructor and research coach or group of research coaches. This appeared to be beneficial for a number of reasons. First, research coaches who described a collaborative relationship with their instructor reported more personal and professional benefits of participating as a research coach. These were the coaches that participated in lesson planning, delivering research content, facilitating, and developing the research experience. Second, this type of relationship was perceived as beneficial because these research coaches felt they had a better understanding of their role, responsibilities, and the means to accomplish the goals of their work.

- Consistent attendance and participation in the UGR events, meetings, and workshops. These instructors had a better picture of the goals and processes of the course-based undergraduate research initiative. They perceived themselves, their research coaches, and the UGR staff as a team working towards the same goals. Faculty in this group were more invested in the project and had a clearer understanding of what they were working towards.

- Using tools and methodologies of the discipline. If the purpose of the research experience is to provide a greater understanding of research in a field, using the tools and methodologies of that discipline would be advisable. It can be difficult to use discipline-relevant tools and methodologies in the social sciences because of ethical issues in working with human participants (i.e., most research with human participants requires ethical clearance, which is difficult and time consuming for an introductory class of 300) and difficult in the natural sciences because of the expense of natural sciences research (e.g., much research in agriculture or bioscience requires particular tools or samples that are expensive to provide to an introductory class of 300). Small scale or shared projects may be solutions for these issues.

- Laboratory visits and expert guest speakers. Students in classes containing these elements seemed to gain the greatest understanding of how research works and the goals and importance of research on campus. These learning strategies were not necessarily easy to organize and the UGR initiative and other campus resources may be able to provide support in organizing or facilitating these trips and speakers.

- Topics and projects that integrate, support, or apply course content. This was noted as difficult to integrate at times, but highly beneficial. These elements were seen as helpful to students' assimilating and accommodating new knowledge and facilitative for students' learning both content and methodology.

Discussion

Promise

The results of this evaluation suggest that first-year CUREs show promise in terms of benefiting undergraduate student participants as well as the faculty and research coaches involved. Faculty were the participant group that reported the highest levels of benefitting from the initiative for themselves and the other participant groups. The primary benefits that faculty reported experiencing included an increased interest in ways to engage learners, reexamination

of their teaching strategies, the pragmatic support of a research coach helping with their work load, and an invigoration of their research. The primary benefits to research coaches included increased professional skills via experience in lesson planning and delivery, gaining facilitation skills, CV building and an ideology shift in how to best facilitate learning for undergraduate students.

Of all the outcomes considered for undergraduate students, the most prominent benefits appeared to be that they gained a better idea about how researchers think and work, that they increased their understanding of how research works, and that their own research and professional skills had improved. From the perspectives of the faculty and research coaches, the program was a pleasant introduction into what can be a daunting field for new undergraduates. Faculty and coaches perceived the experience to have helped eliminate methodology "phobia" among first-year students and decreased their traditional hesitancy to take methods courses. Further, faculty and coaches believed students gained an awareness of careers options and possibilities, suggesting also that students had become more informed research consumers and participants as a result of the in-class research experience. Faculty and research coaches described how they saw undergraduate students' skills in group-work, presentations, research, and academics improve. Students were perceived to have exhibited more pride in their research projects than they typically do in more traditional assignments.

Classes were not uniform in terms of their approach, reported achievement of outcomes, or satisfaction with the process. Likewise, research coaches exhibited a range of satisfaction with process and perceived outcome achievement for themselves. Aspects of implementation that seem to best facilitate achievement of the initiative's expected outcomes included: a collaborative and supportive relationship between the instructor and research coach(es); consistent instructor attendance and participation in the UGR events, meetings, and workshops; using discipline-relevant tools and methodologies; engaging in laboratory visits and inviting expert guest speakers; and focusing on topics and projects that integrate, support, or apply course content.

Pitfalls and Potentials

Some outcomes from the students' perspectives that did not appear to be achieved as often or as much included increased clarity about what field they would like to pursue, whether they had an interest in graduate studies, increased engagement in class, and an increased sense that they had developed to think and work like researchers. Although faculty agreed that students were not quite identifying as researchers yet, faculty and coaches believed that students did gain a sense of their potential to become researchers. Focus group discussions mirrored the students' survey responses in that faculty and research coaches did not believe students gained concrete ideas about their future. Faculty also suggested that perhaps the particular goals of clarity around career interests or beginning to think and work like a scientist may be inappropriate for a first-year research experience.

