

Evolution of Undergraduate Research Training Approaches in the Biomedical Sciences:

Moving from Apprenticeship-Type Training to include Group-Based Team Research

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May 2, 2024 – Queen's CTL Showcase of Teaching and Learning

Who are we ...




... and why are we here? Welcoming the Discovery Labs



Global NEWS

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Videos

New Queen's research facility offers undergrads more than just hands on experience

01:44 | OCTOBER 20, 2023

Entering the job market with apprenticeship program

02:02 | NOVEMBER 15, 2018

New Queen's research facility offers undergrads more than just hands on experience

"The future of discovery is collaboration"

- Dr. Lynne Postovit

A philosophical question meets a practical conundrum

Theoretical and Practical Benefits and Challenges

- Benefits of team-based research: enhances academic performance, skill development, and interest in STEM careers (*Haeger CBE Life Sci Educ 2016; Petrella Int J Exerc Sci 2008*)
- Massification of education a challenge for apprenticeship models to research training (*Fendos CBE Life Sci Educ 2022*)
- Group-based research may additionally enhance collaborative skills, teamwork, conflict resolution, and project management (*Wilson CBE Life Sci Educ 2018; Finelli CRLT 2011; Johnson JECT 2014; Lamm J Agric Ed 2012*)
- 80% of graduates (i.e., employees) transition to team-based work environments (*Attle Int J Teach Learn High Educ 2007*)
- *Is group-based research training the solution?*
- ***Will people see it as the solution?***

Study Objective(s)

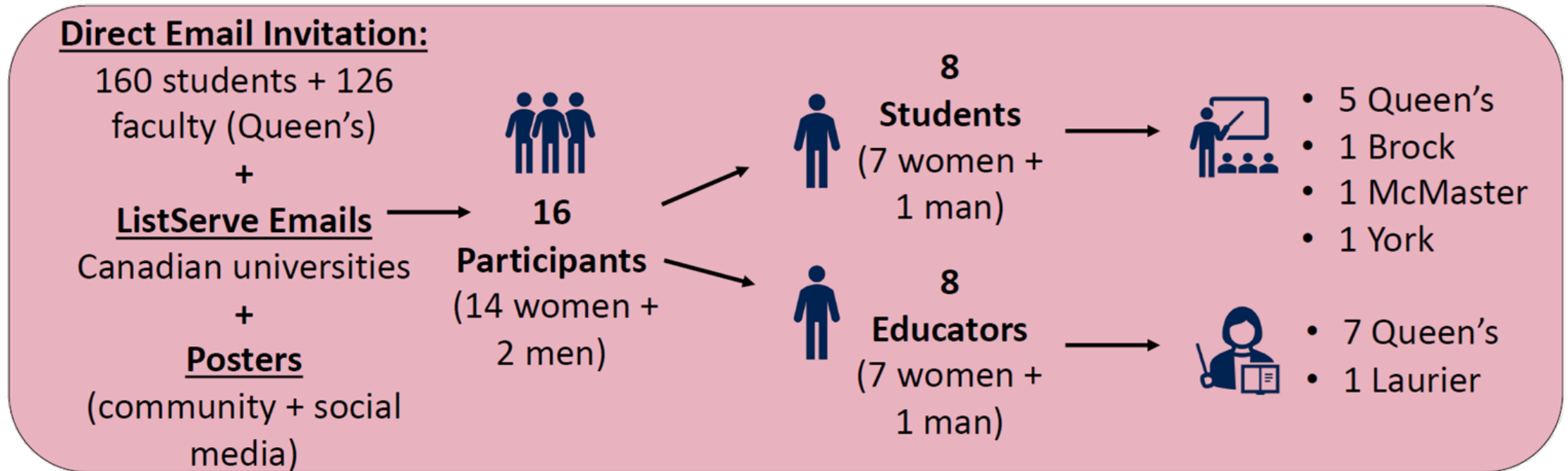
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Students: i) understand motivations for pursuing UR, ii) examine expectations, iii) monitor perceptions of chosen research stream.

