

***Creative* CONNECTIONS — How-to Guide**

Put Heavy Equipment & Transportation Technology in the Picture at Your Local High School

A how-to guide for a successful business/education partnership

Steps followed by The AED Foundation in creating a
secondary school program for students interested in
Heavy equipment & transportation technology



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Introduction

Whether your field is business or education, the only prerequisite needed for reading and using this information is an understanding that many high school students in your local area need better preparation and more skills for the jobs available in America's emerging high-tech, fast-moving economy. You probably know from experience in your own community that many young people--even those that have a high school diploma--are lacking in the math, science and language skills needed for a job market dominated by computers and other forms of high technology.

You're not alone. The shortage of skilled workers in the American workforce is a problem that gets more serious every year. The AED Foundation, a not-for-profit organization, represents only one key industry: construction equipment. That industry manufactures, sells and services the machines used on every kind of construction project. In the early years of the new century, this one industry will have thousands of jobs available for skilled men and women who can repair and maintain increasingly complex and sophisticated construction equipment. Add the needs of related industries such as construction trades, agriculture, trucking, material handling and auto, and the number of available jobs balloons into the tens of thousands. In fact, while skilled jobs represented only 20% of the total job market in the United States in 1950, they will represent 65% to 70% of the jobs in the year 2000, according to the Bureau of Labor Statistics (BLS). Yet not enough students are finishing high school with the basic skills needed for these jobs.

This information provides basic background and some specific ideas for the development of one program that can work. It is certainly not the only answer. The National Center on Education and the Economy (NCEE), a Washington, D.C.-based school development organization, believes that the entire framework of American education must change in order to produce a world-class workforce to compete with our competitor nations. Obviously, you can't change a whole system of education overnight, nor can we. But together we can make positive, fundamental educational changes in our own local areas. A way to accomplish that is by creating secondary school programs with focused education that prepare young people with the skills they need to obtain high-paying, rewarding jobs in construction equipment and in many other industries.

The AED Foundation, with help from NCEE, opened an Equipment and Technology Institute at a Chicago public high school in the fall of 1997. When the idea was presented

to us 18 months earlier, we knew very little about the concept of focused secondary education and had to learn everything from scratch. If it's any consolation, we had the same "what's it all about?" and "how-to?" questions then that you probably have now. But as time went on business people and local educators found that a partnership like this one can definitely succeed.

By sharing our experiences, we hope to save you time and money. All of the steps are in chronological order, so you can proceed as we did in planning, organizing and launching

a high school technical institute. *(The term career “academy” may be more familiar to those in California and other states that have developed focused secondary school programs. “Institute” was the name chosen by the school for this particular project).* It took The AED Foundation and NCEE about 18 months to get the Chicago program underway. But as much as one-third of that time was spent on modeling procedures and details that may not be necessary in your local area. However, we strongly recommend you spend at least 12 months in the planning and implementation of a similar program. But there is no magic number and preparations could take more or less time in your particular case. Remember that a group of high school sophomores will eventually enter your program and, from the very beginning, they need to see that the adults in charge can answer their questions and provide a strong sense of preparedness and purpose.

The following pages concentrate only on the major highlights of the 12-month set-up period. Exhibits with additional information on various steps follow each month’s recommended list of things to do.

We purposely omitted some planning details in an effort to keep the guide short and to the point, and because the details will vary from case to case. Naturally, no two situations are alike. For example, our experience reflects what took place in the city of Chicago and the state of Illinois, where laws and regulations covering the delivery of education may be different than in your school district and state. However, Chicago is probably typical in most ways of the American public education process and we hope our experience serves as a representative model for your area.

We suggest a review of this booklet by all potential partners, specifically the business people and educators who want students to finish school with more preparation for the careers available to them. Key people should then meet to discuss launching a similar project nearby.

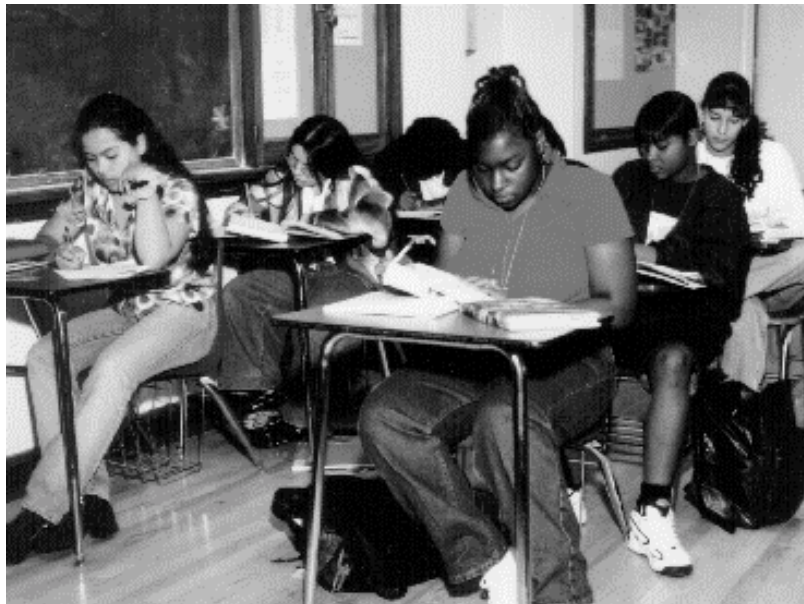
Many thanks for your interest in this program.

M.J.McGinty
Director of Programs,
The AED Foundation
Oak Brook, IL

The Concept

Here are basic purposes and descriptions. You may also want to write down similar guidelines for your program, as they help keep plans on track:

- The AEDF Equipment & Technology Institute is an ongoing, voluntary business-educational partnership at a typical American public high school. It is based on the “school within a school” concept.
- Its purpose is to supply the construction equipment industry with skilled people who are now in great demand, and, in a broader sense, to help America create a world-class workforce for the 21st Century.
- There is a twofold purpose: 1. To raise academic standards so that every one of the program’s graduates possesses math, science and communication skills equal to or surpassing the higher standards typical in many of our competitor nations; 2. To provide students with extra knowledge in the form of technical skills that can be applied to the growing variety of jobs requiring technical abilities in computer sciences, electronics, hydraulics and other technical subjects.
- Institute graduates have choices: 1. To enter the workforce immediately after graduation with the basic skills needed for entry-level technical work; 2. To go on to post-secondary technical school or community college, where students can pursue two-year degree or certificate programs in technical disciplines; 3. To enter a four-year college degree program. *It is important, however, for teachers and counselors to recognize that the institute supports all three of these choices and does not focus on four-year college as the “only” path to a successful career.*
- The institute program incorporates important ingredients that may be new to your local educational system, such as mandatory tutorials for students, smaller class loads for teachers, college credit for students while in high school, etc.



