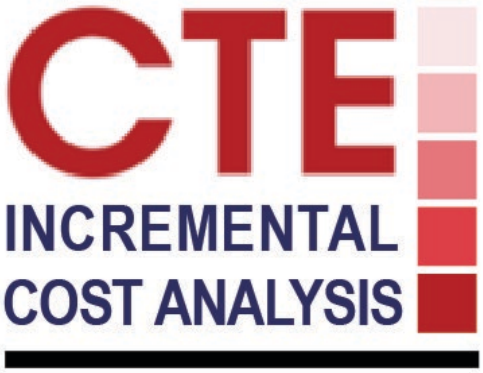
IES Institute of Education Sciences

CTE Career & Technical Education RESEARCH NETWORK

Incremental Costs in Career and Technical Education

JANUARY 2023

Workgroup on CTE Cost Analysis
Career and Technical Education Research Network
American Institutes for Research®



The Career and Technical Education (CTE) Research Network is a learning community of researchers who have grants from the Institute of Education Sciences to conduct causal research studies on CTE. The Workgroup on CTE Cost Analysis is a CTE Research Network subgroup dedicated to considering cost-related issues in CTE research. Members of the workgroup and contributors to this report include the following:

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This report is available on the CTE Research Network website at:
https://cteresearchnetwork.org/resources/incremental-costs

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Introduction

The intent of this brief is to guide researchers, evaluators, and administrators who are documenting what resources are required to provide a range of career and technical education (CTE) experiences for learners in high schools and community colleges. The brief follows the Institute of Education Sciences (IES) report Cost Analysis: A Starter Kit,[1] which shows how to measure both the standard "business as usual" costs as well as the incremental costs[2] of an educational program using the "ingredients method."[3] As a workgroup of researchers engaged in CTE cost study analysis, we developed this brief to guide IES-funded studies of CTE. Some methods may also apply in other contexts. Because the general tools for cost analysis in education are available in the IES starter kit and elsewhere, we focus here on identifying specific additional resources used in CTE programs that would not be needed in standard classrooms. After a brief framing on the purpose of cost analysis and cost measurement, we outline these specific CTE resources and how to measure them.

Why does it matter what specific additional resources are used in CTE? The CTE Research Network, which sponsors our workgroup, aims to develop and promote causal studies on the effects of CTE programs. Cost studies are a critical part of that research because they tell schools and colleges what resources are needed to provide effective career exposure and preparation for students as they journey toward further education and employment.

Analyzing Costs

Cost analysis identifies the resources required to deliver a program or service. It includes all resources committed to the program regardless of who pays for those resources, and can show how costs are distributed across local, state, or federal sources. Combined with evidence on impact, evidence on cost is necessary for comparing the cost-effectiveness of different programs, measuring return on investment, or calculating benefit–cost ratios. Even in the absence of impact estimates, cost information can be used to identify disparities in resources dedicated to different groups or programs. We return to the issue of resource equity at the end of this brief.

Measuring Costs

Cost studies require various levels of measurement depending on their purpose. For example, to measure a program's overall cost-effectiveness, costs and average impacts can be measured at the program level. To analyze equity within a program—what we call "cost equity"—researchers also would have to collect individual-level student data to measure exposure to distinct parts of the CTE experience.

Whatever the level of measurement, an incremental cost analysis typically must go beyond budgets and expenditure reports to interview or survey program administrators and staff about the resources or "ingredients" that programs require to operate. Main ingredients are staff time, equipment, materials, and facilities. Operating budgets show amounts of money to be spent on personnel, facilities, equipment and supplies, transportation, and administrative costs, but usually do not include details such as amounts of time actually spent by staff on particular program activities. Measuring actual cost in physical units, such as hours per week spent by teachers and administrators or pieces of large equipment, is necessary to understand how resources are used in different parts of a CTE program. For the field as a whole, measuring cost in physical units such as teachers' time allows

[1] Institute of Education Sciences. (2020). *Cost analysis: A starter kit* (IES 2020-001). U.S. Department of Education. https://ies.ed.gov/seer/pdf/IES_Cost_Analysis_Starter_Kit_V1.pdf
[2] Business as usual costs are the costs of traditional, comprehensive education; incremental costs are the additional resources associated with providing other specific educational programs and services, such as CTE or special education.
[3] See Levin, H., McEwan, P., Belfield, C., Bowden, A., & Shand, R. (2018). *Economic evaluation in education: Cost-effectiveness and benefit–cost analysis.* SAGE Publications, Inc, https://dx.doi.org/10.4135/9781483396514

cost estimates to be readily applied in other locations where teachers' time can be translated into dollars using local salary scales.

Costs Particular to CTE

The IES starter kit explains the "ingredients method" for accurately calculating education costs, showing how to measure the physical amounts and dollar values of resources ordinarily used in schools and colleges. These include classroom space, teacher instructional time, computers, and software. Here we describe other resources that are used in CTE programs more than in standard education at the high school or community college level. We recommend that researchers pay particular attention to these resources as they design cost studies for CTE programs, including for IES-funded research. Given the significant variation in CTE programs and contexts, researchers should also identify the "business as usual" standard (i.e., the counterfactual) appropriate for their study.[4] We have provided a summary table at the end of the brief to help facilitate your work.