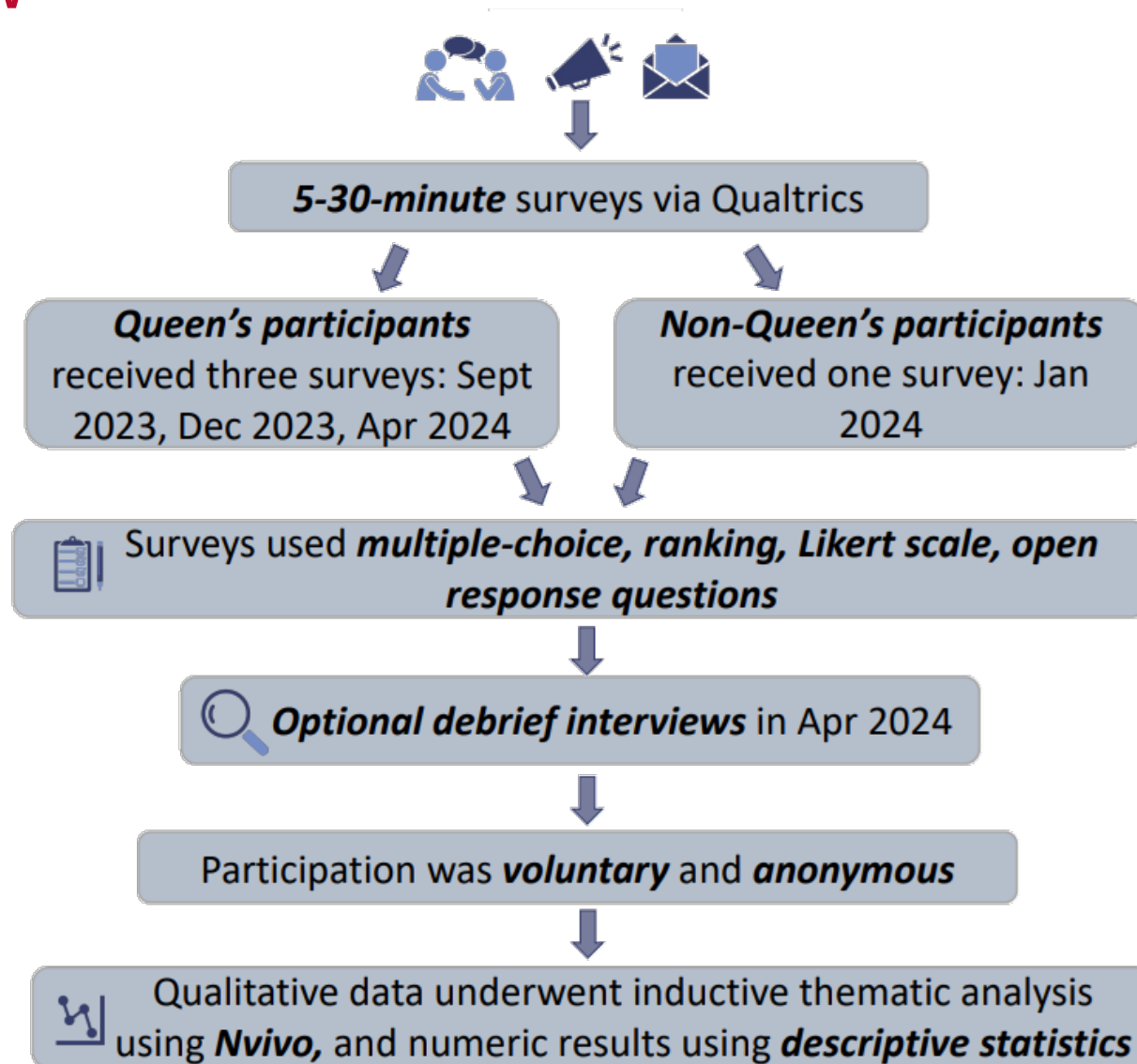
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Educators: i) explore experiences supervising students in UR, ii) challenges and factors influencing adoption of group-based research, iii) impressions of training levels attained by students in both streams.

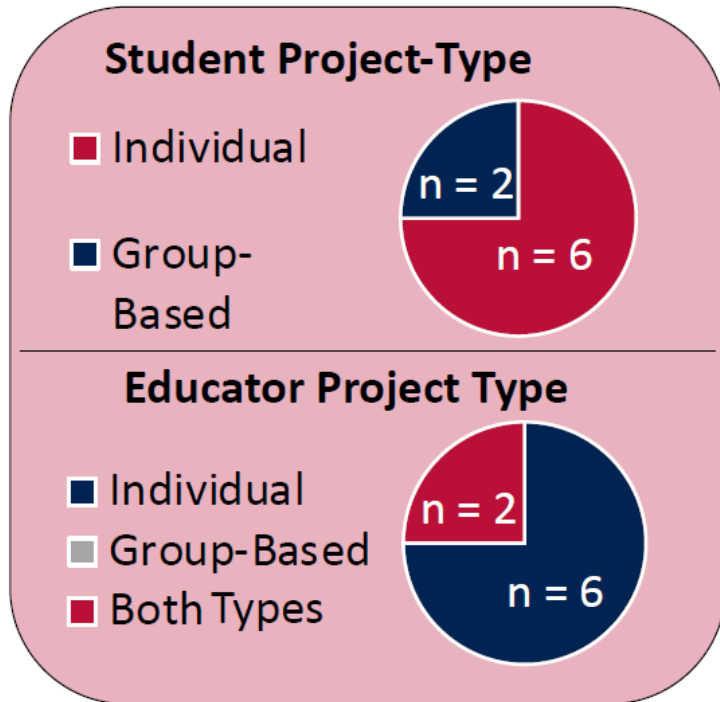
Recruitment and Participants



Study Overview



Who is represented?



