

A group-forming course content-focused icebreaker for life science classrooms

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ABSTRACT Collaboration and communication are important competencies for undergraduate life science education, as noted in the *Vision and Change in Undergraduate Biology Education* report. However, initiating collaboration and communication in the classroom can be an anxiety-inducing experience for many students. In contrast to traditional-style icebreakers, we introduce a course content-focused icebreaker activity that served as a group-forming undertaking on the first day of class. We developed four sets of handouts (icebreaker tickets), each having a common course theme (e.g., microbiology, cell biology, physiological system infections/disorders, virology). Students were randomly provided with a ticket at the beginning of the course, and they worked to establish groups with their peers, based on their own interpretation of the ticket's content and rationalization of a grouping scheme. Student feedback and engagement data collected from implementation at three independent institutions were largely positive, where students reported the activity to be an effective tool for building a course content-focused community of learners. The icebreaker tickets and instructor's notes disseminated in this manuscript can be adapted to fit educators' course goals and help set the tone for the first day of the class and beyond that fosters communication and collaboration among students.

KEYWORDS classroom icebreaker, group formation, group work, collaborative learning, interactive classroom activity, group selection methods, life science education, active learning, anxiety

Here, we describe a course content-focused icebreaker developed for the first session of a course that doubles as a semi-structured group-forming activity. The icebreaker/group-forming activity builds upon a first-class session activity described by Wood (1) but is formalized with icebreaker tickets featuring icons or images and associated contextual information that allows for the creation of semi-structured groups based on student interpretation (Fig. 1). The activity's pedagogical goals are to (i) captivate students with course concepts, while (ii) facilitating peer interaction and (iii) providing students with a degree of autonomy in group creation, and (iv) to provide the experience of collaborating in classroom groups that may be used throughout the course for student engagement (Table 1).

The first academic session of a collegiate course can set the tone for the remainder of the semester and have long-lasting effects on student motivation and performance (2, 3). Thus, it is important during the first-class meeting for instructors to demonstrate classroom pedagogical techniques and engage students in course concepts in addition to classroom norms and expectations to establish a semester routine (4, 5). This course content-focused icebreaker satisfies these pedagogical needs for instructors looking to engage students in team-based interactions with peers as the semester progresses.

Contemporary education reform efforts have challenged passive lecture approaches in the classroom and promoted student engagement through pedagogy that integrates

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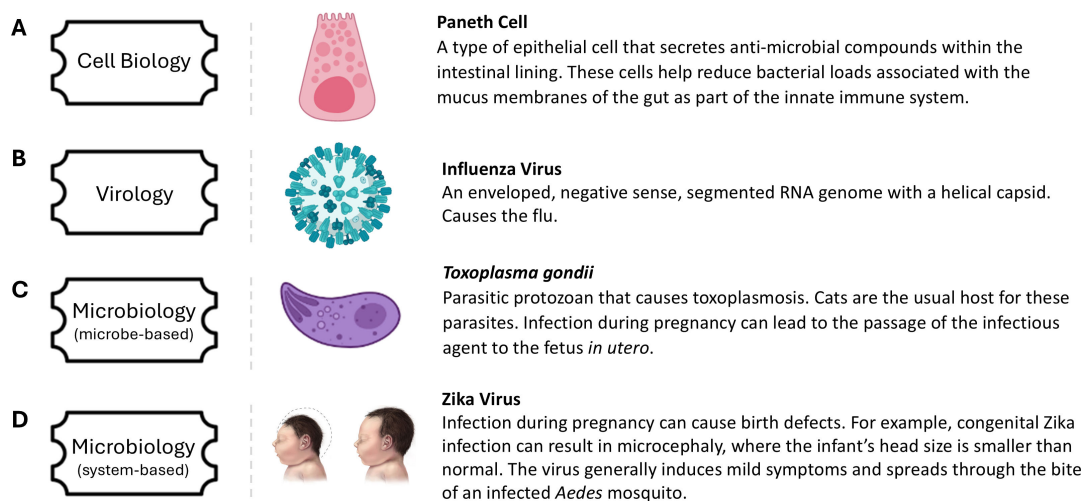


FIG 1 Exemplars of group-forming content-based icebreaker tickets from each targeted life science course. (A) Cell biology. (B) Virology. (C) Microbiology—microbe-based. (D) Microbiology—systems-based. Paneth cell, influenza virus, and *Toxoplasma* icons were created with BioRender.com, the “ticket” icon is from TheNounProject.com CC BY 3.0 by Maxim Kulikov (<https://thenounproject.com/icon/ticket-6873981/>), and the Zika virus-associated icon was provided by the Centers for Disease Control and Prevention, Public domain, via Wikimedia Commons (<https://commons.wikimedia.org/wiki/File:Microcephaly-comparison-500px.jpg>).

active-learning activities (6, 7). Active, inquiry-based approaches to teaching place importance on engaging students in course concepts during class through “student talk” with their peers (8). Student talk enriches student classroom learning, motivates learners, can provide instructors with formative feedback, and promotes collaborative rather than competitive classroom culture (8).

