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"I Learned How to Think, Not What to Think." Student Perspectives on an Interdisciplinary Undergraduate Honours Programme

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“I Learned How to Think, Not What to Think.” Student Perspectives on an Interdisciplinary Undergraduate Honours Programme

Abstract
The Arts and Science Honours Academy (ASHA) is a unique interdisciplinary undergraduate honours programme at a large research-intensive university in Canada. Data were collected in early 2020 from 108 past and present students, representing the first eleven cohorts of the programme. Triangulating results from quantitative and qualitative analyses, we describe the ASHA students’ educational and social experience during their time at university and, for those who have graduated, their post-graduate activities. Situating our investigation within previous literature examining interdisciplinary undergraduate learning communities and high impact practices, we assess whether students from arts and science disciplines experienced the programme differently, and which aspects of the programme were most impactful. We find that academically, students reported benefiting from the exposure to interdisciplinary thought, the opportunity to do research, and the study abroad requirement. Socially, students reported benefiting from the connections they formed with a small cohort of high achieving peers from a variety of disciplinary backgrounds. While science students reported benefitting the most from ASHA socially, arts students were more likely to indicate that the programme influenced their careers following graduation. These findings provide evidence to support the creation and design of future interdisciplinary undergraduate programmes.

Le programme Arts and Science Honours Academy (ASHA) est un programme interdisciplinaire unique de premier cycle offert dans une grande université canadienne à forte intensité de recherche. Des données ont été recueillies au début de l'année 2020 auprès de 108 étudiants et étudiantes, anciens et actuels, représentant les onze premières cohortes du programme. En triangulant les résultats des analyses quantitatives et qualitatives, nous décrivons l'expérience éducative et sociale des étudiants et des étudiantes du programme ASHA pendant leurs années d’études à l'université et, pour ceux et celles qui ont obtenu leur diplôme, leurs activités post-universitaires. Situant notre enquête dans le cadre de publications antérieures examinant les communautés d'apprentissage interdisciplinaires de premier cycle et les pratiques à fort impact, nous évaluons si les étudiants et les étudiantes des disciplines artistiques et scientifiques ont vécu le programme différemment, et quels aspects du programme ont eu le plus d'impact. Nous constatons que sur le plan académique, les étudiants et les étudiantes ont déclaré avoir bénéficié de l'exposition à la pensée interdisciplinaire, de la possibilité de faire de la recherche et de l'obligation d'étudier à l'étranger. Sur le plan social, les étudiants et les étudiantes ont déclaré avoir bénéficié des liens qu'ils ont noués avec une petite cohorte de camarades très performants issus de différents horizons disciplinaires. Si les étudiants et les étudiantes en sciences sont ceux et celles qui ont le plus profité du programme ASHA sur le plan social, les étudiants et les étudiantes en arts sont les plus nombreux à indiquer que le programme a influencé leur carrière après l'obtention de leur diplôme. Ces résultats fournissent des preuves pour soutenir la création et la conception de futurs programmes interdisciplinaires de premier cycle.

Keywords
honours, interdisciplinary, high impact practices, learning community, mixed methods; spécialisation, interdisciplinaire, pratiques à fort impact, communauté d'apprentissage, méthodes mixtes

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Learning communities in post-secondary settings typically involve a cohort-based experience where a small group of students take classes together. They provide a unique educational experience, where students interact regularly with peers and professors (Goldman, 2012). Research demonstrates that the academic benefits of learning communities may include higher grades, retention, and graduation rates (Lenning & Ebbers, 1999). Such communities also have social benefits, particularly in large universities where undergraduate students might otherwise be enrolled in very large classes during their first years (Goldman, 2012).

We examine a unique learning community at a large research-intensive university in Canada, summarizing findings from quantitative and qualitative data collected from current and past students. The Arts and Honours Academy (ASHA) is a unique honours programme that brings together students from the Faculty of Arts and the Faculty of Science. The students form a learning community and take courses together for all four years of their degree. The programme includes two main high impact practices—the students conduct individual research projects, and they are encouraged to study abroad.

This investigation does not constitute a program evaluation, as a control group was not included. Instead, we provide a descriptive analysis with a focus on three questions. First, we ask how students experienced the programme. Second, we examine whether students’ perceived experiences of this interdisciplinary programme differ by disciplinary background. Finally, we ask which practices were perceived to be most impactful. Our findings add to the literature on interdisciplinary undergraduate honours programmes and high impact practices and will be useful for those designing or modifying similar interdisciplinary undergraduate programmes.

Literature Review

We draw from three separate literatures in the scholarship of teaching and learning to situate our study: interdisciplinary undergraduate programmes; honours programmes; and high impact practices.

Interdisciplinary Programmes

Interdisciplinary approaches to research are becoming more common (Siemens et al., 2014; Vienni-Baptista et al., 2022) and many funding agencies now explicitly require interdisciplinary teams in their calls for research proposals (Gillis et al., 2017). University teaching, however, is still largely organized within disciplinary boundaries, especially at the undergraduate level. Proponents of interdisciplinary undergraduate programmes argue that it is becoming more important to teach undergraduate students how to work across disciplines, while at the same time still supporting them in becoming knowledgeable in their chosen fields (National Academies of Sciences, Engineering, and Medicine, 2018; Shandas & Brown, 2016).

