



Journal of Educational Studies and Multidisciplinary Approaches (JESMA)

www.jesma.net

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To cite this article:

Zhu, G. & Burrow, A.L. (2022). Youth Voice in Self-Driven Learning as a Context for Interdisciplinary Learning. *Journal of Educational Studies and Multidisciplinary Approaches (JESMA)*, 2 (1), 131-154. <https://doi.org/10.51383/jesma.2022.29>

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Youth Voice in Self-Driven Learning as a Context for Interdisciplinary Learning

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ARTICLE INFORMATION

Original Research

Doi: 10.51383/jesma.2022.29

Received 05 November 2021

Revision 04 December 2021

Accepted 25 January 2022

ABSTRACT

The recognized importance of including student voice in learning has grown. Youth leadership, which empowers young people to choose the learning topics that they are passionate about, may provide a context for exploring complex issues that demand interdisciplinary solutions. This study explored the extent to which youth chose to pursue interdisciplinary learning topics and why they chose certain learning topics (i.e., task values: “why do I do this”) when they were supported to lead their own learning. Through a content analysis of the application materials of 800 youth ($M_{age}=16.59$) participating in a 10-week self-driven learning program called *GripTape*, we found that 44% of learners chose interdisciplinary learning topics. Compared to those who chose single-subject topics, youth who chose interdisciplinary learning topics placed significantly greater prosocial value on learning but placed lower intrinsic or interest value. The selection of interdisciplinary learning topics was positively correlated with social science-relevant learning topics; social science-relevant learning topics were positively correlated with prosocial value. The results suggest that when youth voice is empowered in self-driven learning, youth may be willing to explore complex societal issues and pursue interdisciplinary knowledge.

Keywords: Adolescents, interdisciplinary learning, leadership, self-driven learning, task values, youth voice



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Introduction

Student voice work concerns the ways in which youth can participate in learning decisions that will shape their own lives and that of their peers (Fielding, 2001; Levin, 2000). Student voice has been nominated as a component of youth positive development (Perkins & Borden, 2006), to the extent that it helps students be more engaged and see themselves as knowledge creators (Mitra, 2018), improves classroom practice and academic performance (Conner & Slattery, 2014), and helps educators understand students' specific perspectives on learning issues (Mitra, 2018). Therefore, including student voice in decision-making concerning what and how to learn is increasingly recognized as important (Mitra, 2006, 2018).

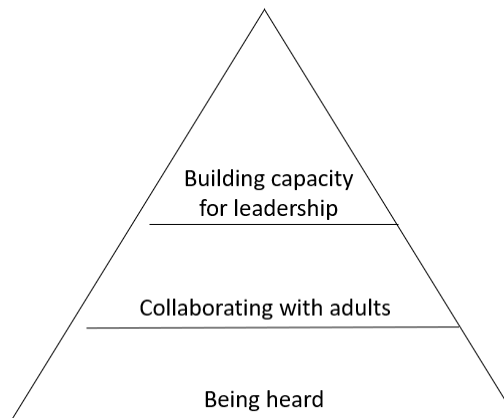
Although the importance of youth voice is emphasized, opportunities are often limited to listening to youth and asking about their concerns and desires for youth programs (Serido et al., 2011). Youth lack opportunities to lead their learning, exert decision-making power, or put their voice into action (Evans, 2007; Lerner, 2002). Youth programs have the potential to promote the civic engagement of young people, and youth voice helps them authentically engage in community initiatives and societal challenges (Serido, 2011; Stoll, 2020). Furthermore, understanding complex community and societal problems, situations, and themes requires youth to draw and integrate knowledge derived from multiple disciplines – a hallmark of interdisciplinary learning (Fraser & Greenhalgh, 2001; Ivanitskaya et al., 2002). Interdisciplinary learning also requires youth's greater voice and more central roles in learning because passive learners can hardly integrate disciplinary perspectives. As a result, youth voice may provide a context for interdisciplinary learning as students navigate complex and authentic issues at the school, community, or even statewide levels. However, limited studies focus on whether youth voice promotes interdisciplinary learning, what topics youth are passionate about and why. Therefore, educational programs may miss opportunities to incorporate evidence-based practices that support interdisciplinary learning.

Here, we consider one revelatory and novel case of youth self-driven learning programs that provides a context to nurture youth voice and implement their leadership. The program entitled *GripTape* offers adolescents between 14- and 19-years old opportunities to pursue learning challenges that they are passionate about. It serves as an ideal context to examine when youth voice is empowered in their decision-making, what learning topics they choose, the extent to which their preferred interdisciplinary learning topics, and why they choose certain tasks (i.e., subjective task values).

Student Voice and Self-driven Learning

Student voices can play roles at different levels. In the pyramid of student voice framework, Mitra (2006, 2018) described a three-level pyramid of student voice: being heard, collaborating with adults, and building capacity for leadership (see Figure 1). The higher the pyramid, the greater leadership students would take and the more they would benefit (Mitra, 2018). "Being heard" is the most basic and common form of student voice. It is about listening to students' perspectives and experiences and interpreting the data collected from them. The "collaborating with adults" level describes students and adults working together at school to make changes. At this level, adults tend to initiate relationships and make final decisions. At the top of the pyramid is "building capacity for leadership". At this level, students take the leadership roles in initiating relationships and making decisions with adults' assistance.

Figure 1. Pyramid of Student Voice (adapted from Mitra, 2006; 2018)



Although the pyramid of student voice framework was developed in a school reform context, it can be applied to other contexts that respect and enable youth to freely state their opinions and ideas (Fredericks et al., 2001). Particularly, community-based organizations provide settings for youth voice to flourish (Mitra, 2018) and can nurture youth activism (Kirshner, 2015) because youth are not constrained by teacher-student relations in these settings. Youth need opportunities to assume and practice leadership roles to prepare for future adult responsibilities (Connell et al., 1998). However, the narrowing shape of the pyramid indicates that it is relatively challenging for youth to take greater agency and leadership in an organization, and it is hard to maintain youth's leadership roles. One reason is that groups used to traditional roles may continually push against counter-normative forces (Mitra, 2018). Macedo and Freire (1994) suggested that voice cannot be simply given but requires struggles; the most that educators can do is creating structures that enable the emergence of submerged voices.