These outcomes were anticipated for the UGR initiative because previous research (Hunter et al., 2007; Lopatto, 2009; Seymour et al., 2004) has indicated that benefits to students' participating in UREs include thinking and working like a researcher, becoming a scientist, clarification, confirmation, and refinement of career/education paths, and enhanced career and graduate school preparation. However, most previous research and evaluation of UREs generally has focused on upper year science students, most often completing a summer apprenticeship

where they work one on one with a faculty or graduate student mentor. It may be more likely that these senior students, being farther along in their education, and already more specialized, are at a stage where they are prepared for, and acknowledge, these academic and professional gains. Also, summer student research apprentices are often either self-selected or invited by a faculty member to engage in research. Rather than being an optional opportunity for particularly promising students, CUREs involve all students in the participating first-year classes.

Thus, it may be a pitfall, and potentially setting the initiative up for failure to expect that students in first-year CUREs will experience identification as a researcher, or clarity of their careers goals. When considering these outcomes, faculty participants suggested gaining awareness and understanding their potential rather than experiencing clarity might be more appropriate and achievable goals of CUREs with first-year students. They suggested students gained *awareness* of career/field or options or possibilities, *awareness* of the potential of research, *awareness* of their own potential to be researchers, *respect for and exposure to* multiple fields and ideas, and *self-confidence* approaching methodology. Thus, the UGR and similar research initiatives at other universities may consider changing their emphasis from outcomes that involve narrowing first-year students' focus to outcomes that involve broadening their horizons. Similarly, given the main outcomes experienced by the faculty/instructors focused on an increase in self-reflective teaching practice, the UGR and similar initiatives might consider changing their outcome focus from increased use of new or alternative pedagogical practices to facilitating self-reflective teaching and research practice (which might very well include new or alternative practices) for faculty and research coaches.

Limitations of the Evaluation

Some limitations warrant discussion. First, the evaluation was unable to secure qualitative data from undergraduate student participants. This data could help understand the students' perceptions of the research experience, the extent to which outcomes are being achieved, and the discrepancy between students' and faculty's assessment of the extent to which student outcomes are being achieved. Second, the evaluation entailed a cross-sectional descriptive design, and thus the evaluation cannot speak to the causal role of the initiative in the achievement of outcomes, persistence of initial outcomes, or achievement of long-term outcomes. We can only report that at this stage of the pilot, these are the participants' perceptions of the initiative's effects. Relatedly, third, all data was self-reported, based on individuals' perceptions and impressions. Although this is appropriate to understand issues such as instructors' invigoration in research or undergraduates' clarity about course selection, outcomes such as improved academic performance could be measured with more objective methods. Fourth, although all survey items and focus group questions were focused on the research experience proper, it is difficult to know the extent to which general opinions about the classes (e.g., students' thoughts about the instructor or course content; instructors' attitudes towards the cohort of students) affected responses. Fifth, there was a lack of standardization of mode of survey delivery (i.e., in person, pen and paper versus online) and format of qualitative data collection (i.e., interview versus focus groups). Although this may not be ideal, it was necessary to accommodate the real-world constraints of our participants. In addition, although modes and formats were not standardized, items and questions were, and, similar themes emerged from the interviews and focus groups, suggesting that the format of data collection did not noticeably affect the responses.

Finally, in all cases, faculty/instructors were more certain than research coaches and students that the students experienced the expected benefits of the program. There are a number of explanations that could underlie this finding. First, faculty may have perceived themselves as owners of the project and may be more personally invested in the success of the program, and thus biased in their assessment. On the other hand, faculty may simply have a different vantage point for comparison. That is, they have had the opportunity to observe students across a number of years and classes. They have seen the levels engagement, clarity, and skill of umpteen students in other classes who did not have the research experience. Thus they may have ta different baseline with which to compare and formulate opinions about these students' experience. The undergraduate students might not perceive the benefits to them, because they might not be aware of a potentially different situation or the full-range of benefits. To them, the research experience may be the standard to which they have little to compare.

Interestingly, faculty was also the participant group that reported the highest levels of agreement with the personal proposed benefits as a result of the initiative. As above, they may have actually benefitted the most, or have had years of teaching and research practice with which to compare their recent experience, and thus are able to notice the changes from this point of comparison. Regardless, faculty appear to be highly satisfied with the outcomes of the experience.