There is currently no standardized approach to evaluating the success of interdisciplinary programmes or courses as it can be difficult to assess learning outcomes outside of a disciplinary framework (Knight et al., 2012; Lattuca et al., 2017). Many of the proposed outcomes of such programmes, such as enhanced ‘scientific reasoning skills’ or ‘critical thinking skills’ are hard to measure, and therefore not easy to assess. Most of the research evaluating interdisciplinary undergraduate teaching focuses on individual courses (rather than programmes) taught at institutions in the United States (for examples see Copeland et al., 2018; Goodman & Huckfeldt,

2014; White & Nitkin, 2014; Wingert et al., 2014). Researchers report that students enjoy these courses, appreciating the integration of disciplines around a specific topic.

In 2018, the US National Academies of Sciences, Engineering and Medicine (NASEM) conducted a review of interdisciplinary programmes at US institutions. This expert panel concluded that the higher education sector needs to move towards integrated teaching of arts, humanities, and STEMM (science, technology, engineering, mathematics, and medicine) at both the graduate and the undergraduate levels. They noted that programmes that integrate arts and humanities into STEMM disciplines are more common, and more frequently evaluated, than programmes that integrate STEMM into arts and humanities disciplines.

The ASHA programme under study is explicitly interdisciplinary in design, as it draws students from both the Faculty of Arts and the Faculty of Science. Professors teaching in the programme are encouraged to reflect on, and teach about, the contributions of their home discipline to interdisciplinary research and academic endeavours.

Honours Programmes and Learning Communities

Post-secondary honours programmes have a long history in the United States, dating back to the 1800s, and are now common in most universities. Rinn and Plucker (2019) conducted a systematic review of the literature on undergraduate honours programmes, finding 52 empirical studies published between 2002 and 2017. They divide this literature into two groups: one set of studies looks at the characteristics of individual students that predict their achievement in honours programmes; the second looks at the effects of honours programming on student outcomes.

Most studies find that honours programmes have positive impacts on grades, retention, graduation rates, intellectual outcomes, and social and emotional outcomes (Rinn & Plucker, 2019; Savage, 2019). Unfortunately, this literature is plagued by selection bias, as it is very hard to disentangle the effects of the programmes themselves from the effects of the characteristics of the students who self-select into such programmes (Bowman & Culver, 2018; Cognard-Black, 2019). Several authors argue that in order to understand how and why honours programmes are successful, researchers need to shift their focus to the subjective experience of students in these programmes, as opposed to objective measurable outcomes such as GPA or retention rates (Bottoms & McCloud, 2019; Mould & DeLoach, 2017).

In Canada, evaluation research has been published on two honours programmes - the University of Toronto's First-Year Learning Communities (FLC) (Goldman, 2012) and McMaster University's four-year long Honours Integrated Science Programme (iSci) (Symons et al., 2017). These evaluations are very positive, highlighting students' reports of both academic and social benefits, including more interaction with professors and with like-minded peers. However, neither of these programmes is designed explicitly to foster interdisciplinarity across science and the arts.

The ASHA programme under study is a unique honours programme where students are placed in an interdisciplinary cohort yet conduct their independent research and write their honours thesis in their home discipline. It was designed to enable students to experience the breadth of interdisciplinary studies while still maintaining the depth of exploration necessary to attain an honours degree in a specific discipline. Moreover, it was explicitly designed to bring together students from two separate faculties who would not normally take classes together.

High Impact Practices

There has been much research on the effects of high impact educational practices on student outcomes. These are defined as transformative undergraduate learning experiences that increase student satisfaction, success, and retention (Bernstein, 2018). In his seminal work, Kuh (2008) listed the following six high impact practices: field internships, leadership experiences, learning communities, research experiences, study abroad, and service learning. Since the mid 2000's there has been a push to emphasize such practices in Canadian universities (Bartlett, 2003; Hoddinott & Wuetherick, 2006).

Much of the research on high impact practices focuses on administrative goals of boosting student satisfaction, student engagement, and retention (which in turn boost University-level rankings) (Mitchell, 2022). Universities sometimes use high impact practices to attract students (Wells et al., 2022). Researchers have shown that the assessment of high impact practices should also include student feedback, focusing on benefits to students as well as to the institution (Finley, 2019).

The ASHA programme under study offers students exposure to three of Kuh's (2008) high impact practices: it is a learning community, students are involved in research, and students are encouraged to study abroad. We examine ASHA students' reflections on these experiences. As not all ASHA students conduct research or study abroad, we assess whether students who are able to take advantage of these opportunities have different opinions about the programme than those who do not.

