Building Feelings of Community in Upper-Division Online Biochemistry Courses Using Small Group Activities

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Abstract

This research study explored how small group activities in upper-division online Biochemistry courses affect students' feelings of community. The goal was to develop best practices for promoting student-student interactions in asynchronous online courses, particularly within STEM fields. Two types of small group activities were assessed: designed activities and contextual activities. The designed activities were task-oriented, with stepwise instructions, while the contextual activities were informal group interactions. At the end of each term, consenting students completed a survey rating their feelings of community within their groups (N = 321). Overall, students had high feelings of community within their groups; even students completing the control activity rated the interactions highly. The presence of student-student interactions in small groups was likely the most important factor in their sense of community. These results underline the importance of designing course activities in which students can build community, regardless of whether the activity itself is highly structured or open-ended.

Introduction

Online learning, or distance education, is a rapidly growing sector of higher education (National Center for Education Statistics, 2023). Its popularity reflects the current need for academic classes and degree programs that can be accessed by learners asynchronously to fit around jobs, childcare, and other responsibilities, as well as to avoid the burden of relocation. The challenge for educators is to find ways to recreate the desirable elements of face-to-face learning in their online courses. Perhaps the most difficult to cultivate is a meaningful sense of community. This is especially difficult in content-heavy STEM disciplines like biochemistry that don't easily lend themselves to discussion, and are often still taught in a didactic, instructor-focused manner. Research shows that students in asynchronous online courses benefit from instructor-student, student-content, and student-student interactions (Bernard et al., 2009). Student-student interaction in particular plays a crucial role not just in cognition but in motivational support (Kanuka & Anderson, 1999), yet this type of interaction is notably difficult to arrange in asynchronous, large-enrollment online courses where students may never meet in real time. A lack of peer interaction can diminish the sense of belonging and engagement in these courses (Rovai, 2002a).

Small group work is one of the most effective methods for building student-student interaction and community in online courses, and the use of both directed activities and open forums helps diminish any sense of isolation (Newman et al., 2011). In large-enrollment courses, breaking students into smaller groups for collaborative tasks may increase their feelings of social presence and engagement (Tu & McIsaac, 2002).

Importantly, sense of community is also closely tied to self-reported cognitive learning in online courses (Rovai, 2002a). Academic outcomes may be influenced by the type of group activity that students perform. In a meta-analysis by Borokhovski et al. (2002), students who engaged in designed activities had higher achievement outcomes than students who engaged in contextual activities, where designed activities were intentionally created to promote student collaborations, and contextual activities simply provided conditions for student interactions to occur. Choosing group activities that foster a sense of community is therefore a key goal for online educators, but few studies to date have attempted to measure this feeling in STEM courses.

This study compared contextual with designed group activities for their ability to foster a sense of community in online Biochemistry courses at Oregon State University. In this investigation, designed activities were task-oriented, with stepwise instructions, while the contextual activities were informal group interactions. The goal of this study was to help instructors in STEM

disciplines determine which group work strategies successfully foster a sense of community, leading to better student experiences in online courses.

Methods

Participants and recruitment

The research was conducted in five asynchronous, online 400- and 500-level biochemistry courses during the 2023-2024 academic year. Participants were recruited from the Oregon State University Ecampus course series General Biochemistry I and General Biochemistry II, under the numbers BB450/550 and BB451/551[1], which were offered by OSU's Biochemistry and Biophysics Department. The courses included in this study were: BB451/551in Spring of 2023 and Summer of 2023; BB450/550 in Summer of 2023, Fall of 2023, and Winter of 2024. Terms during the academic year were 10 weeks with 1 week of final exams. The Summer term versions of these courses were four weeks long. Each course enrolled 75-85 students. Participants were recruited via a Qualtrics survey embedded in the LMS for their course that explained the purpose of the study and a brief description of the two surveys (Demographics and Feelings of Community) they would be invited to complete. Four-hundred and thirty total students were enrolled, and 375 consented to fill out the end of term surveys, of which 355 completed the surveys. Of these 355, 34 participants' responses were excluded from the data analysis for either 1) not checking the box specifying which activity they participated in, or 2) marking "I prefer not to answer" for all 12 questions in the Feelings of Community survey.