Youth are often willing and able to raise issues that adults try to avoid or might not see (Mitra, 2018). Smyth (2007) suggested that even those not succeeding in the current school system can provide insights concerning school structure and culture problems. In community-based organizations, youth not only can work on school-specific problems but also can tackle community and statewide issues (Mitra, 2018) or even beyond. Youth voice is specifically relevant to their goal setting and learning topics. The ones who cannot set their own goals are deprived of their voice and agency, might disagree with the goals set for them, and may not feel obliged to accomplish the goals (Bandura, 1997). Therefore, youth voice concerning what learning topics they perceive as important and relevant is critical (Phillips, 2013). In this study, youth took leadership in determining what to learn, how to learn, and how to evaluate their learning with the assistance of dedicated adults in a youth self-driven learning taking place in a community-based organization.

Interdisciplinary Learning

Interdisciplinary learning is not just about looking at an issue from multiple perspectives without changing the disciplines (i.e., multidisciplinary learning, Kezar & Elrod, 2012) but emphasizes integrating disciplinary perspectives. Educators and policymakers are increasingly interested in supporting interdisciplinary learning opportunities (e.g., Ivanitskaya et al., 2002; Jiang et al., 2019; MacLeod & van der Veen, 2020; Washington STEM Study Group, 2011) because it has several benefits for learners. First, focusing on a problem or theme and comparing and contrasting contributions from the perspectives of multiple disciplines support learners to connect various domains, facilitate them to

develop their personalized organization of knowledge, and promote intellectual maturation (Ivanitskaya et al., 2002). Second, exposure to interdisciplinary learning can foster high-order critical thinking and metacognitive skills (Ivanitskaya et al., 2002). Interdisciplinary learning can help learners sharpen their metacognitive skills as they deliberately expand their knowledge, draw connections between existing knowledge and new interpretations, and reflect on their ways of thinking. Third, the knowledge, skills, and thinking that learners acquire through interdisciplinary learning can be transferred to other contexts and applied to complex real-world issues or problems (Alberta Education, 2015). Finally, interdisciplinary problem solving provides contexts for creativity to arise (Sternberg, 2003; Madden et al., 2013).

Despite these mentioned benefits, several challenges tend to hinder the implementation of interdisciplinary learning. First, as described above, the organization of curricula is usually discipline-specific and does not support students to navigate across disciplines to fully understand a theme or solve a problem (Baloché et al., 1996), especially in the K-12 context. Second, students may not have developed the competencies (e.g., critical thinking, metacognitive skills) to navigate complex problems or deal with conflicting theoretical, epistemological, and methodological intentions at the intersections of disciplinary boundaries or (Ivanitskaya et al., 2002). Third, teachers need to adopt more holistic approaches and support students to take more responsibility in determining their learning content and process to enable them to navigate complex conceptual spaces. In this process, teachers may feel a sense of uncertainty, incompetence, and discomfort (Wilkie, 2004).

Although the need for interdisciplinary learning is well recognized (McNair et al., 2011), current literature on interdisciplinary learning mainly focuses on the conceptual and theoretical perspectives rather than on the practical aspect (Franks et al., 2007). In practice, some explorations have been made in higher education concerning designing interdisciplinary programs, curricula, and research experiences (e.g., Graybill et al., 2006; Hannon et al., 2018). Program designers and instructors in higher education tend to have more control over designing programs and curricula than K-12 teachers. This motivates us to explore when youth take leadership in determining their learning topics and not constrained by curriculum structures, whether and the extent to which they would choose interdisciplinary learning topics.

Subjective Task Values

Youth want to do specific tasks (i.e., learning topics in this study) for reasons (i.e., “Why do I do this”), which can be described as subjective task values (Wigfield et al., 2006). Task values are subjective because different individuals may assign different values to the same task (Wigfield & Eccles, 2020). For instance, some students may learn math because they enjoy doing so while others may do so because math is important to their future. Eccles and colleagues (1983) defined four dimensions of subjective task values: intrinsic or interest value, attainment value, utility value, and cost. Intrinsic or interest value is about individuals performing tasks for enjoyment and subjective interest. Attainment value is the importance of doing a task well because of its connection with individuals’ identity, self-expression, and life. Utility value is more about how tasks relate to individuals’ future goals and doing the tasks for extrinsic reasons (e.g., exploring skills that help pursue a career in the medical field). Unlike other task values, the cost value is about the negative aspects of doing the task, including required time and effort, limited access to other activities, and anticipated emotional cost (e.g., fear of failure, anxiety).

Learners’ task values do not operate isolated or independently but are correlated. Learners may have more than one task values towards an activity, but they may place the values at different orders. These placement/hierarchies are influenced by individual factors such as identities, self-concept, self-schema; characteristics of tasks such as perceived task difficulty, the emphasis of collaboration or competition; individuals’ interpretation of different sources of information; previous experiences and affective memories relevant to tasks; biological needs; social and cultural factors (Higgins, 2007; Wigfield et al.,

2017; Wigfield & Eccles, 2020). The components of values develop over childhood and tend to be more distinguishable and mature at adolescence (Wigfield, 1994). Altogether, youth may have multiple task values towards an activity, and adolescence is an appropriate time to observe various task values. Wigfield and Eccles (2020) provided a comprehensive review of research on 'students' subjective task values and motivation in the past 35 years. Details of definitions of subjective task values, its development, relevant interventions to enhance subjective task values, and future directions can be referred to this article.

Subjective task values and expectancy for success (i.e., "Can I do this," Gaspard et al., 2019) are two core constructs of expectancy-value theory, which suggests that learners' expectations for success and subjective values of domain areas predict their academic choices (Wigfield et al., 2016). Expectancy for success refers to learners' beliefs about how well they can perform on upcoming tasks (Eccles et al., 1983). Learners are more likely to choose academic areas that they believe they can perform well and are important to them. Expectancy-value theory has often been used to explain learners' academic motivations and intentions. For instance, adopting the expectancy-value framework, Ball and colleagues (2017) examined whether changes in students' academic expectancy, intrinsic value, and utility value positively correlate with their STEM attitudes. In another study, Ball et al. (2017) applied the framework to investigate the factors influencing students' intentions and motivations for completing high school and attending college. Gaspard and colleagues (2019) explored how upper secondary school students' expectancies and values in math and English influenced their concurrent academic achievements and future choices of STEM majors at university. In this study, we posited that because the youth chose their learning topics, they had high expectancies for success towards these topics. Therefore, this study focused on what task values motivated the youth to work on their choice's learning topics.