Description of the ASHA programme and Research Questions

ASHA is based at a large, research-intensive university in Western Canada, which had 24,200 undergraduate and 6,500 graduate students enrolled in 2019. The ASHA, established in 2007, is a joint programme between the two largest undergraduate Faculties, Arts and Science, admitting 25-30 high achieving incoming students each year. ASHA students are required to maintain a GPA of 3.5 or higher throughout their time in the programme and complete an honours degree in their chosen discipline. They take one year-long required course in their first year, two required courses in each of their second and fourth years, and a research seminar in their final year. Professors from both the Faculty of Arts and the Faculty of Science teach in ASHA in two-year rotations. Professors are given the freedom to design their courses independently and are encouraged to highlight their own discipline.

ASHA students are also required to take a year's worth of a language course or an approved equivalent language experience (a course in a computer science language, or learning a new instrument, for example), and to spend a semester abroad or participating in an approved equivalent culturally immersive experience (volunteering in a small rural community in Canada, for example). There is some flexibility about the required study abroad requirement, if travel is not possible due to financial limitations, health problems, etc.

The ASHA programme is distinctive in Canada in that it is an interdisciplinary honours programme that is also a community of learners, drawing students together during all four years of their degree. Also uniquely, it provides students equal exposure to arts and science disciplines and accepts equal numbers of students from the Faculty of Arts and the Faculty of Sciences. We explore past and present students' perspectives on ASHA, posing the following three research questions.

1. What are past and present students' experiences of ASHA?
2. Do Faculty of Arts and Faculty of Science students experience ASHA differently?
3. Which of the high impact practices included in ASHA programming affect student experience?

Method

Participants

Respondents included past and present students who were admitted during the first eleven years of the ASHA programme from 2007-2018. Past students were not required to have completed the ASHA program to be eligible for the study.

A total of 108 survey responses were collected, accounting for 39% of the total number of students (280) who were admitted to ASHA from 2007-2018. The sample composition is shown in Table 1. Sixty (56%) were former students and 48 (44%) were current students. The respondents were almost evenly split between Arts majors (53%) and Science majors (46%). Approximately 40% of the former students who answered the survey had completed all the ASHA requirements (including the independent research project) and received the certificate, while approximately 80% of current students were expecting to receive the certificate. Seventy-seven percent of respondents had travelled abroad or intended to travel abroad.

Table 1

Characteristics of ASHA Student Sample (N=108)

Variable	*N*	%
Student status		
Current	48	44.4
Former	60	55.6
Studied / plan to study abroad		
Yes	83	76.9
No	25	23.1
Faculty[a]		
Arts	57	52.8
Science	50	46.3
Received / expect to receive certificate (research)		
Current	39/48	81.0
Former	24/60	40.0

Note. [a] One respondent did not provide their Faculty.

Materials

Several quantitative measures were employed to assess students' experiences of the ASHA programme. First, respondents rated their overall academic, social, and advisory experience with the programme on a 5-point Likert scale with 1=poor and 5=excellent. Next, respondents rated the extent to which they agreed with the following statements on a scale of 1-5 (1=strongly disagree to 5= strongly agree): "ASHA is/was a positive experience for me", "I learn/learnt a lot in ASHA", "I enjoy/enjoyed my ASHA classes", "I made friends with my ASHA cohort", "ASHA classes

are/were intellectually challenging", "It is/was easy to fit ASHA classes into my schedule", "ASHA affected the direction I took in my undergraduate degree", and "Being in ASHA has given/gave me a sense of community" .

Former students were also asked to rate their level of agreement with the following statements: "ASHA helped me get to where I am today", "I am still in touch with students I met in ASHA", "I am still in touch with ASHA professors", "I use the things I learnt in ASHA in my day to day life", "I reflect on the things I learnt in ASHA frequently", and "I am glad I participated in ASHA".

The qualitative portion of the survey contained four open-ended questions: 1) "What is one important thing you learned from ASHA? Identify specific skills that ASHA helped you cultivate"; 2) "How are your ASHA courses different from your other courses?"; 3) "From your experience, identify the most positive features of the ASHA programme"; 4) "From your experience, identify the most negative features of the ASHA programme. Do you have any suggestions for improving the programme?"

Respondents were classified according to whether they were current or former students, their Faculty (Arts or Science), whether they studied abroad or not (current students who planned to study abroad were coded as 'yes'), and whether they obtained the ASHA certificate (which indicated that they had completed the research portion of the ASHA curriculum). All quantitative data were analyzed in IBM SPSS, Version 28, while qualitative data were saved as text data and analyzed in NVivo.

Procedures

The research team obtained approval from the University's research ethics board. We used non-probability sampling methods, starting with convenience sampling by sending a recruitment email to all alumni and current students for whom we had contact information. They were encouraged to forward the recruitment message to others who may be interested in the study. We also posted the survey link on the ASHA Facebook page and the ASHA Alumni Facebook and LinkedIn pages. Responses were anonymous, but participants were able to enter their email address separately from the survey data to receive a $20 Amazon gift card.