Sociodemographic Characteristic	Students <i>n</i>	Educators <i>n</i>
Program of Study/Supervision		
Health Sciences	5	5
Life Sciences	1	2
Other Biological or Biomedical Science	2	1
Seniority		
3 rd Year UG / Early Career	2	3
4 th Year UG / Mid-Career	6	3
Other / Late Career	-	2

What did we learn?

Initial Impressions: Group- vs Individual-Research

Group Research

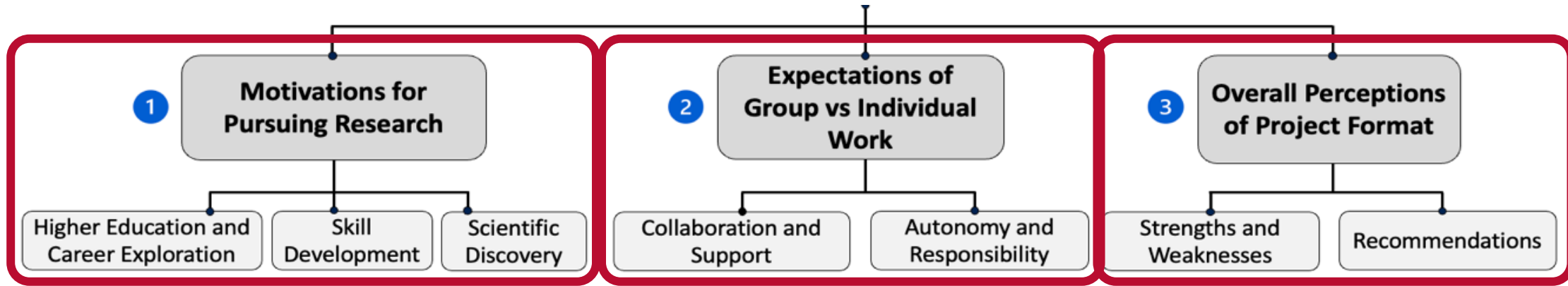


Individual Research



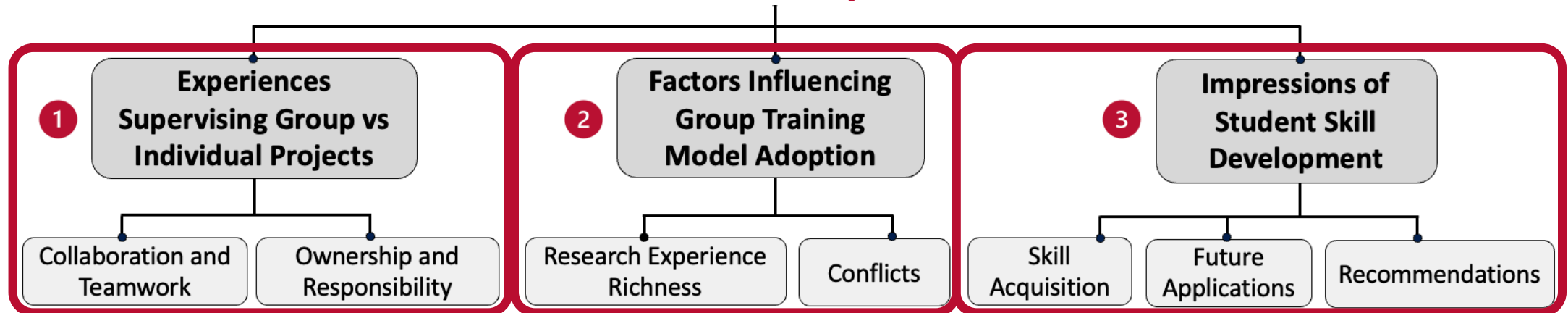
Words used by students *and* educators to describe research approaches; word size reflects frequency of reporting.