The Current Study

Available research suggests the potential role of community-based organizations in nurturing youth voice (including leadership roles) and promoting interdisciplinary learning because of the weak or absence of curriculum constraints and teacher-student relations. Youth leadership may foster interdisciplinary learning because it supports learners to choose authentic learning topics that they are passionate about. Not only what learning topics adolescents choose are important, but also why they desire to do the task are critical. Adolescence is an appropriate period to observe how individuals may place various task values toward learning activities. This study aims to explore the extent to which youth select interdisciplinary learning topics when they are empowered to drive their own learning; how youth's task values are related to their actual choices of learning challenges in various domains. We explored this question among youth participating in a community-based self-driven program called GripTape. This study examined the following research questions:

1. To what extent do adolescents choose interdisciplinary topics when empowered to lead their own learning?
2. Do task values differ between the *Single-subject Topic* and *Interdisciplinary Topic* groups?
3. Are adolescents' topics of interest associated with their task values in self-driven learning?

Methods

Participants and Procedure

There were 1,217 adolescents accepted by the *GripTape* self-driven learning project (<https://griptape.org/>) from 2016 to 2020. *GripTape* provides opportunities, funding, and adult support for 14 to 19 years old adolescents across the United States to pursue their self-determined learning challenges. The program is driven by a belief that "all young people should have the support and

resources to deepen their interests and chart their path to success” (<https://griptide.org/>). Therefore, priorities are given to youth without an abundance of available learning opportunities. This program usually takes place in three cycles each year, and each learning cycle lasts for about ten weeks. Before each learning cycle, a call for proposals is advertised on the *GripTape* website and social media and distributed through GripTape staff and alumni networks. Various methods are offered for youth to submit their applications, including text, video, and presentations. Applicant selection is made based on *GripTape* staff’s interpretations of (1) whether the youth is passionate about what they have proposed; (2) whether there is a clear and significant learning part in their goals; (3) whether the youth has a starting place for how to approach the challenge. The participants of this study were 800 youth who were accepted to the *GripTape* program and whose textual responses to the application questions were made available to us by program administration. This study focused on participants’ textual responses to questions “*What topic or skills are you planning to explore during this Challenge?*” and “*Why are you passionate about this?*” Participants’ responses ranged from several sentences to several paragraphs. This study was waived from the ethics protocol review by the researchers’ institution because we only have access to unidentifiable information of the participants.

The average age of the 800 participants was 16.59 years old. There were 58.25% female participants, 39.50% male participants, and the other 2.25% participants reported non-binary, other genders, or preferred not to report gender information. One participant could report multiple races/ethnicities. Among the participants, 32.13% did not report race information; 20.75% identified as Hispanic or Latino; 19.63% identified as Black or African American; 11.88% identified as White, Non-Hispanic; 63 identified as Asian/Asian American (7.88%); 7.88% identified as American Indian or Alaska Native; 0.75% identified as Native Hawaiian or Other Pacific Islander; and 4.25% selected other (4.25%).

Ethical Considerations

The data set was collected by the *GripTape* team (<https://griptide.org/>) for internal evaluation and future research purposes. The Institutional Review Board at Cornell University waived the ethics protocol review on January 28, 2021 because we do not have access to the private identifiable information of the participants nor any master list that would allow the re-identification of the data. Derived data supporting the findings of this study are available from the corresponding author upon request and with the permission of the *GripTape*.

Code Development

A coding scheme was developed to analyze the content of the youth’s determined topics or skills, mainly using a deductive qualitative approach (Hsieh & Shannon, 2005; Armat et al., 2018). Common subject and skill classifications guided the development of the coding scheme, and new categories were added inductively when the data did not fit the categories. The learning topics were very diverse; therefore, we used the common subject classification to frame them: Arts & Humanities, Business & Economics, Clinical, Pre-Clinical & Health, Computer Science, Engineering & Technology, Life Sciences, Physical Sciences, Social Sciences and Law (Timers Higher Education, 2020; Cornell University, 2021). Detailed descriptions of each subject classification and relevant examples extracted from the applications of the participants are shown in Table 1.

Sometimes learning challenges were more skill-based rather than knowledge-based. Skills are about individuals’ abilities to do things or work with expertise (Kalyani, 2019). It involves the knowledge of what to do and the procedures, experiences, or habits of how to do it (Kalyani, 2019). Grounded in the data, we added Transferable/Functional skills, Personal Traits/Attitudes skills, and Knowledge-based skills to capture the skills that the learners aimed to develop during their learning challenges (Kalyani, 2019; Skillscan, 2012).

Transferable/Functional skills are a core set of skills and abilities that can be applied in various areas and contexts, such as writing, speaking, and communication skills (Kemp & Seagraves, 1995). Personal Traits/Attitudes skills are individual distinguishing characteristics and qualities that contribute to task performance, such as being confident and independent and opening to different ideas (Skillscan, 2012). Knowledge-based skills refer to knowing specific procedures and information necessary to perform particular tasks such as sewing, baking, and welding (Skillscan, 2012). In this study, we distinguished the code of Arts & Humanities and Knowledge-based skills based on whether a learning challenge emphasizes the artistic, creative value, or talents elements.

There are also cases that the learners mainly aimed to attend or organize an activity (e.g., attending a conference or summer camp, organizing an event) during their learning challenges. Therefore, another big category “Activity” was added in addition to knowledge and skills.

Table 1. A coding scheme of subjects, skills, and activities of participants’ choosing

Dimensions	Sub-dimensions	Descriptions of the sub-dimensions	Examples extracted from participants’ applications
	Arts & humanities	Art, performing arts, design, languages, literature, linguistics, history, philosophy, theology, architecture, and archaeology	Music, Latin American rhythms, music and culture and learn how to play guitar, culture, play a guitar, music industry and production; African heritage through dance, art of dance; Spanish Language and Dominican Culture, I would like to learn other languages, writing stories, poetry, academic papers; film, artwork and art studio, skilled photography, fashion, fashion/Styling and Photography, graphic design, culinary arts and fashion designing, shading in drawings, acting, Branding/Business (skating collective), how business works, business management, attend a business institute, entrepreneurship, run your own business;
	Business & economics	Business and management, accounting and finance, and economics and econometrics.	Entrepreneurship, entrepreneurship and starting a business, enterprise, venture ecosystem, entrepreneurship and leadership The medical field, a medical field with people and with animals, cardiovascular surgeon, Sports Medicine; Neurodegenerative Disease Mental disabilities; Dentist, orthodontist; physical health awareness, create a better way for genuine doctors to both connect with patients and critically understand their symptoms;
	Clinical, pre-clinical & health	Medicine, dentistry, and other health subjects	look for colleges that include nursing programs CS, Artificial Intelligence, Virtual Reality, IT/computer design, UI/UX, games, Blockchain, computer forensics;
	Computer science		computer programming, coding, program, R and Python, software development (coding)
Knowledge	Engineering & technology	General engineering, electrical and electronic engineering, mechanical	Go further in-depth in the sciences programs;