Data Analysis

This study used a convergent parallel mixed methods design where quantitative and qualitative data were collected in parallel (in the same online survey), analyzed separately, and then findings were merged (Creswell & Plano Clark, 2011). The quantitative data were used to summarize respondents' experiences with the ASHA programme, comparing their assessments across faculty, study abroad experience and certificate completion status. The qualitative data were used to probe students' experiences in more detail particularly about important lessons learned and skills cultivated. Having both quantitative and qualitative data enabled the research team to provide a more comprehensive assessment of students' experiences of the programme.

For the quantitative portion of the research, we first examined overall student ratings of their academic and social experiences. We next examined bivariate relationships between students' background and their opinions about the ASHA programme. We conducted a factor analysis to summarize students' experiences of ASHA. We then used these factor scores as dependent variables in multivariate regression analyses examining the combined effects of participants'

faculty, participation in study abroad, and completion of the ASHA certificate on attitudes about the programme.

We conducted thematic analysis of the qualitative data using grounded theory and theoretical coding (Thornberg & Charmaz, 2014). Two authors coded each response, and four of the authors examined the coding for reliability and consistency. We looked for patterns amongst the codes to see where themes co-occurred. We summarized the frequency of the themes and examined whether they varied by the student characteristics. We report on the most frequently occurring themes with illustrative quotes chosen for representativeness.

Results

Ratings of ASHA

Table 2 shows respondents' overall ratings of ASHA. Respondents rated both academic and social experiences in ASHA very highly (mean score 4.4 on a scale of 1 (poor) to 5 (excellent)). The advisory experience was rated lower, receiving an average score of 3.6, but the difference between the advisory score and the other scores was not statistically significant.

The lower sections of Table 2 show the relationship between student characteristics and their ASHA ratings. Significant differences between rows (categories of student characteristics) are noted with asterisks. There are no differences between arts and science students' ratings. However, current students rated their overall experience slightly higher than former students. Those who studied abroad gave significantly higher ratings of academic, advising, and overall experience than those who did not study abroad. Those who completed the research requirement and received ASHA certificates rated their academic and overall experiences higher than those who did not.

Table 3 shows the average ratings on the more specific attitudinal questions. With two exceptions, respondents rated each of the dimensions about which they were asked very highly. Except for "ASHA classes were easy to schedule" and "ASHA affected my sense of direction in my undergraduate degree," the average scores were all above 4 (on a 5-point scale from strongly disagree to strongly agree).

We find that science students rated the social aspects more highly than arts students. Those who studied or plan to study abroad found ASHA more intellectually challenging than those who did/do not and found a stronger sense of community. Those who studied abroad were more likely to say that ASHA affected their sense of direction in their undergraduate studies than those who did not. Finally, students who received or plan to receive the ASHA certificate (meaning that they completed or will have completed the research requirement) rated almost all aspects of the programme more highly than those who did/do not.

Table 4 shows the results of the additional attitudinal questions we asked former students. These students also rate their experiences very positively. There are no differences in ratings between arts and science students. Former students who studied abroad were in general more positive about their ASHA experience, as were former students who had completed an independent research project.

Table 2

Relationship Between Student Characteristics and Overall Experiences with ASHA

	N	Academic Experience[a] Mean (SD)	Social Experience[a] Mean (SD)	Advising Experience[a] Mean (SD)	ASHA is / was a Positive Experience[b] Mean (SD)
Overall	108	4.36 (.757)	4.35 (.979)	3.61 (1.118)	4.66 (.799)
Student status					
Current	48	4.45 (.583)	4.46 (.849)	3.65 (.911)	4.88* (.334)
Former	60	4.30 (.869)	4.27 (1.07)	3.58 (1.27)	4.48* (1.00)
Studied abroad					
Yes	83	4.49* (.572)	4.42 (.952)	3.81* (1.01)	4.76* (.66)
No	25	3.96* (1.10)	4.12 (1.05)	2.96* (1.24)	4.32* (1.11)
Faculty[c]					
Arts	57	4.25 (.837)	4.28 (1.08)	3.46 (1.10)	4.54 (.908)
Science	50	4.48 (.646)	4.44 (.861)	3.78 (1.13)	4.78 (.648)
Certificate / Research					
Yes	63	4.52* (.593)	4.46 (.895)	3.71 (.991)	4.90* (.296)
No	45	4.16* (.903)	4.20 (1.08)	3.47 (1.27)	4.31* (1.10)

Notes: [a:] 1=poor, 5 = excellent; [b:] 1 = strongly disagree; 5 = strongly agree; [c:] One respondent did not provide their Faculty; *Difference between categories of the student characteristics (rows) significant at $p<.05$

