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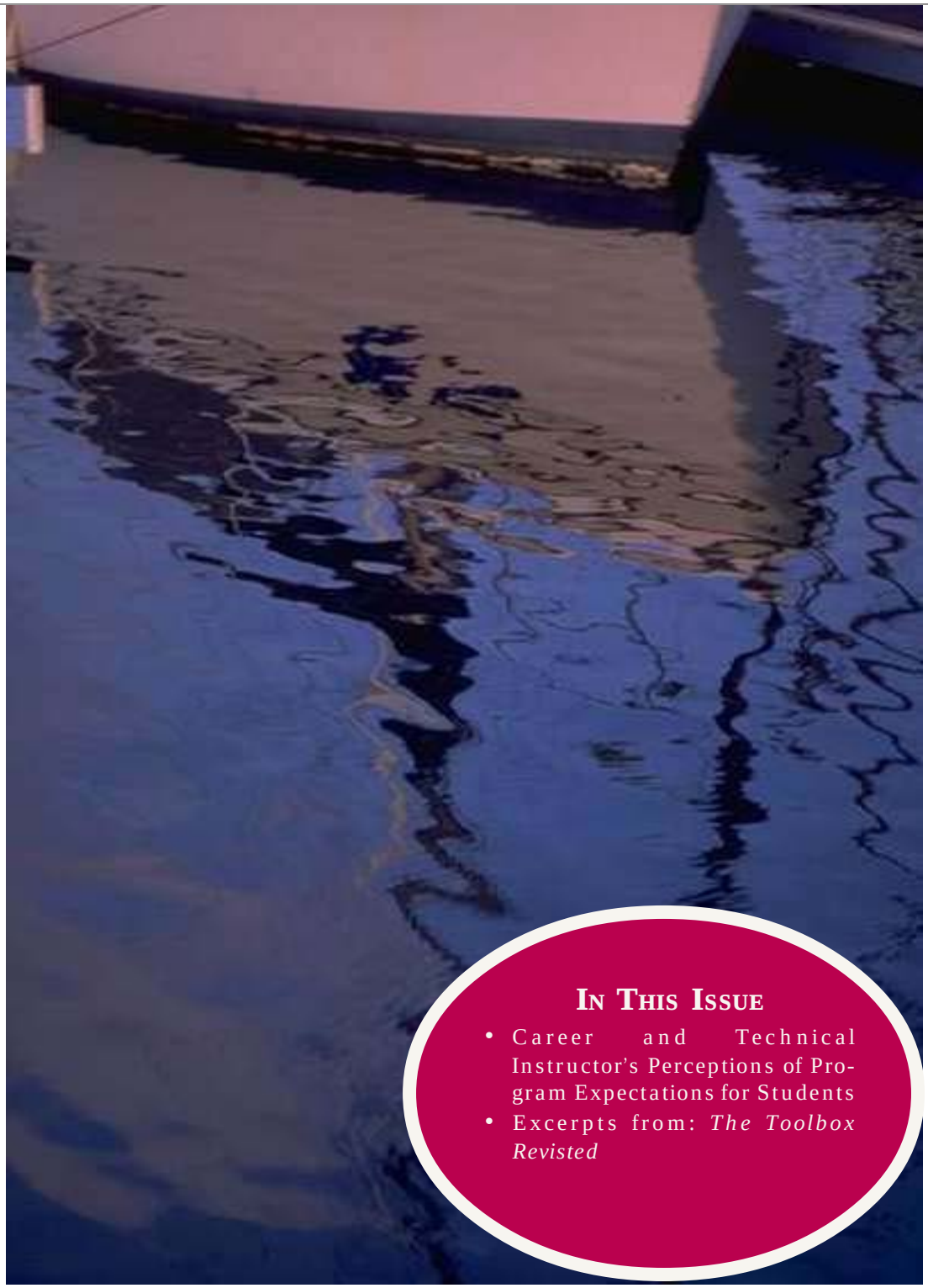

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The Journal of the National Association of Vocational Education Special Needs Personnel

Affiliate of the Association for Career and Technical Education's Special Needs Division

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Author Guidelines for JVSNE

Purpose

The purpose of the Journal for Vocational Special Needs Education (JVSNE) is to advance the professional development of personnel in the field who are engaged in educating students from wide variety of special populations with an emphasis on educators, service providers, staff, and administrators who provide education or training for students preparing for the workforce and postsecondary education. Consistent with our purpose, we seek to publish articles that assist personnel who provide education or services to special population students from a diverse array of education or training settings. Articles should be centered on one of the following objectives: a) illustrate practical information; b) provide resources for the classroom or training setting; c) provide tools for the classroom or training setting; and d) report research.

JVSNE has an open submissions policy and seeks manuscripts from the field on a wide variety of practical issues confronting special needs personnel and the individuals they serve. We encourage submissions that include multiple authors representing the diversity of professional roles within the field.

We seek to publish original work that describes action research, research with an applied focus, specific instructional and management interventions. We also seek articles that help us understand underrepresented points of view, (i.e. foster care issues, Native American education issues, incarcerated youth issues) issues concerning service delivery, curriculum, and roles; strategies for fostering professional development; information pertaining to state and federal legislation that impact services from a variety of entities servicing special populations (i.e. vocational rehabilitation legislation, the McKinney Homeless Act, Juvenile Justice Act); and issues related to the effectiveness of workforce education and training for special populations. Manuscripts on these, as well as additional topics, will be accepted at any time.

Guidelines

Style

Focus must be on the practical application of knowledge for special populations and those professionals who work with individuals from this category in any capacity related to workforce education and training, postsecondary education, or workforce education and training issues. We encourage authors to avoid jargon that may only be understood by one professional field working with those populations and to be mindful that the journal audience is diverse in its training and background because the personnel from the field of special populations are diverse.

We seek manuscripts that have a central message, that are pertinent to the professionals within the field, that are research based (either from hardscience research, or qualitative action research in the classroom or training setting) but that are written in a way that will allow individuals within this field, whether novice or advanced in their knowledge, to utilize the information in their professional capacity with special populations. When research from other individuals is included in the manuscript, it must be properly cited in accordance with the American Psychological Association Manual (5th edition).

Format

Manuscripts should be well organized, follow a central theme, and be written in a direct, clear style. All materials must be typed, double-spaced, including quotations and references, in 12 point font with one inch margins. Table and figures should be clearly labeled and, if they are from other research, should be cited appropriately.