	and aerospace engineering, civil engineering, and chemical engineering	welding and electrical engineering, digital electronics, mechanical engineering, 3D printing; audio engineering, video development as well as editing software Alternative methods for farming, ranch management; Biomedical Engineering, biology or science, biology; Sports management, mindset, and work ethics that are needed to become a great quarterback in football, girls' wrestling
Life sciences	Agriculture and forestry, biological sciences, veterinary science, and sport science	
Physical sciences	Mathematics and statistics, physics and astronomy, chemistry, geology, environmental sciences, and earth and marine sciences.	Math, difficult mathematics topics, such as statistics and calculus; Physics; Chemistry; Pollution, renewable energy YouTube, sport media; Voter Registration, Naval Special Warfare/SEALs, Police-Community Relations; Homelessness, Income Inequality and systematic oppression, media and reaching low-income parents, while promoting Summer Learning; Raise funds to reach desired transportation, social working, How technology can help in the fight against human trafficking? Create a non-profit organization, what makes up a successful social enterprise? Black Panther Party; Curriculum in elementary and secondary schools and its evolution over the years, education - as a whole - and different minority groups across the world Empowerment of Girls, helping people to become self-sufficient and sustainable signs of development, human development; building an amazing physique builds confidence, race and identity; Mental Health Impact of Bullying, mental and physical health, suicide, anti-bullying, depression & LGBT+, body image among young teen girl and young women's, mental health problems and suicide prevention issues, change in society with relation to the impressions left on children ages 4 – 8, Mental Disabilities in Health Care, physical health awareness; Animal Therapy, animal behavior and animal communication Criminal justice and law; computer forensics, Forensic Science; I want to first start with the fight against human trafficking.
	Communication and media studies, politics and international studies (including development studies), sociology (e.g., gender, inequality), and geography. Education, teacher training, and academic studies in education. Educational, sport, business, animal, and clinical psychology.	
Social sciences		
Law		

	Transferable /Functional	Actions taken to perform a task, transferable to different work functions and industries	Writing, public speaking, communication skills, leadership skills and my presenting skills;
	Personal Traits/Attitudes	Traits or personality characteristics that contribute to performing work	creativity, thinking outside the box and being a leader, critical thinking skills; ability to organize large events and projects; editing software
Skills	Knowledge -based	Knowledge of specific subjects, procedures, and information necessary to perform particular tasks; do not emphasize the artistic or creative value or talents	Self-confidence and independence, wants to learn how to become more confident; the ability to expand my ideas and willingness to take charge and be proud of my ideas
Activity	Activity	The main task is attending activities such as summer programs and conferences	Baking, cooking, culinary, sweet; Sewing, sewing class; Cosmetology/Make-Up, my skills on doing hair, modeling; Welding, blacksmithing and welding Summer program "Science: It's a Girl Thing", explore conferences at Rice University, study abroad program in Spain, attending a Model United Nations conference in Washington, D.C., medical field by wanting to attend a summer away program, attend a business institute

Similarly, a task value coding scheme was developed to analyze the task values connected with the topical areas reflected in participants' applications. We referred to Eccles et al.'s (1983) classification and definition of interest, attainment, utility, and cost values. Given the high motivation of the participants (authors) and the self-driven nature of the learning challenge, the participants did not describe costs associated with their learning challenges. Therefore, cost value was not included. Because nearly all the participants used the phrase "passionate about" in their application, we did not consider an application to fall into the intrinsic or interest value category unless more relevant terms (e.g., love, like, interested) were used. Our data suggested that many participants considered contributing to and influencing their families, communities, or even the whole society as a driving force of their learning challenges. Therefore, we added the "Prosocial" code to capture this value (Beutel & Johnson, 2004).

Table 2. A coding scheme of subjective task values

Task values	Descriptions of the dimensions	Student examples
Intrinsic or interest value	The enjoyment individuals get from performing the task, or the subjective interest they have in the subject.	I've always been interested in manufacturing/ creating my own computer. I cannot explain why I am passionate about this field, but my interest started when I was around 12, but it wasn't until this year that I experienced it in a classroom.
	Doing well on a task is important because it is linked with one's identity; the task is a big part of one's life; doing the task is a way to express oneself and show others who we are. A participant may talk about their previous experiences or connections that have been there for years.	I want to become as skillful as my grandfather, which welds himself. I am good at the subject, but I feel I can be better and would like to further my knowledge. I'm against early child marriage because I believe that everyone deserves chances at getting a good education no matter what their race is or gender. This learning will help me decide whether to go into the medical or engineering field.
Attainment value		

Utility value	A task relates to future goals or is a step toward big goals. It captures more-extrinsic reasons for doing the task (e.g., valuing an organic chemistry class because of planning to be a doctor).	I'm passionate about this because drawing to me is a good way to let your creativity out for the world to see. I love taking pictures and editing them it really distracts me from all my problems at home and school. I'm inspired by amazing works like Alfred Hitchcock, Stephen Spielberg, and a lot of short films on YouTube
Prosocial value	Related to help others, serve the community and influence the societal structure.	The skills that I am most interested in exploring are those that will most help me pursue a career in the medical field. I want to attend a business institute to explore different opportunities in regard to business. I hope my project can shed light on how autism can impact a child's education and life. I enjoy helping out people especially those in need when they are sick. MUN allows me to find collaborative measures to solve these problems and gain a new perspective while solving them.

Analytical Plan

Qualitative Coding

Two raters first examined the data together and applied the subjects, skills, and activities (see Table 1) and subjective task value (see Table 2) coding schemes to the data. We aimed to develop a shared understanding of the data and coding schemes through this process. Then the two raters independently coded 258 (31.73%) application content. In the process, they met every week to compare and discuss the disagreement. The coding schemes were updated if there was a new understanding, and the previous coding results were discussed again and updated if revisions were made to the definitions of the coding categories. After good inter-rater reliability between the two raters was achieved, the two raters split the remaining data and coded separately. The two raters highlighted the coding they were not certain about during the independent coding process, especially the Activity and Physical Science coding. They met two more times to discuss uncertainties to reach an agreement.