Table 3

Relationship Between Student Characteristics and Detailed Experiences with ASHA

	N	Learned a Lot Mean (SD)	Enjoyed Classes Mean (SD)	Made Friends Mean (SD)	Intell. Challenge Mean (SD)	Easy to Schedule Mean (SD)	Affected Direction Mean (SD)	Sense of Commun. Mean (SD)
Overall	108	4.45 (.778)	4.56 (.801)	4.52 (.859)	4.44 (.910)	3.69 (1.220)	3.44 (1.270)	4.20 (1.125)
Status								
Current	48	4.58 (.577)	4.69 (.468)	4.73* (.610)	4.56 (.681)	3.73 (1.18)	3.71* (1.22)	4.46* (.898)
Former	60	4.35 (.899)	4.45 (.982)	4.35* (.988)	4.35 (1.06)	3.65 (1.26)	3.22* (1.28)	4.00* (1.25)
Abroad								
Yes	83	4.51 (.705)	4.64 (.673)	4.58 (.899)	4.55* (.753)	3.71 (1.20)	3.57* (1.25)	4.40* (1.02)
No	25	4.28 (.980)	4.28 (1.10)	4.32 (.690)	4.08* (1.26)	3.60 (1.32)	3.00* (1.26)	3.56* (1.23)
Faculty[a]								
Arts	57	4.44 (.866)	4.51 (.947)	4.37* (1.05)	4.40 (.997)	3.88* (1.04)	3.39 (1.21)	4.02* (1.26)
Science	50	4.46 (.676)	4.60 (.606)	4.70* (.544)	4.48 (.814)	3.46* (1.39)	3.48 (1.36)	4.40* (.926)
Certificate								
Yes	63	4.65* (.513)	4.70* (.557)	4.65* (.765)	4.62* (.580)	3.75 (1.18)	3.75* (1.16)	4.46* (.877)
No	45	4.18* (.984)	4.36* (1.03)	4.33* (.953)	4.20* (1.20)	3.60 (1.29)	3.00* (1.30)	3.84* (1.33)

Notes: Scale: 1 = strongly disagree; 5 = strongly agree; [a] One respondent did not provide their Faculty; *Difference between categories of the student characteristics (rows) significant at $p<.05$.

Table 4

Relationship Between Student Characteristics and Detailed Experiences with ASHA – Former Students Only

	N	Helped me get where I am Mean (SD)	Still in touch – students Mean (SD)	Still in touch – instructor Mean (SD)	Use in life Mean (SD)	Reflect on ASHA Mean (SD)	Glad I participated Mean (SD)
Overall	60	3.48 (1.321)	3.97 (1.221)	2.42 (1.319)	3.57 (1.095)	3.63 (1.221)	4.43 (1.064)
Abroad							
Yes	45	3.78* (1.17)	4.04 (1.22)	2.67* (1.26)	3.76* (.933)	3.78 (1.09)	4.64* (.883)
No	15	2.60* (1.41)	3.73 (1.22)	1.67* (1.23)	3.00* (1.36)	3.20 (1.52)	3.80* (1.32)
Faculty[a]							
Arts	34	3.44 (1.33)	3.76 (1.39)	2.38 (1.37)	3.50 (1.11)	3.65 (1.30)	4.24 (1.18)
Science	25	3.56 (1.36)	4.24 (.926)	2.48 (1.30)	3.72 (1.06)	3.60 (1.16)	4.68 (.852)
Certificate							
Yes	24	4.00* (1.02)	4.13 (1.22)	3.13* (1.39)	4.04* (.751)	4.08* (.929)	4.92* (.282)
No	36	3.14* (1.40)	3.86 (1.22)	1.94* (1.04)	3.25* (1.18)	3.33* (1.31)	4.11* (1.26)

Notes: Scale: 1 = strongly disagree; 5 = strongly agree; [a] One respondent did not provide their Faculty; *Difference between categories of the student characteristics (rows) significant at $p<.05$.

Summary of Experiences

To summarize students' experiences, we conducted an exploratory factor analysis on the detailed attitudinal questions. We used principal components analysis with varimax rotation and extracted factors with eigenvalues greater than one. Results for all students (including the seven variables from Table 3) are shown in Table 5 and results for former students (including the thirteen variables from Tables 3 and 4 combined) are shown in Table 6, with coefficients less than .6 suppressed (Kim & Mueller, 1978).

Two factors emerged for all students (Table 5). The first factor, which explained 33% of the variance in the data (Cronbach's Alpha .744), includes "I learn/learnt a lot in ASHA," "I enjoy / enjoyed my ASHA classes," and "ASHA classes are / were intellectually challenging." We label this factor "Academic Experience". The second factor, which explained 32% of the variance (Cronbach's Alpha .827), includes "I made friends with my ASHA cohort," and "Being in ASHA has given me a sense of community." We label this factor "Social Experience." These results clearly point to the fact that the ASHA programme affects two distinct areas of students' university experience—academic and social.

A third factor emerged for the former students (Table 6) in addition to the academic and social experience factors, The third factor, explaining 21% of the variance (Cronbach's alpha .724), included: "ASHA affected the direction I took in my undergraduate degree" and "ASHA helped me get to where I am today," We label this factor the "Long-Term Direction" factor.

