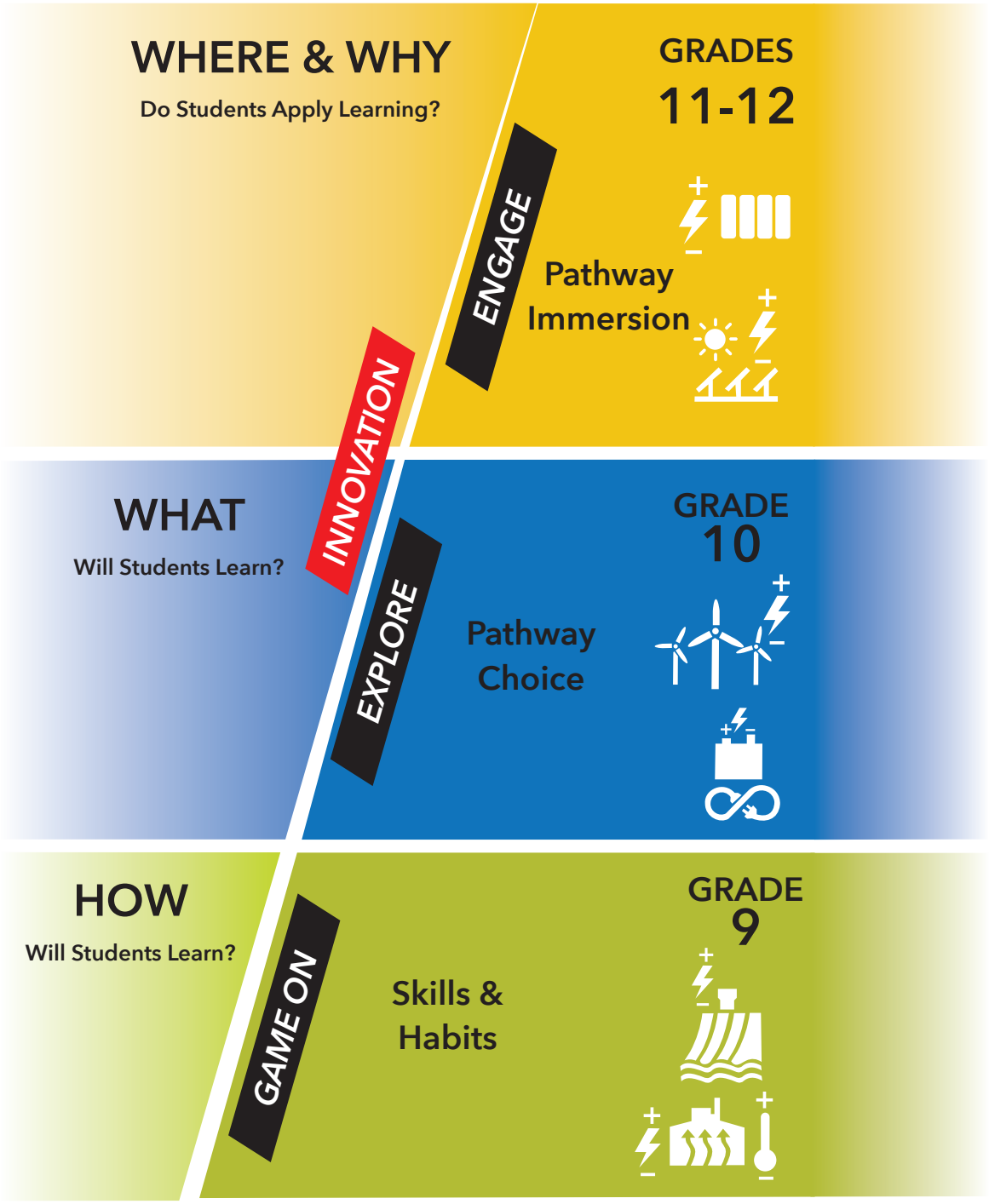
Expanding STEM at Clean Tech Early College High School



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THE PAST FOUNDATION

EXPANDING STEM AT THE CLEAN TECHNOLOGIES EARLY COLLEGE HIGH SCHOOL:

The Knowledge Capture and Professional Development Perspective

2014-15

Submitted to

Ballston Spa Central School District

Ballston Spa, New York

Dr. Joseph P. Dragone, Superintendent

Submitted by

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Expanding STEM at the Clean Tech Early College High School:
From the Perspective from the Knowledge Capture and Professional Development Programs
Final Report, August 2015

Introduction

The PAST Innovation Lab's Professional Development and Knowledge Capture teams worked with the faculty and administration at Clean Technologies Early College High School (Clean Tech) to help design and document the launch of the 9th grade cohort (2014-15) and initiate preliminary planning for the rising 10th grade cohort (2015-16) enrolled in the P-Tech program. This is an ambitious undertaking and PAST is proud to be a partner in helping guide real-time design and coordination of program implementation strategies. This final report documents the work conducted during the 2014-15 school year to continue building a robust STEM education program at Clean Tech. The report presents an overview of the completed work, and recommendations for progress going forward in regard to both Professional Development and Knowledge Capture program evaluation.

Reports issued following the summer bridge program (*Summer 2014 Program Report: Ninth Grade Program Launch*) and the mid-year Interim Report (February 2015) are also included in the appendix of this document to provide a complete presentation of all work conducted during phases of program implementation and evaluation in support of Clean Tech's program expansion for the 9th and 10th grade level.

Summary of Work Conducted by the PAST Professional Development Team

Starting in June 2014, PAST began working with the teaching cohort at Clean Tech ECHS to expand the program to include 9th and 10th grade. The teaching cohort had used the delivery system of Problem Based Learning with 11th and 12th grade since the program began in 2010. In an effort to share a common language and align with PAST's vernacular, the team was provided with online podcasts produced by PAST Innovation Lab, which explores Transdisciplinary Problem Based Learning (TPBL) and its instructional and cultural strategies, along with a systems approach to delivery. This set

the stage for on-the-ground professional development (PD) conducted by PAST. Three on-site PD workshops were conducted by the PAST Professional Development team at strategic points in program development and implementation across the 2014-15 academic year. The two-day workshops were conducted on the following dates:

- June 30-July 1, 2014
- January 29-30, 2015
- June 22-23, 2015

PAST also provided on-site support for the 2014 9th Grade Summer 5-day Bridge Program (July 14-18, 2014), including Knowledge Capture program evaluation. Ongoing PD was provided to the Clean Tech faculty via virtual meetings with the Clean Tech faculty, September 2014 through May 2015, including two sessions with the Knowledge Capture Director of Research to gain input from faculty and administrators on student survey design, and discuss the post-year 1 student survey findings. The summary of PD support conducted during the 2014-15 school year is presented in the final section of this report, and provides recommendations for PD and program support for the 2015-16 school year when the Clean Tech ECHS will reach its program goal for student enrollment in four grade levels (9th through 12th grades).

Summary of Work Completed by the PAST Knowledge Capture Team

The Knowledge Capture Program conducted program evaluation during the 2014-15 school year. Key evaluation activities included work with both teachers and students as follows:

- Summer Bridge Program observation and daily debrief with the Clean Tech faculty, PAST Foundation STEM Coordinator and Clean Tech administrators (July 14-18).
- Teacher focus group, July 18, 2014, (see Appendix B, *Summer Bridge Program Report*)
- Student focus group, July 18, 2014, (see Appendix B, *Summer Bridge Program Report*)
- Student pre-year 1 survey, July 16, 2014, (see Appendix B, *Summer Bridge Program Report*)
- Virtual session with Clean Tech faculty and administrators to review post-year 1 survey questions, April 1, 2015

- Student post-year 1 survey (open to students from April 22nd through May 29th, 2015)
- Preliminary analysis presented in a draft report, June 22, 2015 (see Appendix D for the final survey report)
- Virtual session with Clean Tech faculty and administration to review the post-survey preliminary analysis held on June 22, 2015

In the following section, a comparison of the pre- and post-student survey findings are presented to identify key areas of change over the course of the first school year of the 9th grade student experience.

Ninth Grade Student Survey: Pre- and Post-Year 1 Comparative Analysis

The pre-survey was conducted with 96% (n=70) of the 9th grade students who participated in the Summer Bridge Program in July, 2014 (73 total enrollees). The post-survey was conducted during the fourth quarter of the school year, April-May, 2015, with 87% (n=58) of the 9th grade students responding to the survey (67 total enrolled students). It should be noted the survey timeframe was concurrent with student focus on building increased understanding of the importance of establishing *habits of mind* as a focus of student work during the 4th quarter (see Appendix F: Crosswalk MentorPlace and 4th Quarter Unit). This is particularly important for pre- and post-year student responses related to interests in real world problem solving. This issue will be discussed further as it relates to students making connections between building skills essential to TPBL, and student perceptions of the larger context in which individual projects connect with real world issues and STEM career pathways.

Survey questions for the pre- and post-surveys are presented in Table 1 and Table 2 below. In both the pre- and post-year 1 survey, questions were designed to explore student interests aligned to STEM education and potential for college and career development through the Early College High School Program. On April 1, 2015, the faculty and administrators participated in a virtual session to review the pre-survey question set, and provide input to the post-survey design essential to understanding the experience of 9th grade students as of April 22nd, 2015. The post-survey was held open for a period of 5 weeks, during which time students were encouraged to logon to the secure website, Survey Methods®, to complete the post-year 1 survey.

Table 1 (pre-survey) and Table 2 (post-survey) show that the post-survey questions were modified to capture the key aspects of the program and experience of students

as of the 4th quarter of the 2014-15 school year. However, three questions asked in the pre-survey, and three questions in the post-survey were the same or similar and will be discussed further in the next section of this report.

Table 1: Pre-Year 1 Student Survey Questions

1. How did you first hear about the Clean Tech Early College High School?
2. *Why did you choose to enroll in the Clean Tech Early College High School?
3. What was your favorite class in 8th grade, and why?
4. What do you think will be the most exciting thing about your first year of high school
5. *What do you think will be the most exciting thing about becoming a Clean Tech High School student?
6. Do you enjoy working in teams with other students?
7. *Do you have ideas about what you want to do after you graduate from high school?
8. Have you ever participated in a STEM challenge or competition?

*Questions for comparative analysis.

Table 2: Post-Year 1 Student Survey Questions

1. *Why did you choose to enroll in the Clean Tech Early College High School?
2. *What was your expectation when you enrolled in the ECHS?
3. What goals do you hope to achieve as a student at the ECHS?
4. *Do you have ideas about what you want to do after you graduate from high school?
5. What are the important skills you think you need in order to be prepared for your future?
6. What have you like most about your first year at the Clean Tech Early College High School?
7. What do you think about the technology you are using at ECHS?

*Questions for comparative analysis.

In the discussion that follows, thematic analysis of the three questions that were the same or similar are presented in Tables 3, 4, and 5 based on the following questions (see highlighted questions in Table 1 and 2 above):

- Table 3: Why did you choose to enroll in the Clean Tech Early College High School?
- Table 4: What do you think will be the most exciting thing about becoming a Clean Tech High School student?/What was your expectation when you enrolled in the ECHS?
- Table 5: Do you have ideas about what you want to do after you graduate from high school?

In *Table 3: Why did you choose to enroll in Clean Tech ECHS?*, students were given a choice among a set of nine responses including an open-ended choice of "other," where students could expand their comments on reasons they wanted to enroll at Clean Tech.

Table 3: Why did you choose to enroll in Clean Tech Early College High School?

Response	2014 (n=70)	2015 (n=58)
Choose all that apply:		
I like math	45%	40%
I like science	67%	74%
I like computers	61%	67%
I am interested in environmental issues	43%	48%
I am interested in learning about new technology	80%	72%
I am thinking about my career	80%	72%
I am thinking about college	76%	78%
My parents wanted to enroll me in the program	36%	43%
Other	13%	14%
If other, please describe:		
Greater/new opportunities	4%	7%
Obtain an Associate degree/college credits	1%	2%
Open new ideas for career pathways	3%	3%
Fun and/or great experience	3%	⦸
Develop public speaking skills	1%	⦸
Prepare for career in engineering	⦸	3%
Get a "head start"	⦸	3%
Meeting new people	⦸	2%
Being in a new environment	⦸	2%

Table 3 shows student responses to the same question asked in both the pre- (July, 2014) and post-survey (April-May, 2015). In the student survey administered in July 2014, students were given a drop-down menu of nine responses to Question 2: "Why did you choose to enroll in the Clean Tech Early College High School?" The same question with an identical drop-down menu of choices was posed as Question 1 in the student survey administered during April to May, 2015. 'If other, please describe" responses were analyzed and compared, and are also shown above.

The percentages shown are based on the total number of responses for each survey (e.g., "I like math" in 2014 is 45% of a total [n] of 70 respondents; and in 2015, 40% is the percentage of responses based on a total [n] of 58). Pre-/post-survey responses range slightly up or down by 5-8%. Note that, "I like math," decreased, while students

responding to, "I like science," increased. Students stating they are interested in the environment also increased slightly from 43% to nearly half of students, at 48% in the post-survey.

The statement, "I like computers," increased slightly as a reason for enrolling in the program, chosen by nearly half of the respondents (48%) in 2015. However in survey question 7 (see Appendix D, Survey Report 2015), nearly half of the students (46%) had issues with the laptop computers reflected in response to what students like least (n=57). The increase in the number of students who selected, "My parents wanted me to enroll," (36% in 2014, and 43% in 2015) could show that the six students who dropped the program may not have had strong parental support, and therefore dropped out of the program.