Activities

Within each course, students were randomly assigned to one of four group activities. The group size was 5-6 students, and with a total of 75-85 students per course, there were 3 or 4 separate groups for each activity every time the course was offered (see Table 1). The students were not made aware of the details of the activities that they were not assigned. All enrolled students completed a group activity for a grade, regardless of whether they consented to fill out the surveys for Demographics and Feelings of Community. Activities were graded on the basis of timely, repeated participation.

The course was divided into four units, with one group activity per unit. Students remained in the same group, with the same assigned activity, throughout the course, giving them four chances to work on their activity with the same group members each time. The activities were as follows:

***Game Group (designed)*:** Students played a science-based game as a group, focusing on biochemistry content relevant to each unit.

***Research Paper (designed)*:** Students read a scientific research paper relevant to the course content, then together compiled a document answering questions about the paper.

Study Team (ST) (contextual): Students were prompted to work on their course-provided study guides together by asking each other for help answering anything that was unclear.

Discussion Board (DB) (control): Students had access to a general discussion board but were not given specific instructions and were told it was there for them to use as they wished.

Measures

***Demographic survey*.** This optional survey asked participants to provide their gender identity, racial or ethnic identification, age, college major, and class standing (i.e., senior, junior, etc.). In addition, they were asked the level of education their parents had completed, and whether they are a first-generation college student. As the course was

[1] The 400-level is the undergraduate and it is slash listed with the 500-level graduate version. The majority are undergraduate students; each course has approximately 5 seats for the graduate level, and the 400- and 500-level students are all in one class together.

Table 1. Number of Consenting Participants by Term, Course and Activity

Course	Term	Game	Research Paper	Study Team	Discussion Board (Control)	Total
BB 450/550	Fall '23	8	16	18	21	63
BB 451/551	Spring '23	20	19	24	14	77
BB 450/550	Summer '23	11	16	21	14	62
BB 451/551	Summer '23	16	12	20	17	65
BB 450/550	Winter '24	9	10	18	17	54
	Total	64	73	101	83	321*

** Sufficient data was missing for 34 consenting participants, bringing the total from 355 down to 321.*

provided by OSU Ecampus, participants were also asked whether or not they lived in the local area, how many hours per week they worked, and the reason(s) they chose to take the course online rather than in person. As an incentive, students were given 5 points for completing the surveys, even if they marked "prefer not to answer" for each item.

Feelings of Community Survey. The Feelings of Community survey consisted of 12 items modified from Rovai (2002b) and were a mix of queries about inclusivity, interdependence, and mutual support. Eight of the 12 questions were worded in a positive way, such that responding "agree" indicated the student had a positive experience, and the other four questions were worded in a negative way, such that responding "disagree" indicated the student had a positive experience.

The Feelings of Community survey questions were as follows:

Q1. I feel welcomed and included in my group.
Q2. I feel friendly toward one or more people in my group.
Q3. I don't trust the other people in my group to get things done.
Q4. My group has a spirit of community.
Q5. I feel that I can rely on my group.
Q6. I feel isolated in my group.
Q7. My group members depend on me.
Q8. I believe that my group members are supportive of me.
Q9. I feel uneasy exposing gaps in my understanding to this group.
Q10. I feel that my group members are interested in helping me learn.
Q11. The people in my group seem present and interactive.
Q12. I don't think my group would work well together as a team.

Students responded to the items above with a 5-point Likert scale where "1" indicated Disagree; "2" indicated Slightly Disagree; "3" indicated Neither Agree Nor Disagree; "4" indicated Slightly Agree; and "5" indicated Agree. For data analysis, the negatively worded questions were reverse-coded (i.e., Disagree = 5). A reliability analysis with SPSS software indicated a high amount of consistency among all 12 items, $\alpha = .88$. Therefore, after reverse coding negatively valanced items, average scores across all 12 items were calculated for each participant for the statistical analyses.

The Feelings of Community survey also included a text box for optional comments, with the instruction, "Please use this space to give any additional comments you have on feelings of community within your group." This part of the survey was not formally analyzed; however, anecdotes from individual student comments are provided in the Results section for additional context.