Welch Two Sample T-tests and Association Analysis

Based on the qualitative coding result, the responses with two or more subject, skill, or activity coding were labeled as interdisciplinary learning topics. To respond to the first research question, we analyzed the frequency of different learning topics and the percentage of interdisciplinary learning topics. We also summarized the popular combinations of different learning topics to understand how participants connected various subject areas. To answer the second research question, we calculated the percentage of various task values. We used Welch Two Sample t-tests to analyze how participants who chose single-subject and interdisciplinary learning topics differ in task values. Regarding the third question, we conducted a correlation analysis to examine how participants' learning topics were associated with their task values.

Results

The inter-rater reliability between the two raters was calculated using Cohen's kappa. The average agreement for all the sub-dimensions of learning topics is 0.62, indicating substantial agreement (Landis & Koch, 1977). As shown in Table 3, moderate to perfect agreement (0.48 to 1.00) was achieved for most categories except for the Physical Sciences and Activity. The low inter-rater reliability on Physical

Sciences and Activity categories was because of their low occurrence, which led to fewer discussions between the two raters on these coding during the process of reaching a shared understanding; rater B misunderstood environmental-related issues as Life Sciences rather than Physical Sciences. Concerning task values, the average Cohen's kappa is 0.57, and the agreement for each sub-dimension ranges from 0.44 to 0.73, indicating moderate agreement (Landis & Koch, 1977).

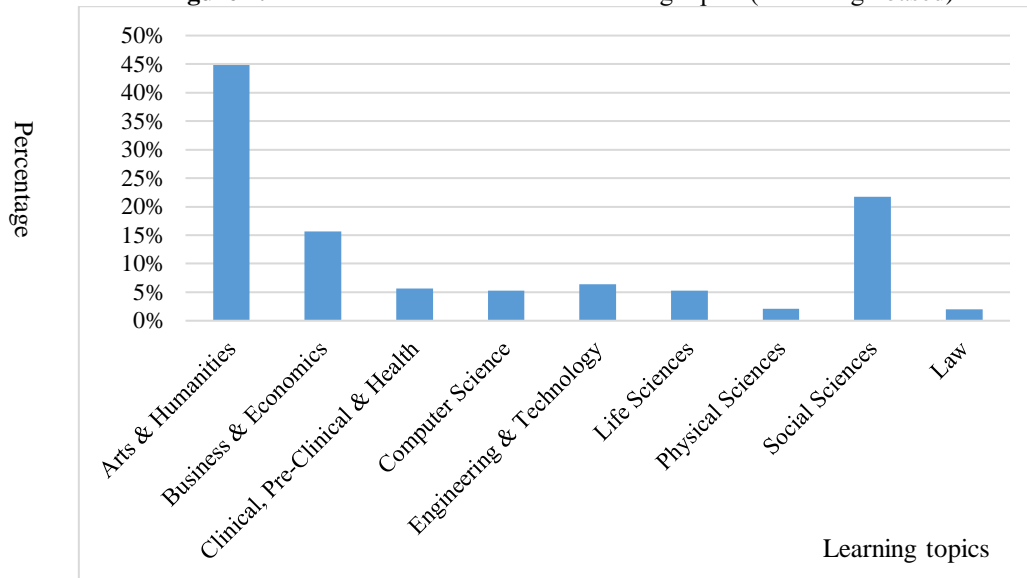
Table 3. Inter-rater agreement of the content and task value coding

Dimensions	Sub-dimensions	Cohen's kappa
Knowledge	Arts & Humanities	0.83
	Business & Economics	0.86
	Clinical, Pre-Clinical & Health	0.74
	Computer Science	0.87
	Engineering & Technology	0.60
	Life Sciences	0.53
	Physical Sciences	0.00
	Social Sciences	0.69
Skills	Law	1.00
	Transferable/Functional	0.68
	Personal Traits/Attitudes	0.66
Activity	Knowledge-based	0.48
	Activity	0.16
Task values	Intrinsic or Interest	0.54
	Attainment	0.57
	Utility	0.44
	Prosocial	0.73

Single-subject and Interdisciplinary Learning Topics

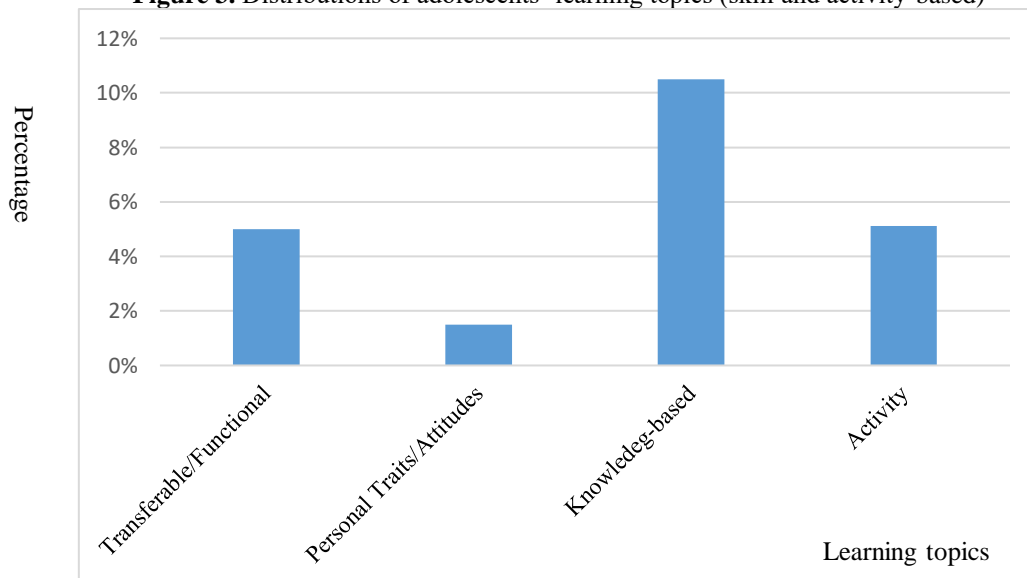
Figure 2 shows the learning topics chosen by the participants. Arts & Humanities (44.88%), Social Sciences (21.75%), and Business & Economics (15.63%) are the three most popular topical areas that the participants were interested in pursuing in their self-driven learning. The majority of the participants chose to work on photography, music, dancing, fashion design, branding, business, management, entrepreneurship, psychology, education, sociology, communication, politics, etc. There were about similar percentages of participants interested in Engineering & Technology (6.38%), Clinical, Pre-Clinical & Health (5.63%), Computer Science (5.25%), and Life Sciences (5.25%), respectively. Physical Sciences and Law were less popular among the participants when they could decide their learning topics, with 2% and 2.13% choosing relevant learning challenges.