Length

Manuscripts should not exceed 20 double spaced typed pages. This includes the cover page, abstract, figures, and references.

Submission

Manuscripts will be accepted for review when the author(s) provide: a) a cover letter indicating that the manuscript has not been published, or is not being considered for publication anywhere else, in whole or in substantial part; b) the original manuscript and three copies; c) an address, both mailing and email, where the recipient can be reached for clarification of any material submitted, for notification of acceptance of publication, or for notification of nonacceptance of publication.

First-Time Authors

Practitioners are encouraged to submit manuscripts or outlines of possible articles for review. Writing assistance is available if needed.

Submission Information

Any inquiries concerning publication or rejection of material submitted may be directed to the journal editors:

JOHN GUGERTY, Co-Editor, JVSNE, Center on Education and Work, University of Wisconsin, 964 Educational Sciences Building, 1025 W. Johnson Street, Madison, WI 53706; phone: 608-263-2724; fax: 608-262-3050; Email: jgugerty@education.wisc.edu;

–or–

KELLI CRANE, Co-editor, JVSNE, TransCen, Inc., 451 Hungerford Drive, Suite 700, Rockville, MD 20850; phone: 301-424-2002; fax: 301-251-3762; Email: kcrane@transcen.org.

Indiana Career and Technical Instructors' Perceptions of Program Expectations for Students With and Without Disabilities

By Michael W. Harvey, Samuel E. Cotton, Kourtland R. Koch, Ball State University

Abstract

This study investigated the relationship between demographic variables of secondary Indiana career and technical education (CTE) instructors and program expectations for students with and without disabilities participating in CTE. Respondents' gender, age, level of education, years in current position, years in education, and training in special needs (i.e., university coursework, in-service training) are reported. A survey research design using student case studies and non-random survey methods were used to explore instructors' perceptions of students' social integration, academic and occupational skill attainment, and postsecondary occupational employability. Significant differences were found regarding students' social fit, academic attainment, occupational skills competencies, and employment potential in the occupational area by respondents' demographic variables. Teacher training and future research efforts are discussed.

There are several differing views concerning what secondary level transition planning for students with disabilities should involve (Phelps & Hanley-Maxwell, 1997). Recent educational reforms have narrowed this debate. As such, the recently reauthorized IDEA, the Individuals with Disabilities Education Improvement Act of 2004 (P.L. 108-446), makes clear that transition planning/services are to begin at age 16, eliminating the age 14 program of study requirement of IDEA 1997. Although the new IDEA continues to support transition, many in the field believe that the change de-emphasizes the important need to start planning early and focus transition programming throughout the high school experience. There is no contention that the new IDEA aligns with the national educational reform agenda under The No Child Left Behind Act (NCLB) of 2001 (P.L. 107-110). This agenda has established rigorous academic standards and accountability measures for all students. The intent of NCLB is to close the achievement gap and to ensure high levels of academic attainment for all students (National Association of Secondary School Principals, 2005). States have interpreted NCLB mandates in the context of strict grade level academic achievement due to the stated goal as having all children, with the exception of 1% who participate in alternative assessments, on grade level by the 2013-2014 academic year. The NCLB regulations establish federally approved state systems of accountability for progress reporting on annual yearly progress (AYP). State assessment measures focus on grade level academic standards in language arts, math, and science. The IDEA of 2004 reinforces high achievement for students with disabilities and supports NCLB. The emphasis on academic performance for all students, including those with disabilities, has been mandated through NCLB and also articulated in IDEA 2004.

Although there is an emphasis on academics, Johnson, Stodden, Emanuel, Luecking, and Mack (2002) indicated that students with disabilities need to have access to the full range of general education curriculum options. Transition planning for students with disabilities involves aligning student's interests and postsecondary goals with the most appropriate secondary educational curriculum option (e.g., college prep, career and technical education). Gray (2001) stated that CTE is designed to serve all students who choose to participate in secondary CTE within public education. The National Assessment of Vocational Education (U.S. Department of Education, 2002) reported that 37.5% of CTE occupational concentrators (those concentrating in a specific occupation program of study) were students with a disability. Secondary CTE programs, exploratory and CTE that focuses on occupationally specific training, are important for students with disabilities (Harvey, 2001; Sarkees-Wircenski & Scott, 2003; Wagner, 1991). The U.S. Government Accounting Office (2003) reported that work experience and vocational education were significant factors leading to postsecondary employment

for students with disabilities. Given the mandates of NCLB and IDEA 2004, educators should not lose sight of the fact that secondary career and technical education is a viable curriculum option for students with disabilities.

Career and technical education programs serve a diverse student population (Gray & Herr, 1995; NAVE, 2002). This diverse student population has presented CTE educators with instructional challenges (Clark & Kolstoe, 1995; Rojewski, 1991). A direct relationship has been reported concerning CTE instructors' attitudes toward students with disabilities and students' success in CTE programs (Rowjewski, Pollard, & Meers, 1990). Inclusion, teacher attitude, and instructional effectiveness have been studied regarding teachers' perceptions of their instructional effectiveness in providing for the needs of students with disabilities in general education settings (Cook, Tankersley, & Landrum, 2000; Treder, Morse, & Ferron, 2000). Several studies have investigated CTE educators' attitudes and expectations toward students with disabilities (Custer & Panagos, 1996; Harvey, 1999; Harvey, 2000; Harvey & Pellock, 2003; Kraska, 1996; Kraska, 1997; Rowjewski, Pollard, & Meers, 1990; Trott & Holton, 1996). Researchers have reported CTE teachers' lack of preparation and perceived training needs to effectively serve special needs students (Custer & Panagos, 1996; Harvey, 1999; Harvey 2000; Harvey & Pellock, 2004; Kraska, 1997). Okolo and Sitlington (1988) found no significant effects on Iowa's CTE teachers' attitudes by demographic variables (i.e., occupational program area taught, level of education, training experiences, years of teaching). Rowjewski, Pollard, and Meers (1990) reported that age, experience with special needs students, education level, and years of teaching experience were not factors in CTE teachers' attitudes toward students with disabilities. Trott and Holton (1996) explored age, gender, and education level for postsecondary level technical educators. They found only gender had a significant influenced on attitude and that females had more positive attitudes toward students with disabilities compared to males. Kraska (1997) found that age, years of teaching, and education level were not significant influences on CTE attitudes toward special needs students in Alabama CTE programs. Harvey and Pellock (2004) found that Pennsylvania CTE instructors did have significant differences when responding to students with and without disabilities. Significant differences were found regarding CTE program social fit, academic and occupational performance, and employability by CTE respondents' when variables of age, gender, education level, years in education, and training experiences were disaggregated and subgroupings of each variable (i.e. Age by 20-30 yr. old; 31-40 yr. old…) were taken into account. These findings differ from most of the literature and are different due to the nature of variable definition in this investigation.