Table 4: Student Expectations, was generated from student responses to two similar open-ended questions. In 2014, students were asked to describe their expectations for what would be most exciting about being a Clean Tech student. During the 4th quarter of the school year (April to May, 2015), students were asked to reflect on their expectations at the start of the year in becoming a Clean Tech student. Slightly more than one-third of student responses identified working with new technology, increasing from 16% in 2014 (n=70), to 38% in 2015 (n=58). Student responses also showed an upward move regarding the "early college experience" (from 11% to 16%), "hands-on learning" (7% to 19%), and shifts in their views of the program as "challenging" (1% to 17%). Students also expressed a desire to spend more time at the Clean Tech campus to work with fellow students and the Clean Tech faculty (from 1% in 2014 to 10% in 2015.) Note also that Survey Q12 (2015), 'what would you change,' shows 27% of students said that they would like to spend more time at the Clean Tech campus.

Areas that students identified having anticipated at the start of the year that dropped by the end of the school year included, "helping the environment by working with clean energy" (16% to 5%). Given that nearly half of 9th grade students (48%) at the end of their first year reaffirmed their interest in environmental benefits as an aspect of coursework in clean technologies, this suggests that the real world problem solving context for individual student projects could be more explicitly articulated for first year students. Student views on "having an education/career advantage" (14% to 3%), and "experiencing real world learning" (10% to 2%) also contributes to a perspective about 9th grade student ability to make connections with the larger context for real world understanding. Greater emphasis on the value of critical skill building, including goals to engender *habits of mind,* may also need to be more strongly linked for students to make the connection between skill development and aspirations for advancing from student to STEM career professional.

Table 4: Clean Tech ECHS Student Expectations

Response	2014 (n=70)	2015 (n=58)
Meeting new people	33%	12%
Learning and working with new technology	16%	38%
Helping the environment by working with clean energy	16%	5%
Having an education/career advantage	14%	3%
Learning new things	14%	9%
Being with engaged students who share interests	13%	⦸
Early college experience	11%	16%
Hands on projects	7%	19%
Difficult program	1%	17%
Experiencing real world learning	10%	2%
Fun and engaging program	3%	10%
More time on campus	1%	8%
Working in groups	9%	9%
Learning in a new way	9%	3%
Prepare for the future	7%	9%
Learning STEM fields	6%	9%
Working with computers	4%	9%
Expanding career opportunities	7%	3%
Not fun or engaging	6%	7%
Exposure to new opportunities	6%	⦸
Earn college credits	6%	⦸
Obtaining an Associate's degree	4%	⦸
Being challenged	3%	3%
Becoming better students	3%	2%
Gaining leadership skills/becoming a role model	3%	⦸
Gaining confidence	3%	⦸
No expectations	⦸	7%
Less online work	⦸	3%
Being outside the classroom/field trips	⦸	3%
Less time on campus	⦸	3%

In July 2014, incoming 9th grade students were asked, "What do you think will be the most exciting thing about becoming a Clean Tech Early College High School student?" (Q5). In April 2015, enrolled 9th grade students were asked in Q2: "What was your expectation when you enrolled in the ECHS?"

Students also shifted in their expectation of meeting new people (33% in 2014 to 12% in 2015), and engaging with others in shared interests (13% to 0%). This is likely a factor of the challenge of working virtually with their team members (cited by 59% of

students in Q8, 2015) and fewer opportunities to socialize with their classmates compared with traditional high school.

Table 5: Clean Tech ECHS Student Aspirations, shows that nearly half of students in 2015 stated in an open-ended response that they are planning to enter a four-year college program and attain their Bachelor's degree, up from 38% in 2014. Additionally student interest in entering the field of technology rose from 4% in 2014 (n=55), to 15% in 2015 (n=52).

Table 5: Clean Tech ECHS Student Aspirations

Response	2014 (number of respondents=55)	2015 (number of respondents=52)
College (4 years, Bachelor's degree)	38%	48%
Engineering or design	15%	15%
Creative arts	15%	12%
Technology	4%	15%
Computer Science	11%	10%
Veterinary science/work with animals	11%	2%
Financially secure job	2%	10%
Psychology	2%	10%
Medical field	9%	8%
Business	9%	8%
Graduate school	9%	8%
Clean energy/clean technology career	7%	8%
Math/science field	7%	8%
Nanotechnology	7%	4%
Police work/law/forensics	4%	6%
Agriculture	5%	2%
Athlete	5%	4%
AA degree	4%	4%
Speech pathology/speech therapy	4%	2%
Sportscaster/journalist	2%	4%
Teaching	2%	4%
Military	2%	4%
Game programmer	2%	4%
Hospitality	2%	2%

In July 2014, incoming 9th grade students were asked "Do you have ideas about what you want to do after you graduate from high school?" (Q7). 90% students responded "yes," and of those who responded affirmatively, 92% (n=55) identified one or more aspirations represented thematically in Table 5. In April 2015, enrolled 9th grade students were asked the same question (Q4). 90% of students responded "yes," and of those who responded affirmatively, 100% identified one or more aspirations represented thematically in Table 5.

However, of those aspiring to earn a Bachelor's degree, a very small number of students identified a particular career pathway that they want to pursue, and less than 10% say they will attend graduate school. In comparing 2014 responses with 2015 responses, it is likely that students are not yet making connections between their academic interests and STEM careers, suggesting that the new 9th grade cohort as well as the rising 10th grade cohort would benefit from guidance and more emphasis on defining educational pathways open to them through the early college program.

Overall 2015 Survey Themes

The final 2015 survey report is presented in Appendix D of this report. Students expressed particular ideas about what skills they think they need (Q5) in order to succeed in the future.

Question 5: What are the important skills you think you need in order to be prepared for your future?

Theme	Sub-theme	(n=58*) Number	Number/percentage of students
Academics	Knowledge in specific content areas	15	26%
	Technical/hands on	11	17%
	Excellent education	6	10%
	Computer and coding languages	5	9%
	Good grades	2	3%
21st Century Skills	Time management	18	31%
	Communication	15	26%
	Collaboration	13	22%
	Organization	11	17%
	Problem solving	9	16%
	Leadership	3	5%
Personal Growth	Social skills	7	12%
	Determination/perseverance	7	12%
	Confidence	7	12%
	Flexibility	4	7%
	Focus	3	5%
	Good manners	3	5%

*Some student respondents identified more than one skill in their response.

In the table above, 26% (n=58) of students are focused on gaining knowledge in specific content areas. In particular, students think *gaining knowledge* is a higher

priority than achieving *good grades* (3% of respondents), suggesting that students are not motivated solely by the idea of "getting good grades," and are more focused on gaining knowledge as an important aspect of future success. Additionally, students expressed an understanding of the value of managing their time (31%), attaining good communication skills (26%), having the ability to collaborate in their work (22%), and being organized in their work (22%), all of which are associated with 21st century skill sets and essential to integrated STEM education.

Providing the opportunity for students to give feedback on the program was framed in two ways: first, students were asked what changes they would make in the program (Q12); and second, students were asked what advice they would give to incoming 9th grade students entering the program in fall 2015 (Q13).

Question 12: If you could make any changes in the program, what would you change and why?

Theme	Sub-theme	(n=56*) Number/Percentage of Students	
Technology	Better laptops	13	23%
	Simplify online classroom software	8	14%
	Remove "deep freeze" function	6	11%
	Change how College Forum is used	6	11%
	Improve student notification system	4	7%
	Remove web restrictions	4	7%
	Do not use Mentor Place	4	7%
	Less virtual learning	3	5%
Program Aspects	More time on campus	15	27%
	More field trips	5	9%
	Extend summer bridge program	3	5%
	More projects	9	16%
	More hands on work	6	11%
	Make projects more engaging	5	9%
	More engagement with teachers	3	5%
Communication	Provide more information on Clean Tech program specifics	5	9%
	Improve student notification system	4	7%
	Clarify instructions	4	7%
	Increase communication with mentors on Mentor Place	3	5%
Collaboration	Allow students to select team members to improve collaboration	12	21%
	More opportunities to work together will improve collaboration	7	13%

*Some student respondents identified more than one program component in their response.

The tables for Q12 (n=56) and Q13 (n=57) show key areas where students either feel the program can be modified to better meet their needs, or aspects of the program that would benefit from clarifying information for new students suggesting what current students think is important to know to be better prepared for entry into the Clean Tech program.

Improving laptops (23%) and program software (14%) for students are among the two top issues related to technology and virtual participation essential to successful engagement in the 9th grade program. Students also identified a desire to spend more time on campus (27%), as well as increasing the number of projects they complete during the school year (16%).

Some students (21%) cited the potential for improving collaboration based on the idea that student selection of team members is a factor of successful teamwork. Note that during the year projects ranged in their design, with certain projects structured for students to select their teammates. Given this experience, students may have found it more challenging to navigate team dynamics within groups of diverse talents, skills, and interest levels in groups designed and formed to meet other criteria applied by instructors.

Advice for incoming 9th grade students (Q13) concerned two key areas. By far, a high number of students thought that learning time management skills is the most important aspect of being prepared for the early college high school (63%), followed by a smaller number of students who identified learning to persevere in completing schoolwork as an important aspect of being a Clean Tech student (16%).

Concluding Observations

Ninth grade students enrolled during the 2014-15 school year are the first cohort to complete the entry grade level of the high school program and will rise to become part of the first 10th grade cohort beginning in the fall of 2015. Their experience and views on the program as it evolves will continue to inform program design, as well as provide important feedback for faculty who are designing curriculum for integrated STEM coursework. In this experience, program achievements offer measureable gains as well as insight on challenges associated with integrating the first 9th grade cohort in new learning experiences that are the hallmark of the Clean Tech Early College High School Program. Engaging 9th and 10th grade students both virtually and in real time at the Clean Tech campus will continue to be informed by student and faculty experience as

students prepare for advancing to 11th and 12th grade-level coursework at the Clean Tech campus.

In the following section, program support and professional development provided to teachers in 2014-2015 is presented in a summary overview of work completed during implementation of the 9th grade program, as well as recommendations for the 2015-2016 9th grade year and for work to support program implementation of the first 10th grade level coursework.

Work Conducted by the PAST Professional Development Team 2014-15

The PAST professional development team worked with the teaching cohort at Clean Tech ECHS through a combination of on-site professional development workshops and virtual meetings to expand the program to include 9th and 10th grades. The teaching cohort had been implementing Problem-Based Learning with the 11th and 12th grades since the program began. The on-site professional development workshops provided the opportunity to strategically align program objectives with student projects and intensively plan Transdisciplinary Problem-Based Learning units for the 9th and 10th grades. Virtual meetings throughout the year with Clean Tech faculty and the PAST PD team benchmarked implementation, provided a platform for the teaching cohort to reflect on successes and areas to improve and plan for upcoming quarters. The following section provides a summary of work completed from June 2014 to June 2015 and includes recommendations to meet ongoing the program objectives.

June 30 - July 1, 2014

The teachers at Clean Tech ECHS began working with PAST's Professional Development team in June 2014 during a two-day professional development workshop, which introduced the teachers to PAST's approach to Transdisciplinary Problem-Based Learning (TPBL). Building on previous program successes, the two days focused on:

- Designing the 9th grade 2014 Summer Bridge Program
- Planning the first quarter for 9th grade (fall 2014)

Much was accomplished during these two days, however more time was needed to complete the plan for the weeklong summer bridge program and design for the first quarter. The format of distant education and communication utilizing a web-based platform is a new modality of teaching and learning for the majority of the faculty and students. As a result, additional planning time was coordinated to occur during the summer bridge program, July 14-18, with teachers participating in planning sessions before the start of the school day, or following the end of the school day.

July 14 – 18, 2014

PAST PD provided planning and implementation support during the five-day 9th grade Summer Bridge Program. The goal of the summer bridge program was to provide a foundation of necessary skills for the students as well as form a learning community. Students were introduced to, and began working on, Quarter 1 projects during the summer bridge program. PAST PD facilitated and provided the following support:

- Conducted planning sessions with the teachers early in the morning before the school day began in order to prepare
- Debriefed every afternoon about successes and challenges of the day, and identified real time program modifications to meet student learning objectives
- Documented the daily goals and schedule for each day outlining the coordinated plan for team teaching sessions
- Coached teaching team on areas and skills for students to focus on, and provide guidance for development of necessary instructional tools
- Provided overall logistics support

September 2014 – January 2015 (virtual support)

Clean Tech ECHS faculty and administration met regularly (12 one-hour meetings) with the PAST PD team via an online platform to:

- Plan second and third quarter 9th grade TPBL units
- Benchmark program successes and limitations
- Create systems for student engagement

During this time period, PAST debriefed regularly with the program coordinator to develop a framework and set goals for ongoing meetings through January 2015.

January 29 - 30, 2015

The PAST PD team facilitated a two-day professional development with the Clean Tech ECHS faculty and administration. The PAST PD team and program coordinator met prior to this two-day professional development workshop to identify areas of focus. The final agenda for the two days was developed the morning of January 29 with input from the teaching team, program coordinator and the PAST PD team (see Appendix E: *Clean Tech ECHS Agenda and Goals*). The two days focused on:

- Creating a vertical rise for 9th grade to 12th grade (see front cover)
- Finishing 4th quarter project plans for 9th grade, which included integrating college course work and mentor program with the P-Tech program
- Developing a MentorPlace sequence to align to design cycle and program objectives (see Appendix F: *Crosswalk MentorPlace and 4th Quarter Unit*)
- Planning and Backmapping 9th grade Summer Bridge Program (Summer 2015)
- Planning and Backmapping 10th grade Summer Bridge Program (Summer 2015)
- Creating a wire frame for the 10th grade 2015-16 school year

February 2015- May 2015 (virtual support)

Clean Tech ECHS faculty and administration met regularly (8 one-hour meetings) with the PAST PD team via an online platform to:

- Create strategies for more effective planning and time management for the teaching cohorts (see Appendix G: *Draft Planning Schedule)*
- Design strategies to support students in distant learning and increase regular student engagement (see Appendix H: *Student Login Infographic and Habits of Mind Rubric)*
- Integrate college course work with program objectives and high school course work
- Finalize 9th grade project plans for the remainder of the 2014-15 school year
- Refine the 10th grade Summer Bridge Program (Summer 2015)
- Begin to plan the 10th grade 2015-16 school year

June 22 - 23, 2015

PAST PD team conducted a two-day professional development with the Clean Tech ECHS faculty and administration. The following advancements were made during this workshop:

- Completed 9th and 10th grade week-long Summer Bridge Program plans
- Planned goals and wireframe for the 10th grade 2015-16 school year
- Modeled effective planning and time management strategies
- Reviewed successes and needed modifications from the 2014-15 9th grade school year

Recommendations Reported in the Interim Report

The following recommendations were put forward in the Interim Report, submitted February 2015 (see Appendix I: *Interim Report*). The previous section outlines completed worked from February 2015 to June 2015 and explains advancements across the different recommended components.