Procedure

The data were collected in the form of two online surveys designed with Qualtrics and embedded in the Canvas course sites (the Demographic survey and the Feelings of Community survey). At the beginning of the term, students either declined or consented to participate in the surveys by filling out a Consent to Participate form (also Qualtrics), which assured them that the study was voluntary and their choice whether or not to participate would have no effect on their grades, relationship with the instructor, or standing at the university. Students were assured that any identifying information would remain hidden from the instructor and compiled only by the Project Assistant, who was not associated with the courses. They were also told that they could change their mind about participation at any time. Consenting students filled out a Demographics survey in Week 1 of the course, and a Feelings of Community survey in the last week of the course. Students were awarded 5 points for filling out each survey, even if they declined to participate. Choosing not to participate meant they could mark "prefer not to answer" for each item and still earn the points. GraphPad Prism (version 10.3.1) was used to compare the means and medians for each activity.

Results

About the participants: The study had a high participation rate, with 87.2% of the students enrolled consenting to take part, and over 80% of those fully completing the Demographics and Feelings of Community surveys. In the demographics survey, nearly 29% of students answered "yes" to the question, "Are you (and/or your siblings) the first person in your immediate family to go to college?" Students from all over the world enroll in this course series, but just over 49% of them indicated they were students at OSU's main campus, and nearly 47% were not (the rest declined to answer). Just over 21% were graduate or post-baccalaureate students. The largest racial group was White (59.1%), followed by Asian (14.1%), Hispanic or Latinx (10.9%), and Black or African-American (5.4%); students were able to check more than one category and/or write in their own. Participant gender identity was female (70.5%), male (20.4%), transgender female (0.25%), transgender male (0.76%), gender nonconforming (4.5%), and "not listed" (0.5%). Nearly 46% of students indicated that they worked 20+ hours per week outside of school.

Of the consenting participants, 20% were in the Game Group, 22.3% were in the Research Paper analysis group, 31.7% were on a Study Team, and 25.9% were in the Discussion Board group. Although the students were equally distributed into the four activities, the consent process resulted in unequal numbers of consented students in each group (see Table 1). Consenting participants in all activity groups filled out a survey at the end of the term to gauge the feelings of community they experienced in their group work.

Analysis by academic term: Table 2 reports descriptive statistics by term, course and activity. To compare the five different courses overall, data from the Feelings of Community survey was averaged for all students in each course regardless of the activity completed. A one-way ANOVA with the course as the independent measure and average feelings of community scores as the dependent measure revealed an overall effect of course, F (4, 316) = 5.64, $p < .001$, $\eta^2 = 0.07$. A Bonferroni post-hoc test for multiple comparisons revealed that Summer 2023, BB451/551 course had a higher overall average feelings of community scores than both Fall 2023 BB450/550 ($p < .001$) and Spring 2023 BB 451/551 courses ($p = .03$; see

Table 2. Means and Standard Deviations for the Feelings of Community Survey by Course and Activity

Course	Term	Game	Research Paper	Study Team	Discussion Board (Control)	Total
			M (SD)			
BB 450/550	Fall '23 (n = 63)	4.03 (0.59)	3.68 (0.71)	3.94 (0.73)	3.73 (0.68)	3.82 (0.69)
BB 451/551	Spring '23 (n = 77)	3.78 (0.71)	3.88 (0.72)	3.93 (0.80)	3.97 (0.61)	3.86 (0.71)
BB 450/550	Summer '23 (n = 62)	3.76 (0.89)	4.13 (0.56)	4.21 (0.55)	4.23 (0.71)	4.11 (0.66)
BB 451/551	Summer '23 (n = 65)	4.26 (0.69)	4.38 (0.64)	4.16 (0.64)	4.46 (0.47)	4.30 (0.65)
BB 450/550	Winter '24 (n = 54)	3.99 (0.85)	4.18 (0.78)	4.28 (0.56)	4.11 (0.57)	4.16 (0.70)
	Total (N = 321)*	3.96 (0.75)	4.01 (0.74)	4.10 (0.67)	4.08 (0.65)	4.05 (0.70)

** Substantial data was missing for 34 consenting participants*

Table 2). No other course comparisons showed statistically significant differences. However, the results for students' feelings of community were higher than expected across all activities.

Comparison of activities: Because there was an overall effect of the course on feelings of community, this factor was included in the analysis of course activities. A 4 (activities) × 5 (course) ANOVA was conducted with activities and course as the between subjects factors and average feelings of community scores as the dependent measure. As expected, the main effect of course was significant, F (4, 301) = 4.69, p = .001; however, the main effect of activity was not significant F (3, 301) = 0.52, p = .67, nor was the interaction between activity and course, F (12, 301) = 0.71, p = .74. No one single activity had significantly higher mean scores on the Feelings of Community survey than the other activities. The three activities did not differ from the control condition (Discussion Board) on feelings of community.