The literature indicates training needs are critically important for CTE instructor's to more effectively teach students with disabilities enrolled in secondary CTE (Custer & Panagos, 1996; Harvey, 1999; Harvey 2000; Kraska, 1997). The attitudes of CTE instructors as reported by age, gender, education, years of teaching experiences were generally found not to be a strong predictor of student performance (Kraska, 1997; Okolo & Sitlington, 1988; Rowjewski, Pollard, & Meers, 1990; Trott & Holton, 1996). Harvey and Pellock (2004), in a more recent study, found that CTE respondents' variables did influence perceptions and expectations of student performance when comparing students with and without a disability. Several researchers have recommended further research concerning CTE educators' attitudes toward special needs students.

Purpose of the Study

The purpose of this study was to explore the relationship between Indiana career and technical educators' demographic variables and program expectations for students with and without disabilities. Respondents' gender; age; level of education; years in current position; years in education; and special needs training, involving university coursework and in-service, were identified demographic variables. This study used survey research methods seeking CTE instructors' perception ratings of student case studies where all participants rated a student without a disability (control case) and all CTE participants rated a second pre-assigned case study for a student with a specified disability (1 of 5 disability cases) presented in this research. The cases of students with disabilities included: a) physical disability; b) specific learning disability; c) behavior disorder; d) mental retardation; and e) visual impairment. All student cases included information on educational abilities, behaviors, labels and learning characteristics. Student cases were used to explore instructors' views of students' social integration, academic and occupational skill attainment, and post-school employability in the CTE program areas (see Harvey & Pellock, 2003 for further de-

tail). The following questions guided this investigation.

1. Are there differences between CTE educators' perceptions of secondary CTE program socialization, academic and occupational skill attainment, and employability of students with and without disabilities as identified by respondents' gender?
2. ...as identified by respondents' ages?
3. ...as identified by respondents' education level?
4. ...as identified by respondents' years in current positions?
5. ...as identified by respondents' years in education?
6. ...as identified by respondents' special needs training through university coursework?
7. ...as identified by respondents' special needs training through in-service programs?

Methodology

Population and Sample

This study included the random selection of ten secondary CTE sites representing the northern and southern regions of east central Indiana (IN). The population included all secondary level CTE educators serving students in secondary occupational programs in this region. The study region represented an approximate 30% of CTE programming in the state of Indiana. Five schools were located in northern east central IN and five schools were located in southern east central IN. One hundred and forty-nine (n=149) secondary level CTE occupational instructors participated in the research project. Participation by site ranged from a low of 25% to a high of 94% with an overall participation rate of 68%. Participation in this research study was strictly voluntary.

Instrumentation

The assessment instrument, *Student Characteristics and Career and Technical Education Instructional Expectations Assessment Survey,* was developed by Harvey and Pellock in 2000 (see Harvey & Pellock, 2003 for further detail). The study used demographic information from Section II of the survey instrument to create study variables. Section III of the survey instrument used four specific questions regarding respondents' perceptions of students' potential for social fit in CTE, academic skill attainment, occupational skill attainment, and post-school occupational employability. A 5-point Likert-type scale (1=strongly disagree with statement; 5=strongly agree with statement) was used to rate survey items.

Six student case studies were developed for the research project. A case study for a student without a disability (control case) and five specific disability case studies (comparison group) were used. All cases included background information with basic academic profiles and narrative descriptors of the student, including disability classifications and a statement of special needs. The cases for students with disabilities included: a physical disability (PHY) with mobility limitation; legal blindness (VI) with low vision; limited reading comprehension with a learning disability (LD); impulse control and hyperactivity with behavior disorder (BD); limited IQ and adaptive behavior skills with mental retardation (MR). The disability cases were grouped for comparison purposes in this study.

Reliability of the instrument for this specific study was established with a Cronbach's alpha internal consistency coefficient of 0.63. Sylvia and Ysseldyke (1985) suggest a conservative minimum reliability coefficient of .60 for group assessment data.

Procedure

The researchers sought permission from CTE site administrators to conduct this study and developed procedures with the ten CTE site administrators in Indiana to complete the research. The study was presented to CTE instructors at staff meetings and/or in-service sessions at each site. All CTE participants were provided with survey procedures prior to the study. Student case studies included a student without a disability (control case) and five student cases with specified disabilities (comparison group). Participants completed two survey forms, one for each of their two case studies. The first case study CTE participant read was the non-disabled student case study (control case). All CTE participants were asked to rate survey items after reading the first case study control case. After completing the first survey, CTE participants were given a second pre-assigned case study to read and rate (a student with one of the following disabilities: PHY; VI; LD; BD; MR). Data were analyzed using both descriptive and inferential statistical procedures. Kruskal-Wallis tests were used to explore the effects of specified demographic variables concerning respondents' ratings for CTE program social fit, academic and occupational skill attainment, and post-school employability in the occupational area. These nonparametric measures were used to explore differences in the response distribution by mean ranks. All significant effects were set at the $p < .05$ significance level. The variables explored included respondents' gender, age, level of education, years in current position, years in education, and special needs training (i.e. university coursework and in-service

training). Mean, standard deviation, Chi-square (χ^2), and level of significance are reported (see tables 2-8).

Results

The results are reported by section addressing the findings for each research question posed in this study. (See Exhibits A and B for a summative and graphic representation of the data.) Table 1 presents demographic information by region for the study participants. Indiana CTE instructors were predominately male (62%), were 51 years old or older (39%), held a graduate degree (39%), had been in their current position for 1-5 years (41%), and had been in the field of education for 21 years or more (31%).