General Description

The groundwork for the Equipment & Technology Institute (ETI) was developed over 20 years ago. Even then, various organizations began realizing that American high schools were not adequately preparing the majority of students for the highly technical jobs that were being developed by industries worldwide.

The National Center on Education and the Economy (NCEE) studied the educational systems in Western Europe and other places which are generally doing a much better job than the United States in providing students with both academic and technical knowledge necessary for a burgeoning number of high-tech jobs.

The initial school-to-career “academies” were launched in Philadelphia and later in southern California. They achieved a considerable amount of success. The trademark of the academy (or as we call the Chicago program, an Equipment & Technology Institute) is the merging of higher academic standards in math, science and language with technical skills that can be applied to various emerging jobs in the high-tech field. Another distinguishing feature is the close partnership between educators and local industry partners. The business partners involved in this model program do much more than attend meetings. They design the technical curricula, mentor the students, supervise job-shadowing experiences and provide entry-level jobs to graduates.

Further, by providing externships for teachers, the teachers receive specialized training in how to incorporate technical training into general educational course work. The industry partners provide a large part of the training.

Opportunities for Students

The Institute’s courses are taught at an accelerated rate and the students are expected to learn as much or more in the basic disciplines as those heading down the four-year college track. This is partially accomplished through opportunities for additional student support, such as mandatory tutorials to accelerate student performance and more one-on-one relationships between students and their teachers. These and other characteristics make this program far different from the traditional high school “shop” course sequence, which is how some people mistakenly label school-to-career programs. It is not for at-risk students or for those pigeonholed as “not smart enough for college”. Rather, it is as much an opportunity for high performers as for those who require special guidance.

In our case it called for highly focused courses during the summer. Students, parents and teachers understood early on that the Institute continues throughout the 12 months of the year. Students take summer courses at a local community college, technical school or four-year institution, usually in the computer or technical sciences. Students who finish the Institute program should have at least 26 hours of college credit. Struggling students must also catch up, if necessary, by attending summer academic programs offered through the high schools.

Real World Experiences

Students enter the Institute after their freshman year (9th grade). During the next three years, or longer if required, they will absorb skills necessary for real jobs. They tour the businesses sponsoring the Institute, participate in “job shadowing” experiences, and work

on a “Capstone” project that requires research and thinking on a real industry issue. After completion of their second year in the institute (11th grade), paid

apprenticeships are recommended, if available, and each student has a mentor from local industry. Successful completion of the Institute program requires students to compile a portfolio of work accomplished.

A student graduates from the Institute with the following credentials:

1. An Honors Diploma from the High School
2. A Certificate of Recognition from the industry that sponsored the program
3. As much as 33 hours of college credit.

The Institute’s staff is comprised of a team of teachers, typically four or five, a counselor and a director on the high school staff. This group remains with an Institute class through all three years. The first group of students usually numbers 60 to 90, but this number may vary depending on the school. Naturally, the number grows as the program continues.

Next are the *Major Design Components of a Successful Partnership Institute*. Read these pages carefully as they provide further details on the program’s characteristics.



Major Design Components

Business Partners

Partners in the program from business and industry can participate in one or more of the following ways:

- Develop or authorize technical standards for the program.
- Volunteer for and participate in Steering Committee as business partners.
- Serve on a subcommittee team
- Provide curriculum integration in the form of workplace skills and contextual experience.
- Offer externships and/or on-the-job experiences for teachers.
- Supply tools, equipment and instructional aids related to industry for the technical classroom.
- Offer paid internships and/or jobs to students during the high school training or after graduation.
- Assist in placement of students in vocational/technical post-secondary programs.
- Provide field trips, mentors and/or job shadowing experiences for the students.
- Donate seed money to help offset the costs of starting the program.
- Recommend or review textbooks chosen for the technical courses.
- Serve as speakers, workshop leaders or conduct technology demonstrations at special class or school events.
- Design a scholarship program for institute students.

School/Teachers: Program Structure and Instruction

- Team of teachers responsible for “x” number of students for 3-4 years in high school (e.g., core academic subjects and one major business/industry theme, in this particular example, construction equipment technology).
- The lead teacher of the institute has the same status as a department chair or sub-administrator in a school-within-a-school structure.

- Block scheduling/teachers in the institute control the time.
- Common planning period for all of the institute teachers (daily or one/two large blocks weekly).
- Steering committee made-up of teachers, business-industry partners, post-secondary partners, the school principal and district liaison personnel.
- Major decisions regarding the institute, including personnel, budget, resources, standards and curriculum/instruction are made by the steering committee.
- The institute receives the total amount per pupil resources allocated to the school minus salaries, personnel expenditures, and indirect administrative costs.
- Institute classrooms are clustered together and the program has its own physical identify on the campus.
- Students take post-secondary approved academic classes in English, math, science, social science/history and vocational education while in the institute.
- Acceleration programs are provided before or after school, on Saturdays and/or during the summer in all core academic subjects and skills.
- Students and teachers work together on rigorous academic and vocational standards that are a) performance-based, b) understandable, and c) assessed both through exams and portfolios.
- Students practice and demonstrate real workplace competencies and applied learning standards within the classroom as well as in the workplace.
- Students use basic skills as well as higher learning skills to help solve real-life problems in each academic and vocational subject area.
- Specific academic and occupational skills are emphasized together at all work-based learning experiences.
- Institute teachers keep track of their students' post-secondary progress and work (college credit courses at partner institutions) while they are in high school.
- Institute teachers receive ongoing feedback from the business-industry partners on how their students are performing at the workplace.
- At least one teacher is responsible to visit the students at each workplace assignment.

Transition to Workforce

- Students work on real equipment and use the tools and technology that are used by their business-industry partners.
- Workplace connection sequence by grade level:
 1. Grade 10—field trips to partnering businesses
 2. Grade 11—mentorship program; job shadowing
 3. Summers (grades 11-12)—paid youth apprenticeships
 4. Grade 12—advanced training or part-time apprenticeship
- Post-secondary connection sequence by grade level:
 1. Grade 10 = 6 units (vocational only)
 2. Grade 11 = 12 units (academic or vocational)
 3. Grade 12 = 12 units (academic or vocational)

Note: Each institute student should graduate with 25-33 units of college credit.