Histograms of the data for each question in the Feelings of Community survey showed that the frequency distributions for these questions were not normal (data not shown). Compiling the data allowed a view of the overall trends. As a result, medians were calculated for each feeling of community question in each group and are shown in Table 3. The Research Paper group, which had a deliverable for each unit, had higher median scores for "I feel that I can rely on my group" (Q5) and "My group members depend on me" (Q7) than did the other groups. The Research Paper analysis required the highest level of interdependence of all the activities, and the data suggest that overall, the participants in this condition reported high feelings of community. The median for "I feel uneasy exposing gaps in my understanding to this group" (Q9, a reverse-coded question) was highest for the Study Team compared to other groups; because this item was reverse coded, this suggests that studying together contributed to a sense of community. The median for "The people in my group seem present and interactive" (Q11) was higher for the Game Group compared to the

Table 3. Mean and Median Feelings of Community Item Scores for the Four Activities

	Game Group (GG) N=66		Research Paper (RP) N=73		Study Team (ST) N=104		Discussion Board (DB) (Control Group) N=85	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Q1	4.6	5	4.6	5	4.6	5	4.7	5
Q2	4.2	5	4.4	5	4.5	5	4.5	5
Q3	4.3	5	4.0	5	4.1	5	4.4	5
Q4	3.7	4	3.6	4	3.9	4	3.8	4
Q5	4.0	4	4.1	5	4.0	4	3.8	4
Q6	4.3	5	4.2	5	4.1	5	4.3	5
Q7	2.9	3	3.5	4	2.7	3	2.8	3
Q8	3.9	4	4.1	4	4.1	4	4.2	4
Q9	3.9	4	3.7	4	4.1	5	4.2	4
Q10	3.7	4	3.7	4	4.2	4	4.1	4
Q11	4.1	5	3.9	4	4.1	4	4.0	4
Q12	4.2	5	4.0	4	4.2	5	4.2	5

Differences in means, $p > 0.05$.

others, suggesting that playing a game may have encouraged frequent participation.

Trends in Feelings of Community: When separated by activity (GG, RP, ST, DB), the means for the responses to each question do not differ significantly (See Table 3), and histograms of the data showed that the frequency distributions for these questions were not normal (data not shown). To better view the trends regarding Feelings of Community, Table 4 shows the grouping of "agree" with "somewhat agree," and "disagree" with "somewhat disagree" for all activities and courses combined. The questions that were designed to understand students' sense of belonging within their groups were Q1, Q2, and Q6. Overall, the majority of students surveyed agreed or somewhat agreed with the statement, "I feel welcomed and included in my group." When presented with the statement, "I feel friendly toward one or more people in my group," most participants agreed or somewhat agreed. Most students did not feel alone within their groups, as evidenced by their responses to the survey question, "I feel isolated in my group." Most students disagreed or somewhat disagreed with this statement.

The survey included questions to understand interdependence within the groups: Q3, Q5, and Q7. In answer to the survey question, "I feel I can rely on my group," most agreed or somewhat agreed. Only a small number agreed or somewhat agreed with "My group members depend on me." "I don't trust the other people in my group to get things done" was disagreed or somewhat disagreed with by the majority of students.

To understand feelings of mutual support, the survey included questions Q8, Q9, and Q10. In answer to the survey question, "I believe my group members are supportive of me," a large number of students agreed or somewhat agreed. Many also disagreed or somewhat disagreed with the statement, "I feel uneasy exposing gaps in my understanding to this group." In response to "I feel that my group members are interested in helping me learn," a majority of students agreed or somewhat agreed.