Connections that needed improvement as of February 2015:

- Documentation of broad plans: use Backmaps to provide a wireframe for project plans, which can be revisited each year and modified.
- Detailed planning documentation: use Two-week Planners to record project details and daily benchmarks.
- Redesign regularly scheduled planning time to structure dedicated work for specific grade levels.

- Develop a consistent and regular schedule for meetings, both virtual and in person, to work with 9th and 10th grade students during the school week.

In order to work on the improvements listed above, in February 2015 we recommended:

- Providing the teacher team PAST PD support during the Summer 2015 Program(s)
- Continue PAST PD virtual support until the program has full enrollment into the 2015-16 school year for 9th and 10th grades
- Provide additional opportunities for Clean Tech ECHS to conduct online sessions with 9th and 10th grade students

PAST Professional Development Team: Projected Work Fall 2015

September 2015- October 2015 (virtual support): 6 virtual one-hour meetings scheduled to be conducted in September and October 2015. The intended goals of these meetings are:

- Meet with 9th and 10th grade teaching cohort separately (alternating weeks)
- Design goals and work pathways for the 2015-16 school year for each grade level
- Create a plan to support the 10th grade students in college course work and align course work to the P-Tech program objectives
- Solidify a planning process for systematic documentation

Concluding Overview

The faculty at Clean Tech ECHS are experienced teachers, motivated to try new teaching approaches to engage students and prepare students for the future. Yet, like anyone engaged in gaining new skills and strategies, they need time to adequately learn a new methodology and successfully implement it. It is important to recognize the Clean Tech teachers as early adopters and dedicated teachers, however it is essential that they are provided strategic support and structured guidance in creating a design for delivery and evidence of effectiveness essential to continued success with the incoming 9th grade cohort, and the initial year for the upcoming 10th grade program launch. In this effort, the teachers have completed year 1 of a 3-year process for designing and implementing the unique Clean Tech Program for the 9th and 10th grades.

The length of time for adoption or launch of any product or process is generally assumed to be three years by most industries and analysts. PAST concurs with these projections and recommends three years as an adequate period of time for designing, implementing, and securing a paradigm shift. In this endeavor, teachers and school administration require dedicated time to support design and implementation of Transdisciplinary Problem-Based Learning though a hybrid teaching and learning approach of distant education and scheduled onsite classes.

Over the last year of professional development, both on the ground and virtual, the PAST team has identified areas of constraint that require attention to support a successful paradigm shift, to assure the program has fidelity and resonates with both teachers and students.

PAST Professional Development Team: Recommended Actions for the 2015-16 School Year

The following suggestions focus on particular aspects of the programs that will benefit efforts to strengthen connections that need continued support to meet program objectives (*references in parentheses refer to particular 2015 survey questions*):

- Articulate the vertical rise on a regular and consistent basis to both students and parents alike (see also Appendix D: 2015 Student Survey, Q3)
- Communicate a clear outline and description, including benchmarks, for the four pathways to both students and parents (see also Appendix D: 2015 Student Survey, Q4 and Q11)
- Increase integration of college courses into Clean Tech Early College High School program (see also Appendix D: 2015 Student Survey, Q3 and Q11)
- Use pre- and post-assessment to gather baseline information and benchmark skills and literacy in any given area
- Help students bridge the aspiration of *Habits of Mind* to the application of *Habits of Mind* in a relevant way to foster career readiness (see also Appendix D: 2015 Student Survey, Q3 and Q5)

- Strengthen relevance and understanding through increased articulation of the context of TPBL and real world problems

- Modify mentor program to increase effectiveness of mentor/student interaction (see also Appendix D: 2015 Student Survey, Q8 and Q12)

- Solidify a planning process for systematic documentation by faculty to share planning documentation with program administration and colleagues
    - Documentation of broad plans: use Backmaps or other document to record project plans, which can be revisited each year and modified.
    - Detailed planning documentation: use Two-week Planners or other document to chronicle project details and daily benchmarks

- Develop effective time management strategies for grade-level teaching cohorts

- Design differentiated instructional deliveries to engage learners across multiple intelligences in an online learning environment

- Support successful collaboration by defining student roles within teams; students receive an individual grade and a group grade (see also Appendix D: 2015 Student Survey, Q10, Q11, Q12, and Q13)

- Develop additional touch points to home schools, specifically targeting counselors

- Build student habits to regularly check online platform (see also Appendix D: 2015 Student Survey, Q13)

- Develop consistent virtual meeting times for 9th and 10th grade students (see also Appendix D: 2015 Student Survey, Q12 and Q13)

Knowledge Capture
APPENDIX
Clean Technologies Early College High School
Expanding STEM at Clean Tech Early College High School

Appendix A:
Clean Tech ECHS New Student Survey
July 2014

Appendix B:
Clean Tech ECHS Summer 2014 Program Report:
9th Grade Program Launch
July 2014

Appendix C:
Clean Tech ECHS 9th Grade Student Survey
April 2015

Appendix D:
Clean Tech ECHS
9th Grade Student Post-Year 1 Survey Report
April 2015

Appendix A: Clean Tech ECHS New Student Survey 2014

PAST InnovationLab
access through education

Clean Tech ECHS New Student Survey 2014

1. **How did you first hear about the Clean Tech Early College High School? (choose all that apply)**
   - ❑ Math teacher
   - ❑ Science teacher
   - ❑ Other teachers
   - ❑ School counselor
   - ❑ Parent or other family member
   - ❑ Friend
   - ❑ Current Clean Tech student
   - ❑ Program outreach (flyer, mailings, information night, email etc.)
   - ❑ Other
   - ❑ If other, please describe

     _____

     _____

2. **Why did you choose to enroll in the Clean Tech Early College High School? (choose all that apply)**
   - ❑ I like math
   - ❑ I like science
   - ❑ I like computers
   - ❑ I am interested in environmental issues
   - ❑ I am interested in learning about new technology
   - ❑ I am thinking about my career
   - ❑ I am thinking about college
   - ❑ My parents wanted me to enroll in the program
   - ❑ Other
   - ❑ If other, please describe

     _____

     _____

3. **What was your favorite class in 8th grade, and why?**

   _____

   _____

   _____

   _____

4. **What do you think will be the most exciting thing about your first year of high school?**

_____

_____

_____

_____

5. **What do you think will be the most exciting thing about becoming a Clean Tech Early College High School student?**

_____

_____

_____

_____

6. **Do you enjoy working in teams with other students?**
   - ❍ Yes
   - ❍ No
   - ❍ I don't know
   - ❍ If yes, what do you like about it?

_____

_____

7. **Do you have ideas about what you want to do after you graduate from high school?**
   - ❍ Yes
   - ❍ No
   - ❍ If yes, what are your ideas?

_____

_____

8. **Have you ever participated in a STEM challenge or competition?**
   - ❍ Yes
   - ❍ No
   - ❍ If yes, what did you enjoy about the experience?

_____

_____

Appendix B:
Clean Tech ECHS
Summer 2014 Program Report:
9th Grade Program Launch

Clean Technologies
Early College High School

Summer 2014 Program Report:
Ninth-Grade Program Launch

Ballston Spa Central School District
Ballston Spa, New York
Dr. Joseph P. Dragone, Superintendent

KNOWLEDGE CAPTURE PROGRAM
PAST Foundation
Monica S. Hunter, Ph.D, Director of Research
Kat Deaner, STEM Coordinator
Maria Green Cohen, Senior Research Associate
Meghen Matta, Research Associate

THE PAST FOUNDATION

OVERVIEW OF THIS REPORT

During the spring quarter of 2014, the PAST Foundation provided support for the Clean Technologies Early College High School (Clean Tech) preparation for the first cohort enrollment of ninth-grade students entering high school in fall 2014. The first report issued in June 2014 tracked the early stages of planning, including outreach and recruitment strategies for opening enrollment to eighth-grade students from across the region seeking STEM education as a component of their high school course work. The report, "Program Design for Ninth-Grade Enrollment, Fall 2014," outlined regional recruitment efforts conducted by Clean Tech in collaboration with middle schools, and identified key issues and challenges for increasing enrollment of under-represented students, including females as well as at-risk and disadvantaged youth.

This report documents planning and implementation for conducting a 9th grade five-day summer bridge program held at the TEC-SMART campus during July 2014. The Clean Tech summer program hosted (73) ninth-grade students led by four Clean Tech instructors. Support provided by PAST included professional development for the Clean Tech instructors (June 30 to July 1, 2014), as well as on-site coaching and formative evaluation conducted during the five-day summer program. The latter included observation of student and teacher interactions, and involved administration of a mid-week student survey (day three). Focus groups were conducted at the end of the program with five Clean Tech instructors, and with a group of eight students who volunteered to take part in a focus group.

The following sections of the report include a summary description of the two-day professional development and goals for the 9th grade program design. Focus group data provides the basis for analysis of the program from the perspective of the teachers as well as from views held by students gained through structured dialogue held during the summer program. Together the focus group data for both teachers and students offer a context for considering the achievements of the launch of the first ninth-grade cohort. Issues identified in a 'work-in-progress' review of the program explores targeted areas of program support as teachers and students enter into a new, collaborative learning experience based on mutually defined expectations and strategies for academic success, and for developing critical skills including establishing new social roles and relations.

CLEAN TECH INSTRUCTOR PROFESSIONAL DEVELOPMENT

As part of the preparation for the incoming 9th grade cohort, teachers at Clean Tech Early College High School participated in a two-day professional development (PD) workshop led by the PAST Foundation (June 30 and July 1, 2014). The goals for the two-day PD workshop were to:

1) Plan the five-day summer bridge program for the 9th grade cohort
2) Plan the first quarter for the 9th grade cohort
3) Learn new planning and teaching strategies to build upon the existing integrated STEM education for the Clean Tech ECHS Program

Teachers were given the following materials in advance to prepare for the two-day PD: Course content for the online class titled, *P3: Introduction to Transdisciplinary Problem-Based Learning* and the corresponding workbook, *Problems > Projects > Products: Designing Transdisciplinary Problem-Based Learning* by Sheli Smith, Ph.D. and Annalies Corbin, Ph.D. (September 2013).

P3 Course

The content for the PAST Foundation's online course, *P3: Introduction to Transdisciplinary Problem-Based Learning*, was made available to the Clean Tech ECHS teaching team via Basecamp™ on June 2, 2014. Clean Tech faculty had the option of accessing the course material at their own pace in preparation for the two-day professional development with the PAST Foundation. Teachers reported that the teaching team watched all of the course podcasts together as a group during one session.

The P3 introductory course provides an overview of the instructional strategies associated with Transdisciplinary Problem-Based Learning (TPBL), a 21st century model used to deliver integrated STEM instruction. This course covers the antecedents of the process as well as the innovative system used to develop a culture of learning that resonates with the specific community in which the instruction is delivered. The process explores all components of building a TPBL educational environment, including establishing school habits which impact a school's instructional climate, demonstrating gained knowledge, and benchmarking progress in ways that define success for students and teachers. Each of the eight PD modules in the P3 course has three parts: 1) informational podcasts; 2) extension activities that include videos and 2-3 corresponding discussion questions; and, 3) planning templates/deliverables.

The titles for each module are listed below:

1. Introduction to TPBL
2. Problem Development for TPBL
3. Principles of Design
4. Building TPBL Modules
5. The Lewis Rubric
6. Aligning Standards to TPBL Modules
7. Short Cycle Assessment
8. Fidelity and Benchmarking

Workbook

Copies of the workbook, *Problems > Projects > Products: Designing Transdisciplinary Problem-Based Learning*, were sent to program administrators and faculty at Clean Tech on June 8, 2014. The workbook corresponds with the P3 course and is process-driven, offering hands-on templates for designing and implementing 21st century education. The step-by-step process outlined in the book is intended to help instructors and community partners build robust and sustainable environments that engage the learning team of teachers and their students.

Professional Development Formative Feedback

To maximize the two-day professional development, teachers were given resources in advance of the on-site training to become familiar with PAST's TPBL planning process. As part of the initial design for professional development, PAST constructed a Socrative™ survey to assess understanding of the TPBL process. Teachers were given the Socrative™ link on the first morning (June 30, 2014) of the two-day PD. The following four questions were asked:

1. What is the purpose of a problem?

2. What is the difference between a project and a product?

3. How does pre- and post-assessment drive real time course correction?

All teachers who participated in the two-day PD responded to all four questions. Teacher responses to the four Socrative™ questions demonstrated alignment with the P3 course objectives and understanding of the TPBL process. In response to the questions, "What is the purpose of a problem?" and "What is the difference between a project and a product?" teachers were able to distinguish differences in the hierarchy of problems, projects, and products. Products are the tangible demonstration of learning, while the project is the process used to get to a solution. Teachers reported that the problem provides authenticity and relevance to learning, while giving students the opportunity to develop multiple solutions. In response to the question, "How does pre- and post-assessment drive real time course correction?" respondents reported that assessment allows for individualized instruction and informs teachers about the student level of understanding in order to differentiate instruction. In response to the question, "How does presentation of learning to an authentic audience affect project management?" teachers reported that having a deadline with a real purpose supports student engagement and ownership.