- The business-industry partners place all successful institute graduates in jobs related to the industry sponsoring the program (except for those going to college/military.)
- Institute teachers spend 5-10 days a year as externs working in the sponsoring business-industry companies. (Paid by partners in most cases.)

Concerns & Questions

The Equipment & Technology Institute at Gage Park High School in Chicago required changes to the traditional secondary school framework that gave rise to questions and concerns from teachers and staff.

Because rules and regulations vary greatly from state-to-state, school administrators and teachers will have to determine how the implementation of a school/business partnership such as the ETI in Chicago may affect their own situations. Obviously it is important to have a representative on the Steering Committee who has a thorough knowledge of the local and state requirements.

As a guideline, following are some of the typical issues that may surface:

- How are teachers to be selected? Through individual applications? Selection by the principal? Do local teachers' union contracts affect or govern the process?
- What are the reactions of teachers not selected for the institute team? And, what questions will they ask about how the existence of the institute affects their schedules and teaching loads?

- Do the teachers selected for the team meet state or local certification requirements for teaching courses such as electricity, hydraulics, engine operations? If not, is there a plan to obtain necessary certification?
- Mandatory tutorials for students: Will teachers be paid for conducting them? How does time for daily tutorials affect number of classroom periods?
- How is the overall school budget affected?
- Can the technical courses be incorporated into the required course load without difficulty?
- Institute teachers are a “team” responsible for the students over 3-4 years. How does this affect traditional schedules? Will it create a burden for teachers who are not part of the institute team?
- Will institute class sizes be at variance with class size requirements as determined by the local school district and/or union contract?
- Are funds available through the local or state school system to support a school-to-career institute? Does the steering committee have access to school system personnel who can answer questions about funding and apply for such funds if available?
- How can a program like this save costs? For example, will there be lower expenditures for remediation as the program grows?

Sources: The National Center for Education and the Economy (NCEE), Washington, D.C., and The AED Foundation (AEDF), Oak Brook, IL.

Sample Mission Statement

The Gage Park High School/AEDF Equipment & Technology Institute is dedicated:

- ❑ To offering students the high skills they need to become part of a world-class American workforce in the 21st Century;
- ❑ To instilling in them the desire to reach high educational standards;
- ❑ To opening doors for students of all cultural backgrounds and educational levels;
- ❑ To encouraging their interests in further training and learning after Gage Park; To preparing them with skills necessary for entry-level jobs in equipment technology, or for additional education at post-secondary institutions to further their opportunities in equipment and other industries.



Monthly Planning Guide

The following 12 sections identify key steps in the planning and start-up of an Equipment & Technology Institute. They are based on this one experience and are submitted only as examples. The schedule for this purpose assumes that your first meeting needs to take place in August, or a full 12 months prior to the opening of the school year the following August/September. But don't hesitate to start on a schedule that meets your needs. As you'll see, planning and implementation can't end with the opening of the program. There are many more issues to address as the program grows and matures, but this guide deals only with initial formation and preparation.



Twelve Months Out

CHECKLIST

- Start-Up Meeting:** Two or three local business owners/executives (ideally from different businesses but within the same industry) meet informally with local school officials to discuss the need for an Equipment & Technology Institute similar to the one described here.
- Discussion:** Do both school and business partners understand the concept of a school-to-career program?
- Can it work in a local high school?
- Can such a program meet all or most of the Major Design Components?
- Buy-In:** If so, can school/business people form a partnership to develop a high school program?
- Are all the partners committed to starting and maintaining a program for at least five years?
- Initial investment:** Can the business partners pledge an amount of seed money for start-up of the program (*see exhibit A*)?
- Convenience:** Is the chosen school within reasonable driving distance for business partners and for the students who will eventually spend time at the local business partners?
- Follow-up:** Can all agree to meet every month for one year to plan and develop the program?
- Plan ahead:** The next meeting should include additional business partners who have been invited to participate, plus the school's principal and key administrative staff and teachers.
- Representatives from local two and four-year colleges who can partner with you in providing post-secondary courses should also be invited.
- Document:** Write a summary of the start-up meeting.
- Representatives from local and state school boards should be present. (These individuals should be high up on the decision making ladder.)

Exhibit A

Business Partners' Costs

Following are projected startup expenses leading to the opening of the Equipment & Technology Institute program at Chicago's Gage Park High School. Estimate is based on AEDF's experience with this particular program. Costs will vary depending on what current resources can be utilized and on partners' ability to offset costs or contribute materials. At Gage Park the entire technical classroom needed an overhaul. This may not be the case at the school in your location. This list does not include teacher salaries, classroom repairs or administrative expenses that the school or school district would normally contribute to a program of this kind.

Expenses for outside consultants*	\$4,000.00
Printing expenses	
Student handbook	
Recruitment brochure	
Letters & miscellaneous	\$2,000.00
Postage	\$250.00
Teacher Training	
(Special seminars, travel expenses, costs of consultants, if needed, externships at partners' facilities, etc.)	\$4,500.00
Steering committee meetings (supplies, photocopying refreshments & miscellaneous.)	\$1,250.00
Materials, tools, teaching aids for courses in electricity, hydraulics, engines**	\$19,000.00
Tuition for students attending 1 st college course***	\$6,000.00

*If necessary

**This figure is based on the retail prices of the materials obtained for the technical classroom. Subsequently, the AED Foundation was able to procure many of the materials through donations from equipment distributors and manufacturers. Support of this nature can dramatically reduce the cost of equipping a technical classroom to reflect the needs of sponsoring industry.

***If necessary and unless an alternative funding source is found.

Note: In addition the AED Foundation assigned a staff person to oversee the development of the ETI program. This amounted to approximately 50% of this individual's time.

Eleven Months Out

CHECKLIST

- Pre-Meeting:* Distribute a brief agenda.
- Welcome new business partners, school principal, key administrative staff, teachers, counselors, school board representatives and post-secondary partners.
- Meeting:* Have refreshments available.
- Start with self-introductions.
- Review the results of the start-up meeting.
- Make sure new partners and school principal/administration understand the purpose of the program and how it will enhance options for students.
- Review the Major Design Components and discuss the issues as they affect the school, students and teachers.
- Distribute literature describing successful school-to-career programs. Note: Background materials are available on request from the National Center on Education and the Economy (NCEE).
- Committee:* Ask for volunteers to serve on a permanent Steering or Advisory Committee (*see worksheet*).
- Have the school's administration appoint an Institute Coordinator (*see Exhibit B*).
- Representatives on committees should include business partners, high school administrators, teachers, counselors, the local school council (if applicable), local school system representatives, and post-secondary institutions. You may even want parents and students to participate.
- Pick a date and place for the Advisory Committee meeting the following month.
- It is suggested that the meetings take place at the same time and place each month. For example, the AEDF group met at 2:30 p.m., on the third Wednesday of each month at the high school's library.