Conclusion

The first-year undergraduate research experience at the University of Saskatchewan shows great promise to benefit the participating students, research coaches and faculty. According to this preliminary evaluation, first-year research experiences may benefit faculty by encouraging self-reflective teaching practices, they may benefit research coaches by preparing them for future teaching and facilitation roles, and they may benefit undergraduate students by helping them improve their research and professional skills and gain a better understanding research. Early, bottom-up evaluation identified characteristics of implementation that appear to best facilitate achievement of the initiative's outcomes and identified the potential pitfall of imposing outcomes, from related but distinct initiatives, that may not be achievable or optimal in in the setting of first-year classes. The results of this evaluation suggest that rather than gaining clarity or focus, first-year students in CUREs might gain awareness of their personal potential, of the potential of research, and of their career/educational options.

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Appendix A
Student Survey Items

1. I thought the research experience was adequately organized.
2. I understood the purpose of the research experience when it was introduced.
3. I think I have an understanding of research: what it is and how it works.
4. In the research we conducted, I contributed to creating a research question.
5. To my knowledge, we investigated our research question.
6. We shared or disseminated our results with someone other than our instructor.
7. Because of the research experience, I have a better idea about what courses I would like to take (or not to take) in the future.
8. Because of the research experience, I have a better idea about what subject I want to major in (or what subject I know I do not want to major in).
9. I think I have an increased understanding of [insert discipline] because of the research experience.
10. I think I have an increased understanding of how research works because of the research experience.
11. I believe my research skills have improved as a result of the research experience.
12. I believe my professional skills (i.e., critical thinking, problem-solving, and getting along in groups) have improved as a result of the research experience.
13. I believe my academic skills (i.e., finding and reading journal articles, summarizing research findings) have improved as a result of the research experience.
14. I found the research experience to be engaging (interesting and captivating).
15. The research experience made me more engaged (interested) in class.
16. The research experience made me more engaged in learning about [insert discipline].
17. I have a better idea about what I would like to pursue (or not pursue) as a career because of the research experience.
18. Because of the research experience, I have a better idea about my interest (or lack thereof) in graduate studies (i.e., pursuing a master's degree or PhD).
19. I think I have a better idea about how researchers think and work as a result of the research experience.
20. I feel like *I* think and work more like a researcher since the research experience.
21. I believe participating in the research experience will contribute to my academic success.
22. I think I have an understanding of the purpose of research on campus.
23. I have discussed the good things about my research experience with other people on or off campus.

Appendix B
Research Coach Survey Items

1. I felt satisfied with the research coach training/training experience.
2. I felt the training experience was well organized.
3. Training provided me a clear understanding of the role of the UGR initiative on campus.
4. Training provided me a clear understanding of my role as research coach.
5. I benefited through my experience as a research coach (beyond being paid).
6. The research coach experience helped me develop my professional skills (i.e., critical thinking, problem solving, interpersonal skills)
7. I plan to work on a scholarship of teaching and learning (SoTL) publication.
8. I learned new teaching methods during my time as a research coach.
9. I plan to use these methods in my future group facilitation or teaching.
10. I see research and teaching as more connected as a result of participating as a research coach.
11. I feel like I benefitted from working closely with a faculty member or team of research coaches and tutorial leaders.
12. I think participating as a research coach will contribute to my own academic success.
13. In class, I think the 'research arc' was adequately explained to the undergraduate students.
14. To my knowledge, the class spontaneously developed a research question (it was not the instructors question).
15. The results of the research experience were disseminated outside of class.
16. Overall, I was satisfied with how the UGR experience was implemented in class.
17. I think undergraduate students developed a good understanding of research on campus.
18. I think the undergraduate students developed a good understanding of the goals and importance of research at the University of Saskatchewan.
19. I think undergraduate students began to understand they have a role in research on campus
20. I think the undergraduate students have an increased understanding of the research process as a result of the in-class research experience.
21. I believe the research experience has contributed to improving the undergraduate students' professional skills.
22. I believe the undergraduate students are more engaged in learning as a result of the in-class research experience.
23. I think the research experience provided the undergraduate students increased clarity regarding what courses they would like to take in future.
24. I think the research experience provided the undergraduate students increased clarity regarding what field they might like to pursue at university.
25. I think the research experience provided the undergraduate students increased clarity regarding if they may be interested in pursuing graduate studies.
26. I think the research experience provided the undergraduate students increased clarity regarding their career interests.