Student Perspectives



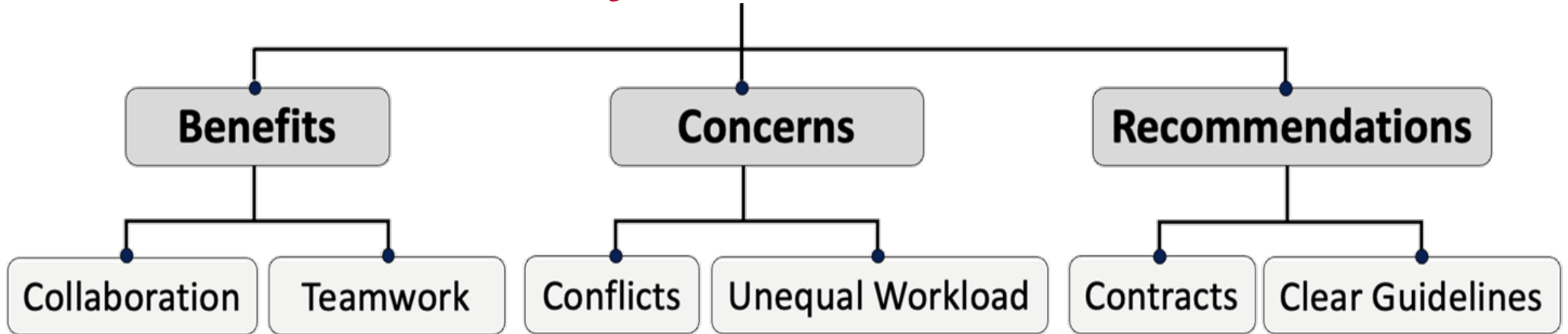
| *“Overall contribution to scientific discovery depends on the novelty of the research findings”* – Student 3

Educator Perspectives



|“Whether the research experience is “richer” will depend on supervisor engagement and student motivation” – Educator 2

Joint Themes



Take Home Messages

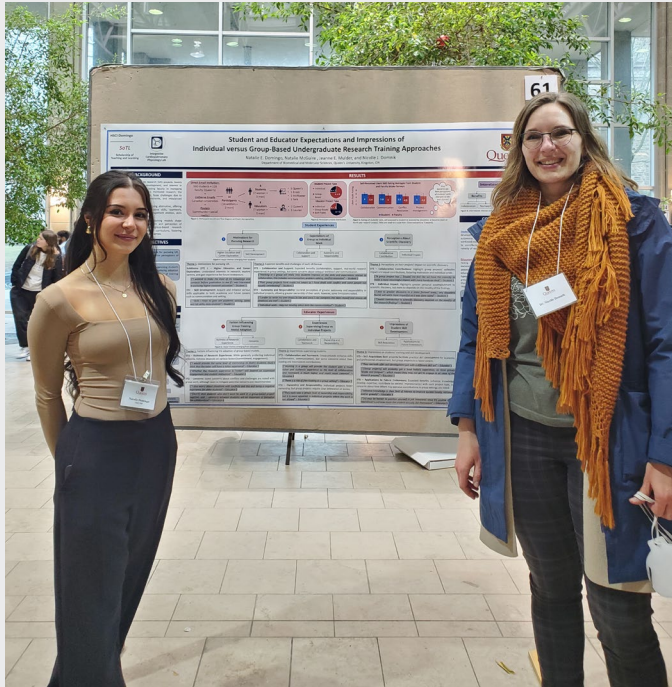
- Group-based team research offers significant potential, which is recognized by students and educators amidst some reservations
 - Specific conditions required for group-based team research to thrive
- Fostering greater interdisciplinarity could further enhance group efficacy: a call to other disciplines
- *Shameless plug for the Discovery Labs!*



Thank-you!

Feel free to reach out, if you'd like to connect about the Discovery Labs:


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**Heartiest thanks to
Natalie Domingo,
who really drove this work!**


DISC599: Discovery Labs

Radical Collaboration through Team-Based Research



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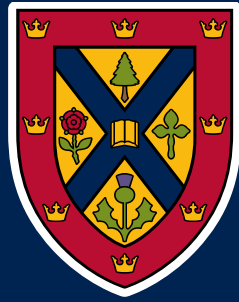
The Discovery Labs are your sandbox for experiential learning and essential, practical research skill development. By developing and executing your own unique research project, you will learn about diverse research tools and approaches... and how to use them, positioning you for success as scientists.
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Science increasingly involves multidisciplinary teams that leverage member skill diversity to achieve more than a single researcher in isolation. We are excited to deliver this approach via the Discovery Labs, training you - our next generation of scientists - to work collaboratively in teams of ~5 to achieve research success.
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DISC599 will provide you with training and experience-building in a rich breadth of topics relevant to science while completing your research project. You will be work as a team under the mentorship of disciplinary experts to develop and maintain the highest standards of professional academic performance.