Exhibit B

Responsibilities of the High School's Institute Coordinator

The coordinator is normally a school staff member who may also be a teacher or counselor. It is his or her job to keep the program on track at the school and to communicate with and through the business partners. Responsibilities include:

Program Coordination

- Serve as liaison between the school and the school district's department of vocational/technical education, and for the program's external partners.
- Confer with students/parents to achieve success.
- Facilitate student recruitment and program enrollment.
- Create and maintain database on student cohort groups.
- Monitor student achievement.
- Participate in teachers' weekly planning sessions.
- Act as resource colleague for teachers, school administrators and external partners.
- Coordinate student enrollment, participation and achievement in college courses completed at post-secondary partner institutions.
- Arrange for field trips, guest speakers, program visitations.
- Develop student informational presentations regarding the institute.
- Coach and facilitate presentations by student speakers.
- Make arrangements for and maintain records of steering committee meetings.
- Maintain a written and photographic record of institute activities.

Preparation of Written Materials

- Create/revise necessary correspondence to students, parent and others.
- Draft letters related to special student projects.
- Develop course outlines for the benefit of state and district learning and/or standards requirements.
- Write course descriptions for any courses requiring district approval.
- Develop and write an Institute Student Handbook and CIM transcript record

Budget & Finance

- Secure bids for goods and services needed from outside sources.
- Provide financial information for supplemental expenditures not provided through regular school fiscal resources.
- Prepare requisitions for supplemental expenditures incurred in conjunction with program operations.

Ten Months Out

CHECKLIST

- 1ST Advisory/Steering Committee Meeting:** Prepare a brief agenda.
- Elect a Chairperson to lead the group. **Note:** It is recommended that one of the business partners be appointed to this post. Also a vice-chair can be added this can be a teacher as well as an executive secretary to be responsible for recording meetings as well as other administrative responsibilities.
- Appoint a secretary to take notes and write monthly summary.
- Determine dates for program formation benchmarks (*see Exhibit C*)
- Teams:** Ask for volunteers to serve on at least four subcommittee teams that will meet separately (usually on the day of the regular monthly meetings) and report their progress to the entire group.
 - 1) **Program Team:** Typically the high school principal heads this group. It determines how students will be recruited for the program, how teachers will be selected, what courses will students take, how the program meets state/local educational requirements, how teachers will be trained, what classrooms will be used and other program issues related to start-up and ongoing development.
 - 2) **Technology Team:** Identifies and works on agreements with local two and four-year post-secondary schools that will become partners in the program and offer college credit courses to institute students. Audits classrooms to ensure that the proper equipment and training aids are available. Assists in development of curricula for the technical classes.
 - 3) **Business/Industry Team:** Assists in the development of the curricula for the technical classes based on the particular industry's needs. The group also updates the classroom used for the technical courses to reflect the "atmosphere" of the particular industry and provides appropriate teaching aids, equipment and materials. This team is also responsible for recruiting additional business partners. A business partner should head this team and take the lead in planning workplace activities such as field trips, job shadowing and mentor programs.
 - 4) **Grants/Resource Team:** Contacts the local school system's offices, business/industry groups, foundations and government agencies to determine if funds are available to support this kind of program.
- Each team should have at least three members.
- Each team should meet separately after this meeting to assign tasks and responsibilities to report on at the next meeting. Time should be set aside for these groups to meet.

Exhibit C

Suggested Dates for Major Benchmarks

Ten months before the opening of the high school's new technical program is a good time to set dates for critical steps in its formation. Using The AED Foundation's experience in Chicago as a model, here are five benchmarks and the months in which they occurred:

December	Finalize copy for descriptive brochure. Select specific dates for "public engagement" meetings in February. That is when the program will be announced and described to 9 th grade students and parents.
January	The principal announces the teachers selected for the new program and a counselor to work with students. Distribute and/or mail descriptive brochure and announce dates for public meetings to introduce the program.
February	Hold two or three public meetings to introduce the program, and to sign-up students.
March	A good time to clean up issues and finalize plans for the academic and technical courses students will take over the three years of the program.
April	Partnership Team's final report on college credit courses available to institute students throughout their three years in the program. Include course names, descriptions and sequence (including options). Also a time to discuss the needs of your technical classroom.
May	Identification of 9 th grade students who become the institute's first class in August/September. Take the students on a tour of a business partner's facility and make arrangements for summer teacher training.

Nine Months Out

CHECKLIST

- Monthly meeting reports:** A spokesperson for each of the subcommittee teams is prepared to make report.
- Discussion:** Reports by the Program and Business/Industry Teams to identify academic and technical courses and course sequencing for:
 - 10th grade (*see exhibit D*).
 - 11th grade “ “
 - 12th grade “ “
- The school’s Institute Coordinator and other members of the Program Team should learn as much as possible about program characteristics, using this and other sources, to be familiar with the following:
 - Completion of program may take more than three years.
 - Summer college credit courses require students to take 12 months of school.
 - Capstone Project
 - Tutorials
 - Portfolios
 - Mentoring
 - Job Shadowing
 - Paid internships
 - Entry-level job availability.
- Report by Technology Partnership Team member on college credit courses available to the students and, if possible at this time, course sequencing.
- Report by Grants/Resource Team on its initial work

Exhibit D-1

AEDF's Institute Curriculum

To help guide your teams' selection of courses for 10th-12th grade students, here are complete lists of the courses for students in each of the three years at Chicago's Gage Park High School. School and business partners worked in concert to select the content for each semester. Be sure that the courses chosen meet state high school graduation requirements. In Illinois, hydraulics and diesel engines were not originally on the state's list of approved secondary level technical courses, but a detailed description of the courses and proof of their applicability to local job demands allowed for their inclusion.

10th Grade

- College prep level courses in math, science, English and social studies.
- A tutorial period for institute students.
- Technical courses in theory and fundamentals of electricity and hydraulics.
- Athletics/activities and service learning.
- Summer course prior to 10th grade in computer science at a local college.