The Socrative™ survey provided formative feedback to the PAST PD team, validating readiness of the Clean Tech teaching team to move forward with the PAST approach to the TPBL planning process. Additionally, the Clean Tech teaching team has three to four years of experience with integrated STEM education, therefore use of the Socrative™ survey provided a tool to tailor the approach appropriate for the Clean Tech PD workshop, building on existing teacher skill levels to maximize the two-day PD in designing the plan for the 9th grade summer bridge program and the first quarter of the fall 2014 academic year.

In the following sections of this report, focus group and survey data are presented to offer further understanding of the five-day bridge program experience, including challenges and achievements identified by the Clean Tech teaching team, and student views on the accomplishments of the bridge program.

SUMMER BRIDGE PROGRAM

The summer program was conducted Monday, July 14 through Friday, July 18 at the TEC-SMART campus and was attended by (73) 9th grade students. Support provided to Clean Tech instructors by an onsite PD Coordinator, and engagement with instructors and students by the Knowledge Capture Program are reported here. The Knowledge Capture staff conducted a student survey (mid-week), and two focus groups, one with instructors and one with students, to gain insights on summer program design and expectations for the 9th grade Clean Tech Program.

On-site Coaching

The PAST Foundation staff provided on-site coaching to the Clean Tech teaching team during the five-day summer bridge program. The on-site coaching assisted with real time course correction for implementation of the plan designed during the two-day PD to launch students on their first project. The summer session project asked students to consider possible ways to maintain critical communication within communities, as well as between communities over long distances during times of difficulty such as natural disasters. The PAST Foundation PD Coordinator worked directly with teachers and with administrators during the five-day bridge program, conducting daily review and planning sessions with the Clean Tech teaching team. The PD Coordinator also conducted observation of daily instruction and student activities, providing feedback as well as guidance for implementation strategies to support on-site real time course correction. Daily observation was also supported through formative evaluation conducted by the Knowledge Capture Director in coordination with the PD Coordinator. Daily review and planning sessions provided the opportunity for the Clean Tech instructors to reflect on daily objectives with input from the PD Coordinator and Clean Tech administrative team.

Clean Tech Instructor Focus Groups

Focus group discussion with five instructors was conducted at the conclusion of the program, giving instructors the opportunity to reflect on the summer program and consider emerging perspectives on issues and challenges for the coming 2014-15 academic year for the 9th grade program. The issues identified throughout the discussion were framed by focus group questions concerning strategic approaches to future program planning and program design.

Teachers' observations about the summer bridge program included ways to restructure the schedule to meet program objectives by designing a program of half-day sessions for students. Teachers noted that half-day summer program sessions would allow instructors time to work collaboratively in extended daily planning sessions. These planning sessions would provide teachers with time to review initial assessments of developmental differences in freshmen-level students, and create strategies to enrich activities in ways that address those differences.

This proposed restructuring was also viewed as being more consistent with best practices established by the Clean Tech teaching team who work daily in collaborative strategy sessions to identify and respond to emerging student needs during the course of the regular academic year. In this approach, it was also suggested that it would be beneficial for students to attend two five-day summer sessions, as opposed to one summer session designed for six-hour days. Holding two summer sessions (2-3 weeks apart) would provide extended face-to-face time for students and instructors, and increase time for appraisal of grade-level skills. The extended timeframe would also allow students to more fully absorb program objectives, as well as build essential communication skills and gain a more in-depth understanding of program expectations of students entering the 9th grade.

A final view of the summer program expressed by instructors concerned the potential for bringing in other teachers to support 9th grade students during the summer session. This involves including 8th grade instructors during the summer session to assist with identifying developmental differences. Additionally it was observed that involving 8th grade instructors during the summer session could provide opportunities to build experience and training in problem based learning in Clean Tech feeder schools.

Observations about the 9th grade program design overall involved views on increasing planning time in the future, as well as PD to support curriculum development. Ideas centered on designating time to assure that instructors develop effective strategies throughout the year for 9th grade students who will engage primarily through an online system supported by CANVAS®. Consideration of approaches via online interaction for mentoring students, as well as structuring dedicated time to focus on 9th grade students throughout the school year were raised as important components of the 2014-15 program envisioned by the instructors.

Discussion of this aspect of the program also included the potential for bringing on additional instructor support for online student interaction, for teaching online courses, or assisting as a co-teacher. Industry partners were also identified as a source of potential ways to provide additional resources for classroom support and should be explored further as the Clean Tech program expands to full 9-12 grade level enrollment.

Additionally, instructors agreed that a priority for the 9th grade program would be to establish opportunities for face-to-face engagement with students during the academic year, when instructors will also be involved with 11th and 12th grade students. This was raised as a challenge that could be met by designating regular opportunities to engage with 9th grade students to address particular needs. Teachers also identified a key challenge regarding having sufficient engagement to address grade-level skill development, and assure that students advancing through the 9th and 10th grade Clean Tech Program will achieve academic readiness for entry to the 11th grade program.

Student Survey and Focus Group

A student survey was conducted on day three of the summer session, followed by a student focus group dialogue held on the last day of the summer program. The student focus group was designed to explore survey questions further, probing student views about the summer program as well as expectations of the Clean Tech program. Analysis of the focus group discussion is presented first, noting that student observations expressed during the focus group were generally consistent with survey responses from mid-week. However, discussion about the program on expectations for the year ahead were mainly focused on student experiences during the week with Clean Tech instructors, which was not as evident in the survey responses from earlier in the week. Focus group discussion about the Clean Tech program suggested that students experienced a significantly different interaction than they had experienced with other instructors in the past. The tenor of the discussion among the eight students reflected a positive outlook on their ability to achieve academic success because of the quality of instruction experienced during the five-day summer session, and expectations of the program as a whole to support higher academic performance.

Focus group participants volunteered to join the discussion, and included four females and four males (n=8), representing four of the eleven school districts. In reviewing the survey questions, students were enthusiastic in their views of the program and opportunities they anticipate will occur to support their goals for attaining exciting careers in new fields, and increase the probability of entering college in order to enter a STEM-related field. This included the idea that the early college program will reduce the cost of college overall, which was described as a definite advantage.

Identifying their favorite subjects in middle school, students noted science and math, technology as well as social studies. Several students commented that they had the opportunity to take a "STEM" class where they learned about nanotechnology, forensics, robotics and rockets.

Obstacles to entering the program centered on their experience with transportation to the TEC-SMART campus during the summer session. However, all students thought this was a minor problem their parents could contend with, and anticipated that they would be in a position to transport themselves by the time they entered 11th grade, even while acknowledging as much as a 30-minute commute.

The majority of discussion topics among the eight students included anticipated differences between their home high schools and the Clean Tech Program focused on teacher engagement and teacher expectations. All students commented that the summer program had given them a very positive and strong sense that Clean Tech instructors are dedicated to their academic success. This was in contrast to many observations about prior experience, where lack of engagement with teachers was a common theme among the student participants. All acknowledged that they had good relations with their teachers in the past, but felt that they seemed satisfied with being "good" in a subject, and that expectations were not as high, or that school was not as challenging as they expect of the Clean Tech program.

When sharing views about the work completed during the week, students commented positively on teamwork, communication, and making a deeper connection with their Clean Tech instructors than they had expected. One student mentioned that instructors knew her name by the end of the week when no one wore a nametag, which she found surprising given the large student group of over 70 students (4005-214).

All students commented that teachers were approachable, interested in their questions and in communicating clearly and effectively about the work underway. Students also noted that the teamwork process was very different than they had experienced in other classes because everyone had a defined role. This made it possible for everyone to do their work because they understood what was expected, rather than simply not participating and letting the others on the team do all the work. The clarity of instruction and expectation for each member of the team created an experience in which they were able to work with students from different schools, noting that it was possible to work as a team despite not knowing each other because they could rely on their role on the team to engage with their fellow team members.

The concept of collaboration was also viewed as an essential aspect of teams with defined roles, where no one team member takes control or dictates to the group. Collaboration was associated with being mature, recognizing that work was a priority over socializing during class time, and eliminated conflict among the team members about the process for completing the assigned tasks. Collaboration was associated with good communication. Students commented that virtual communication using CANVAS® or other social media would allow them to "collaborate whenever we need to," whether at school or at home (4005-131).

Freedom to explore to attain new knowledge was identified by students as an important aspect of their experience during the summer session. In the context of the week's work, this freedom was considered a key element of "thinking outside the box," and independent learning (4008-186). The real-world aspect of thinking about communication in the context of natural disasters also injected a sense of purpose, reinforcing both the need to work through the project to completion, and in laying groundwork for real solutions to overcoming obstacles to communication. The latter was recognized by students as a "real situation" requiring skills they will need during the coming academic year when they will work virtually with their teammates on their projects during the 2014-15 academic year.

Finally, the quality of instruction and the instructors' style of communication was described by all eight students as creating high expectations of themselves and of their experience to come as freshmen in the Clean Tech Program. One student commented that because they could attain a higher level of academic success, it would be possible to assist other students at their home high school who are struggling in their schoolwork. The student observed that he expected he could help others to learn in ways taught in the Clean Tech Program using skills he will have that other students might not (4006-174). Students also shared awareness that the summer program was

itself "re-engineered" during the course of the week. This involved shifts that occurred due to unexpected delays with computers and technical glitches with accessing their Hudson Valley Community College online account (4008-223). This experience created awareness of problem solving through modeling of problem solving skills exhibited by program instructors and support staff, including technical support staff and Hudson Valley students who also came to the campus to assist with technical support.

At the conclusion of the discussion students shifted their focus to consider the skills they thought they would acquire during their four years in the Clean Tech program. Many of their observations concerned preparing for college and career. When asked to comment on the potential skills students thought they would gain, attaining real knowledge and understanding was noted in contrast with more than just "giving out homework" and "taking a test on Fridays" (4006-218). One student summed up by observing that it's not so much about what should be learned in the Clean Tech program, but what do students *want to learn* while in the program (4001-219).

In the following and concluding section of the report, analysis of the student survey conducted on day three of the summer program is presented.

Student Survey Overview

An online survey was conducted with Clean Tech ECHS 9th grade students on July 16, 2014. The survey was administered via Survey Methods© to students on day three of a five-day summer bridge program, conducted Monday July 14 through Friday July 18 at the TEC-SMART campus. Of the (73) 9th grade students enrolled in the summer program, 96% (70) completed the survey. These (70) students represent (11) PreK-12 school districts participating in the first 9th grade cohort, enrolled in the Clean Tech ECHS Program for the 2014-15 academic year. Student survey participants utilized their Clean Tech laptop computers to access the online survey posted on a web-based platform (www.surveymethods.com) that supports anonymous survey administration.

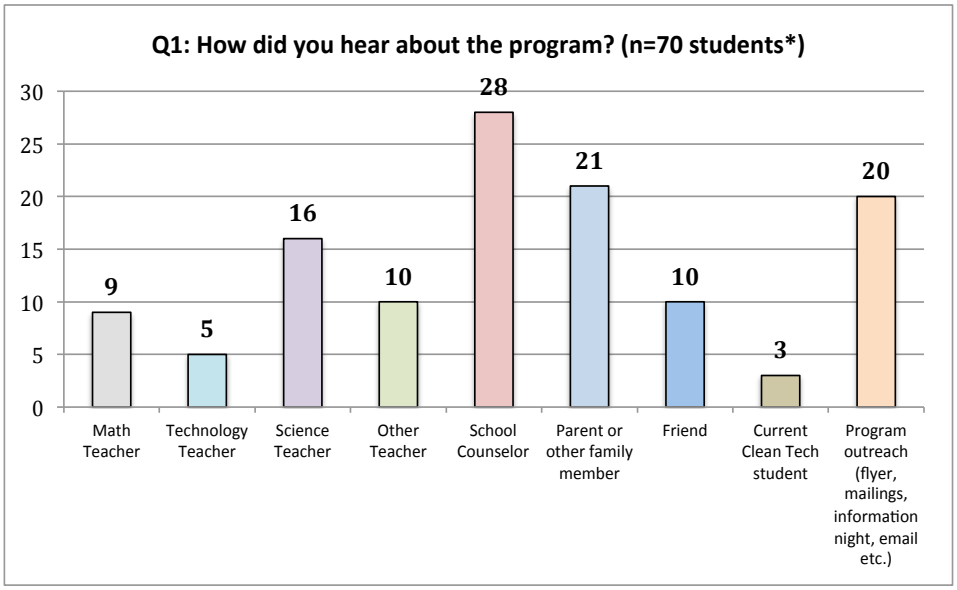
The survey design was initially developed using data gathered during prior Clean Tech student focus groups and surveys, as well as interviews conducted with the staff, students, administrators, parents and program partners. The final survey design was developed by the Knowledge Capture Team, and was also circulated for review and input from the PAST Foundation Professional Development (PD) team and the Clean Tech ECHS administrative staff. The final survey consists of (8) questions (see Appendix A).

The survey was developed to gain an understanding of student characteristics including: 1) reasons for choosing the Clean Tech ECHS Program; 2) expectations of high school, and in particular, expectations about becoming a Clean Tech student; 3) student interests; 4) ideas about college and career; and 5) prior experience with STEM informal education.