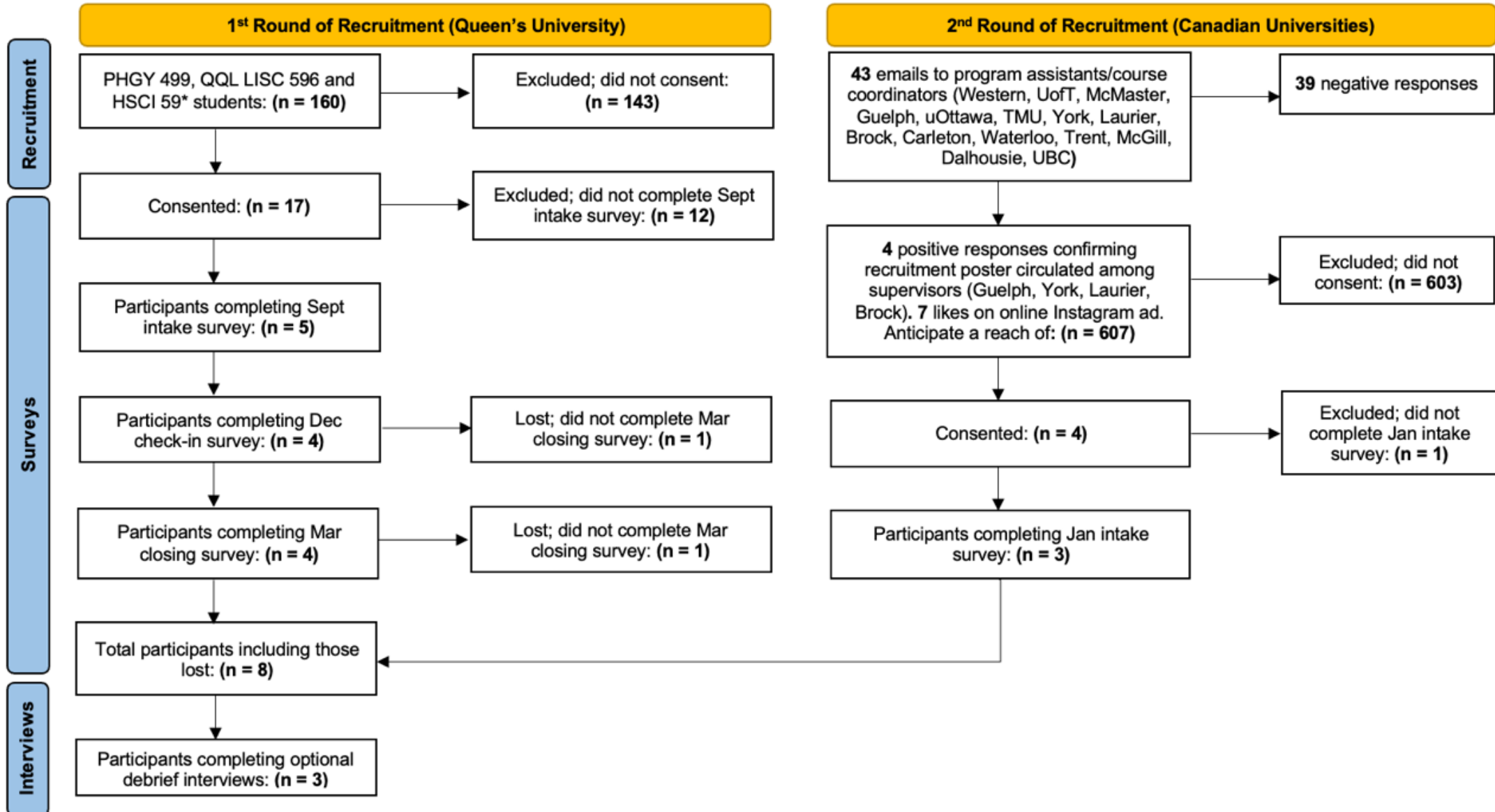
Project support: DBMS
Research Initiation Grant (NJD)