Table 5

Factor Analysis of Attitudinal Variables – All Students

	Factor Loading	
Item	I	II
I learn/learned a lot in ASHA	.854	
I enjoy/enjoyed my ASHA classes	.721	
ASHA classes are intellectually challenging	.657	
It is easy to fit ASHA classes into my schedule	.641	
I have made friends with my ASHA cohort		.907
ASHA has given me a sense of community		.878
Variance Explained	33%	32%
Cronbach's Alpha	.744	.827

Notes: Factor loadings less than .60 were suppressed. *N*=108. "ASHA affected the direction I took in Undergraduate" did not load on either factor.

Table 6

Factor Analysis of Attitudinal Variables – Former Students

	Factor Loading		
Item	I	II	III
I learned a lot in ASHA	.844		
I enjoyed my ASHA classes	.836		
ASHA classes are intellectually challenging	.788		
I am glad I participated in ASHA	.812		
I have made friends with my ASHA cohort		.832	
Being in ASHA gave me a sense of community		.684	
I am still in touch with students I met through ASHA		.860	
ASHA affected the direction I took in undergrad			.658
ASHA helped me get where I am today			.724
Variance explained	31%	21%	21%
Cronbach's Alpha	.915	.869	.724

Note. Factor loadings less than .60 were suppressed. *N*=60.

"Easy to schedule ASHA classes", "Still in touch with ASHA professors", "Reflect on ASHA frequently", "Use thing I learnt in ASHA in my day to day life", and "I am glad I participated in ASHA" did not load on any factor. We ran multiple regression models to examine the combined impact of the student characteristic variables on the factor scores. These results, shown in Table 7, illustrate that once all the student characteristics are included in the model, none of the student variables affect the Academic Experience factor score. However, compared to arts students, and controlling for whether they went abroad or received the certificate (indicating that they completed the research portion of the ASHA curriculum), students from the sciences scored higher on the Social Experience factor. Former science students scored lower than former arts students on the Long-Term Direction factor, and those who received the ASHA certificate (indicating that they completed independent research) also scored higher on this factor.

Table 7

Factor Scores Regressed on Student Characteristics

	All Students Academic experience	**All Students** Social experience	**Former** Academic experience	**Former** Social experience	**Former** Long term direction
Science (Reference Arts)	-.234	.393*	.256	.548*	-.530*
Studied abroad	.141	.433	.189	.213	.401
Received / expect to receive ASHA certificate	.413	.233	.343	.152	.530*
Former (Reference Current)	-.021	-.307			
Adjusted R^2	.029	.117	.011	.048	.144
N	107	107	59	59	59

Note. * Significant at $p<.05$

Thematic Analysis of Qualitative Data

Table 8 illustrates the frequency of the main themes that emerged from our analysis of the four open-ended questions focusing on the students' accounts of their ASHA experiences. We include quotes throughout this section which are illustrative of the most common responses.

Table 8
Frequency of Themes Mentioned by Students in Qualitative Responses

	Number of Students	Percent of Students
What did you learn?		
Academic skills	98	91
Interdisciplinarity	43	40
Ways of thinking	71	66
Personal growth	41	38
How was ASHA different?		
Class size	39	36
Course structure	59	55
Varied ways of thinking	55	51
Positive aspects of ASHA		
Community	58	54
Course content	67	62
Negative aspects of ASHA		
Lack of Advising	15	14
Difficulty Scheduling Classes	12	11

Note: Each theme was counted only once per student.

What Did You Learn?

We asked the students what they learned in ASHA. Four themes emerged from their responses: academic skills; interdisciplinarity; ways of thinking; and personal growth. Almost all the respondents noted that their academic skills had improved because of the ASHA classes. Specific academic skills mentioned included reading and writing, research, statistical skills, presentation skills, and public speaking.

> "I learned how to think, not what to think. ASHA generally prepared me for academic processes like research and paper writing and ethics before other classes. I felt better prepared than non-ASHA peers." (Former Student, Arts)

Many students also noted that their soft skills had improved, especially communication skills, such as active listening, collaboration, and navigating interpersonal relationships. Science students were more likely to mention communication skills than arts students.

Almost half of the respondents mentioned interdisciplinary thinking as one of the most important skills they learned in their ASHA classes. Students wrote that the structure and content of the courses, as well as the interactions with their peers in their ASHA classes, encouraged thinking through an interdisciplinary lens. Both science and arts students commented that

interdisciplinarity helped them approach their work in their primary subjects with a broader perspective.

> "I have learned to look at things beyond the lens of my field, and to assess my own work in an interdisciplinary manner. For example, while I was sharing my research during the capstone seminar, many thought-provoking questions on the economic and social impact of my project were raised, which I had admittedly not thought about before." (Former Student, Science)

> "One important thing I have learned is that one does not have to feel restricted and limited by a discipline. Just because you are an arts student does not mean you cannot explore or enjoy or excel in concepts/subjects that belong to the sciences. I learned how you can obtain a more cohesive interdisciplinary experience that balances out multiple areas of interest without confining one to a box limited to one area of interest." (Former Student, Arts)

Many respondents mentioned the variety of ways of thinking as one of the most important skills they learned in their ASHA classes. These included critical thinking, adaptive thinking, and creativity. Both science and arts students benefitted from learning how to think critically.