11th Grade

- College prep level courses in math, science, English and social studies.
- A tutorial period for institute students.
- Technical courses in electronics and fluid power systems.
- College level course(s) in technology at a local college partner.
- Mentorship program (mentors are industry partner volunteers).
- Athletics/activities and service learning.
- Summer courses prior to 11th grade in technology/computer science at local college.

12 Grade

- College prep level courses in math, science, English and social studies.
- A tutorial period for institute students.
- Technical course in internal combustion engines.
- College level course(s) in technology at a local college partner.
- Mentorship program continues
- Athletics/activities and service learning.
- Paid internship provided by an industry partner.

Some students may need an additional year to complete the program, and this should be explained up-front to students and parents. Purpose of the program is not to rush students along as in many traditional programs.

Exhibit D-2

Note: This is the second generation of the programs technical curriculum. It is the result the process of seeking state approval for the ETI program.

Heavy Equipment & Transportation Technology Technical Course Sequence and Description For

Equipment & Technology Institute A High School Program Model

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Introduction

The course descriptions and sequences that follow are to be used as a guide for those groups who are starting a secondary school-to-career program in Heavy Equipment and Transportation Technology. Local needs and state educational requirement may effect the extent of what will or can be included. The intent of this curriculum is to prepare students to continue their education at a post-secondary technical school or enter the workforce as an entry-level service technician.

The sequence combines a fully credited high school technical curriculum with a sequence of college credit bearing technical courses that compliment those at the high school. Each student upon graduation will receive the traditional credit for vocational courses taken at high school as well as approximately one year of college credit. Depending on state and local criteria some of these college and or high school courses will carry dual credit.

The AED Foundation has a list of textbooks and curriculum outlines for these courses. To get a copy's of these please contacts us at (630) 574-0650 or send an e-mail to fpgiannelli@aednet.org.

This document is the culmination of three years of research and development conducted by the AED Foundation, Gage Park High School, the Chicago Public School's Department of Vocation Education, the Illinois State Board of Education/Department of Secondary Education, Universal Technical Institute, and Chicago's Daley College.

Heavy Equipment And Transportation Technology

Occupations: Heavy Equipment Service Technician

Industrial Equipment Service Technician
Diesel Technician
Equipment Technician
Field Service Technician
Parts Specialist
Warranty Claims Writer

High School Course Listing	Grade	Credit Upon Completion
----------------------------	-------	------------------------

Introduction to Technology	9 th	1.0
Heavy Equip. & Trans. Tech I	10 th	1.0
Drafting Orientation	10 th	1.0
Heavy Equip. & Trans. Tech II	11 th	1.0
Heavy Equip. & Trans. Tech III	12 th	1.0

*College Course Listing	Grade	Credit Upon Completion
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Introduction to Micro Computers/ Microsoft Office Suite	10 th	.5
Blue Print Reading	10 th	.5
Introduction to Machining I&II	10 th	.5
Introduction to Microsoft Excel	11 th	.5
Principles of Mechanism	11 th	.5
Industrial Electricity	11 th	.5
Advanced Electronics	12 th	.5
Fluid Power Systems	12 th	.5
Programmable Logic Controllers	12 th	.5

*These courses are offered to the students in the program and are taken during summer break and during the school year on Saturdays, evenings or to upper classman during the school day.

High School Technical Course Descriptions

INTRODUCTION TO TECHNOLOGY

Grade 10 1 Year 1 Credit

This is an orientation level course, which provides a wide variety of experiences with the tools, processes and materials of the industrial community. Topics covered included: the fundamental principles of industrial equipment technology, its technical aspects and functions, the developmental stages of manufacturing, construction, communication, transportation and biotechnology production systems, industrial equipment technology's positive and negative implications for human life. Throughout this course, vocational skills are integrated with transitional skills and employability skills.

HEAVY EQUIPMENT AND TRANSPORT TECHNOLOGY I

Grade 10 1 Year 1 Credit

This course provides overviews of the four major disciplines, (Electricity, Hydraulics, Engines/Fuel Systems and Transmission of power), of Heavy Equipment and Transport Technology. Topics included are the fundamental principles of the above as well as the basic safety skills needed to work with the tools and materials associated with this type of equipment. Throughout this course, vocational skills are integrated with transitional skills and employability skills.

DRAFTING ORIENTATION

Grade 10 1 Year 1 Credit

This orientation level course introduces the student to the graphic language of technical drawing. It provides an overview of the fields of mechanical drafting. Students are provided experiences with orthographic projection, pictorial drawings, and exposure to computer-assisted drafting CAD. Students who complete the course will be able to: understand the nature and purpose of drafting; use basic drafting instruments; perform mathematical computations dealing with drafting; draw freehand sketches; develop freehand lettering skills; construct simple graphic figures; layout and draw one, two and three view orthographic drawings. They will also be able to: utilizing sectional views as necessary; layout and draw isometric, cabinet, oblique or perspective pictorial drawings; utilize standard dimensions along with adjusting tolerance to the extent needed for each application; use the computer as a drafting tool to draw and edit lines, arcs, and circles; investigate occupational opportunities in technical drafting and allied technical trades. Throughout this course, vocational skills are integrated with transitional skills and employability skills.

Heavy Equipment and Transportation Technology II

ELECTRONIC CONTROL AND FLUID POWER SYSTEMS

Grade 11 1 Year 1 Credit

This skill level course provides students with the opportunity to build upon the knowledge and skills acquired in the orientation and introductory courses as well as the College curriculum. This course provides a laboratory study of electricity/electronics and fluid power systems as it relates to heavy equipment and transportation technology. Students who complete this course will be able to: perform hydraulic maintenance checks, including flushing systems, preventing leaks and protecting against overheating as well as to diagnose and repair hydraulic system problems. Students will demonstrate the mastery of capacitance, inductance, and AC/DC voltage as they disassemble, reassemble, diagnose and repair electric motors and multiple-load and complex circuits. They will use precision mechanical and electronic measuring devices to perform these tasks. Throughout this course, vocational skills are integrated with transitional skills and employability skills.