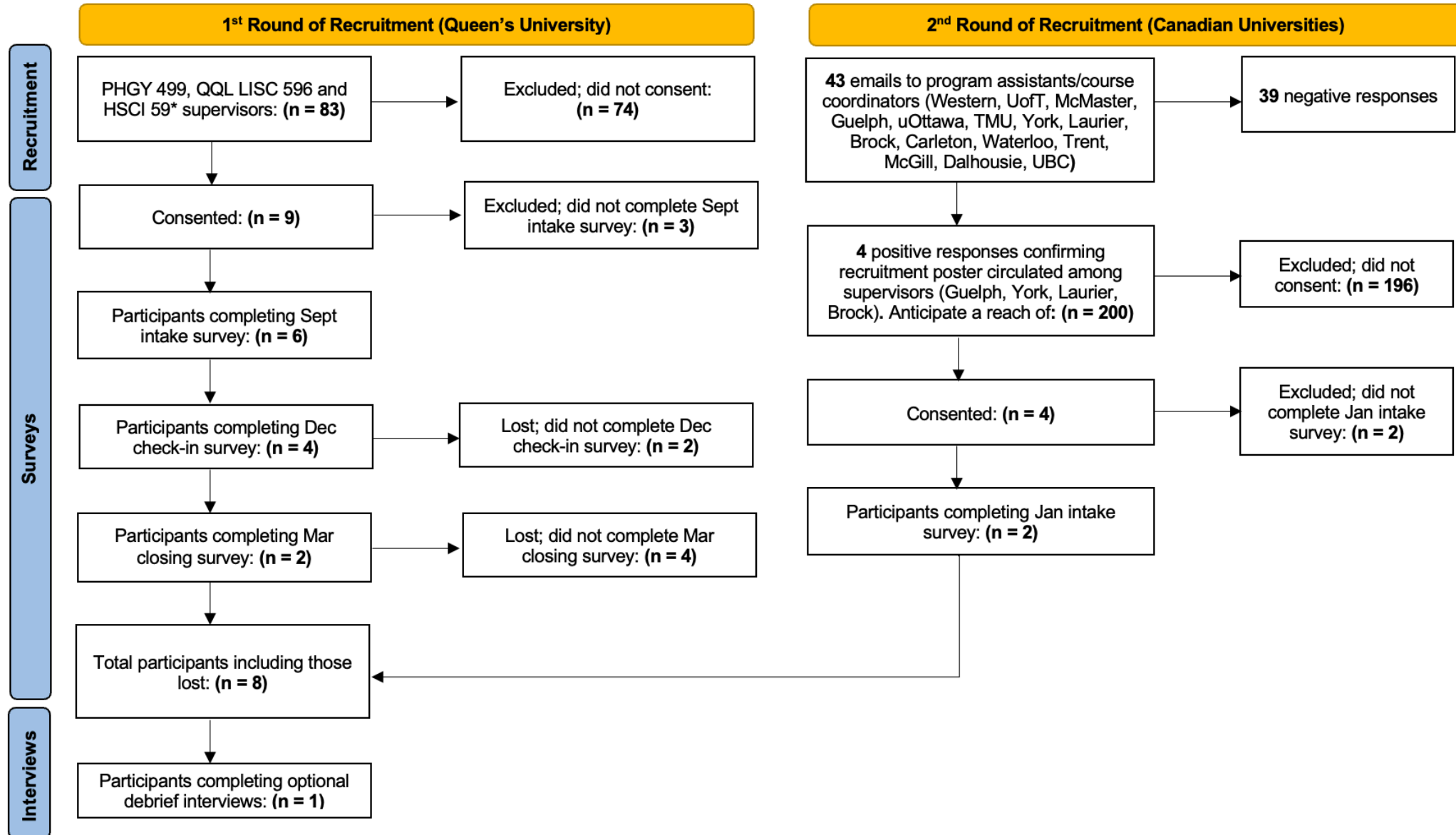


Queen's
UNIVERSITY

Recruitment: Students



Recruitment: Educators



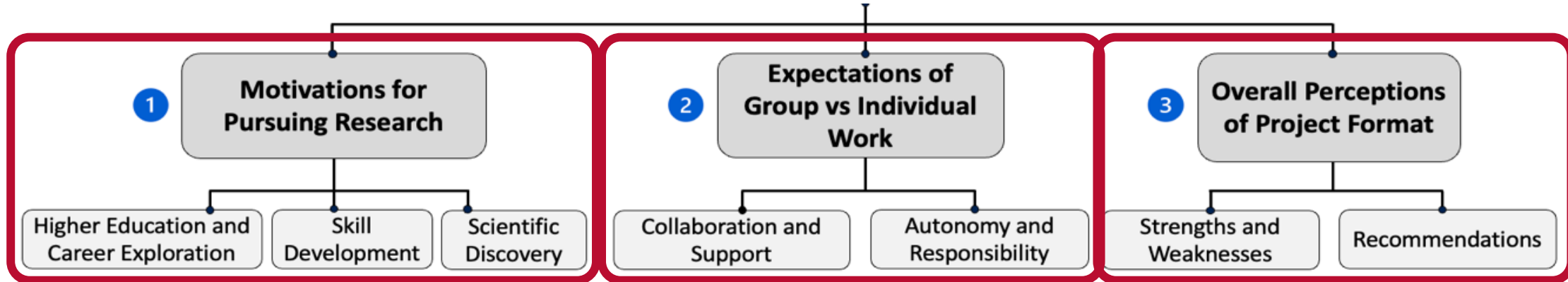
Participants

Sociodemographic Characteristic	Students	
	<i>n</i>	%
Female*	7	75
Male*	1	25
Student Age		
20-21	7	87.5
22 +	1	12.5
Racial Identity		
White	4	50
East Asian	1	12.5
South Asian	1	12.5
Middle Eastern	1	12.5
Indigenous	1	12.5
University		
Queen's	5	62.5
McMaster, Brock, York	1 / each	12.5 / each
Program of Study		
Health Sciences	5	62.5
Life Sciences	1	12.5
Other Biological or Biomedical Science	2	25
Level of Study		
Third Year Undergraduate Research	2	25
Fourth Year Undergraduate Research	6	75
Research Project Format		
Individual	6	75
Group-Based	2	25

Sociodemographic Characteristic	Educators	
	<i>n</i>	%
Female*	7	75
Male*	1	25
Educator Age		
31-40	4	50
41-50	3	37.5
61+	1	12.5
Racial Identity		
White	6	75
East Asian	1	12.5
Hispanic	1	12.5
University		
Queen's	7	87.5
Laurier	1	12.5
Program Supervising		
Health Sciences	5	62.5
Life Sciences	2	25
Other (e.g., biology)	1	12.5
Research Seniority		
Early Career	3	37.5