Facilities

Comprehensive high schools and community colleges may build labs within existing buildings or construct separate buildings to house CTE programs. In some instances, districts with high schools may build or renovate facilities that are accessed by students from different schools in the district or pay to send students to area CTE centers serving multiple school districts and sometimes postsecondary and adult learners as well. In other instances, students may attend CTE-dedicated high schools. These required facility expenses will need to be recognized in cost calculations. On an annualized basis, the calculation would include the amortized cost of construction or renovation, or what it would cost to rent the space, plus any additional utilities consumption or maintenance time that may be needed.

Equipment and Supplies

CTE is one of the most equipment-intensive parts of the educational experience, along with lab science and music. Hydraulic lifts in automotive, computer numerical control machines in manufacturing, stoves and refrigerators in culinary arts, computers for graphic design, or medical equipment in health sciences may cost significantly more than equipment in the standard classroom. Amortized equipment costs may be a big part of incremental costs in some CTE programs. Not uncommonly, programs are given equipment from businesses and these in-kind contributions should be considered as part of the overall costs of the program. For computing annual cost, equipment is usually amortized over a shorter period than buildings.

Some CTE programs purchase additional inputs that should be counted on an annual basis. Supplies are a significant recurring cost in some CTE programs that use a lot of consumables (e.g., culinary, carpentry, and health occupations). In media and engineering, software licenses may be a significant cost. As with equipment, in-kind donations of supplies from industry or area businesses should also be considered as part of the overall costs since they would be required to recreate the program.

[4] For more about the counterfactual in CTE research, see Ross, S. L., Brunner, E., & Rosen, R. (2021). Identification and counterfactuals for program evaluation of career and technical education. *Career and Technical Education Research, 46*(3), 15–36.

Smaller Class Size

Because CTE programs often use specialized facilities or equipment, CTE classes may have fewer students than "business as usual" classes. Administrative data on the size of each class section can be used to determine whether and to what extent CTE classrooms provide more instructor time per student. This additional or incremental instructor time is part of the overall cost of the CTE program.

CTE Teacher Time

CTE teachers often spend time in duties that are typically not expected of non-CTE teachers. These duties include developing and supervising work-based learning (WBL) opportunities, organizing and running advisory committees, and more. These would show up when teachers are asked how many hours a week they spend on various activities. In addition, researchers may find, when converting amounts of teacher time to dollar amounts, that salaries of CTE teachers may be higher or lower than non-CTE teachers or may vary by program in areas where schools and colleges need to compete with private employers. Because staff time and benefits account for roughly 80 percent of education costs, the incremental cost of teacher and faculty time in CTE classrooms may be substantial.[5]

Professional Development

CTE teachers and staff may be required to complete periodic professional development, including continuing education hours, to maintain professional licenses and meet industry certification standards for educators. Professional development for CTE teachers can include more intensive activities, such as externships with employer partners, and preparation for activities beyond classroom instruction, such as how to manage WBL programs, advise student organizations, and more. The cost of the professional development activity includes the staff time for participation and any fees paid to content providers.

Employer Time

Employers often provide volunteers to serve on program advisory committees and support a range of WBL experiences from exploratory visits and job shadowing to paid or unpaid internships[6] and mentorships. An energetic advisory group may contribute hundreds of hours of volunteer time over the course of a year. Employer time is a resource that could have been used for other purposes, so a cost analysis should find out how much time is spent, unless the only interest is in costs borne by the school or college, not the cost to society as a whole.

[5] McFarland, J., Hussar, B., de Brey, C., Snyder, T., Wang, X., Wilkinson-Flicker, S., Gebrekristos, S., Zhang, J., Rathbun, A., Barmer, A., Bullock Mann, F., & Hinz, S. (2017). *The condition of education 2017* (NCES 2017-144). National Center for Education Statistics.

[6] Wages or stipends paid to learners could be considered a program cost. Alternatively, they could be viewed as compensation for learners' time, which is usually considered a free resource. Although the time of learners in compulsory schooling could be considered to have zero opportunity cost because the learners are required to be there, this does not apply to community college students. Foregone earnings of students participating in WBL outside of school time instead of working could also be considered a program cost. Whether and how to value students' time is an important question beyond the scope of this discussion.

Partner Time

High school CTE programs are increasingly connected to pathways that allow students to move smoothly to postsecondary education, mainly in 2-year but also in some 4-year colleges. Building and sustaining these pathways, dual enrollment programs, and other opportunities takes active collaboration from both secondary and postsecondary partners. Postsecondary partners may also have ongoing administrative costs associated with enrolling, tracking, counseling, and otherwise supporting students at their institution.