> "The most important lesson I have taken from ASHA is the importance of problem solving through critical thinking. In reflecting back on my ASHA experience, I realized the one over-arching theme is the importance of critical thinking, a skill I think society is greatly in need of at present." (Former Student, Arts)

> "ASHA helped me think more critically about the world. It made me question what I was even doing in university, why I was studying, and what the point was. I began to critically reflect on the systems which privilege certain types of education and achievements and how they often do not truly account for the many different experiences and power structures at play in the world. This critical thinking has led me into a field where power is interrogated and challenged more, and it feels more in line with my values." (Former Student, Science)

Respondents also experienced personal growth in their ASHA classes exhibited through gaining academic confidence, ambition, and leadership experience. Others mentioned respect for others, open-mindedness, self-reflection, and self-discovery. Students who studied abroad also mentioned that they had learned the importance of respect for other cultures and self-reflection.

How Was ASHA Different?

Three main themes emerged when we asked students how their ASHA courses were different from other courses: the size of the classes; course structure; and encouraging varied ways of thinking. Almost a third of respondents mentioned that their ASHA courses were smaller than all the other classes they took during their degree. Most mentioned the collaborative and participatory nature of the classes, commenting that unlike their other classes, ASHA classes encouraged collaboration, discussion, debate, participation, and interaction. Almost half the

students mentioned that the courses encouraged different ways of thinking including interdisciplinary, creativity, and critical thinking.

> "The class size was very small, and this greatly increased the quality of discussions. There was more depth to ASHA than other courses, it felt more like a graduate level course than an undergraduate course." (Former Student, Arts)

Positive Aspects of ASHA

Two main themes emerged in response to a question about the most positive aspect of ASHA—the community, and the course content. Respondents who mentioned the community aspect stressed that being with the same group over time contributed to their positive class experiences. Science students mentioned the community aspect more than arts students, and those who studied abroad were more likely to mention peer friendships than those who did not.

> "The sense of community is like no other. Sharing this experience with like-minded passionate and intellectually curious peers has been incredible. For the first time in my life, I feel like I found my people. They have offered me so much support and love. Everything I have learnt is in part because of them. I have made lifelong friends with my future colleagues." (Current Student, Arts)

> "The most positive feature of the programme was the opportunity to develop community. My personal experience during my undergraduate was rife with a feeling of loneliness and disconnect as I failed to make meaningful connections with others in my major courses, in large part due to the large class sizes but also due to the lack of opportunity to be vulnerable in those classes, which I consider an essential component to making connections." (Former Student, Science)

Students also mentioned the academic freedom they felt ASHA gave them, including the freedom to be creative and solve problems, and the flexibility and the self-directed nature of many of the assignments in the ASHA courses. The quotes below suggest that specific ASHA requirements, including conducting an independent research project and traveling abroad, were positive experiences.

> "Traveling abroad was a great experience for me personally. The best things from the programme are all the ones that forced me to do something uncomfortable, or something I wouldn't have done otherwise." (Current Student, Arts)

> "ASHA taught me how to write a research paper long before any of my other courses, giving me an advantage throughout my undergraduate career." (Former Student, Arts)

Negative Aspects of ASHA / Improvements

Asked what they thought could be done to improve ASHA, students focussed on the structure of the programme and the advising support. In terms of programme structure, the respondents pointed out problems with course continuity and the turn-over of professors, compatibility with other majors, course clarity and content. Students found it difficult to schedule

their ASHA classes around their other courses. Problems with advising support included the clarification of requirements, and the need for more support for mental health issues.

Discussion

What Are Past and Present Students' Experiences of ASHA?

Triangulating our quantitative and qualitative results, we return to a discussion of our research questions. Measured quantitatively, we find that students' academic, social, and overall experiences of ASHA were generally very positive. Two factors accounted for most of the variation in attitudes for all students—Academic Experience and Social Experience. A third factor emerges for former students—the effect of ASHA on students' Long-Term Direction. These findings reflect those of others who have examined the short and long-term benefits of both undergraduate learning communities and honours programmes (Rinn & Plucker, 2019; Taylor et al., 2003). Importantly, the benefits are not just academic, but extend to the social, and even beyond the university years. As universities become more attuned to student mental health, it will be important to continue to support and develop programmes that attend to students' social, as well as their academic, needs.

The qualitative data allow us to delve more deeply into the students' experiences with ASHA. Academically, students felt that they learned writing, presentation, and research skills in the programme. They also learned to value interdisciplinarity, critical thinking, and collaboration. Socially, the students clearly valued the ASHA community. The ASHA programme appears to have similar effects to many other interdisciplinary learning environments (White & Nitkin, 2014), improving both the academic and the social experience for high achieving post-secondary students. Almost 60% of the former students in our survey reported obtaining further education after leaving university; these students are well-positioned to succeed in interdisciplinary graduate programmes and workplaces.