HEAVY EQUIPMENT AND TRANSPORTATION TECHNOLOGY III

Engines and Transmission of Power

Grade 12 1 Year 1Credit

This course provides students with the opportunity to build upon the knowledge and skills acquired in the preceding courses at the High School and the College. This course provides a laboratory study of engines and power transmissions as it relates to heavy equipment and transportation technology. Students who complete this course will be able to disassemble, reassemble, diagnose and repair gas and diesel engines. They will also be able to disassemble, reassemble, diagnose and repair manual and hydrostatic transmissions including the usage of precision mechanical and electronic measuring devices. Throughout this course, vocational skills are integrated with transitional skills and employability skills.

Eight Months Out

CHECKLIST:

Note: Since members now have experience with conducting monthly meetings, and creating agendas, the sections from this point on deal with issues and questions needing to be addressed during the whole of the particular month, and not necessarily at the monthly meeting of the partners.

- Brochure:** Have you decided how the brochure or folder announcing the program will look? (*see Exhibit E*)
- How will it sell the program? Is there a theme and convincing information? Strong academic and technical standards?
- Has someone been assigned to write the copy and have the brochures printed?
- Student Selection:** How will students be selected? How many?
- How will the fairness of the selection process be ensured?
- Is application available to all students, including top performers?
- Attrition rate?
- Public engagement meetings to announce program?** Are the dates convenient for partners to attend? Are evening dates appropriate?
- Classroom:** Has a classroom been identified for the institute's technical training?
- Will the business partners equip the classroom with state-of-the art tools, equipment and instructional aids?
- Do all classrooms meet acceptable levels to teach the ETI curriculum.
- Communications:** This is a good month for the business partners to recruit additional businesses to support the program.
Note: The AED Foundation showed businesses a number of ways to support the institute's program. Among them:
 - 1) Financial contribution to equip or upgrade classroom.
 - 2) Serve on one of the subcommittee teams.
 - 3) Volunteer to serve as student mentors or sponsor a field trip or job shadowing opportunity.
 - 4) Provide a paid internship or job to one or more students.
- What is the feedback, both positive and negative, from teachers, department heads and others about starting an institute?
- Is the Program Team developing guidelines for the teachers and counselor who will be selected for the program?
- Develop informational handbook to be distributed to parents and students at the public engagement meetings.

Exhibit E

Tips for Brochure Announcing Your Industry-Focused High School Program

Questions before you start writing:

- ✓ What size brochure or folder?
- ✓ Black & white or in colors?
- ✓ What major points should the copy address?

- ✓ Who will write the copy
- ✓ Who will review and proofread it?
- ✓ Is there a need to have it printed in a second language?
- ✓ Will it include photographs?
- ✓ Will it be mailed to freshman students?
- ✓ When will it be mailed or distributed?
- ✓ Do you want copies to reach parents, too?
- ✓ Can the coordinator answer students' questions?
- ✓ Is the brochure to be designed internally, or given to an outside professional?
- ✓ Can a business or school partner print the brochure, or will an outside printer be used?
- ✓ What is the total cost to design and print the brochure?
- ✓ How many copies will you need?

Note: Samples of brochures can be obtained by calling the AED Foundation.

Seven Months Out

CHECKLIST:

- Institute staff:*** Introduce teachers chosen to teach math, science, English and the technical courses over the three-year program.
- Introduce counselor if that person has already been chosen.
- Program Team:*** Mail or give program brochure to students and parents. School officials should spend time with recruiting class, explaining the program's benefits before the brochure arrives.
- Publicize dates for public engagement meetings.
- Ask all partners to attend the meetings.
- Discuss preliminary plans for teacher training (externships) during the summer (providing knowledge of the industry sponsoring the program.)
- Work on outlines of the technical courses that will be incorporated into the curriculum (*see exhibit F*).
- Business/Industry Team:*** Work on developing program of field trips to business partners' facilities for 1st year students and start a list of speakers to address the students on the industry and how it works.
- Technology Team:*** Finalize relationships with post-secondary institutions that will partner by providing college credit courses to institute students or through articulation agreements that will honor the college level courses taken.
- Grants/Resources Team:*** Continue to explore funding opportunities that may be available through the district, state or federal government, foundations and other educational institutions.

Note: Programs may be available to pay college course tuition for certain high performing students; the state or district's vocational education department may also have funds for school to career programs.

Exhibit F

Technical Course Outlines

Institute sophomores (10th graders) in the program sponsored by The AED Foundation study basic electricity and hydraulics as their technical education courses. The foundation's Technical Training Committee, in conjunction with Universal Technical Institute, Glendale Heights, IL., developed the following course outlines. Mastering these topics will prepare students for their more demanding work in electricity and hydraulics at the post-secondary technical school level, as outlined in the AEDF booklet *Raising Standards for the Future in Construction Equipment Technology*. Outlines of courses taken in 11th and 12 grades are available on request from The AED Foundation.

ELECTRICITY

1. Basic Electricity12 hours
 - Atomic structure
 - Conductors
 - Ohm's Law
 - Series circuits
 - Parallel circuits
 - Series/parallel circuits

2. Test Equipment18 hours
 - Test lights
 - Analog multimeter
 - VAT
 - DVOM

3. Magnetism.....6 hours
 - Theory of magnetism
 - Magnetic fields
 - Permanent magnets
 - Temporary magnets
 - Electromagnets
 - Principles of motors
 - Principles of generators
 - Induction

4. Batteries6 hours
 - Function
 - Construction
 - Operation
 - Rating

Maintenance
Testing

5. Wiring Systems.....18 hours
 - Types of conductors
 - Insulation
 - Primary wiring
 - Secondary wiring
 - Harnesses and looms
 - Circuit protection
 - Control devices
 - Diagrams/schematics
 - Troubleshooting and diagnosis

6. Starting Systems.....12 hours
 - Principles of operation
 - Components
 - Solenoids
 - Troubleshooting and diagnosis

7. Charging Systems12 hours
 - Principles of operation
 - Components
 - Control devices
 - Troubleshooting and diagnosis

HYDRAULICS

1. Principles of Hydraulics.....3 hours
 - Fluid power
 - Liquids
 - Gases
 - Pascal's Law
 - Power transmission

2. Diagrams3 hours
 - Types of diagrams
 - Hydraulic symbols

3. Hydraulic Fluids.....2 hours
 - Types of fluids
 - Purpose
 - Fluid properties
 - Additives
 - Hydraulic fluid care

4. Reservoirs/ Heat Exchangers 1 hour
 - Construction
 - Types
 - Inspection and service

5. Filters
 - Purpose
 - Types of filtration
 - Types of filters
 - Service

6. Plumbing12 hours
 - Piping
 - Tubing
 - Flexible hose
 - Material consideration
 - Installation requirements
 - Service