Discussion of the graphic illustration and tabled survey data is presented in the next section. Responses have been analyzed and presented graphically in bar chart format allowing comparison of student responses for "yes/no" questions, or for questions that allowed students to select among defined categories. Open-ended questions (e.g., Why did you enroll in the Clean Tech Program?) are shown in tabled format organized by themes identified in student responses. Questions 2, 6, 7, and 8 include both a bar chart and tabled data of associated responses (e.g., "If yes, please describe"). Note that a student response to an open-ended question could contain multiple themes; in that event, responses were parsed to identify each theme included by the student in their response.

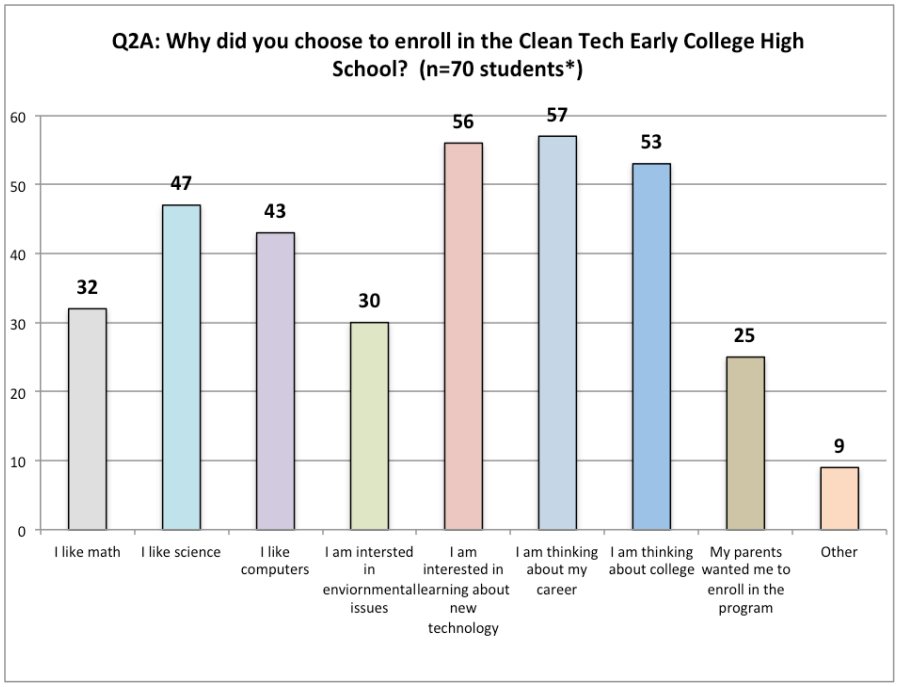
Clean Tech ECHS Student Survey Analysis

The 9th grade outreach and recruitment strategy for the Clean Tech ECHS Program employed a multi-faceted approach that directed program information to school faculty and counselors, as well as directly to families through a range of outreach activities including holding evening events for prospective students and their parents. Of the (70) students who responded to the question, 40% identified school counselors and 57% reported teachers as the source of information about the Clean Tech Program, validating an important outreach component for building interest in the program. Reaching out to parents also proved effective, with nearly one-third of students (30%) identifying a parent or family member as a source for developing student interest. The latter was considered by program staff to be an important aspect of outreach for 9th grade students, who it was thought could need more involvement of parents in making the choice to enroll in the early college program. Overall, 44% (31) of the 70 students identified more than one source of information about the Clean Tech ECHS Program (total responses = 122).



** Students could select more than one category, indicating more than one source of information about the Clean Tech ECHS Program (total responses=122).*

In response to the question, "Why did you enroll in the Clean Tech Program," students selected from among nine choices, including the option to give a written response (n=70). Students were also given the option to select more than one reason for choosing to enroll at Clean Tech. Sixty-six students (94%) identified multiple reasons for becoming a Clean Tech student. At least three-quarters of the students identified their interest in preparing for a career (81%) or in preparing for college (75%). Students also identified science (67%), math (47%), environmental issues (43%), technology (80%) or interest in computers (61%) as reasons to attend the program. Just over one-third (36%) said their parents wanted them to enroll in the program.



**Students were given the option to select more than one reason; total reasons given by students = 352.*

Q2B: Why did you enroll? (n=9*)	Number of Responses
Greater oppertunities	3
Fun and/or great experience	2
Develop public speaking skills	1
Intrest in clean energy and/or technolgoy	1
Obtain an Assosiate's degree	1
Curious about new program	1
Open new ideas for career pathways	1

Sixty-nine students responded to the open-ended question, "What was your favorite class in 8th grade?". Just over one-third of students Identified science (35%) as their favorite class, followed by math (28%) as their favorite class. Note in response to why a student liked a particular class, 35% of students identified the teacher as a factor in their choice of favorite subject. Only five students identified more than one favorite subject.

Q3A: What was your favorite class? (n=69*)	Number of Responses
Science	24
Math	19
Technology	12
Social Studies	8
English Language Arts	4
Foreign Language	3
Family and Consumer Science	2
Engineering	1
Art	1
STEM	2
Chorus	1

**Five students identified more than one class; total number of subject areas identified by students = 77.*

Q3B: Why was it your favorite class? (n=69*)	Number of Responses
Themes	
Inspiring and engaging teacher	24
Hands on learning	16
Course experience is fun	14
Proficiency in subject	13
Problem solving	7
Use of and learning about technology	6
Challenging material	4
Enjoy subject material	2
Real world learning	2
Trandisciplinary learning	1
Creative freedom	1
Improving skills	1

**Some students identified more than one idea about their favorite class; total reasons identified by students = 88.*

In response to the open-ended question, "What do you think will be the most exciting thing about your first year of high school?", the top two student responses included either more freedom in general, or more freedom to choose coursework, for a combined total of 44% of student responses (n=70). Just over one-third of students (36%) identified either the Clean Tech Program, or related program components (technology classes, college preparation, or career preparation), although only 5 students identified college preparation and 1 student said that career preparation was the most exciting aspect of high school. This is in contrast with Q2: "Why did you enroll in Clean Tech?" where at least three-quarters of the students (n=70) identified their interest in preparing for a career or in preparing for college as their reason for enrolling in the program.

Q4A: Most exciting thing about first year of High School (n=70*)	Number of Responses
Theme	
More freedom	17
Variety of classes, electives, and choices	14
Working with new teachers	13
CTECHS program	11
Working with new people	8
New technology; technology classes	8
New building and/or environment	6
Working with older students	6
College preparation	5
Seeing friends	5
New opportunities	2
Freedom to carry personal belongings to class	2
Sports and clubs	2
Maturity and responsibility	1
Group projects	1
Career preparation	1
Vacation time	1
Learning new things	1

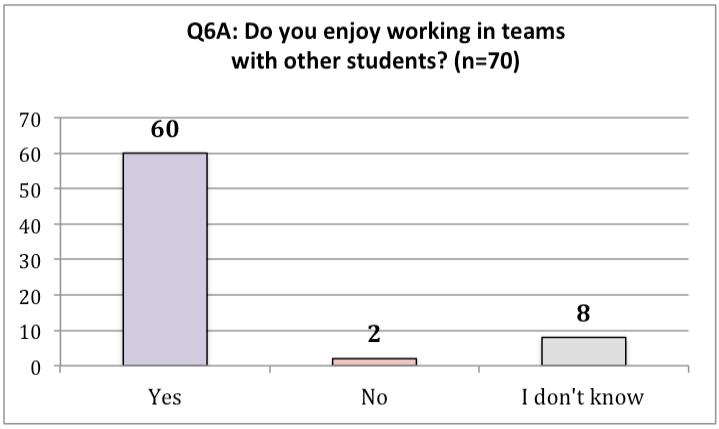
**Twenty-eight (40%) of students identified more than one idea about being a high school freshman; total ideas identified by students = 104.*

Student expectations (n=70) about the most exciting aspect of becoming a Clean Tech student shows a clear difference between their views on their home high school and the early college program, with 21% of students identifying the opportunity for early college coursework, and 13% citing working with new technology or helping the environment. Only five students included expanding career opportunities as the most exciting thing about becoming a Clean Tech student in comparison with responses to Q2, with 81% of students citing preparing for a career as the reason they chose to enroll in the Clean Tech program. Thirty-five students (50%) identified multiple ideas about becoming a Clean Tech student.

Q5A: Most exciting thing about becoming a CTECHS student (n=70*)	Number of Responses
Theme	
Meeting new people	24
Early college	15
Learning new things	11
Learning and working with new technology	9
Helping the environment	9
Learning in a new way	8
Expanding career opportunities	5
Being with engaged students who share interests	4
Other opportunities	3
Hands on projects	3
Obtaining an Associate's degree	3
STEM	3
Being challenges	2
Being an early adaptor	2
Becoming a role model	1
Gaining leadership skills	1
Working in groups	1
Gaining closer relationship with teachers	1
Becoming a better students	1
Experiencing real world learning	1
Gaining confidence	1

**Half of the students responding to this question identified multiple ideas about becoming a Clean Tech Student; total ideas included by students = 108.*

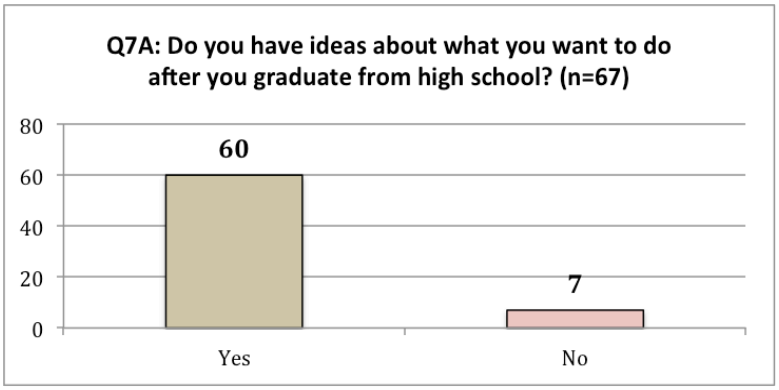
A major component of the 9th grade program will focus on building skills to support collaborative teamwork to design and complete school projects. Of the (70) students who responded to the question about teamwork, (87%) indicated that they enjoy working in teams. Fifty-three of the (60) students who said they enjoyed teamwork, also responded to the open-ended question giving reasons why they like working in teams. Students identified a range of reasons for their positive view of teamwork including sharing ideas (39%) and working together to solve problems (31%). Of the eleven themes presented in Table 6B, five are related to sharing or working together.



Q6B: What do you like about working in teams? (n=53*)	Number of Responses
Theme	
Sharing ideas	27
Solving problems together	22
Working together	8
Sharing work equally	6
Meeting new people	6
Bonding with other students	4
Sharing skills	4
Making new friends	4
Working more efficiently	3
Having fun with the experience	2
Personal growth	1

**Fifty-three students identified reasons why they like working in teams; (28) included multiple ideas about working in teams. Total ideas about working in teams given by*

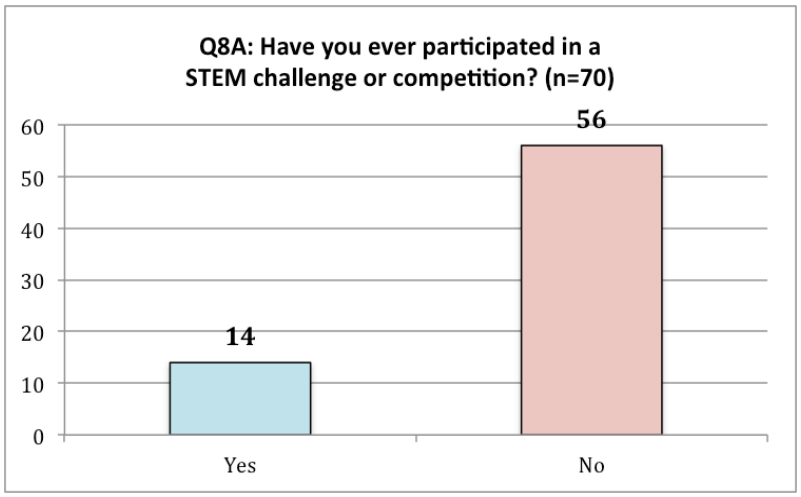
In response to the question, "Do you have ideas about what you want to do after you graduate?" (n=67), 90% replied they did. Fifty-five students identified specific career interests, and these are listed in Table 7B.



Q7B: What are your ideas for after High School? (n=55*)	Number of Responses
Themes	
College (4 Years, Bachelor's degree)	17
Engineering or design	8
Computer Science	6
Medical field	5
Business	5
Graduate school	5
Clean energy/Clean technology career	4
Veterinary science	4
Nanotechnology	4
Creative arts	4
Math/Science field	4
Technology	2
Speech pathology/Speech therapy	2
Teaching	1
Military	1
Police work	1
Sportscaster	1
Financially secure job	1

**42% of the students responded with more than one goal (e.g., I want to go to college and become a veterinarian).*

A surprising number of students (80%) indicated that they had not participated in a STEM challenge or competitive project activity prior to enrolling in the Clean Tech program. This suggests that increased outreach could potentially raise awareness and interest in STEM learning through informal activities, and help to expand the regional pool of students enrolling in the Clean Tech program in future years.