Figure 2. Distributions of adolescents' learning topics (knowledge-based)



In addition to knowledge-based learning topics, as shown in Figure 3, a fair number of participants focused on improving their skills or attending or organizing activities during their learning challenges. In detail, 10.50% of participants aimed to acquire or enhance Knowledge-based Skills, 5.00% aimed to work on Transferable/Functional Skills, and only 1.50% planned to work on Personal Traits/Attitudes. Among all the applications, 5.13% had an Activity focus.

Figure 3. Distributions of adolescents' learning topics (skill and activity-based)



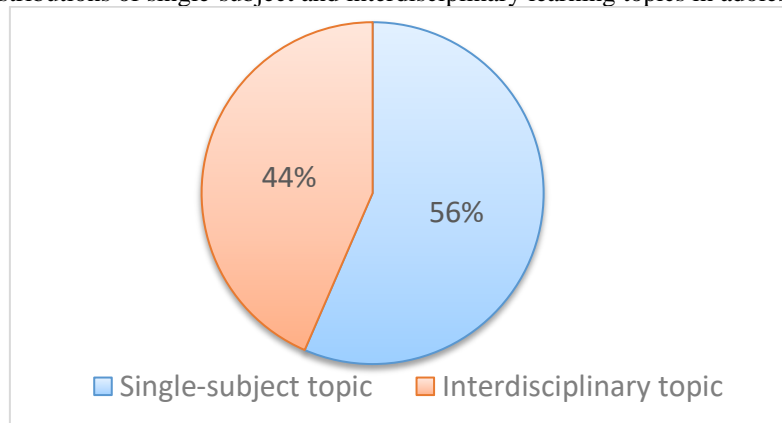
As shown in Figure 4, 56% of participants focused on one topical area in their learning challenges. We named the learning topics only involving one topical area as single-subject topics. The following is an example of a single-subject topic that falls into the area of Arts & Humanities:

“I plan on exploring music and singing during this challenge. I want to buy music equipment so that I can record the songs that I have written (and hopefully post videos on Youtube). I am passionate about this because music is all that I know. I have been singing and writing songs since I was a little girl, about 6 or 7 years old, I really want to make it into the entertainment field...”

The other 44% of participants integrated two or more topical areas in their learning challenges. We named these topics interdisciplinary learning topics. Some most frequently occurring combinations of these interdisciplinary learning topics are Arts & Humanities and Business & Economics (53 out of 800); Arts & Humanities and Social Sciences (50); Social Sciences and Activity (23); Arts & Humanities and Knowledge-based skills (21); and Law and Social Sciences (16). The following quote represents an example of interdisciplinary topics involving Arts & Humanities and Psychology.

“I hope to pursue study in photography and the increase of self-esteem of youth that comes from the inner city (using cameras and images), specifically at James Hillhouse school. I’m passionate about this because I was once bullied and didn’t have the person in my life besides my mother, (who was alive at the time) to help me build that inner confidence with this project I hope to alleviate some of that pain that students like myself have faced.”

Figure 4. The distributions of single-subject and interdisciplinary learning topics in adolescents’ applications



Distinctions of Task Values

Figure 5 displays the distribution of the task values reflected in participants’ applications. Roughly two-thirds (66.13%) of participants indicated that attainment value drove their learning challenges, suggesting they worked on the learning challenges that were important for them to do well. These learning challenges could be relevant to participants’ identities, previous experiences or connections, or had been a big part of their life. We found that 45.25% of participants had intrinsic or interest value. Notably, 40.38% of participants had prosocial values, suggesting their driving force of helping others (including families), serving the community, and influencing the societal structure. Compared with other task values, fewer participants (30.63%) had utility value related to efforts to prepare for future careers or other goals through the learning challenges.

Figure 5. Distributions of the task values reflected in adolescents' applications

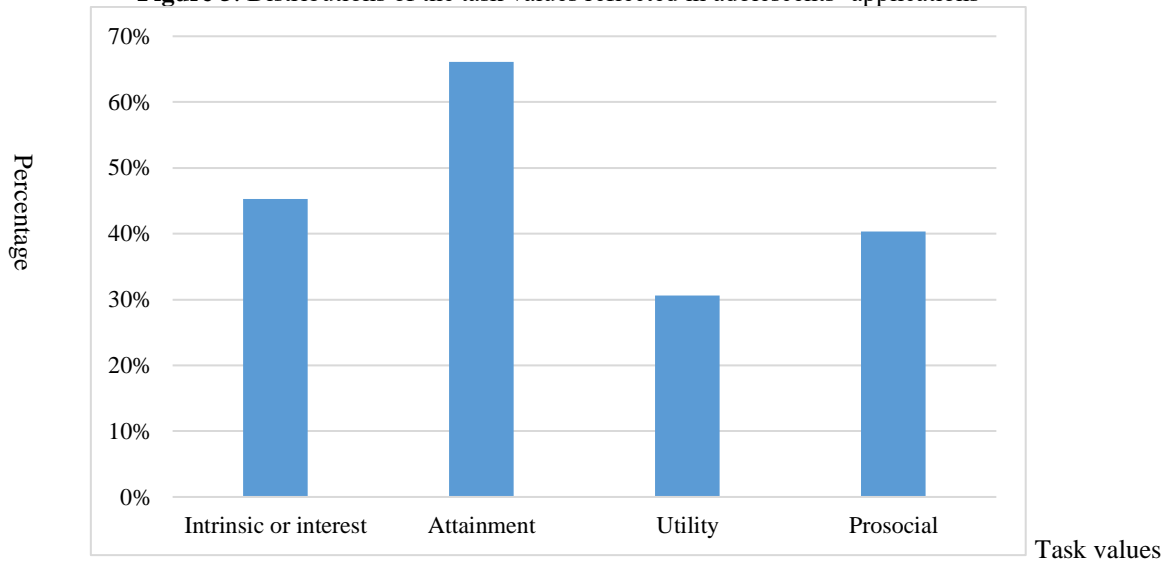


Table 4 shows the task value distinctions between participants who chose single-subject and interdisciplinary learning topics. The two groups did not differ significantly concerning attainment or utility values. However, the *Interdisciplinary Topic* group had significantly greater prosocial value than the *Single-subject Topic* group but significantly lower intrinsic or interest value.