(course outline continued)

- 7. Seals12 hours
 - Leakage
 - Sealing
 - Types
 - Inspection and service

- 8. Pumps.....10 hours
 - Purpose
 - Classification
 - Types
 - Mountings and alignment
 - Inspection and service

- 9. Motors1 hour
 - Types
 - Troubleshooting
 - Service

- 10. Valves8 hours
 - Major groups
 - Primary functions
 - Types of valves
 - Control devices
 - Inspection and service

- 11. Cylinders10 hours
 - Types of cylinders
 - Classifications
 - Components
 - Inspection
 - Testing
 - Service

- 12. Accumulators2 hours
 - Purpose
 - Types
 - Inspection
 - Service

- 13. General Maintenance2 hours
 - Safety
 - Maintenance (PM's)

(course outlines continued)

14. System Diagnosis.....2 hours

Procedures

Conditions/causes of failure

Testing instruments

15. Electric Controls4 hours

Components

Testing and inspection

Service

Six Months Out

CHECKLIST:

- Public Engagement Meetings** (*see exhibit G*):
- Do you have a student application and contract (*see exhibit H, contact AEDF*)?
- Program Team:** Identify textbooks to be used for the technical courses in the 1st year (10th grade).
- Work with Technology Partnership Team to make sure textbooks to be used meet local industry expectations of student knowledge.
- Ensure that textbooks meet state/district requirements and are approved for purchase.
- Technology Team:** Work with a post-secondary partner on the selection of college-level technical courses available to the institute's students (*see exhibit I*).
- Plan to announce the selection of courses in April.
- Ensure that courses being considered are applicable to the institute's career focus.
- Plan for tuition to be paid for students taking the college level courses.
- Decide if a summer program be offered for students entering 10th grade.
Note: In The AED Foundation's example, a course called "Introduction to Microcomputers" was offered to students in the summer after 9th grade. This course was offered at the college campus.
- Program Team:** Find a volunteer among the business partners who will provide at least a summer week of training for teachers at the firm's facilities. If possible, find a way to reimburse teachers for this experience.
- Investigate and report on how the district's insurance programs will affect the institute and its students? For example, do they cover student trips to business facilities, internships and job shadowing experiences?
- Other:** Monthly reports from the other subcommittee teams.

Exhibit G

Public Engagement Meeting Agenda

Here's an outline to follow for the meetings. There were three identical sessions in order to accommodate as many students and working parents/guardians as possible. Meetings took place all in the same week on a Tuesday evening at 7 p.m., Thursday morning at 10 a.m. and Saturday at Noon. The school library was used for the program. Audience included students interested in applying for the program and their parents or guardians. Cookies and soda/coffee were available for the guests, who listened to the following lineup of speakers (*presentations were no longer than 10 minutes each*):

1. Welcome and call to order by the high school principal. A general description of the partnership with industry is provided, along with words about the program being an exciting addition to the high school's educational offerings.
2. A business partner (in Chicago's case the chairman of the Steering Committee) describes the industry's workforce problems and how the institute can help students learn the skills they need to get high-tech, good-paying jobs.
3. A respected school official describes the characteristics of the institute, focusing on the mandatory tutorials, more one-on-one time with teachers, the Certificate of Initial Mastery, job shadowing experiences, etc.
4. A representative from a local community college, technical school or four-year institution describes its partnering role in the program.
5. High school principal or a teacher describes the application process. Applications are distributed to the student guests. (See Exhibit # 7).
6. Time for questioning of speakers.

Exhibit I

Partnerships with Post-Secondary Schools

Acquiring hours of college credit while in high school is an attractive advantage for students in the Equipment & Technology Institute at Chicago's Gage Park High School. The Partnership Team formed a relationship with Daley College, which is one campus in the city's junior college system. Reasons the partnership worked include:

1. Daley's campus is only 10 minutes from the high school.
2. College administrators see the program as a recruiting opportunity for its courses in manufacturing technology and other skilled disciplines.
3. High school teachers and administrators believe the college exposure has a maturing influence on the students.
4. Parents were thrilled to have their children earning college credit.

In the Chicago example, students took a college level course called "Introduction to Microcomputers" in the summer between their 9th and 10th grades. This introduction provided basic computer skills that were important to their general high school academic experience and also served as background for subsequent post-secondary technology credits. Ideally, students will finish the program with 24-33 hours of transferable college credit.

Through the arrangement worked out with Daley College, following is a list of the courses made available to students attending the high school's Equipment & Technology Institute:

Introduction to Microcomputers	Blueprint Reading
Introduction to Microsoft Excel	Pneumatics
Introduction to Machining	Program Logic Controllers
Advanced Machining II	Introduction to Business Mgmt.
Advanced Electronics	Quality Control

An important matter for the Partnership Team to consider is who will pay the tuition for the students. For the Chicago model, The AED Foundation

Exhibit I *continued*

and various business partners paid the tuition costs and the Chicago Public Schools paid for the textbooks. The college participated by waiving fees for students who did outstanding academic work in their first year of high school.

In your case it is important to explore potential opportunities for funding programs of this nature. Various grants or special state/local special project funds through vocational education departments may be available to some or all students. When setting up the partnership with a local post-secondary institution, be sure team members have talked to the right people at the college and the local school system regarding funding.

Five Months Out

CHECKLIST:

- Monthly Meeting:** Report on results of student recruitment at public engagement meetings.
- Were the descriptions of the program well received?
- What was the feedback from students, parents, others?
- How many students applied?
- How many students can the program accommodate the first year?
- Institute program director or principal should describe how students will be selected, taking into account legal and systematic considerations.
- Provide the partners with information on the class rankings and attendance records of the students who have applied.
- Review and finalize academic and technical courses available to students over all three years.
- Program Team:** Make sure the teacher for the technical programs has the proper credentials to satisfy state and/or district requirements. **Note:** In the Chicago example the technical teacher needed to take a summer course in hydraulics at a local technical school so as to provide proper instruction of the topic at the high school level.
- Finalize plan for teacher training. How much time will be devoted to:
 - 1) Training by the industry sponsoring the program (5 days?)
 - 2) Curriculum development (5 days?)
 - 3) Additional days needed?
- Discuss student trips to partnering facilities and how to prepare them for these experiences.
- Develop a work assignment for students to use during tours/trips.
- Identify a date to tour a post-secondary technical school.
- Identify a date to tour a partner's business facility.
- Grants & Resources Team:** Report on whether funds are available:
 - 1) Funds through the district.
 - 2) Perkins money (federal).
 - 3) Grants
 - 4) Other.