Question 1. CTE educators' perceptions by respondents' gender

Gender was found to be a significant factor concerning Indiana respondents' perceptions of students by disability classification in all four areas (see table 2). Significant differences between males and females were found concerning students fitting in socially with others in CTE programming (χ^2=38.661), similar academic attainment (χ^2=17.386), gain occupational skill competencies (χ^2=35.632), and postsecondary employability in the full range of jobs within the occupational area (χ^2=74.410). Female respondents indicated that students with disabilities would have more challenges fitting in socially compared to others in their CTE programs. Male respondents indicated that students with disabilities would least likely have similar academic attainment compared to others in their CTE programs. Males indicated that students with disabilities would not gain occupational skill competencies at the same level as others in their CTE programs. Males also indicated that students with disabilities would have more challenges in being employed in the full range of employment within the occupational trade area compared to female respondents' ratings.

Question 2. CTE educators' perceptions by respondents' ages

Age was found to be a significant factor concerning Indiana CTE educator's perception ratings of students with and without disabilities by all four areas (see table 3). Significant differences were found concerning students fitting in socially with others in CTE programming (χ^2=38.772), similar academic attainment (χ^2=18.200), gain occupational skill competencies (χ^2=42.031), and postsecondary employability in the full range of jobs within the occupational area (χ^2=76.165). Respondents rated students with disabilities lower across all areas compared to the student without a disability. Indiana CTE instructors between the ages of 20-30 and ages 41-50 indicated that students with disabilities would have more challenges with social fit. Rating differences were noted regarding students with disabilities having similar academic attainment compared to others in their CTE program. Respondents who were in the older age groups (41-50, 51+ years old) had lower ratings for students with disabilities regarding the acquisition of occupational skill competencies at the same level as others in their CTE program. Respondents who were 41 years old or older indicated that students with disabilities would have more challenges being employed in the full range of employment within the occupational trade area compared to those without a disability.

Question 3. CTE educators' perceptions by respondents' education level

Education level was found to be a significant factor concerning Indiana CTE perception ratings of students with and without disabilities by all four areas (see table 4). Significant differences were found concerning students fitting in socially with others in CTE programming (χ^2=38.804), similar academic attainment (χ^2=24.578), gain occupational skill competencies (χ^2=44.012), and postsecondary employability in the full range of jobs within the occupational area (χ^2=77.956). Indiana CTE instructors rated students with disabilities lower in all areas compared to the student without a disability. Respondents who had earned a high school diploma indicated that students with disabilities would have more challenges in their mind concerning all areas compared to other education level groups.

Question 4. CTE educators' perceptions by respondents' years in current position

Respondents' number of years in their current position was found to be a significant factor concerning their perceptions of students with disabilities regarding all four areas (see table 5). Significant differences were found concerning students fitting in socially with others in CTE programming (χ^2=41.677), similar academic attainment (χ^2=26.591), gain occupational skill competencies (χ^2=44.457), and postsecondary employability in the full range of jobs within the occupational area (χ^2=87.754). Indiana CTE respondents who had been in their current position 6-10 years, 16-20 years, or 20 years or more disagreed that students with disabilities would gain occupational skill competencies at the same level as others in

Table 1

Indiana Career and Technical Education Participation by Region and Demographic Characteristics.

	IN Northern Region		IN Southern Region		Total	
	n	%	*n*	%	*n*	%
Participants' Gender						
Male	39	26.2	53	35.6	92	61.7
Female	34	22.8	23	15.5	57	38.3
Total	73	49.0	76	51.0	149	100
Participants' Age						
20-30 yrs.	6	4.0	2	1.3	8	5.4
31-40 yrs.	17	11.4	16	10.7	33	22.1
41-50 yrs.	25	16.8	24	16.1	49	32.9
51+ yrs.	25	16.8	34	22.8	59	39.6
Total	73	49.0	76	51.0	149	100
Educational Level						
HS Diploma	10	6.8	31	20.9	41	27.7
2 yr. Associate	10	6.8	9	6.1	19	12.8
4 yr. Bachelors	19	12.8	11	7.4	30	20.3
Graduate	33	22.3	25	16.9	58	39.2
Total	72	48.6	76	51.4	148	100
Years in Current Position						
1-5 years	27	18.1	34	22.8	61	40.9
6-10 years	14	9.4	19	12.8	33	22.1
11-15 years	9	6.0	6	4.0	15	10.1
16-20 years	6	4.0	10	6.7	16	10.7
21+ years	17	11.4	7	4.7	24	16.1
Total	73	49.0	76	51.0	149	100
Years in Education						
1-5 years	14	9.4	19	12.8	33	22.1
6-10 years	17	11.4	16	10.7	66	22.1
11-15 years	8	5.4	5	3.4	13	8.7
16-20 years	8	5.4	16	10.7	24	16.1
21+ years	26	17.4	20	13.4	46	30.9
Total	73	49.0	76	51.0	149	100
University Coursework						
None	31	20.9	36	24.3	67	45.3
Within 6 months	9	6.1	6	4.1	15	10.1
Within 1 year	6	4.1	8	5.4	14	9.5
Within 2 years	6	4.1	8	5.4	14	9.5
More than 2 years	20	13.5	18	12.2	38	25.7
Total	72	48.6	76	51.4	148	100
In-Service Training						
None	22	15.0	15	10.2	37	25.2
Within 6 months	29	19.7	22	15.0	51	34.7
Within 1 year	8	5.4	12	8.2	20	13.6
Within 2 years	3	2.0	17	11.6	20	13.6
More than 2 years	10	6.8	9	6.1	19	12.9
Total	72	49.0	75	51.0	147	100

Note: Percentages represent data reported by category.

Table 2

Indiana Career and Technical Education Expectation and Outcome Ratings by Gender and Disability Level

Career and Technical Program Expectations and Outcomes	Male Respondents				Female Respondents					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	4.15	0.72	3.54	1.01	4.02	0.93	3.23	1.06	298	38.661***
have similar academic attainment compared to others in my program.	3.38	1.06	3.04	1.18	3.79	1.03	3.11	1.34	298	17.386***
gain occupational skill competencies at the same level as others in my program.	3.65	1.18	2.79	1.20	3.80	1.06	2.95	1.30	296	35.632***
have the potential to be employed in the full range of employment in the occupational trade area.	4.47	0.73	3.24	1.25	4.36	0.92	3.32	1.16	295	74.410***

Note: *p<.05, **p.<01, ***p<.001

Table 3

Indiana Career and Technical Education Expectation and Outcome Ratings by Age and Disability Level