Mid-Career	3	37.5
Late Career	2	25
Supervised Project Format		
Individual Only	4	50
Group Only	1	12.5
Both	3	37.5

*sex and self-identified gender were documented and aligned for all n=16 participants

Student Perspectives

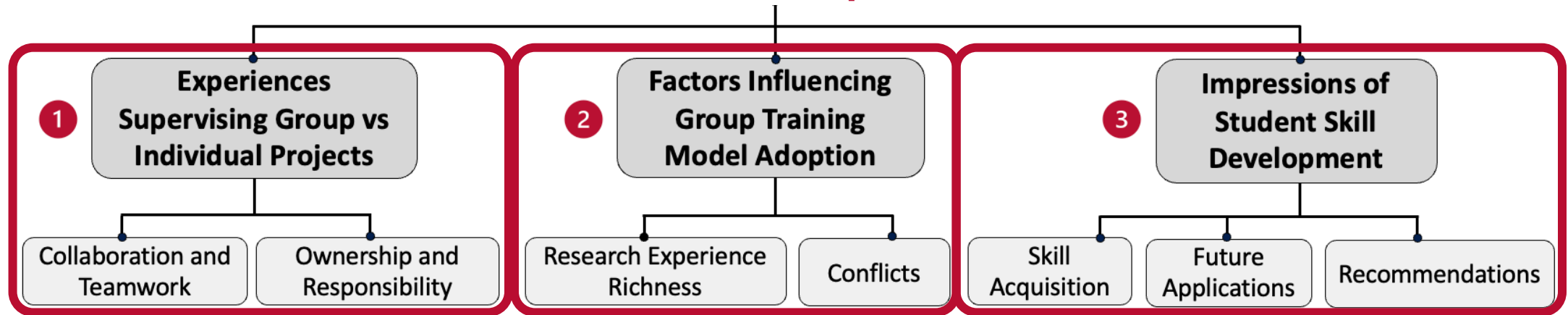


- Understand interests in research, explore careers, gain practical experience
- Acquire/enhance skills applicable to academia *and* careers (e.g., communication, writing)

- Expected benefits re: groups (collaboration, support, real-world experience), with some concerns re: workload and communication
- Perceptions of autonomy and responsibility leading to ownership in individual projects

- Collective impact and working towards shared goal highlighted, versus individual pride
- Sense of personal accomplishment linked to novelty of work more than project type

Educator Perspectives

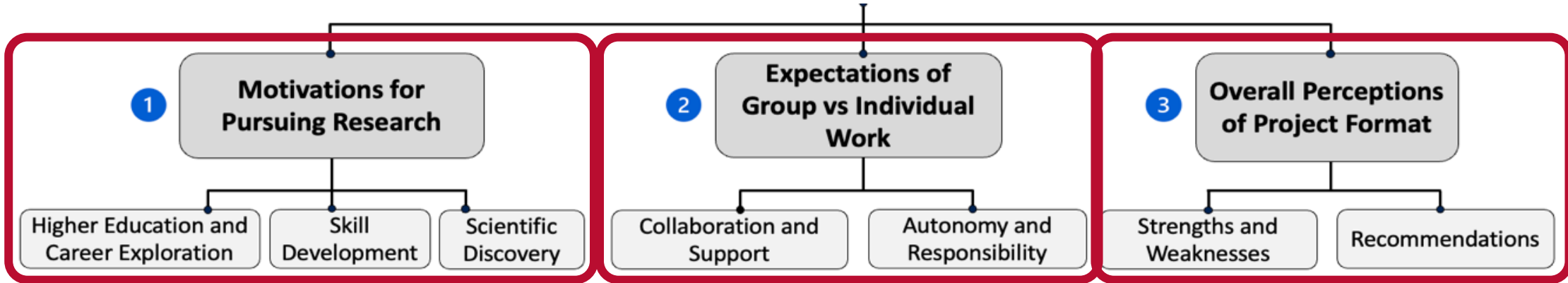


- General preference for individual projects, but richness of research depends on factor including supervisor and student engagement
- Some group conflicts, with some mitigation strategies suggested