Table 4. T-tests results of task values between participants who chose single-subject and interdisciplinary learning topics

Task value	Mean		SD		df	t	p
	Single-subject group (n=452)	Interdisciplinary group (n=348)	Single-subject group (n=452)	Interdisciplinary group (n=348)			
Intrinsic	0.54	0.37	0.50	0.48	758.13	4.79	<.005
Attainment	0.67	0.68	0.47	0.47	750.35	-0.41	0.68
Utility	0.31	0.34	0.47	0.47	738.4	-0.79	0.43
Prosocial	0.34	0.52	0.47	0.50	724.88	-5.36	<.005

Associations between Learning Topics and Task Values

Table 5 shows the correlations between participants' learning topics and task values. Here we only highlighted moderate correlations. Social sciences-relevant learning topics are positively correlated with prosocial value but negatively correlated with intrinsic or interest value. Interdisciplinary learning topics are positively correlated with social sciences-relevant learning topics. These results together indicate that participants were concerned about complex social sciences-relevant topics which usually demand interdisciplinary knowledge to tackle. They chose social sciences-relevant topics mainly to help others, serve their community, or influence the societal structures rather than because of personal enjoyment or interest.

Table 5. The correlations between learning topics and task values

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Arts	1																
2. Biz	0.05	1															
3. Health	0.22***	-0.05	1														
4. CS	0.20***	0.08*	0.02	1													
5. ET	0.16***	0.10**	-0.06	0.18***	1												
6. LS	0.21***	0.11**	0.07*	-0.02	0	1											
7. PS	0.07*	-0.03	-0.04	-0.01	0.04	0.07	1										
8. SS	0.26***	0.16***	0.10**	-0.06	0.14***	0.08*	-0.04	1									
9. Law	0.16***	-0.06	-0.04	-0.04	-0.05	0.05	-0.03	0.18***	1								
10. Trans	0.16***	0.03	-0.05	-0.02	-0.06	0.08*	-0.01	0.07*	0.02	1							
11. Traits	0.09*	-0.01	-0.03	-0.03	0.03	0.04	-0.02	-0.03	0.02	0.04	1						
12. Knowl	0.17***	-0.05	0.08*	0.09*	-0.06	0.06	-0.03	0.09**	0.04	0.09**	0.04	1					
13. Acvy	0.07*	0.11**	0.01	-0.05	-0.04	0.03	0.05	0.09*	0.02	0.01	0.04	0.06	1				
14. Intrin	0.23***	-0.04	-0.06	-0.02	0.02	0.09**	0.01	0.32***	0.07*	0.13***	0.03	0.03	0.08*	1			
15. At	0.16***	-0.06	0.02	-0.01	0.08*	0.02	0	-0.01	0.02	-0.06	-0.03	0.09**	0.06	0.17***	1		
16. Util	-0.05	0.21***	0.04	0.09**	0.03	0.02	-0.01	0.13***	0.04	0.05	0.01	0.03	-0.07	0.02	0	1	
17. Psol	0.29***	0	0.14***	0.05	-0.07*	0.03	0.08*	0.38***	0.05	0.07*	0	0.06	0.10**	0.26***	0.01	-0.10**	1
18. Intd	-0.02	0.21***	0.15***	0.08*	0.10**	0.03	0.12***	0.42***	0.11**	0.17***	0.15***	0.09**	0.26***	-0.17***	0.01	0.03	0.19***

Note. Arts: Arts & Humanities, Biz: Business & Economics, Health: Clinical, Pre-Clinical & Health
 CS: Computer Science ET: Engineering & Technology, LS: Life Sciences, PS: Physical Sciences SS: Social Sciences

Trans: Transferable/Functional skills, Traits: Personal Traits/Attitudes, Knowl: Knowledge-based, Acvy: Activity
 Intrin: Intrinsic or Interest value, At: Attainment value, Util: Utility value, Psol: Prosocial value

Intd: interdisciplinary topics

* $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

This study explored when youth are empowered to make their own learning decisions, to extent to which they choose interdisciplinary learning topics, what the associated task values are, and if the task values of single-subject and interdisciplinary learning groups differ. Results showed that approximately 44% of participants chose interdisciplinary topics, suggesting that youth voice provides a context for interdisciplinary learning. Compared with the *Single-subject Topic* group, the *Interdisciplinary Topic* group had significantly greater prosocial value but lower intrinsic or interest value. There was a moderate positive correlation between social sciences-relevant learning topics and prosocial value; social sciences-relevant learning topics were positively correlated with interdisciplinary topics.

It is worth noting that 44% of participants integrated two or more learning topics into their challenges. It suggests that youth voice in self-driven learning provides a context for pursuing interdisciplinary learning topics. As the correlations between learning topics and task values suggest, participants' chosen learning topics are usually derived from their interests, life experiences, identity, future expectations, and desire to help others or society. This result confirms the connections between youth voice, learning, and identity (Rahm et al., 2014), indicating that youth tend to participate in the larger community and find a place in society where they can lead their learning (Serido et al., 2011). Their chosen learning topics tend to be authentic and complex and may require the participants to acquire related knowledge, resources, and approaches from several disciplines to make sense of (You, 2017). Making connections across different areas can enrich learners' deep understanding of core ideas and practical applications of knowledge (NRC, 2012). Furthermore, interdisciplinary learning benefits the affective aspect of learners as it "can provide relevant, challenging, and enjoyable learning experiences" (Scottish Government, 2008, p. 21). Interdisciplinary problem solving and interactions between subjects provide contexts for creativity to arise (Madden et al., 2013; Sternberg, 2009). Therefore, educators propose that teaching and learning should connect different learning topics within and across subjects and ensure students can explore a subject from multiple perspectives (e.g., NRC, 2012; Ontario Ministry of Education, 2007). This study suggests the feasibility of interdisciplinary studies in self-driven learning where youth are empowered to determine learning content and lead learning.