Q8B: What did you enjoy about participating in a STEM challenge? (n=11*)	Number of Responses
Theme	
Enjoyed working with peers who share their interest and/or skills	6
Specified type of competition, such as Robotics	5
Fun and enjoyable	3
Enjoyed creative problem solving	2
Enjoyed hands-on learning	1
Enjoyed solving real world problems	1

Appendix C:
Clean Tech ECHS
9th Grade Student Survey
April 2015

PAST InnovationLab
access through education

Clean Tech ECHS 9th Grade Student Survey April 2015

1. **Why did you choose to enroll in the Clean Tech Early College High School? (Please choose all that apply)**
   - ❑ I like math
   - ❑ I like science
   - ❑ I like computers
   - ❑ I am interested in environmental issues
   - ❑ I am interested in learning about new technology
   - ❑ I am thinking about my career
   - ❑ I am thinking about college
   - ❑ My parents wanted me to enroll in the program
   - ❑ If other, please describe

     _____

     _____

2. **What was your expectation when you enrolled in the ECHS?**

   _____

   _____

   _____

   _____

3. **What goals do you hope to achieve as a student at the ECHS?**

   _____

   _____

   _____

   _____

4. **Do you have ideas about what you want to do after you graduate from high school?**
   - ❍ Yes
   - ❍ No

   If yes, what are your ideas?

   _____

5. **What are the important skills you think you need in order to be prepared for your future?**

   _____

_____

_____

_____

6. **What have you liked most about your first year at the Clean Tech Early College High School? Please choose your top 3 among the following:**
   - ❑ Projects
   - ❑ Working with my Clean Tech Teachers
   - ❑ Mentoring experiences
   - ❑ Working virtually with other Clean Tech Students
   - ❑ Working with technology
   - ❑ Using Canvas
   - ❑ The Summer Program
   - ❑ Expos at the TEC-SMART campus
   - ❑ Guest speakers
   - ❑ Hudson Valley college class
   - ❑ If other, please describe

     _____

     _____

7. **What do you think about the technology you are using at ECHS? (Computers, laptops, GoPros, etc.)**

   What do you like most? _____

   What do you like least? _____

8. **What have you found to be the most challenging aspect of the Clean Tech Early College High School? Please choose your top three among the following:**
   - ❑ Projects
   - ❑ Working with my Clean Tech Teachers
   - ❑ Mentoring experiences
   - ❑ Working virtually with other Clean Tech Students
   - ❑ Working with technology
   - ❑ Using Canvas
   - ❑ The Summer Program
   - ❑ Expos at the TEC-SMART campus
   - ❑ Time Management
   - ❑ Hudson Valley college class
   - ❑ If other, please describe

     _____

     _____

9. **Were you able to overcome the challenges you experienced in your first year at the Clean Tech Early College High School?**
   - ❍ Yes
   - ❍ No

10. **If yes, how were you able to overcome the challenges you experienced in your first year at the Clean Tech Early College High School? (Please choose all that apply)**
    - ❑ On your own?

- ❑ In collaboration with other Clean Tech students?
- ❑ Through assistance from your Clean Tech teachers?
- ❑ Through assistance from a home high school teacher or other staff?
- ❑ Through assistance from your parents?
- ❑ Through assistance from an older sibling?
- ❑ If other, please describe

_____

_____

11. **Please describe up to 3 ways your experience at Clean Teach is different than your home high school:**
    1. _____
    2. _____
    3. _____

12. **If you could make any changes in the program what would you change and why? (Please list up to 3 things you would change)**
    1. _____
    2. _____
    3. _____

13. **What advice would you give to the incoming 9th grade students in the fall of 2015?**

_____

_____

_____

_____

Appendix D:
Clean Tech ECHS
9th Grade Student Post-Year 1
Survey Report
April 2015

KNOWLEDGE CAPTURE
CLEAN TECHNOLOGIES Early College High School
9TH GRADE STUDENT Post-Year 1 SURVEY REPORT
APRIL 2015

Completed Work with PAST Knowledge Capture

The Knowledge Capture Program provided program evaluation during 2015 through conducting a post-program student survey in April 2015 with 9th grade students enrolled in the Clean Tech Program (n=58). The survey questions were designed to offer insight on the experience of the first 9th grade cohort including comparative analysis of student preferences for program content areas, as well as plans for college and career. The survey was constructed with input from the Clean Tech teachers and program administrators, as well as input from the PAST Foundation Professional Development (PD) Team. A virtual discussion session was held in early April 2015 to discuss student survey design and implementation plans with Clean Tech teachers and the PD Coordinator.

Seven survey questions, listed below, were developed to characterize the 9th grade student expectations and experiences during their first year enrolled in the Clean Tech Program.

1. Why did you choose to enroll in the Clean Tech Early College High School?
2. What was your expectation when you enrolled in the ECHS?
3. What goals do you hope to achieve as a student at the ECHS?
4. Do you have ideas about what you want to do after you graduate from high school?
5. What are the important skills you think you need in order to be prepared for your future?
6. What have you liked most about your first year at the Clean Tech Early College High School?
7. What do you think about the technology you are using at ECHS?

Recommendations from PAST Knowledge Capture

Analysis of the student Spring 2015 survey provides an opportunity for teachers and administrators to assess areas of effective change to increase student engagement and success in transitioning to online participation in problem based learning. Issues associated with challenges identified by students define ways in which the program design can be modified during the second year of the 9th grade program (2015-16), and may also inform projected needs of the rising 10th grade students entering their second year in the Clean Tech Early College High School.

Clean Technologies ECHS 9th Grade Student Survey April 2015

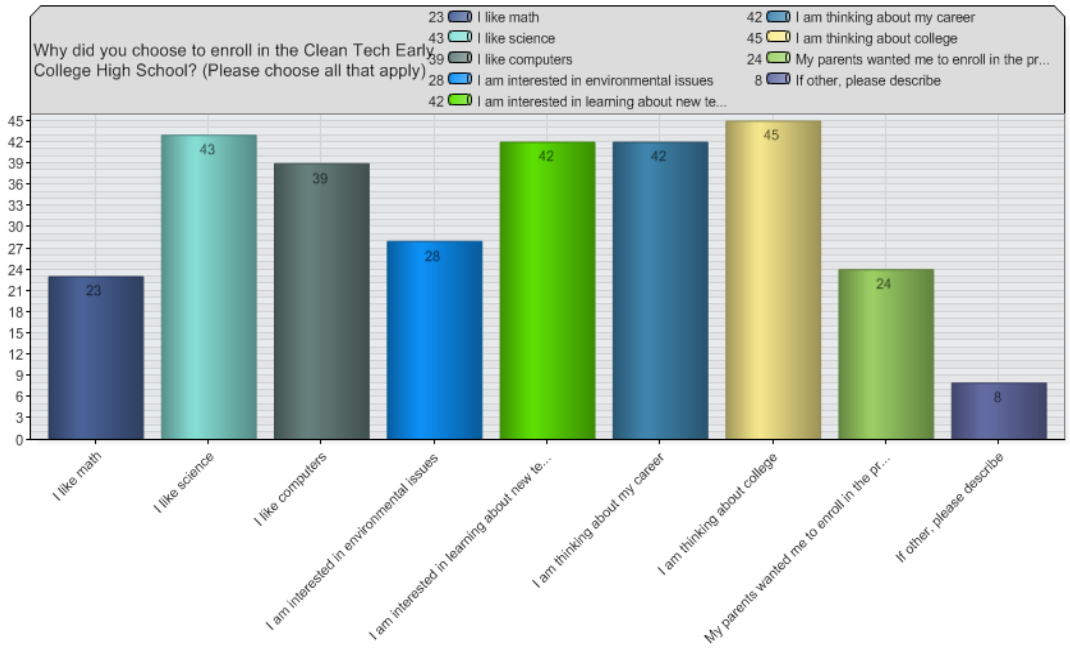
This is a final report for the Knowledge Capture Clean Technologies Early College High School (CTECHS) April 2015 Student Survey. This survey was launched on April 22nd 2015 and closed on May 29th 2015, and was conducted utilizing the online secure platform, Survey Methods™. The total number of respondents was 58 out of 67 students, resulting in an 87% response rate.

Analysis of the open-ended response questions 2, 3, 5, 7, 11, 12, 13 are presented in a thematic table format in this report. Analysis of 'If other' and 'If Yes, please describe' options for questions 1, 4, 6, 8, and 10 are presented in small tables beneath bar charts in this report.

A copy of the full question set and survey is included in the appendix of this report.

The bar charts for questions 1, 3, 6, 8, and 10 are exports from the Survey Methods™ software.

Question 1: Why did you choose to enroll in the Clean Technologies Early College High School? Please choose all that apply. (n=58)



Options from left to right:

- I like math
- I like science
- I like computers
- I am interested in environmental issues
- I am interested in learning about new technology
- I am thinking about my career
- I am thinking about college
- My parents wanted me to enroll in the program
- If other, please describe

If other, please describe (n=8*):

Exposure to new opportunities	4
Having an education/career advantage	2
Learning in a new environment	2
Preparation to be an engineer	2
Meeting new people	1
Earning college credits	1

*Some students included more than one response for "if other."

Question 2: What was your expectation when you enrolled in ECHS? (n=58)

Response	(n=58*)	
Learning and working with new technology	22	38%
Hands on projects	11	19%
Difficult program	10	17%
Early college experience	9	16%
Meeting new people	7	12%
Fun and engaging program	6	10%
More time/less time on campus	6	10%
Learning new things	5	9%
Working in groups	5	9%
Prepare for the future	5	9%
Learning STEM fields	5	9%
Working with computers	5	9%
Not fun or engaging	4	7%
No expectations	4	7%
Helping the environment by working with clean energy	3	5%
Having an education/career advantage	2	3%
Learning in a new way	2	3%
Expanding career opportunities	2	3%
Being challenged	2	3%
Less online work	2	3%
Being outside the classroom/field trips	2	3%
Experiencing real world learning	1	2%
Becoming better students	1	2%

*Some student respondents included more than one expectation in their response.

Question 3: What goals do you hope to achieve as a student at the ECHS? (n=58)

Theme	Sub-theme	(n=58*)	
Academic Growth	Be a successful student	10	17%
	Exposure to/work with new technology	7	12%
	Learn more about STEM fields	7	12%
	Explore innovation in clean energy field	7	12%
	Get good grades	5	9%
	Learn more about computers	4	7%
	Intellectual engagement	2	4%
Personal Growth	Make friends	4	7%
	Become well-rounded	3	5%
	Time management and organization	2	4%
	Develop social skills	2	4%
21st Century Skills	Improve communication skills	4	7%
	Develop collaboration skills	4	7%
	Leadership/role model	3	5%
	Real world problem solving	2	4%
College and Career readiness	Career preparation	12	21%
	College preparation	9	16%
	Prepare for future	5	9%
	Associate's degree	4	7%
	College credits	4	7%
	Get into a good college	3	5%

*Some student respondents included more than one goal in their response.

Question 4: Do you have ideas about what you want to do after you graduate from high school? (n=58)

52 students (90%) responded "yes," and 6 students (10%) responded "no" to this question.

Response	(n=52*)	
College (4 years, Bachelor's degree)	25	48%
Engineering or design	8	15%
Technology	8	15%
Creative arts	6	12%
Computer Science	5	10%
Financially secure job	5	10%
Psychology	5	10%
Medical field	4	8%
Business	4	8%
Graduate school	4	8%
Clean energy/clean technology career	4	8%
Math/science field	4	8%
Police work/law/forensics	3	6%
Nanotechnology	2	4%
Athlete	2	4%
AA degree	2	4%
Sportscaster/journalist	2	4%
Teaching	2	4%
Military	2	4%
Game programmer	2	4%
Agriculture	1	2%
Speech pathology/speech therapy	1	2%
Veterinary science/work with animals	1	2%

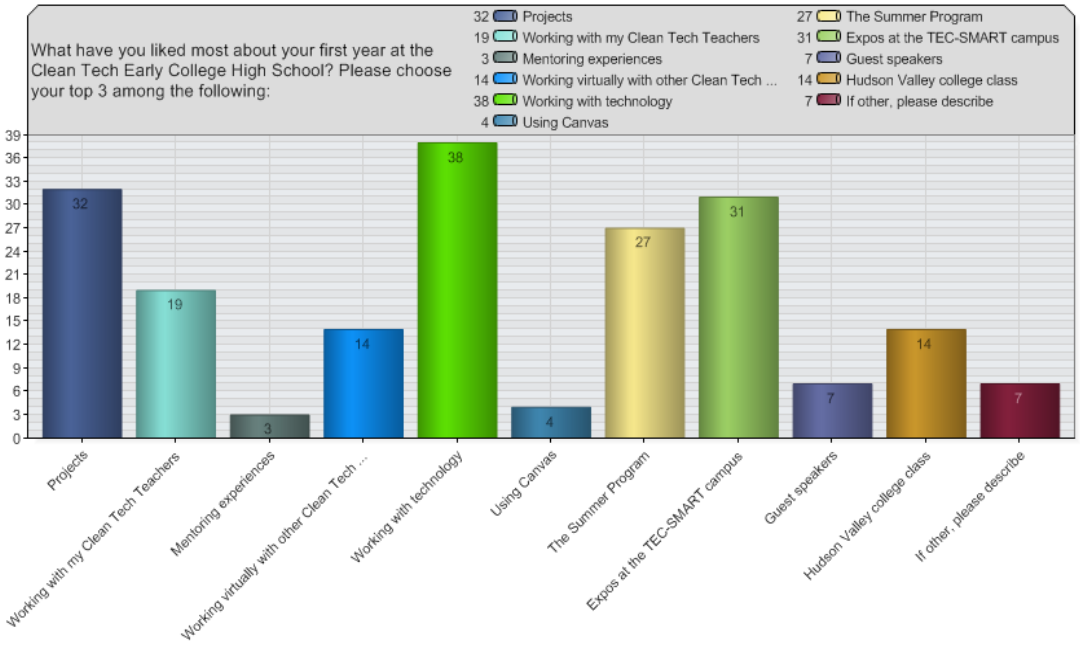
*Some student respondents identified more than one aspiration in their response.