Four Months Out

CHECKLIST

- Technology Team:** Announce the final selection of college level courses for the students during the program's three years.
- Transportation to the post-secondary school: Is this an issue for students? If so, can transportation be arranged for them?
- Discuss how your students will react to the college environment and how to prepare them for that environment.
- How will summer college courses affect students who need to make up courses failed during the regular school year?
- Technology & Business/Industry Teams:** Report on how the technical classroom can be altered/updated/equipped to reflect the nature and work of the industry supporting the program. **Note:** In the Chicago example, the partners knew that the school system did not have the materials appropriate for an Institute related to the construction equipment industry. Consequently, the business partners either donated the following for the Equipment & Technology institute's classroom, or arranged for donations through other sources:

For the course in basic electricity:		For the course in hydraulics:	
<u>Description</u>	<u>Quantity</u>	<u>Description</u>	<u>Quantity</u>
DVOM	1	Fluid power trainer	1
Bread Board	1	2Ton bottle jack	10
Test lights	10	½" drive tool set	10
Analog multimeter	2	Small cylinders	10
Voltage amperage tester	1	Small motors	10
Starter motor	10	Small pumps	10
Alternator	10	Small valves	10
¼" drive socket set	10	Small accumulator	10
Alt./starter tester	1	Rebuildable materials	
Basic tool set	10		

Additional equipment will be obtained later for courses in engines, electronics, etc.

- Monthly reports from other subcommittee teams.

Three Months Out

CHECKLIST

- Program Team:** Finalize students admitted into the program that will begin at the start of the next school year.
- Discuss how to congratulate and welcome the students. **Note:** In the AEDF example the chairman of the steering committee sent a welcome letter to the home address of each student. Information about the construction equipment industry, and its various career opportunities, was also sent as a follow-up (*see exhibit J*).
- Discuss with school administration, district personnel, counselors and teaching staff the ways in which the new program will be measured and evaluated.
- Will the students in the program be evaluated against their non-institute peers? What about state or district evaluation requirements?
- Are there plans to allow adequate time for meaningful results to materialize?
- Plan a future meeting with a district specialist or an outside consultant for discussion and guidelines of program components including job shadowing, mentoring, paid internships, student portfolios, capstone projects and other work-based learning ingredients. **Note:** Materials and consulting services on these components are available from The AED Foundation and The National Center on Education and the Economy (NCEE), Washington, D.C. .
- Make final plans for student tours of partners' facilities.
- Finalize work assignment for students to use during tours.
- Make final plans for training teachers. (You may also want to contact NCEE for additional ideas on teacher training.)
- Other:** Updates from the other subcommittee teams on their work:
- New information on resources/grants.
- New information on partnerships with schools, businesses.
- New information on classroom, donations or procurement of industry training materials.
- Develop Students handbook.

Exhibit J

Letter of Welcome to Students

John Spinoza
5104 Cashman St.
Chicago, IL 60629

Dear John:

On behalf of the Steering Committee of AEDF's Equipment & Technology Institute at Gage Park High School, I want to welcome you to this unique and exciting program.

When school opens this fall, you will begin a journey. It will prepare you for career opportunities in the construction equipment industry. My company, Madison Tractor Sales, and the other business partners, have high-paying, career oriented jobs available to people like yourself who are willing to work hard. As you and your parents or guardians already know, Gage Park and the business partners have designed an experience that will be fun and rewarding. From now on, your classes will have specific goals and a focus to shape your future.

The technical courses will specifically prepare you for a career as a skilled technician. But we support you in whichever walk of life you decide to follow. The teachers and counselors are anxious to help you become successful in school and in your career

Information about our industry will be provided on a regular basis. Beginning next month, your free subscription to our industry's magazine, *Construction Equipment Distribution*, will begin. Welcome aboard!

Sincerely,
Walter Madison,
Chairman, Steering Committee

Two Months Out

CHECKLIST

A good time for the Steering Committee to review the progress of all plans in conjunction with the opening of the program:

- Discuss the student tours the previous month. What kinds of questions did the students have? Do they have enough introductory knowledge of the industry?
- Review student worksheets and report on what they learned on the tours/trips.
- Have teacher schedules been finalized to accommodate the institute students? How will your teachers handle tutorials?
- Is the first year's curriculum fully in place with all of the necessary instructional guidelines?
- How will teachers continue their preparations during the summer, including the special training they will receive? Who will be involved?
- Has the necessary paperwork for the program been completed for the state, district and the school itself?
- Will the technical classroom be ready for the opening of school?
- Is the teacher of the technical programs ready to instruct students in whichever courses your students will take the first year?
- Are plans finalized for any college level courses students will take in the summer?
- What about tuition for the college courses? Does the Technology Partnership Team know how costs for tuition and textbooks will be paid?
- Are the parents supporting the program? What is the feedback from parents?
- How did students about to start the program perform in terms of freshman grades? How many will need to repeat 9th grade courses, and how does this affect their ability to start the program?
- Make preliminary plans for 1st semester tours or field trips for the students.

One Months Out

CHECKLIST

- Review plans for the opening of the Institute.
- Hear progress report on teacher training.
- Prepare list of topics for discussion by the Steering Committee in the months ahead. Examples:
 - 1) Sequencing of the college courses.
 - 2) Implementation of Certificate of Initial Mastery.
 - 3) Business/industry-sponsored activities for students.
 - 4) Future resources and funding.
 - 5) Selection of new steering committee chair (or co-chairs).
 - 6) Mentorship program for the students.*
 - 7) Job shadowing program.*
 - 8) Paid internships and jobs after graduation.
 - 9) Capstone projects.*
 - 10) Tutorials
 - 11) Public engagement meeting for the next class of students.
 - 12) Further teacher training.
 - 13) Additional classroom needs.
 - 14) Involvement of post-secondary partners.
 - 15) Publicity for the program.
 - 16) Transportation issues.
 - 17) Need for outside consultants or specialists.
 - 18) Relationships with non-institute teachers, staff.
 - 19) Additional institute programs representing other industries.
 - 20) Recruitment of students by business partners.
- 21) Continuing or expanded subcommittee responsibilities.
- 22) Communication with state board and district administration.

** Contact The AED Foundation for information on these specific components.*

FOR MORE INFORMATION;

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