This study found that about two-thirds of adolescents chose to work on learning challenges that are important to who they are, relevant to their previous experiences or personal connections, and what they have always been doing, wanted to do, or struggled with. A further examination of the content coded as attainment value suggests the importance of youth racial, gender, and religious identities in directing their learning topics. This study indicates the importance and feasibility of integrating youth voice, identities, and interests in their learning. Similarly, Rahm et al. (2014) suggested that youth voice was tied to their identity development, engagement, and learning within an afterschool ScienceGirls program and beyond. In the school learning context, Faircloth (2009) found that identity connections that are important to the self, background, and the ability to make themselves known contributed significantly to the belonging of grade 9 students. Pellegrino (2020) indicated that breaking down the barriers between school learning and socio-cultural activities will make learning more meaningful, purposeful, and personally relevant. Adolescents are intensively involved in identity development, and their process of identity development can be positioned to powerfully support meaningful connections to school (Faircloth, 2009; Harter, 1990). Exploring the relationships between student identity and learning may be an effective way to support their engagement, comfort, and connection at school (Rubin, 2007). Unfortunately, what adolescents gain from their lives outside of school is rarely accessed in the school setting (Moje et al., 2004; Lee, 2007). From the perspective of youth voice, this study further confirmed the importance of integrating these funds in learning and provided another approach for doing so in a youth self-driven project out of school.

The greater prosocial value but lower intrinsic or interest value of the *Interdisciplinary Topic* group indicates that the participants who chose interdisciplinary learning topics were more motivated by

helping others, supporting the community, and even changing societal structures than their individual interests or enjoyment. This, in turn, confirms the complexity of addressing real-life and societal issues. Furthermore, the positive correlations between interdisciplinary learning and social sciences-relevant topics and between social sciences-relevant topics and prosocial value suggest that adolescents, as citizens, are concerned about complex societal issues and are willing to tackle them using interdisciplinary knowledge. These results speak to citizenship education which is concerned with supporting students to understand the nature of crucial problems that our world is facing and take active roles in addressing them (Ibrahim, 2005; Watt et al., 2000). The active participation of all citizens, including youth, is necessary and critical in a democratic society (Sherrod, 2005). Stoll (2020) also indicated that “young people want and may be able to provide answers to global challenges” (p. 423). This study suggests that adolescents were motivated by their prosocial value to tackle pressing political, societal, and environmental issues such as voter registration, homelessness, income inequality, and environmental and renewable energy issues. Similarly, Ben-Eliyahu et al. (2014) suggested that participating in politics or serving others tended to trigger the “sparks” or deep interests of some 15-year-old adolescents.

This study contributes to the literature on youth voice, self-driven learning, interdisciplinary learning, and task values. Although the importance of interdisciplinary learning has been recognized, various challenges hinder its implementation in the school context. This study confirmed that self-driven learning, which enables youth to integrate their identity, interests, and voice in their learning, provides opportunities for interdisciplinary learning to take place. Furthermore, although there is increasing recognition that task value predicts current and future choice of activities (Wigfield et al., 2016), few studies have specifically researched the correlation between intrinsic or interest, attainment, and utility values and various learning topics in different domains. This study addressed this gap by examining the relationships between adolescents’ specific task values and various domains.

Implications

This study provides implications for schools and positive youth development organizations. First, it implies that youth voice in self-driven learning provides a context for interdisciplinary learning, considering almost half of the participants choose interdisciplinary learning topics when they could lead their learning. A strict disciplinary structure and irrelevant curriculum coincide with students’ disengagement (Fredricks et al., 2019). In contrast, interdisciplinary learning can foster critical thinking, metacognitive skills, engagement, and applications of knowledge and skills to new contexts (e.g., Alberta Education, 2015; Ivanitskaya et al., 2002). Therefore, schools or positive youth development organizations should find ways to better incorporate youth voice in learning (Mitra et al., 2014) to foster interdisciplinary learning, increase their commitment and engagement, and strengthen their ability (Kramer et al., 2020).

Second, this study implies the importance and possibility of integrating youth voice, identities, and interests in their learning, considering most adolescents were directed by their attainment and intrinsic or interest values to choose learning topics. Considering adolescents’ identities and interests in learning tends to enhance the relatedness and connectedness of learning and allow the ones who do not belong to the mainstream to find themselves (Hatt, 2007). Culturally connected curriculum units and materials make learners feel a sense of inclusion (Darling-Hammond et al., 2020). Kramer et al. (2020) also found that secondary schools with better-than-predicted graduation outcomes shared a theme: promoting youth-driven identity development and goal setting. Therefore, schools or positive youth development organizations should harness the assets (e.g., identities and interests) that learners bring with them.

Limitations and Directions for Future Research

Several limitations of this study need to be addressed in future research. First, this study qualitatively analyzed participants' textual application to a self-driven learning program. Future research should be extended to other self-driven or independent learning and collect various data types such as surveys, interviews, and observations to complement and validate participants' textual responses. Furthermore, the data represents a snapshot of youth's learning topics and task values when applied to the project. Future research is needed to investigate how the participants' learning topics and task values unfold over time as they tackle the learning challenges. Second, the participants of this study are not a general sample of adolescents in the United States. Because of the belief of this program, females and racial minority groups (e.g., Black or African American, Hispanic or Latino, Asian/Asian American) are more represented in the sample. Finally, although we achieved moderate to perfect inter-rater reliability for most coding, it should be noted that our agreement on Physical Science and Activity coding was not satisfying. Although we discussed all the differences to reach an agreement and paid specific attention to these coding when we coded separately, compared to the results of other coding, the coding results of Physical Science and Activity may be more skewed from reality. Future research should address these issues.

Constraints on Generality

Our findings suggest that adolescents would choose interdisciplinary learning topics when they could lead their own learning. The participants were 800 youth between 14 and 19 years old in the United States, with a larger proportion of females and racial minorities (e.g., Hispanic or Latino, Black or African American) than their actual proportions among youth across the country. We expect our results to be generalized to other contexts in which a similar group of adolescents can take a leadership role in determining the learning challenges/topics/projects they are passionate about in the formal school or informal learning context. We have no reason to believe that the results depend on other characteristics of the participants, materials, or context.

Acknowledgements

This work is supported by the Silicon Valley Community Foundation under grant number 136823. Any findings, opinions, or recommendations expressed in this paper are those of the authors and do not necessarily reflect the views of the funding agency. The authors are indebted to Mark Murphy, Catherine Holland, and Melody Estevez for initiating and operating the GripTape project. We would like to acknowledge Robert L. Greenberg, an undergraduate research assistant at the Purpose and Identity Processes Laboratory, Cornell University, for assisting the content analysis. We also like to thank all the incredible participants who allowed us to explore a new form of learning and made this research possible.

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