Table 4. Feelings of Community for All Activities and Courses Combined

ALL GROUPS				
		Agree or somewhat agree	Neither agree nor disagree	Disagree or somewhat disagree
Q1	Welcomed and included	88.8%	10.3%	0.9%
Q2	Friendly feelings	78.2%	20.2%	1.5%
Q4	Spirit of community	59.5%	29.0%	11.5%
Q5	Rely on my group	69.5%	18.7%	10.6%
Q7	Group depends on me	31.1%	38.6%	28.9%
Q8	Group is supportive	70.8%	26.2%	2.8%
Q10	Helping me learn	72.3%	19.3%	8.4%
Q11	Present and interactive	77.3%	9.7%	12.2%
		Disagree or somewhat disagree	Neither agree nor disagree	Agree or somewhat agree
Q3	Don't trust they will get things done	72.9%	12.5%	11.5%
Q6	Feel isolated in group	71.7%	18.1%	7.5%
Q9	Uneasy exposing gaps in knowledge	70.1%	14.3%	14.0%
Q12	Group would not be a good team	72.6%	18.4%	6.6%

Percentages do not always add up to 100 because some participants declined to answer one or more questions. Q3, Q6, Q9, and Q12 are reverse-coded questions.

Lastly, to understand the feeling of being on a team, the survey posed questions Q4, Q11, and Q12. Roughly half of students agreed or somewhat agreed that their group had a "spirit of community," but the majority said their group "seemed present and interactive." When asked, "I don't think my group would work well together as team," most disagreed or somewhat disagreed.

Student comments

Students were also provided a text box in which to comment further on their experiences with the group activities. Comments were optional and not required. Below are some comments that were unique to the activity in which the student participated. Note that these comments are provided here for additional context but were not analyzed and therefore should be considered anecdotal.

The **Game Group** played science games on Canvas discussion boards. The students were given instructions to play the game using the information from the content of their current unit. Each of them created clues and let the others try to guess the concept. This gave each of them the chance to be the judge and several chances to be a guesser, every time the game was played. The game was therefore focused on learning the concepts rather than on interpersonal interaction. However, students still replied to each other about whether their guesses were correct, providing the opportunity to interact conversationally. One student said,

> *"I never felt judged … and everyone was very supportive whether you got the answer correct or not"* and another stated, *"Group members were supportive and seem to want everyone to do well in the class."*

In contrast, a student related,

> *"Since our interactions were mostly in context of a game, I didn't feel much of a 'community' feeling,"* which was echoed by another who said, *"I don't feel that I really got to know anyone based on playing a science game. It didn't create much of a community mindset among my group."*

The **Research Paper** analysis had students read a paper related to the course content and answer questions about it together on a Canvas discussion board. By the end of the unit, they were required to post their compiled responses. Students were graded both on their participation on the discussion board and the deliverable being posted. This was the only activity that had deliverables. This designed activity was therefore markedly different from the others, with more urgency to finish a task in each unit. The student comments included:

> *"We got the job done, professional vibes and such. Not very personal, though."*

> *"I felt that certain members of my group were unwilling to share the work load or communicate with other members."*

> *"I feel like the community was fine, it just drove me crazy that I would start discussing things in the group on Monday and other people wouldn't start participating until Thursday or Friday. It made me feel that a lot of the pressure was on me and I was very stressed constantly checking the group discussion board to make sure people were getting their sections in on time."*

Some students felt more positively about their groups:

> *"Everyone was motivated. I believe that my group always worked well with each other and we were able to complete each assignment smoothly."*
> *"When I stated my lack of understanding for something, they quickly helped me."*

> *"I've really enjoyed working with my group, they're always really active and responsive in our discussions."*

These comments suggest that working together to analyze a research paper and deliver a document can produce positive interpersonal interactions.

The **Study Team** was a contextual activity, in that it provided a space for the students to interact, but the only instruction was for them to use the Canvas discussion board space to be a "study team" and to consider using the course study guides as a way to launch the discussion. One student said,

> *"I feel like my group really helped me understand topics that I would not have understood otherwise,"* while another stated, *"I liked sharing questions with the group and I liked being able to answer some of the other members' questions when I knew the answer."*

Some student comments also suggested a sense of trust in their groups: *"I thought everyone in my group was nice and willing to help one another out," and "I never felt uncomfortable or embarrassed about asking a question."* However, not every student felt positively about the activity, as exemplified by the comment,

> *"I feel that a lot of people in the group didn't respond or waited until the last moment to respond so I didn't get the answers that I wanted as quickly as I wanted so I ended up looking them up or figuring it out myself."*