Non-CTE Teacher Time

Some programs in high schools and community colleges integrate CTE coursework with academic corequisites through joint projects, block scheduling, contextualized coursework, or other means. In such programs, the time non-CTE teachers spend on collaborating and adjusting their own instructional plans is an incremental cost of the CTE program. In some schools, non-teaching staff may serve as coordinators with responsibilities for facilitating employer and higher education partnerships, managing WBL programs, proctoring certification exams, etc. The time these staff members spend in support of the CTE program and students should also be counted as an incremental cost.

CTE-Specific Administrative Costs

Some schools, districts, colleges, and states maintain CTE administrative units to oversee funding and programs such as managing the federal Perkins grant for CTE and the comprehensive local needs assessment, which must be completed at least every 2 years for school districts and colleges to be eligible for Perkins funding. Institutions are also required to submit grant proposals to their state to obtain Perkins funding for their programs. Some institutions have dedicated grant writing staff, while others add this responsibility to program staff. These costs should be prorated among the relevant CTE programs and counted as incremental administrative costs.

Common administrative costs for CTE programs include costs incurred for hiring specialized teachers and instructors for CTE programs, hiring career and college counselors and advisors, costs for communications and reporting, and costs for related equipment and supplies. Additional administrative costs may include fees associated with accreditation, exams, and credentialing. Administrative costs may also include refreshments and supplies for advisory committees, student and family information sessions, and celebrations.

Transportation

Transportation to workplaces and college campuses for field trips, WBL, or instruction is another cost that is likely to be higher in CTE than in standard classes. These costs may involve both time of the student outside of regular school hours (which they could otherwise use for schoolwork or other employment, at least hypothetically) and the cost of the transportation mode (e.g., own vehicle, district buses, public transportation).

Insurance and Safety

Students participating in off-site placements or working with dangerous equipment may face increased risks that require districts to secure additional insurance or riders. The cost of safety training and certification for CTE instructors and students, first aid kits, and safety equipment and supplies may also vary based on program type.

Career Planning and Development Activities

Often, CTE programs provide career exploration, planning, and advising services to CTE students. Costs may include time for CTE teachers, non-CTE teachers, or other school staff leading these activities as well as the materials used. For example, CTE programs may purchase annual subscriptions to career planning websites and proprietary tools such as interest inventories and skills assessments to support career exploration and advising for CTE students.

Cocurricular Activities

CTE student organizations supplement CTE programs in many places. Some students travel to regional, state, or national meetings. Staff time and other resources used by these activities, such as facilities for afterschool meetings and transportation to competitions, are an incremental cost of CTE. In addition, fees for student involvement are an incremental cost that may be paid by the student, district, or state.

Equity Considerations

A final note on equity. How resources are allocated across CTE programs, and which programs are available to which students, are essential questions about equity. Within a program, disproportionate participation in costly parts of the CTE experience could be favoring some sociodemographic groups over others. Resources flowing disproportionately to learners in more affluent families and communities would clearly also be an equity issue. For example, more resourced schools with staff time and skill for grant writing are more likely to receive Perkins state grants than less resourced schools that do not have grant writers on staff or staff capacity to develop successful grant proposals. Regardless of whether more affluent groups significantly benefit from the extra teacher time, equipment, and other resources, reallocating resources to less affluent students and places could produce greater benefit there.

Policymakers, taxpayers, and families need information about program costs and resource allocations to identify and address inequities in our education systems. Cost analysis is an important source of that information. The CTE Research Network has produced equity guidelines for CTE researchers that include cost analysis along with other phases of the research process.[7]

[7] Equity in CTE Workgroup. (2022). *Equity framework for career and technical education research.* American Institutes for Research, Career and Technical Education Research Network. https://cteresearchnetwork.org/equity-cte-research-framework For evidence on equity in resources for CTE in K-12, see Kim, E. H., Flack, C. B., Parham, K., & Wohlsetter, P. (2021). Equity in secondary career and technical education in the United States: A theoretical framework and systematic literature review. *Review of Educational Research, 91*(3), 356–396. https://doi.org/10.3102/0034654321995243

Identifying and Measuring Incremental Costs in CTE

Use this table to track which resources and components are (or should be) included in your cost study, key measurement considerations, potential data sources, and notes on defining the counterfactual.

Study/Program:			
Resource	**Key Considerations**	**Data Source(s)**	**Notes on the Counterfactual**
Facilities			
Equipment and supplies			
Smaller class size			
CTE teacher time			
Professional development			
Employer time			
Partner time			

Study/Program:			
Resource	**Key Considerations**	**Data Source(s)**	**Notes on the Counterfactual**
Non-CTE teacher time			
CTE-specific administrative costs			
Transportation			
Insurance and safety			
Career planning and development activities			
Cocurricular activities			
Other			

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The American Institutes for Research (AIR) and its partners—the Association for Career and Technical Education (ACTE), JFF, and Vanderbilt University—serve as the CTE Research Network Lead. The Network Lead provides network administration and coordination as well as research, training, and dissemination to increase the number and quality of CTE impact evaluations and strengthen the field's research capacity

CTE INCREMENTAL COST ANALYSIS

www.air.org | www.acteonline.org | www.jff.org | www.vanderbilt.edu