Appendix C
Instructor Survey Items

1. I felt satisfied with the preparatory discussions and support the UGR Initiative team provided me.
2. I felt the experience was organized
3. The Initiative team supported me in developing an understanding of the role of the UGR initiative on campus and its goals.
4. The initial discussions allowed me to develop a clear understanding of the role of the instructor in the UGR initiative on campus.
5. I benefited through my experience with the Initiative.
6. I learned new teaching methods and approaches.
7. I applied new teaching methods and approaches.
8. I plan to use these methods/approaches in my future teaching.
9. I see research and teaching as more connected as a result of this experience.
10. I plan to integrate teaching and research more in the future.
11. I feel more invigorated about research as a result of the experience.
12. I'm interested in conducting more research as a result of the initiative.
13. I'm interested in conducting more types of research as a result of the initiative.
14. I have worked (or plan to work on a Scholarship of Teaching and Learning (SoTL) publication.
15. I used the concept of the "research arc" or the process of research in my discipline in class
16. My students created their own research questions.
17. Students investigated their questions using discipline-relevant tools and methodologies.
18. Overall, I was satisfied with how the UGR experience was implemented in class.
19. I think the undergraduate students developed an initial understanding of research on campus.
20. I think the undergraduate students developed an understanding of the goals and importance of research at the University of Saskatchewan.
21. I think the undergraduate students began to understand they have a role in research on campus.
22. I think the undergraduate students have an increased understanding of the research process as a result of the in-class research experience.
23. I believe the research experience has contributed to improving the undergraduate students' professional skills (e.g., critical thinking; group work).
24. I believe the undergraduate students are more engaged in their own learning as a result of the in-class research experience.
25. I think the research experience provided the undergraduate students increased clarity regarding what courses they would like to take in future.
26. I think the research experience provided the undergraduate students increased clarity regarding what field they might like to pursue at university.
27. I think the research experience provided the undergraduate students increased clarity regarding if they may be interested in pursuing graduate studies.
28. I think the research experience provided the undergraduate students increased clarity regarding their career interests.
29. I believe the research coaches' professional skills (e.g., facilitation, leadership) have improved as a result of participating as a research coach.

30. I believe the research coaches' research skills have improved as a result of their participation.
31. I believe the research coaches will have increased employability in academic or related fields as a result of participating as a research coach.
32. I found the support of a research coach to be a valuable form of support for me in implementing the research experience.

Appendix D
Research Coach Interview/Focus Group Questions

1. We'll start with some questions about your training. What did your training entail?
   - What type of training did you receive training in professional conduct?
   - Program goals?
   - Facilitation?
   - Teamwork?
   - Interpersonal skills?
2. Were you satisfied with your training/training experience?
   - Did you feel like it was well organized?
   - What could have been improved?
   - What was helpful/useful?
   - Was anything redundant or unnecessary?
3. After training, did you feel had a clear understanding of the role of the UGR initiative on campus?
   - What is that role?
   - What are the goals of the initiative?
   - Did your training inform you of these goals?
4. After training, did you feel you had a clear understanding of you role as research coach?
   - How would you describe that role?
5. Now I'm going to ask some questions about the benefits to you of participating in the initiative. Do you feel there were benefits to you (beyond being paid)?
6. Do you feel like your research or professional skills have improved as a result of participating in the initiative?
   - How so? Describe.
7. Did any of you work on any scholarship of teaching and learning (SoTL) work during your time as research coach?
   - Are you aware of SoTL?
   - Do you plan to engage in SoTL?
   - How could you be supported in this?
8. Did you learn about any new or interesting teaching methods during your time with the initiative?
   - Might have also been called "alternative pedagogical practices"
   - Do you plan to use some of these methods or practices in your own teaching?
9. Do you think about research and teaching any differently as a result of the initiative?
   - Do you see them as any more connected?
   - What are barriers to this idea?
   - Do you think the initiative challenged the traditional teaching/research dichotomy?
   - Do you think this has changed how you will approach research and teaching in your future practice?
10. In what ways do you think that participating in the initiative might contribute l to your own academic success?