The **Discussion Board** group completed the control activity, which was neither designed nor contextual by our definition, rather, students were given a Canvas discussion board every unit and told it was there for them to use as they wished. They were required to post at least three times per unit, which is a criterion shared by the other activities. Without exception, the student groups used the board to ask each other questions about the course content, and in this way, the Discussion Board group was more similar to the Study Team group than intended. The students in this group reported positive interactions:

> *"It was nice to be able to ask things that I was confused about and have several people be interested in helping and providing additional data to help me better understand the material."*

> *"I felt like the group I was in wanted to see all of us succeed and tried our best to help each other even though our schedules made it really difficult to."*

> *"My group was supportive and helpful. Some would even reach out outside of the discussion board for support."*

However, not all comments were positive. One student stated, *"I think the 'open' freedom to use the board as we wished left us disorganized and without a collective goal to work towards."*

Discussion

As the demand for online education increases, educators are seeking ways to leverage asynchronous course activities to recreate a feeling of classroom community. Understanding how different types of online group activities affect students' sense of community is crucial for improving the learning experience. By identifying effective strategies for fostering community, this study aimed to inform future design of course activities. This study found that students felt a sense of belonging in their groups, regardless of the assigned activity. Students also had feelings of interdependence within their groups (see Table 4). The distributions for these questions were skewed toward high levels of feelings of community for all three activities and the control activity. However, in looking at the overall trends, the findings are in line with previous research asserting that people in asynchronous online environments can still form the bonds of trust, even with the implicit reduction of social cues (Henderson & Gilding, 2004). Notably, students agreed they could rely on each other (Q5), and they trusted each other to get things done (Q3), although the trend was not as high in response to "My group members depend on me" (Q7), suggesting that students were not confident of their own roles on the team in this study.

Overall, students in the study were mutually supportive and agreed they were part of a team (Table 4). The distributions for these questions were skewed and answers reflected more positive feelings than would be expected. In a study by Thoms et al. (2008), sharing of knowledge has been found to be an essential part of having a feeling of community in the online learning experience.

Although the study set out to determine which of the activities was best at fostering a feeling of community compared to a discussion board, the results suggest that the most important way to do this is to have an activity, regardless of which one. The feelings of friendliness (Q2) and being welcome (Q1) had the highest mean scores out of all the survey questions, regardless of activity, suggesting that students are primed and ready to interact in the online classroom. It is to our advantage as instructors to capitalize on this sociability by creating ways for students to have positive interactions. This disrupts the idea that online students prefer not to interact with one another or choose online courses for the purpose of reducing interaction.

Limitations and Future Directions

The study set out to compare two intentionally designed activities and one contextual activity with a control activity. However, the control groups (Discussion Board) without exception came together to use the board in the same general way that the Study Teams used theirs, which was to ask each other content questions and share study resources. While it is still possible to consider the strengths and weaknesses of contextual activities versus designed activities, or the two designed activities with one another, any comparisons in this study to the control group are likely less substantial than if the control group had been no activity at all. This is a limitation of the study. However, because of the importance of having student-student interaction in asynchronous online courses, it is not ethical to design a study with a group of students having no peer interaction at all.

For each question, the normal distributions were skewed toward somewhat agree and agree, making it difficult to validate them. The positive correlation between all the questions, as determined by reliability analysis, allowed them to be considered together. However, this is also a limitation of the study. Future work could consider using different questions to measure feelings of community, including some that are particular to the type of activities tested.

The results showed higher medians for certain questions, based on the activity the participants completed. While the means did not differ significantly, these changes in medians provided a surprising view of the different strengths of each activity. The student comments provided insight into their specific experiences with building feelings of community in both contextual and designed interactions. These findings warrant more detailed investigation in a future study of the advantages of the different activities.

Overall, the results of this study emphasize the importance of student-student interactions in small groups for fostering a sense of community in the asynchronous learning environment. All four activities worked well, suggesting that the key to providing this benefit is as straightforward as creating a space for small group interaction.

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About the Research Unit at Oregon State Ecampus

Vision

The Ecampus Research Unit strives to be leaders in the field of online higher education research through contributing new knowledge to the field, advancing research literacy, building researcher communities and guiding national conversations around actionable research in online teaching and learning.

Mission

The Ecampus Research Unit responds to and forecasts the needs and challenges of the online education field through conducting original research; fostering strategic collaborations; and creating evidence-based resources and tools that contribute to effective online teaching, learning and program administration.

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