Career and Technical Program Expectations and Outcomes	Respondents Ages 20-30				Respondents Ages 31-40				Respondents Ages 41-50				Respondents Ages 51+					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	4.13	0.35	3.25	0.88	4.21	0.82	3.64	0.96	3.96	0.93	3.29	1.11	4.15	0.73	3.44	1.03	298	38.772***
have similar academic attainment compared to others in my program.	3.25	1.16	2.88	0.83	3.82	0.88	3.24	1.22	3.37	1.14	2.86	1.25	3.56	1.07	3.17	1.19	298	18.200*
gain occupational skill competencies at the same level as others in my program.	3.38	1.06	3.13	1.12	3.91	1.12	3.09	1.25	3.48	1.20	2.56	1.28	3.83	1.08	2.92	1.19	296	42.031***
have the potential to be employed in the full range of employment in the occupational trade area.	4.63	0.51	3.38	1.30	4.55	0.56	3.42	1.09	4.47	0.73	3.12	1.23	4.30	0.99	3.29	1.27	295	76.165***

Note: *p<.05, **p.<01, ***p<.001

Table 4

Indiana Career and Technical Education Expectation and Outcome Ratings by Level of Education and Disability Label

Career and Technical Program Expectations and Outcomes	Respondents with High School Diploma				Respondents with 2 yr. Associate's Degree				Respondents with 4 yr. Bachelor's Degree				Respondents with Graduate Degrees					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	4.20	0.84	3.41	1.14	4.16	0.60	3.68	0.88	4.00	0.91	3.53	1.04	4.09	0.80	3.31	1.01	298	38.804***
have similar academic attainment compared to others in my program.	3.41	1.02	2.76	1.17	3.32	1.20	3.26	1.24	3.90	0.88	3.53	1.27	3.52	1.12	3.02	1.10	298	24.578***
gain occupational skill competencies at the same level as others in my program.	3.66	1.08	2.53	1.19	3.89	1.23	2.95	1.31	4.03	1.06	3.27	1.31	3.53	1.17	2.86	1.16	296	44.012***
have the potential to be employed in the full range of employment in the occupational trade area.	4.43	0.81	3.08	1.30	4.58	0.50	3.42	0.90	4.53	0.68	3.57	1.16	4.37	0.89	3.21	1.26	295	77.956***

Note: *p<.05, **p.<01, ***p<.001

their program. Respondents who were in their current position 20 years old or more disagreed that students with disabilities had the potential to be employed in the full range of employment within the occupational area compared to those without a disability.

Question 5. CTE educators' perceptions by respondents' years in education

Respondent's number of years in the field of education was found to be a significant factor concerning Indiana CTE perception ratings of students with and without disabilities (see table 6). Significant differences were found concerning students fitting in socially with others in CTE programming (χ^2=46.380), similar academic attainment (χ^2=25.685), gain occupational skill competencies (χ^2=37.605), and postsecondary employability in the full range of jobs within the occupational area (χ^2=76.560). Indiana CTE instructors rated students with disabilities lower compared to the control group in three categories: a) academic attainment; b) occupational skills; c) employability in the occupational trade area. Most CTE respondents who had been in education for 6-10 years or 16-20 years indicated that students with disabilities would not have similar academic attainment compared to others. Respondents who had been in education between 1-5 years, 6-10 years, or 16-20 years disagreed that students with disabilities would gain occupational skill competencies at the same level as others.

Question 6. CTE educators' perceptions by respondents' university coursework

University coursework in the area of special needs was found to be a significant factor concerning Indiana CTE perception ratings of students with and without disabilities by all four areas (see table 7). Significant differences were found concerning students fitting in socially with others in CTE programming (χ^2=41.369), similar academic attainment (χ^2=20.431), gain occupational skill competencies (χ^2=43.565), and postsecondary employability in the full range of jobs within the occupational area (χ^2=78.426). The CTE instructors in this study rated students with disabilities lower in all categories compared to the student without a disability. Respondents who had taken a special needs university course within the last year agreed that students with disabilities would gain occupational skill competencies at the same level as others in their program. Respondents who had taken a university course within the last two years disagreed that students with disabilities had the potential to be employed in the full range of employment within the occupational area compared to those without a disability.

Question 7. CTE educators' perceptions by respondents' in-service programs

In-service training designed to support special needs students in CTE was found to be a significant factor concerning Indiana CTE ratings of students with and without disabilities for three of the four areas (see table 8). Significant differences were found concerning students fitting in

Table 5

Indiana Career and Technical Education Expectation and Outcome Ratings by Years in Current Position and Disability Label

Career and Technical Program Expectations and Outcomes	Respondents' Years in Current Position 1-5 Years				Respondents' Years in Current Position 6-10 Years				Respondents' Years in Current Position 11-15 Years				Respondents' Years in Current Position 16-20 Years				Respondents' Years in Current Position 20+ Years					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	3.97	0.91	3.54	0.99	4.21	0.85	3.18	1.13	4.40	0.73	3.53	1.12	4.19	0.54	3.38	1.08	4.04	0.62	3.42	0.97	298	41.677***
have similar academic attainment compared to others in my program.	3.56	1.08	3.13	1.23	3.73	1.06	3.06	1.27	3.87	0.83	3.00	1.51	2.56	0.96	2.88	1.14	3.67	0.91	3.08	0.92	298	26.591**
gain occupational skill competencies at the same level as others in my program.	3.78	1.10	3.02	1.21	3.67	1.21	2.76	1.32	3.93	0.88	3.00	1.55	3.00	1.15	2.69	1.19	3.92	1.13	2.57	0.99	296	44.457***
have the potential to be employed in the full range of employment in the occupational trade area.	4.49	0.76	3.33	1.19	4.52	0.83	3.33	1.31	4.36	0.92	3.93	1.38	4.13	0.91	3.06	1.12	4.38	0.77	2.79	0.93	295	87.754***

Note: *p<.05, **p.<01, ***p<.001

Table 6

Indiana Career and Technical Education Expectation and Outcome Ratings by Years in Education and Disability Label