11. Now I'm going to ask you some questions about how the UGR experience was actually implemented in class.
    - Do you believe that the "research arc" was adequately explained?
    - Did the class develop a research question spontaneously (i.e., not the instructors question)?
    - Was the research question investigated according to the tools and methodologies of your discipline?
    - Were the results disseminated? How?
12. Overall, were you satisfied with how the UGR experience was implemented in class?
    - Did you feel like it was well organized?
    - What could have been improved?
    - What was well done?
    - Was anything redundant or unnecessary, or poorly executed?
13. Now I have a few questions about the UG students' thoughts about the UGR initiative:
    - Do you think the UG students had a clear understanding of the role of the UGR initiative on campus?
    - Do you think the UG students have a clear understanding of the goals of the initiative?
    - Do you think the UG students have a clear understanding or their role in the initiative?
14. Finally, a few questions about the potential benefits of the initiative for undergraduate students who participated:
    - Do you think the UG students have an increased understanding of the research process?
    - Do you think the UG students' research and professional skills have improved?
    - Do you think the UG students' are any more engaged in learning as a result of the initiative?
    - Do you think the UG students have increased clarity regarding their career interests and interest in graduate studies due to the initiative?

Appendix E
Instructor Interview and Focus Group Guide

1. We'll start with some questions about the discussions and supports the UGR provided you. What did your preparation for participation entail (meetings, workshops; face-to-face events; individual consultations)?
   - Did you access and/or utilize to new teaching strategies, approaches, or assessment considerations?
   - UGR Program strategies and goals?
   - Cooperative learning?
2. Were you satisfied with the preparatory process?
   - Did you feel like it was organized?
   - What could have been improved?
   - What was helpful/useful?
   - Was anything redundant or unnecessary?
3. After preparation, what was your understanding of the role of the UGR initiative on campus?
   - What is your understanding of the goals of the initiative?
   - After initial discussions, did you feel you had a clear understanding of what your role could be in the undergraduate research initiative?
4. Now I'm going to ask some questions about the benefits to you of participating in the initiative. Do you feel there were benefits to you, your department, or your college (professionally, pedagogically, and research-wise)?
5. In what ways has the experience enhanced your knowledge of additional pedagogical practices?
   - Describe. Or give an example.
   - Do you plan to apply some of these practices in your future teaching?
6. Do you think about research and teaching any differently as a result of this experience?
   - How? Why or why not?
   - Do you see them as any more connected?
   - What are barriers to this idea?
   - Do you think the in-class research experience challenged the view that teaching/research are a dichotomy?
   - Do you think this experience has changed how you will approach research and teaching in your future?
   - Do you plan to integrate research and teaching more in the future?
7. In what ways has the experience affected how you approach your own research?
   - Are you any more or less excited, invigorated or enthusiastic?
8. Has the experience affected the range of research you conduct or are interested in?
   - Different types of methodologies perhaps?
   - New topic areas?
   - What about the types of research you value?

9. Have any of you been working on any Scholarship of Teaching and Learning (SoTL) work (or plan to)?
   - Are you aware of SoTL?
   - Do you plan to engage in SoTL?
   - How could you be supported in this?
10. Might you involve undergraduate students any differently (more or less) in your own research as a result of this experience?
11. I'm going to ask you some questions about how the UGR experience was actually implemented in class.
    - Did you use the concept of the "research arc" (or process of research according to your discipline)?
    - Did students develop their own research questions?
    - Were the research questions investigated (according to relevant tools and methodologies of the discipline)? Why or why not?
    - Were the results disseminated/shared? How? (How well did this work?)
12. Now I have a few questions about the UG students' thoughts about research on campus.
    - Do you think the UG students gained an understanding of research?
    - Do you think the UG students gained an understanding of the goals and importance of research at the University of Saskatchewan?
    - Do you think the UG students gained an understanding of their role in research on campus?
13. Now, a few questions about the potential benefits of the first-year in-class research experience for undergraduate students who participated:
    - Do you think the UG students have an increased understanding of the research process?
    - Do you think the UG students' research and professional skills (e.g., critical thinking, working in groups, etc…) have improved?
    - Do you think the UG students' are any more engaged in their own learning as a result of the initiative?
    - Do you think the UG students have increased clarity regarding their career interests, what courses to take, what field might interest them, and/or will show an increased interest in graduate studies due to the in-class research experience?
14. Finally, a few questions about the research coaches:
    - Did you find the salary support of a research coach to be a valuable form of support for you in implementing the research experience? Is it your preferred form of support?
    - How has the experience affected their research or professional skills? (Improved?)
    - Do you see them having increased employability in academic or related fields?