Student talk can be facilitated through collaborative team/group-based interactions during classroom learning activities. Instructor choice of student team/grouping strategy (Table 2) inevitably influences the student classroom experience. Unstructured methods provide students with the agency to self-select their peer groups. Semi-structured methods are instructor directed but involve some level of student autonomy as part of the process. Structured methods rely on instructor-assigned groups and may vary from random instructor selection without defined criteria or nonrandom instructor selection based on instructor-specified criteria using data (9, 10).

Instructors should consider their functional goal for utilizing classroom groups when deciding on a particular method for allocating students into teams/groups (11). For example, informal groups typically function to provide transient low-stake opportunities for students to collaboratively process and apply concepts, shift instruction from didactic instructor-focused delivery of content to being learner-centric, and provide the instructor with formative feedback. Informal groups can be generated rapidly on the fly through unstructured, semi-structured, or instructor-facilitated random selection. In contrast, formal classroom groups often tackle higher-stake tasks and may benefit from instructor investment in structured nonrandom group selection based on instructor-defined criteria (12).

TABLE 1 Group-forming course content-focused icebreaker activity pedagogical goals

Classroom icebreaker pedagogical goals	Pedagogical goal (PG) code
Facilitate student-peer interaction through an icebreaker activity	PG1
Engage students in course content during the first-class session	PG2
Establish classroom groups with a dab of student autonomy	PG3
Provide students with an initial in-class collaborative experience	PG4

TABLE 2 Categorical group formation strategies

Group formation category	Party initiating grouping	Group formation strategy	Example(s)
Unstructured	Students	Self-selection	i.e., students identify peers in the class to group with, often friends or acquaintances
Semi-structured	Stage 1: Students Stage 2: Instructor	Mixed pair	i.e., students pair up by self-selection followed by the instructor pairing two independent pairs
	Instructor	Random selection with group composition flexible on student interpretation and rationale	e.g., randomly distributed course-themed icebreaker tickets coupled with students coming up with rationale to which tickets should be most logically grouped together
Structured	Instructor	Random selection without criteria	e.g., random number generator, counting off and grouping by number, utilizing a deck of cards
		Nonrandom selection based on criteria	e.g., criteria may be used to make homogeneous or heterogeneous groups based on student data such as academic background, personality traits, self-assessment of skills, and performance

PROCEDURE

The icebreaker/group-forming activity takes around 15 minutes depending on class size. In this introductory activity, students were given icebreaker tickets containing icons or images of course concepts with a short corresponding text description (Appendix 1 through 4, Fig. 1). For example, in an introductory cell biology course, students were given a drawing of a specialized cell and a short description of the specialized cell including its function and anatomical location. These tickets were randomized and provided to students as they entered the classroom on the first day of class.

After a brief introduction to the course, students were then given a few minutes to review their ticket before encouraging them to move around the room, introduce themselves, and share the information on the ticket with each other. They were then directed to organize themselves in groups based on a common theme identified from the information on the tickets. At the end of the activity, students had to define the reasoning behind grouping the selected group members and report out to the class. This provided a launch point to introduce class material and allowed instructors to emphasize common course themes and terminology associated with the course.

During the icebreaker ticket design phase, we generated a list of important topics in the class and then grouped the icebreaker tickets so that each ticket would be part of a group of four to five related items associated with a topic. Students were not informed of this organization and were free to form groups based on the information on the tickets, as long as (i) there were four to five students per group and (ii) they could justify the relationships between the tickets. Students then remained in these groups for subsequent classroom activities for part of or for the remainder of the semester.

TABLE 3 Institutions participating in course content-focused icebreaker implementation

Institution	Course	Unique icebreaker tickets	No. of students enrolled	Student survey response rate (%)	Category (level) of undergraduate student	Required/ elective course	Course format
Private liberal arts university	Microbiology	46	29	N/A ^a	Mixed majors	Required pre-nursing course; elective biology major course	Lecture
Private liberal arts university	Cell biology	38	16	87.5	Majors (1st/2nd year)	Required for biology majors	Lecture
Public regional comprehensive university-A	Virology	20	16	93.8	Majors (3rd/4th year)	Elective for biology majors	Lecture
Public regional comprehensive university-B	Microbiology	24	Three lab sections (12, 23, and 24) of 59 total students	89.8	Non-majors (1st/2nd year)	Required pre-nursing course	Lab

^aN/A, not applicable.

Additional stepwise instructor implementation notes and value-added pedagogical techniques associated with the activity are outlined in Appendix 5. The group-forming icebreaker activity was designed for relatively small enrollment classes ranging from 20 to 46 students, but the activity could be scaled up for larger classes by temporarily subdividing students within the classroom space and using a set of duplicated tickets with each classroom subgroup. Teaching/learning assistants and/or near-peers could further assist with facilitating the activity within classroom subgroups (13). Furthermore, the icebreaker ticket sets can be mixed and matched depending on the topical focus of a course, which may allow for an expansion of the number of unique icebreaker tickets for a course.