Career and Technical Program Expectations and Outcomes	Respondents' Years in Education 1-5 Years				Respondents' Years in Education 6-10 Years				Respondents' Years in Education 11-15 Years				Respondents' Years in Education 16-20 Years				Respondents' Years in Education 20+ Years					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	3.82	0.80	4.09	0.72	4.24	0.86	3.45	0.86	4.23	1.16	3.21	1.13	4.25	0.61	3.92	0.95	3.17	1.23	3.54	0.95	298	46.380***
have similar academic attainment compared to others in my program.	3.39	1.02	3.00	1.17	3.76	1.00	2.88	1.29	3.92	1.03	3.54	1.39	3.08	1.13	2.75	1.26	3.61	1.06	3.28	1.04	298	25.685**
gain occupational skill competencies at the same level as others in my program.	3.79	1.05	2.82	1.15	3.73	1.18	2.76	1.32	3.85	1.06	3.00	1.58	3.42	1.13	2.67	1.34	3.76	1.20	3.00	1.11	296	37.605***
have the potential to be employed in the full range of employment in the occupational trade area.	4.52	0.56	3.21	1.16	4.58	0.61	3.27	1.20	4.46	0.96	3.46	1.45	4.27	0.88	3.22	1.27	4.33	0.99	3.28	1.20	295	76.560***

Note: *p<.05, **p.<01, ***p<.001

socially with others in CTE programming (χ^2=39.310), gain occupational skill competencies (χ^2=37.405), and postsecondary employability in the full range of jobs within the occupational area (χ^2=78.744). No significant differences in respondents' ratings were reported for academic attainment. Respondents who had special needs in-service training within the last two years felt students with disabilities would more likely achieve social fit, gain occupational skills competencies, and would have the potential to be employed in the full range of employment within the occupational area compared to CTE respondents who had no special needs in-service training, had training within the last two years, or had training more than two years ago. Respondents who had no in-service special needs training or training that was not recent (within the last year) disagreed that students with disabilities would gain occupational skill competencies at the same level as others in their CTE program. Neither did they feel that these students had the potential to be employed in the full range of employment within the occupational trade area compared to those without a disability.

Discussion

This research explored the effects of demographic variables of secondary CTE instructors in northern and southern east central Indiana concerning students with and without disabilities. The results of this study focused on differences between respondents' ratings of student participation in secondary CTE

Table 7

Indiana Career and Technical Education Expectation and Outcome Ratings by University Coursework and Disability Label

Career and Technical Program Expectations and Outcomes	Respondents' University Coursework - None				Respondents' University Coursework - Within 6 Months				Respondents' University Coursework - Within 1 Year				Respondents' University Coursework - Within 2 Years				Respondents' University Coursework - More than 2 Years					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	4.07	0.85	3.39	1.07	4.40	0.50	3.13	0.99	4.00	0.55	3.79	0.97	4.29	0.61	3.36	1.15	3.97	0.94	3.45	0.97	298	41.369***
have similar academic attainment compared to others in my program.	3.49	1.07	2.94	1.21	3.87	0.91	2.93	0.96	3.86	1.03	3.64	1.08	3.14	1.29	3.00	1.30	3.50	1.03	3.16	1.28	298	20.431*
gain occupational skill competencies at the same level as others in my program.	3.70	1.16	2.67	1.20	4.00	0.75	2.93	1.16	3.86	1.02	3.43	1.45	3.07	1.38	2.71	1.26	3.76	1.12	2.95	1.22	296	43.565***
have the potential to be employed in the full range of employment in the occupational trade area.	4.54	0.65	3.27	1.23	4.43	0.51	3.71	0.91	4.64	0.49	3.64	1.08	4.36	0.92	2.86	1.29	4.16	1.18	3.13	1.29	295	78.426***

Note: *p<.05, **p.<01, ***p<.001

Table 8

Indiana Career and Technical Education Expectation and Outcome Ratings by In-Service Training and Disability Label

Career and Technical Program Expectations and Outcomes	Respondents' In-Service Training - None				Respondents' In-Service Training - Within 6 Months				Respondents' In-Service Training - Within 1 Year				Respondents' In-Service Training - Within 2 Years				Respondents' In-Service Training - More than 2 Years					
	Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Ratings for Nondisabled		Ratings for Disabled		Total	
This student will:	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	χ^2
fit socially with others in my program.	4.08	0.86	3.51	1.09	4.00	0.75	3.47	1.04	4.10	0.85	3.55	0.82	4.30	0.65	3.00	1.17	4.16	1.01	3.47	0.96	298	39.310***
have similar academic attainment compared to others in my program.	3.51	1.09	3.05	1.15	3.69	0.90	3.24	1.22	3.35	1.13	3.30	0.92	3.45	1.23	2.90	1.29	3.37	1.21	2.74	1.36	298	15.215
gain occupational skill competencies at the same level as others in my program.	3.86	1.17	2.76	1.27	3.80	0.96	2.86	1.29	3.55	1.27	3.30	0.86	3.35	1.38	2.65	1.18	3.63	1.16	2.84	1.46	296	37.405***
have the potential to be employed in the full range of employment in the occupational trade area.	4.62	0.68	3.22	1.31	4.38	0.67	3.34	1.22	4.10	1.19	3.45	0.94	4.70	0.57	3.25	1.33	4.22	1.11	3.05	1.22	295	78.744***

Note: *p<.05, **p.<01, ***p<.001

programs and student's social fit, academic attainment, gaining occupational skill competencies, and post-school employability in the full range of employment within the occupational area. The researchers wanted to identify which variables concerning age, gender, education level, length of time in education, and special needs training efforts (e.g. university coursework or in-service training) influenced CTE perceptions of students with disabilities participating in secondary CTE programs. The findings provide an overview of perceptions based on Indiana CTE respondents' experiences and knowledge that shape teaching behaviors and personal interactions in CTE programming. The results should be viewed with the following limitations in mind: a) the sample represents northern and southern east central Indiana; b) the sample was limited to ten CTE sites; c) the sample consisted of 149 secondary CTE educators who participated in the study from the selected CTE sites (68% participation rate). Caution should be used in generalizing the results beyond the parameters of this study.

The findings of this study indicate that demographic variables (i.e. age, gender...) of Indiana CTE instructors had significant effects concerning student perception ratings. Twenty-seven of the 28 items analyzed had significant effects and twenty-five were found to be significant at the $p<.01$ level or higher. The results indicate that demographic variables are

a factor in Indiana CTE instructors' perceptions of students with disabilities concerning CTE program expectations and outcomes. These findings support those reported by Harvey and Pellock (2004) concerning Pennsylvania CTE instructors, but differ from previous research in this area. Demographic variables need to be considered in teacher training efforts in secondary CTE and also in future research studies.