- Excited about skill-enhancement and authenticity – but concerns about freeloading – in group settings
- Individual projects have clear path of ownership while group work requires delineation of duties to avoid conflict

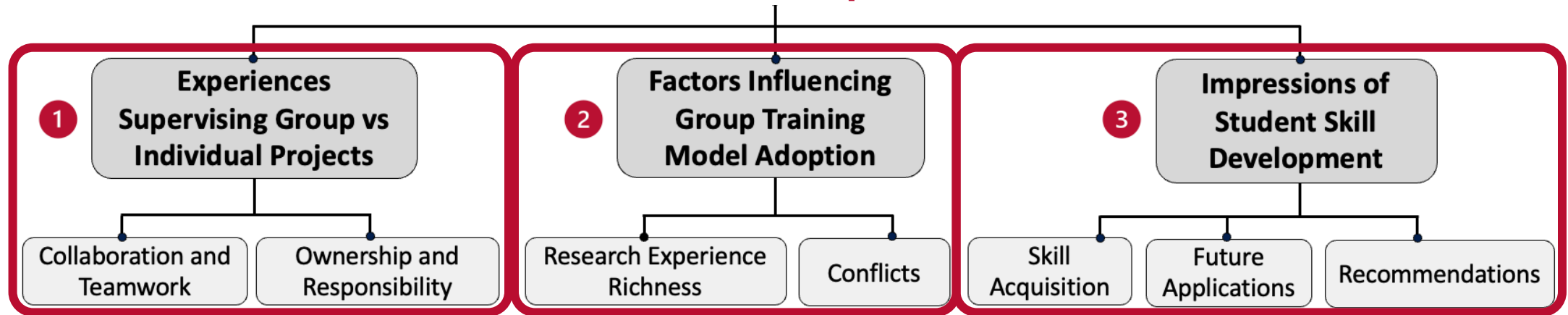
- Feeling that group projects might develop practical, academic and professional skills less (“divide and conquer”)
- Concerns about how others (e.g., interviewers) may perceive student skills or contributions in group settings in the future

Student Perspectives



<p>Theme 2: Ex</p> <p>ST3 – Colla (experience)</p> <p> “Workin collabor</p> <p> “Past g equally c</p> <p>ST4 – Auto (individual pr</p> <p> “I prefe deadline</p> <p> “Indivia</p>	<p>Theme 3: Perceptions on their projects’ impact on scientific discovery.</p> <p>ST5 – Collaboration Contributions: Highlight group projects’ collective impact and equal contributions, fostering motivation and individual pride.</p> <p> “A group project has ... [made] me feel like we have the capacity to make a more meaningful impact with more hands-on deck” – Student 1</p> <p>ST6 – Individual Impact: Highlights greater personal accomplishment to scientific discovery, but more so depends on the novelty of the findings.</p> <p> “Lead to greater discovery in a more focused area... any discovery found, will seem more impactful as it was done alone” – Student 7</p> <p> “Overall contribution to scientific discovery depends on the novelty of the research findings” – Student 3</p>	<p>world research ation.</p> <p>es related to lent 2</p> <p>e people not</p> <p>onsibility in oted.</p> <p>nd ensure all</p>
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Educator Perspectives



Theme 3: Impressions on students' training and skill development.

ST5 – Skill Acquisition: Both projects facilitate practical skill development for academic and professional advancement, but group projects to a lesser extent.

| *"They can both offer skill development just with a different skill set"* – Educator 1

| *"[Group projects] will probably get a least holistic experience, as most groups 'divide and conquer' - which means they may not get to engage in all steps of the research process"* – Educator 3

ST6 – Applications to Future Endeavours: Expected benefits (advance knowledge, develop expertise, contribute to societal improvements) with each project type, but concerns about how others may perceive contributions in group settings are noted.

| *"Advance knowledge in their field of interest to improve society locally, nationally, and/or globally"* – Educator 4

| *"[It] may be harder to position yourself in job interviews since it's unclear on the interviewer's end how much the student actually did themselves"* – Educator 5