Within 1 week following the activity, student participants ($N = 82$) were provided with an IRB-approved (University of Dubuque) survey to determine whether they felt the activity was impactful for their learning and/or classroom climate (Appendix 6).

CONCLUSION

Although we call this activity an icebreaker, it facilitates student interactions around an engaging way of introducing course material, while also functioning to establish classroom learning groups. Course content-focused icebreakers replace traditional-style

The team-building course-content focused icebreaker activity...

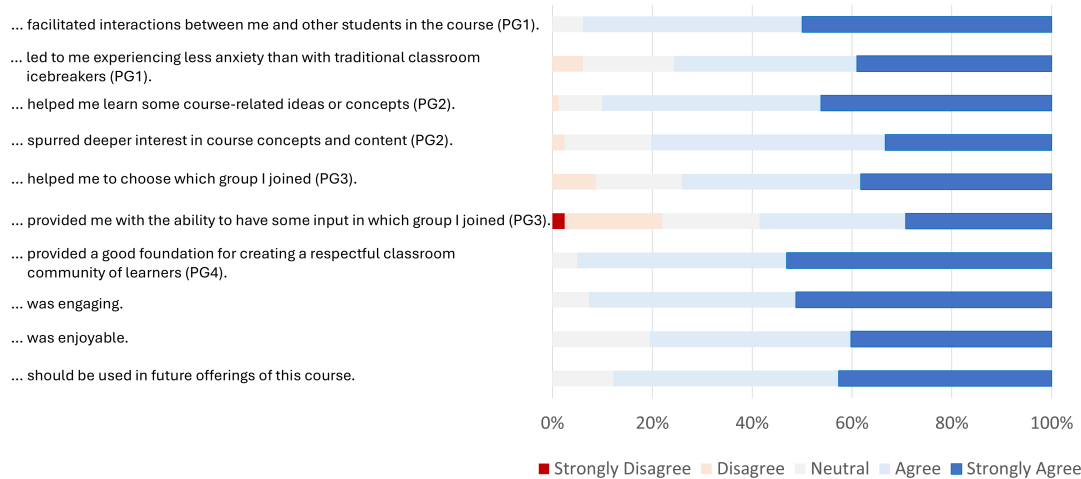


FIG 2 Post group-forming icebreaker student perceptions ($N = 82$) aggregated across courses and aligned to classroom icebreaker pedagogical goal (PG) codes when appropriate (see Table 1). All survey items exhibited a statistically significant ($P < 0.00001$) shift toward positive responses relative to a neutral response using a two-tailed Wilcoxon signed-rank test.

TABLE 4 Emerging themes and representative open-response verbatim comments to the post-survey item: "What specifically did you enjoy about the team-building course content-focused icebreaker activity?"

Theme	Representative examples
Low-stress icebreaker	"That there is an overall goal of interaction, and it makes it less nerve-racking/awkward." "Allowed me to talk to everyone in a structured way, there was less of the pressure of an informal icebreaker."
Early exposure to and learning course concepts	"It created some immediate questions about viruses and transitioned well into our first topic." "It was a good way to get a brief introduction to course content while getting to know classmates."
Fostering collaboration and communication	"Yes, [what] I enjoyed about it [is it] helped to encourage collaboration, communication, and problem-solving." "The interactive nature of the activity encouraged collaboration and communication."

icebreaker activities that directly focus on personal details and may provide some discomfort for select students (14, 15).

This activity was implemented four times at three independent institutions at varying instructional course levels (Table 3). Although initially designed for a lecture or discussion class format, we found that students are receptive to the activity in the laboratory environment as well. The activity is designed with informal group work in mind but has been used for establishing formal groups. We found it imperative that with high-stake formal group work, instructors integrate an optional student survey for students to voice concern on potential group dynamic issues to assist instructors with mediating any necessary post-activity group composition adjustments. Students provided positive feedback and appreciated the "semi-structured" group formation (Fig. 2 and Table S1; Appendix 7). Over 93% of the respondents agreed or strongly agreed that the activity helped facilitate interactions between students and provided a good foundation for creating a community of learners. Over 73% of the respondents agreed or strongly agreed that the activity allowed them some input about which group they joined. Respondents also reported that the activity helped them learn some course-related content and spurred deeper interest in course ideas ($\geq 80\%$ agreed or strongly agreed). Furthermore, respondents reported the activity as enjoyable and that it should be used in future course offerings ($\geq 80\%$ agreed or strongly agreed) and perceived experiencing less anxiety than with traditional-style icebreakers ($>75\%$ agreed or strongly agreed). Major themes from open-response comments on what students liked about the activity included that it was a low-stress icebreaker, that it involved exposure to and learning of course concepts on the first day of class, and that the activity fostered collaboration and communication (Table 4). Additionally, anecdotal feedback from learning assistants helping implement the activity and a reflective colleague was largely positive, where they revealed being eager to adapt the activity to their own classroom.

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ADDITIONAL FILES

The following material is available [online](#).

Supplemental Material

Appendixes 1 to 7 (jmbe00173-24-S0001.docx). Compendium of appendices referenced within the article.

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