Do Arts and Science Students Experience ASHA Differently?

While the academic experience did not seem to differ between arts and science students, both former and current science students consistently scored higher on the social experience measures than arts students. It appears that being in ASHA had more social benefits for science students than for arts students. We speculate that this might be because undergraduate science classes tend to be larger than arts classes at the University under study, and typically are taught in a lecture style. Therefore, it might be harder for science students to make friends or find community in their own disciplines.

Science students were more likely to mention the cohort / community as the most positive aspect of ASHA in the qualitative responses. They were also more likely to mention learning communication tools such as listening and collaborating and navigating interpersonal relationships and creativity as the skills they learned in ASHA. These findings are in line with findings in the NASEM report of 2018, which stressed the importance and value of integrating arts and humanities into STEMM disciplines (National Academies of Sciences, Engineering and Medicine, 2018).

Former arts students were more likely than former science students to feel that ASHA influenced their sense of direction. Those who studied abroad noted that the experience of studying abroad had an impact on their lives after graduation from university. We were able to capture some

of these long-term effects of the ASHA programme through our qualitative data, highlighting the importance of listening to student voices, and not just using quantitative measures such as grades and retention rates when evaluating educational programmes (Wong, 2015). A future study could compare the experiences of honours arts and science students from the same university who were not in the ASHA programme to examine whether the differences between the arts and science students are independent of ASHA participation.

Which High Impact Practices Included in ASHA Programming Affect Student Experience?

The quantitative data illustrate that two of Kuh's high impact practices (2008)—studying abroad and completing an independent research project to receive the ASHA certificate —were correlated with students' higher rankings on academics and more positive attitudes about the programme overall. Amongst former students, those who studied abroad were more positive about their ASHA experience and reported that it affected their lives more than those who did not study abroad.

Studying abroad and research also came up multiple times in the qualitative data, indicating that these high impact practices had influence. Additionally, those who studied abroad were more likely to mention lasting friendships as the most positive aspect of ASHA. The students who felt best about the ASHA programme were those who were able to engage in both study abroad and research, providing evidence for the importance of these high impact practices for student growth and satisfaction (Kuh, 2008).

In summary, integrating the quantitative and qualitative data demonstrates that while both science and arts students benefit academically and socially from the interdisciplinary content and the cohort nature of the ASHA programme, science students benefit more socially, while former arts students feel that ASHA affected their trajectories post-graduation more directly. Both science and arts students emphasize studying abroad and the independent research experience as the most impactful programme requirements.

Limitations

As is common with all studies of honours programmes and learning communities, this study suffers from selection bias (Bowman & Culver, 2018). First, ASHA students are high achievers and may not be representative of the entire student body. Second, the students who chose to participate in the research project (particularly the former students) may be more likely to have positive memories of ASHA.

We also acknowledge that there may be social desirability bias in participants' responses. Although the survey was anonymous, students would have realized that researchers might be able to deduce their identity through a combination of cohort and degree. Even though none of the researchers was involved with the ASHA programme at the time of the survey (or since), two of the researchers taught in the ASHA programme in the past. Students may have felt obligated to report positively on their experiences if they felt it would please their former professors.

We do not claim to provide an evaluation of the ASHA programme, as we do not have a comparison group of similar students who did not participate in ASHA. We certainly cannot attribute respondents' academic or social outcomes solely to the ASHA programme. It may be that these students would have excelled at university even without the ASHA programme. However,

many of the quotes illustrate that the students themselves found the ASHA experience, including research and studying abroad, to be a highlight of their undergraduate degree.

Conclusion

While most research on interdisciplinary undergraduate education has focused on individual courses, this study provides a student view on an entire interdisciplinary programme (Lattuca et al., 2017; Shandas & Brown, 2016). ASHA students recognize and celebrate the importance of the community they built with their peers, and clearly understand the benefits of exposure to interdisciplinary thinking throughout their undergraduate career.

The unique design of the ASHA programme, which brings together a cohort of high achieving students from across the arts and sciences over four years, enables students to engage in several high impact educational practices. We found that students who studied abroad, and those who conducted independent research, were most positive about their experiences.

Our analysis leads us to draw several conclusions about implementing undergraduate interdisciplinary honours programmes. First, such programmes clearly benefit both arts and science students and therefore should be offered across and between faculties. Meanwhile, research should be conducted to examine the possible differential effects of the programmes on students from different disciplinary backgrounds. Second, students who conducted research and studied abroad benefitted more from the programme than those who were unable to complete the requirements. These high impact practices should be included in such programmes.

As many other authors have argued, honours programmes should undergo regular evaluation and should adjust to the evolving needs of undergraduate students (Rook, 2020). Most importantly, such evaluations should include student voices (Bottoms & McCloud, 2019). We conclude with a quote from a former student, which highlights the profound impact ASHA had on both their academic and their personal life. “ASHA taught me how important it is to find people who you are not afraid to express yourself to and who will support you academically, professionally, and personally. ASHA gave me another family.” We hope that future such programmes will have similar impact.

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