Gender was reported as having significant effects concerning CTE social fit, academic attainment, gaining occupational skill competencies, and post-school employability. Trott and Holton (1996) reported females as having more positive attitudes toward students with disabilities. Indiana CTE respondents indicated that females were more concerned about students with disabilities with social fit and gaining occupational skill competencies compared to their male counterparts. Age was found to have significant effects across all categories. Unlike those reported in the literature (Kraska, 1997; Rowjewski et al., 1990; Trott & Holton, 1996), this study found that respondents who were older (41 years old or older) generally rated students with disabilities lower than other age groups. Younger CTE respondents, ages 20 to 30 years old, also rated students with disabilities lower concerning social fit and academic attainment. The results suggest that age is a training issue given that both younger and older CTE instructors in this investigation had lower ratings concerning students with disabilities. Respondents' level of education was found to have significant effects across all variables studied. Interestingly, Indiana CTE respondents who had a high school diploma generally had lower ratings for students with disabilities concerning social fit, academic attainment, gaining occupational skill competencies, and post-school employability. This finding is similar to results reported by Harvey and Pellock (2004) but are not supported by Kraska (1997), Okolo and Sitlington (1988), or Trott and Holton (1996) who found no significant differences concerning education level.

The number of years Indiana CTE instructors had been in their current positions and the number of years respondents had been in education were found to have significant effects concerning social fit, academic attainment, gaining occupational skills, and postsecondary employment. A majority of respondents who were in their current position between 16 to 20 years felt that students with disabilities would not have similar academic attainment or gain occupational skill competencies at the same rate as others. Those who had been in their position for 20 years or more disagreed that students with disabilities would gain occupational skill competencies at the same rate as others or had the potential to be employed in the full range of positions in the occupational area. These findings are similar to those reported by Harvey and Pellock (2004) regarding Pennsylvania CTE instructors. Respondents who had been in education between 6 to 10 years and those with 16 and 20 years in education rated students with disabilities lower concerning academic attainment and gaining occupational skill competencies compared to others. These findings are important given findings reported by Kraska (1997), Okolo and Sitlington (1988), and Rowewski et al. (1990) who found no significant effects concerning teaching experience and CTE instructor's attitudes/expectations.

Respondents' university coursework in the area of special needs was found to have significant effects concerning social fit, academic attainment, gaining occupational skills, and postsecondary employment. Indiana CTE instructors who had not taken any university coursework in the area of special needs rated students with disabilities lower concerning academic attainment and gaining occupational skill competencies. Respondents' in-service training in the area of special needs was found to have significant effects concerning social fit, gaining occupational skills, and postsecondary employment. Respondents who had no in-service training, had in-service training within the last two years, and had in-service training more than two years ago indicated that students with disabilities would less likely gain occupational skill competencies at the same level as others in their CTE program. These findings differ from those reported by Okolo and Sitlington (1988) who reported no significant effects concerning training experiences and teachers' attitudes toward students with disabilities.

Many of the findings in this study confirm those reported earlier by Harvey and Pellock (2004) regarding CTE instructors' demographic variables and their influence on perceptions of students with disabilities. Respondents gender, age, level of educational attainment, years in current position, years in education, university coursework in special needs education, and in-service training addressing special needs students were found to have significant effects. Indiana CTE instructors, similar to Pennsylvania CTE instructors, generally rated students with disabilities lower compared to the student without a disability. These findings are important given that much

of the research in the field concerning CTE instructors' demographic variables and perceptions toward special needs students were found to have no significant effects.

An important difference between the Pennsylvania CTE study (Harvey & Pellock, 2004) and this Indiana replication study was that academic attainment and occupational skill competencies were found to have significant effects for several variables here whereas they were not found to be significant in the Pennsylvania study. These findings indicate potential challenges for Indiana's CTE instructors in meeting the needs of students with disabilities in secondary CTE programs. They also signal a warning to the field that continued awareness and training efforts concerning individual needs, program modifications and accommodations, and a focus on critical academic and occupational skills development are essential mandates under the Perkins Act, IDEA, and NCLB. The data suggest the need for continued education and training efforts in the area of special needs for CTE pre-service and in-service educators. The findings reported here also suggest that CTE special needs training efforts which are current (6 months to 1 year) assistance in more effective CTE program services for students with disabilities. This is an important finding as it relates to vocational special needs. If the educational reform goals of high academic achievement, accountability, and continued U.S. competitiveness (e.g., economic and employment) are to be met, secondary CTE has an important role to play in achieving this end. Secondary CTE must remain a viable option within the secondary curriculum for all students, including those with disabilities, as suggested by Gray (2001) and Johnson et al. (2002).

This study is important in that it provides direction for future training for Indiana's CTE instructors. University coursework and in-service training programs in the area of special needs should be shaped to address the needs that are presented in this study. Perceptions indicate that continued assistance in meeting the needs of special needs students is an important element of professional development at all levels. The following recommendations are made based on these findings.

Recommendations

1. Secondary CTE instructors need to have access to local and regional training to assist them in best serving all students, including those with special needs, enrolled in secondary CTE.
2. Training efforts at the university and local education agency (LEA) level for secondary CTE educators need to focus on research-based educational best practices in the following areas:

a) behavior management and peer relations
b) academic modifications and accommodations within the CTE curriculum/content area
c) occupational skill modifications and accommodations to meet the learning needs of all students enrolled in CTE, especially those with disabilities
d) focused occupational skill training and development to meet the postsecondary employment goals of the individual student enrolled in CTE programming
e) appropriate participation and advocacy for CTE program enrollment/participation for students with disabilities, including participation in the IEP planning process (Sarkees-Wircenski & Scott, 2003).

3. Training and practice need to serve the purposes of the current educational reform agenda concerning academic achievement, occupational skill development, and access to the general education curriculum for students with disabilities. Policy makers need to understand the interconnection between reformers intent, educational mandates, postsecondary outcomes and service delivery articulated in Perkins and IDEA in order to have students with disabilities fully benefit from educational options and full employment opportunities.