Question 5: What are the important skills you think you need in order to be prepared for your future? (n=58)

Theme	Sub-theme	(n=58*)	
Academics	Knowledge in specific content areas	15	26%
	Technical/hands on	11	17%
	Excellent education	6	10%
	Computer and coding languages	5	9%
	Good grades	2	3%
21st Century Skills	Time management	18	31%
	Communication	15	26%
	Collaboration	13	22%
	Organization	11	17%
	Problem solving	9	16%
	Leadership	3	5%
Personal Growth	Social skills	7	12%
	Determination/perseverance	7	12%
	Confidence	7	12%
	Flexibility	4	7%
	Focus	3	5%
	Good manners	3	5%

*Some student respondents identified more than one skill in their response.

Question 6: What have you liked most about your first year at the Clean Tech Early College High school? (n=58)



Options from left to right:

- Projects
- Working with my Clean Tech teachers
- Mentoring experiences
- Working virtually with other Clean Tech Students
- Working with technology
- Using Canvas
- The Summer Program
- Expos at the TEC-SMART campus
- Guest speakers
- Hudson Valley college class
- If other, please describe

If other, please describe (n=7*):

Doing fun activities	2
Working in groups	2
Nothing	2
Meeting new people	1
Speaking with business partners	1
Being in a college environment	1
Going on field trips	1

*Some students included more than one idea about what they liked most in their "if other" response.

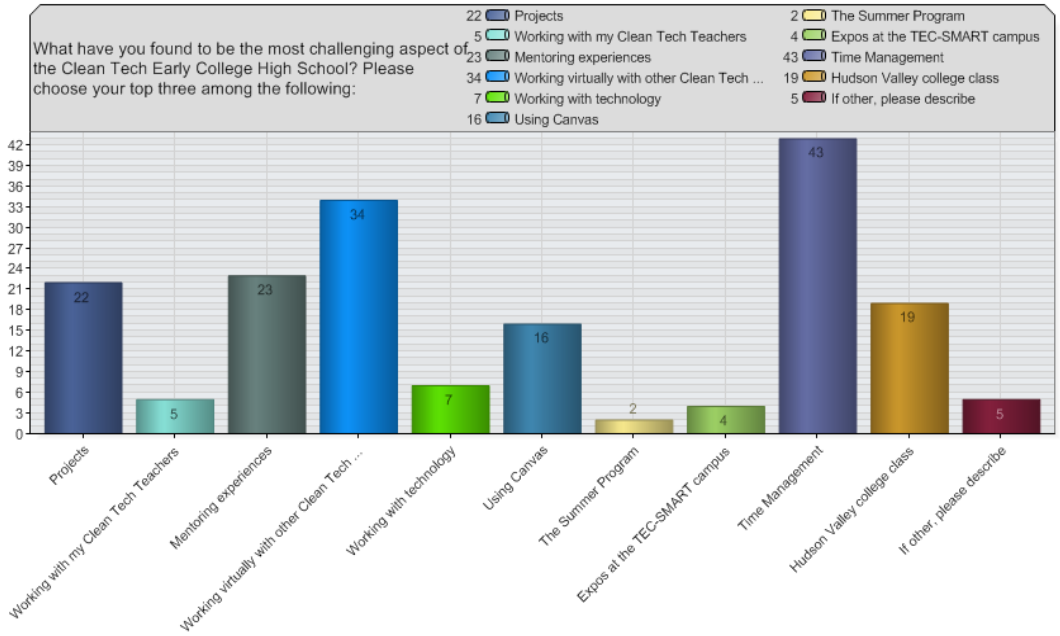
Question 7: What do you think about the technology you are using at ECHS? (n=58)

What do you like most?	(n=58*)	
Having laptops	26	45%
GoPros	24	41%
More advanced technology available than at home school	7	12%

What do you like least?	(n=57*)	
Laptops	26	46%
Too many websites (Canvas, Blackboard, Mentor Place	7	12%
Deep freeze function	6	11%
GoPros	5	10%
Restrictions on websites	4	7%
Lack of human interaction	4	7%
Too many online assignments	4	7%

*Some student respondents identified more than one program component in their response. Program components identified by fewer than 4 students were omitted from these tables.

Question 8: What have you found to be the most challenging aspect of the Clean Tech Early College High School? (n=58)



Options from left to right:

- Projects
- Working with my Clean Tech teachers
- Mentoring experiences
- Working virtually with other Clean Tech Students
- Working with technology
- Using Canvas
- The Summer Program
- Expos at the TEC-SMART campus
- Time Management
- Hudson Valley college class
- If other, please describe

If other, please describe (n=5*):

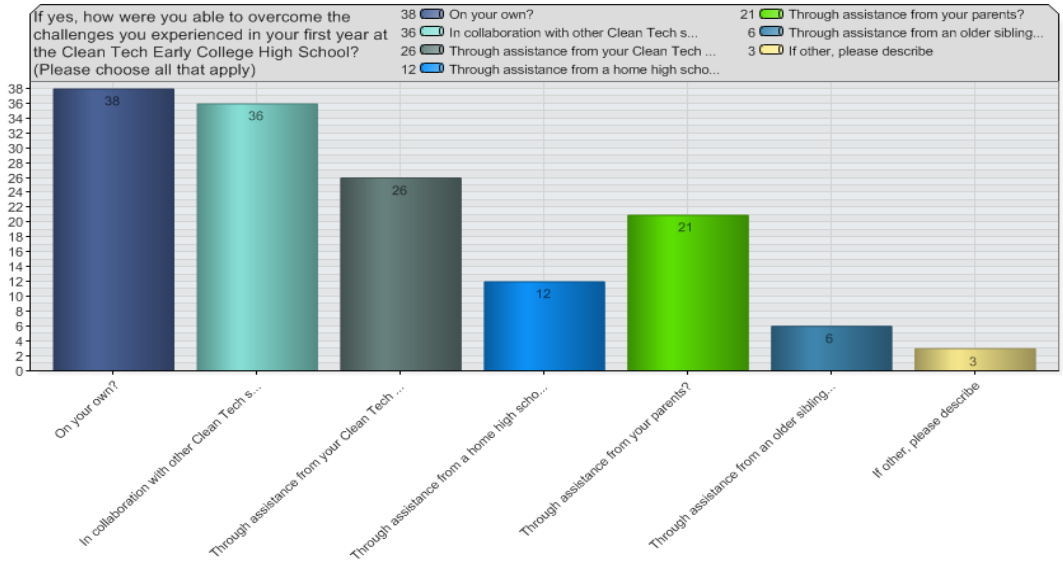
Keeping up with assignments	2
Lack of motivation	2
Working in groups	1
Technology glitches	1
Taking tests	1
Finding relevance in teacher instruction	1

*Some students included more than one idea about year 1 challenges in their "if other" response.

Question 9: Were you able to overcome the challenges you experienced in your first year at the Clean Tech Early College High School? (n=58)

56 students (97%) responded "yes," and 2 students (3%) responded "no" to this question.

Question 10: If yes, how were you able to overcome the challenges in your first year at the Clean Tech Early College High School? (n=57)



Options from left to right:

- On your own?
- In collaboration with other Clean Tech students?
- Through assistance from your Clean Tech teachers?
- Through assistance from a home high school teacher or other staff?
- Through assistance from your parents
- Through assistance from an older sibling?
- If other, please describe

If other, please describe (n=3*):

Help from friends in the program	1
Working harder	1

*One student included a response for "if other" that was already included in the bar chart.

Question 11: Please describe up to 3 ways your experience at Clean Tech is different than your home high school: (n=58)

Theme	Sub-theme	(n=58*)	
Technology	Virtual learning experience	23	40%
	More work with technology	12	21%
	Access to technology	6	10%
Social Aspects	Working with students from other schools	7	12%
	More fun	6	10%
Student skills	Collaboration	16	28%
	Requires responsibility	7	12%
	Requires time management skills	2	3%
Learning Environment	More freedom	9	16%
	Hands on work	8	14%
	Less structure	8	14%
	Easier environment	7	12%
	Doing projects	7	12%
	More challenging	7	12%
	Working with engaged students	5	9%
	Real world learning	4	7%
	More time to work on projects	3	5%
	Creative atmosphere	2	3%
Early College Experience	Less time on campus	9	16%
	Doing college level work	4	7%
	Collegiate environment	4	7%
	Participating in expositions	2	3%
Staff	Teachers are more supportive	6	10%
	Teachers are not as supportive	2	3%

*Some student respondents identified more than one program component in their response.

Question 12: If you could make any changes in the program, what would you change and why? (n=56)

Theme	Sub-theme	(n=56*)	
Technology	Better laptops	13	23%
	Simplify online classroom software	8	14%
	Remove "deep freeze" function	6	11%
	Change how College Forum is used	6	11%
	Improve student notification system	4	7%
	Remove web restrictions	4	7%
	Do not use Mentor Place	4	7%
	Less virtual learning	3	5%
Program Aspects	More time on campus	15	27%
	More field trips	5	9%
	Extend summer bridge program	3	5%
	More projects	9	16%
	More hands on work	6	11%
	Make projects more engaging	5	9%
	More engagement with teachers	3	5%
Communication	Provide more information on Clean Tech program specifics	5	9%
	Improve student notification system	4	7%
	Clarify instructions	4	7%
	Increase communication with mentors on Mentor Place	3	5%
Collaboration	Allow students to select team members to improve collaboration	12	21%
	More opportunities to work together will improve collaboration	7	13%

*Some student respondents identified more than one program component in their response.

Question 13: What advice would you give to the incoming 9th grade students in the fall of 2015? (n=57)

Theme	Sub-theme	(n=57*)	
Being Accountable	Learn to manage your time	36	63%
	Persevere	9	16%
	Check-in online	7	12%
	Communicate with teachers and staff	5	9%
	Be organized	4	7%
	Ask questions	4	7%
Social Adjustment	Have fun	9	16%
	Make friends	7	12%
	Collaborate with your group	7	12%
	Communicate with other students	6	11%
Managing Expectations	Research program before enrolling	3	5%
	Keep expectations low so you are not disappointed	2	4%
	Be sure you are ready for an early college program	2	4%

*Some student respondents identified more than one suggestion for new students in their response.

Professional Development
APPENDIX
Clean Technologies Early College High School
Expanding STEM at Clean Tech Early College High School

Appendix E:
Clean Tech ECHS
Agenda and Resources
January 29-30, 2015

Appendix F:
Crosswalk MentorPlace and 4th Quarter Unit

Appendix G:
Draft Planning Schedule

Appendix H:
Student Login Infographics and Habits of Mind Rubric

Appendix I:
Clean Tech ECHS Interim Report
February 2015

Appendix E:
Clean Tech ECHS
Agenda and Goals
January 29-30, 2015

Clean Tech Early College High School
AGENDA and GOALS
Thursday, January 29 and Friday, January 30, 2015

Thursday, January 29, 2015
Goals: Finish planning for 9th grade 4th Quarter and lay out objectives for the 10th grade year and Summer Bridge Program.

Morning:

Afternoon:

Friday, January 30, 2015
Goals: Plan the 10th grade Summer Bridge Program and 1st quarter for 10th grade.

Morning:

Afternoon:

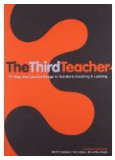
Brainstorming Notes:

Some resources to help you on your journey:

10 STEM Teaching Practices
http://www.middleweb.com/6624/10-stem-teaching-practices/

1. Believe in your students.
2. Transfer control of the learning process to the students.
3. Foster curiosity.
4. Provide hands-on, experiential learning.
5. Increase collaboration among students.
6. Accept failure – both yours and the students – as a necessary part of learning and growing.
7. Be an inspiring leader and role model for your students.
8. Accept some drawbacks.
9. Evolve and grow as a learner.
10. Learn in community.

The Third Classroom by O'Donnell Wicklund Pigozzi and Peterson and Bruce Mau



Basic Needs
Minds at Work
Bodies in Motion
Community Connections
Sustainability in Schools
Realm of the Senses
Learning for All
Rewired Learning

(See attached handout for more details.)

Appendix F: Crosswalk MentorPlace and 4th Quarter Unit

Crosswalk MentorPlace and 4th Quarter Unit				
How can you exhibit the STEM skills and habits you have developed while working collectively with your P-Tech peers and mentors throughout your first year at Clean Technologies ECHS?				
Design Cycle	**MentorPlace Core Standard**	**MentorPlace Activity**	**Trade Show Exhibit Booth "Mini" Product**	**Trade Show Exhibit Booth Demostrated Skills/Sub Question**
Brainstrom	**Motivation**	Introduce Yourself		
		Lesson 1: Goal Setting		
		Lession 2: Goal Setting-Continue the Conversation!		
		Lesson 3: Goal Setting- Accountability		
		Lesson 4: Overcoming Adversity		
		Lesson 5: Proactive Learning		
		Lesson 6: Long-Term Vision		
	Ability to Meet High Expectations	Lesson 18: Meets Deadlines		
		Lesson 19: Planning Effectively		
		Lesson 20: Accountability		

Crosswalk MentorPlace and 4th Quarter Unit				
How can you exhibit the STEM skills and habits you have developed while working collectively with your P-Tech peers and mentors throughout your first year at Clean Technologies ECHS?				
Design Cycle	**MentorPlace Core Standard**	**MentorPlace Activity**	**Trade Show Exhibit Booth "Mini" Product**	**Trade Show Exhibit Booth Demostrated Skills/Sub Question**
Design	**Critical Thinking & Problem Solving**	Lesson 10: The Art of Argumentation		
		Lesson 11: Agrumentation Role Play		
		Lesson 12: Open-Mindedness and Your Biases		
		Lesson 13: Inquisitiveness		
Build, Evaluate, Modify	**Collaboration**	Lesson 14: Willingness to Try New Roles		
		Lesson 15: Willingness to Try New Roles- Share Out		
		Lesson 16: Shared Responsibility		
		Lesson 17: Collective Brain Power		
		Lesson 7: Listening v.. Hearing		
Share	**Communication & Working with Others**	Lesson 8: Strategic Communication		
		Lesson 9: Articulation and Verbal Communication		

Appendix G:
Draft Planning Schedule

DRAFT General Planning Schedule

Clean Tech Early College High School

Weekly					
Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
7:30-8:00 AM	Students Arrive and preparing for the day				
8:00 - 11:00 AM	11th & 12th Teaching				
11:00 - 12:00	Lunch	Lunch	Lunch	Lunch	Lunch
12:00-1:00 PM	All Meetings	11th grade team	9th grade team	12th grade team	All Meetings- to end at 2:00 (2:00 to 2:30 processing time)
1:00-2:30 PM		Individual planning	Individual planning	Individual planning	

Example: DRAFT Planning schedule for 9th and 11th Grade Teaching Team

Weekly					
Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
7:30- 8:00 AM	Students Arrive and preparing for the day				
8:00 - 11:00 AM	11th & 12th Teaching				
11:00 - 12:00	Lunch	Lunch	Lunch	Lunch	Lunch
12:00- 1:00	All Meetings	11th grade team **A Meeting**	9th grade team **A Meeting**	Individual planning- 9th grade and 11th grade feedback	All Meetings- to end at 2:00 (2:00 to 2:30 processing time)
1:00- 2:30		Individual planning- 11th grade focus (post/create assignments & parent communication)	Individual planning- 9th grade focus (post/create assignments & parent communication)		

Every 4 weeks- Quarterly Planning and Event Planning					
Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
7:30- 8:00 AM	Students Arrive and preparing for the day				
8:00 - 11:00 AM	11th & 12th Teaching				
11:00 - 12:00	Lunch	Lunch	Lunch	Lunch	Lunch
12:00- 1:00	All Meetings	11th grade team **B meetings**	9th grade team- **B Meeting**	Individual planning	All Meetings
1:00- 2:30					

Ongoing Items		
Category	**Tasks**	**Teams Members**
9th grade	Short term Planning (1 to 2 weeks out)- **A Meetings** Long term Planning (quarterly)- **B Meetings** School Visits Parent Communication Posting/Creating Assignments Feedback to Students	JB, MG,LS, DA
11th grade	Short term Planning (1 to 2 weeks out)- A Meetings Short-term Planning (2 weeks out) Posting/Creating Assignments Feedback to Students	TL, JB, MG
12th grade	Short term Planning (1 to 2 weeks out)- A Meetings Short-term Planning (2 weeks out) Posting/Creating Assignments Feedback to Students	TL, LS, DA
Daily	Email Responses Project Management	All
Event Planning (logistics for Expos)- **B Meetings**	Room assignments Schedules Technology Support	All
External Meetings (All Meetings)	Faculty meetings at home school Meeting with industry or potential students/parents Meeting with Amber	All

Appendix H:
Student Login Infographic and Habits of Mind Rubric

Name of Student _____ Student's High School or District _____

Hudson Valley WIReD

What is it?
HVCC student registration grades / schedule / registrar

Bb

Blackboard
What is it?
HVCC Course and Class online workspace

Hudson Valley Community College webmail

What is it?
HVCC web-based email system

Hudson Valley Community College

Learning Tools Used at HVCC

Learning Tools Used at ECHS

canvas BY INSTRUCTURE

What is it?
ECHS Learning Management System

MentorPlace

What is it?
Connect with your mentor to complete mentor activities

NoodleTools

What is it?
Online tool for archiving resources

CLEAN TECHNOLOGIES & SUSTAINABLE INDUSTRIES EARLY COLLEGE HIGH SCHOOL

Habit of **Character**				
	Yes	**Inconsistent**	**No**	**Cause for Concern**
Submits work/homework on a regular basis				
Submits work/homework that is complete and authentic				
Able to listen to group members and provide quality feedback				
Listens and adheres to teacher feedback/requests				
Assessment at Present time:	**Demonstrating Mastery**	**Approaching Mastery**	**Not Approaching Mastery**	

Comments:

Habit of **Innovator**				
	Yes	**Inconsistent**	**No**	**Cause for Concern**
Uses class time in order to develop new skills and knowledge.				
Uses an ample amount of evidence to support a statement				
Seeks and uses resources to enhance planning, completion and quality of work.				
Assessment at Present time:	**Demonstrating Mastery**	**Approaching Mastery**	**Not Approaching Mastery**	

Comments

Habit of **Collaborator**				
	Yes	**Inconsistent**	**No**	**Cause for Concern**
Applies skills and lessons taught in class to the work.				
Works effectively with classmates during class.				
Works effectively with teacher during class.				
Student completes his/her part of all shared work.				
Assessment at Present time:	**Demonstrating Mastery**	**Approaching Mastery**	**Not Approaching Mastery**	

Comments:

Habit of **Communicator**				
	Yes	**Inconsistent**	**No**	**Cause for Concern**
Demonstrates control of academic and technical writing conventions (punctuation, grammar, etc.)				
Organizes written work with a clear introduction, body, and conclusion.				
Demonstrates an awareness of audience when producing a piece of work.				
Uses effective topic sentences to organize written ideas.				
Orally communicates ideas during class discussions and presentations.				
Assessment at present time	**Demonstrating Mastery**	**Approaching Mastery**	**Not Approaching Mastery**	

Comments:

Habit of **Curious**				
	Yes	**Inconsistent**	**No**	**Cause for Concern**
Incorporating passions, skills, and interests when completing assignments.				
Making connections within or across the curriculum without being prompted.				
Assessment at present time:	**Demonstrating Mastery**	**Approaching Mastery**	**Not Approaching Mastery**	

Comments:

Appendix I:
Clean Tech ECHS
Interim Report
February 2015

Clean Technology Early College High School
Ballston Spa School District, New York
Interim Report
February 2015

Introduction

The PAST Innovation Lab's Professional Development and Knowledge Capture teams have worked with the faculty and administration at Clean Technologies Early College High School (Clean Tech ECHS) to help design and document each new cohort in the P-Tech program. This is an ambitious undertaking and PAST is proud to be a partner in helping guide real-time design and response. In an effort to continue building the Clean Tech ECHS toward attaining a more robust and authentic STEM program, this report is intended to provide a brief overview of completed work, projected work for 2015, and recommendations for progress going forward in regard to both Professional Development and Knowledge Capture. Reports for previous years are published. This interim report targets the work with the incoming 9th grade for the academic year 2015-16.

Completed Work: PAST Professional Development

Starting in June 2014, PAST began working with the teaching cohort at Clean Tech ECHS. The teaching cohort was first provided with online podcasts to introduce them to the vernacular of transdisciplinary problem based learning (TPBL) and its instructional and cultural strategies, along with a systems approach delivery. This set the stage for on-the-ground professional development conducted by PAST at the end of June 2014, after the academic year concluded.

June 30 & July 1, 2014

The teachers at CleanTech ECHS began working with PAST's Professional Development team in June 2014 during a two-day professional development workshop, which introduced the teachers to PAST's approach to transdiscipinary problem based learning (TPBL). The two days focused on:

- Designing the 9th grade Summer Bridge Program
- Planning the first quarter for 9th grade

Much was accomplished during these two days, however more time was needed to complete the plan for the week-long summer bridge program and design for the first quarter. The format of distant education and communication utilizing a web-based platform is a new modality of teaching and learning for the majority of the faculty and students. As a result, additional planning time was coordinated to occur during the summer bridge program, July 14-18, with teachers participating in planning sessions before the start of the school day, or following the end of the school day. Teacher's also used this meeting time to debrief with each other on the day's accomplishments, and

identify program modifications essential to meet learning objectives during the remaining days of the summer 5-day program.

July 14 – 18, 2014
PAST PD provided planning and implementation support during the five-day 9th grade Summer Bridge Program. The goal of the summer bridge program was to provide a foundation of necessary skills for the students as well as form a learning community. Students were introduced to, and began working on, Quarter 1 projects during the summer bridge program. PAST PD facilitated and provided the following support:

- Met with the teachers early in the morning before the day began in order to prepare
- Debriefed every afternoon about successes and challenges of the day
- Documented the daily schedule and goals for the week
- Coached teaching team on areas and skills to focus on, and provide guidance for development of necessary instructional tools
- Provided overall logistics support

September 2014 – January 2015 (virtual support)
Clean Tech ECHS faculty and administration met regularly (12 one-hour meetings) with the PAST PD team via on online platform to:

- Plan second and third quarter 9th grade TPBL units
- Benchmark program successes and limitations

PAST debriefed regularly with the program coordinator to develop a framework and set goals for ongoing meetings through January 2015.

January 29 and 30, 2015
The PAST PD team facilitated a two-day professional development with the Clean Tech ECHS faculty and administration. The two days focused on:

- Creating a vertical rise for 9th grade to 12th grade (see attached document)
- Finishing 4th quarter project plans for 9th grade
- Planning and Backmapping 9th grade Summer Bridge Program (Summer 2015)
- Planning and Backmapping 10th grade Summer Bridge Program (Summer 2015)
- Creating a wire frame for the 10th grade 2015-16 school year

Projected Work with the PAST Professional Development Team
February 2015- May 2015 (virtual support): 8 virtual one-hour meetings are scheduled to be conducted beginning in February and conitinuing through May 2015 (six virtual sessions will be scheduled under this current contract). The intended goals of these meetings are:

- Finalize 9th grade project plans for the remainder of the 2014-15 school year
- Refine the 10th grade Summer Bridge Program (Summer 2015)
- Begin to plan the 10th grade 2015-16 school year

- Create strategies for more effective planning and time management for the teacher cohort

June 23 & 24, 2015
PAST PD team will meet with the Clean Tech ECHS faculty and administration to:

- Complete 9th and 10th grade week-long Summer Bridge Program plans
- Plan the 10th grade 2015-16 school year

Recommendations from PAST Professional Development Team
The faculty at Clean Tech ECHS are experienced teachers, motivated to try new teaching approaches to engage students and prepare students for the future. Yet like anyone engaged in gaining new skills and strategies, they need time to adequately learn a new methodology and successfully implement it. It is important to recognize the Clean Tech teachers as early adopters, however they do not have a set structure of delivery and evidence of effectiveness. In fact, they are in year 1 of a 3-year process for designing and implementing the unique program to support 9th and 10th grade enrollment.

The length of time for adoption or launch of any product or process is generally assumed to be 3 years by most industries and analysts. PAST concurs with these projections and recommends 3 years as an appropriate amount of time for designing, implementing, and securing a paradigm shift. In this endeavor, teachers and school administration require dedicated time to support design and implementation of transdiscipinary problem based learning. Over the last six months of professional development, both on the ground and virtual, the PAST team has identified areas of constraint that require attention to support a successful paradigm shift, to assure the program has fidelity and resonates with both teachers and students.

Connections that need improvement:

- Documentation of broad plans: use Backmaps to provide a wireframe for project plans which can be revisited each year and modified.
- Detailed planning documentation: use Two-week Planners to record project details and daily benchmarks
- Redesign regularly scheduled planning time to structure dedicated work for specific grade levels
- Develop a consistent and regular schedule for meetings, both virtual and in person, with 9th and 10th grade students during the school week

In order to work on the improvements listed above, we recommend:

- Providing the teachers PAST PD team support during the Summer 2015 Program(s)
- Continue PAST PD virtual support until the program has full enrollment into the 2015-16 school year
- Additional staff for Clean Tech ECHS

Completed Work with PAST Knowledge Capture
The Knowledge Capture Program provided program evaluation during 2014, including conducting a student survey with 96% of the 9th grade students who participated in the Summer 2014 Bridge Program (n=70). A student focus group was also conducted on the final day of the summer 2014 program with 8 students (4 females and 4 males). A report presenting survey and focus group data was submitted to the Clean Tech ECHS in October 2014, entitled "Clean Technologies Early College High School, Summer 2014 Program Report: Ninth-Grade Program Launch."

The survey and focus group questions were designed to explore student interests aligned to STEM education and potential for college and career development through the Early College High School Program. Eight questions listed below also helped to characterize student expectations of the 9th grade Clean Tech Program.

1. How did you first hear about the Clean Tech Early College High School?
2. Why did you choose to enroll in the Clean Tech Early College High School?
3. What was your favorite class in 8th grade, and why?
4. What do you think will be the most exciting thing about your first year of high school?
5. What do you think will be the most exciting thing about becoming a Clean Tech High School student?
6. Do you enjoy working in teams with other students?
7. Do you have ideas about what you want to do after you graduate from high school?
8. Have you ever participated in a STEM challenge or competition?

A follow-up survey will be conducted during the spring term of the 2014-15 academic year and is described in the section that follows.

Projected Work with the PAST Knowledge Capture Program
A post-program student survey is planned to be conducted on April 22nd, 2015. The survey will be designed to offer insight on the experience of the first 9th grade cohort including comparative analysis of student preferences for program content areas, as well as plans for college and career.

The survey will be designed with input from the Clean Tech teachers and program administrators. A virtual discussion session is scheduled for April 1st, 2015 to discuss student survey design and implementation plan.

Recommendations from PAST Knowledge Capture
Analysis of the student Spring 2015 survey will provide the opportunity for teachers and administrators to assess areas of effective change to increase student engagement, and success in transitioning to online participation in problem based learning. Issues

associated with challenges identified by students will define ways in which the program design can be modified during the second year of the 9th grade program (2015-16), and may also inform projected needs of the rising 10th grade students entering their second year in the Clean Tech Early College High School.