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Authors Note

Michael W. Harvey, Ph.D. is an Associate Professor of Special Education and Director of the Doctoral Program at Ball State University, Department of Special Education, 722 Teachers College, Muncie, IN 47306; Tel. 765-285-5715;
E-mail: mwharvey@bsu.edu
Samuel E. Cotton, Ph.D. is an Assistant Professor of Education at Ball State University, Department of Applied Technology, 225 Applied Technology Building, Muncie, IN 47306
Kourtland R. Koch, Ph.D. is an Assistant Professor of Special Education at Ball State University, Department of Special Education, 722 Teachers College, Muncie, IN 47306

Exhibit A

Summary of Indiana CTE Instructors' Expectations and Outcome Ratings by Demographic Characteristics and Student Disability Label

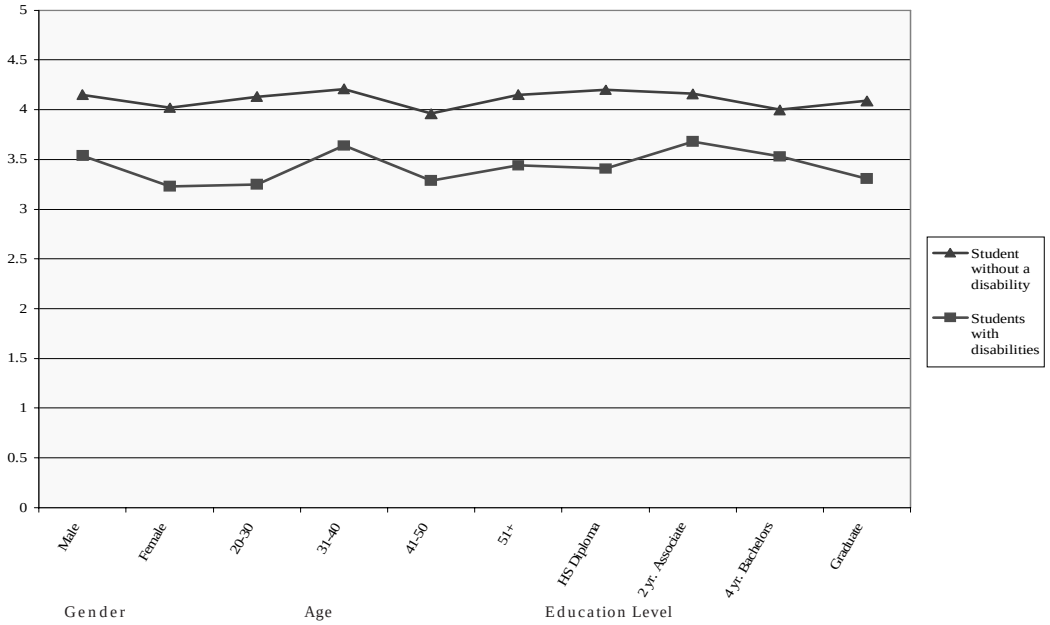
Career and Technical Program Expectations and Outcomes	Gender	Age	Education Level	Years in Current Position	Years in Education	University Coursework	In-Service Training
This student will:	χ^2	χ^2	χ^2	χ^2	χ^2	χ^2	χ^2
fit socially with others in my program.	38.661***	38.772***	38.804***	41.677***	46.380***	41.369***	39.310***
have similar academic attainment compared to others in my program.	17.386***	18.200*	24.578***	25.591**	25.685**	20.431*	15.215
gain occupational skill competencies at the same level as others in my program.	35.632***	42.031***	44.012***	44.457***	37.605***	43.565***	37.405***
have the potential to be employed in the full range of employment in the occupational trade area.	74.410***	76.165***	77.956***	87.754***	76.560***	78.426***	78.744***

Note: *p<.05, **p.<01, ***p<.001

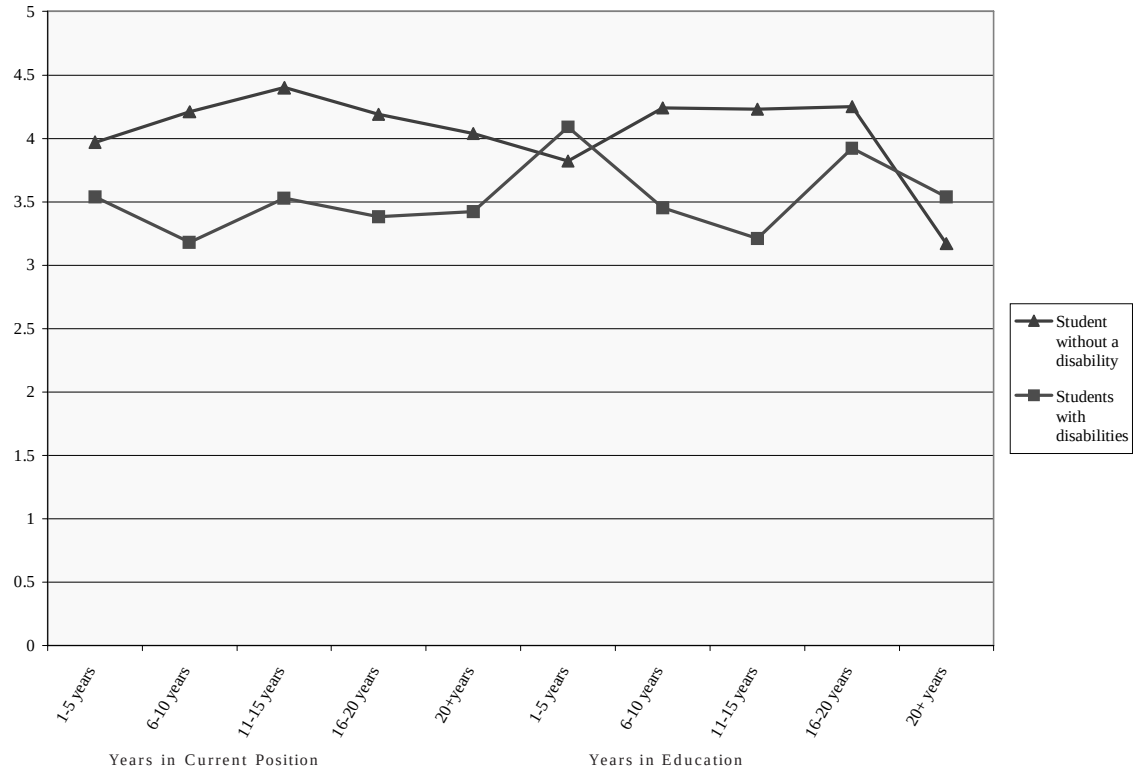
Exhibit B

Graphic Summary of Means for Indiana CTE Instructors' Perception Ratings of Students With and Without Disabilities by Demographic Characteristic

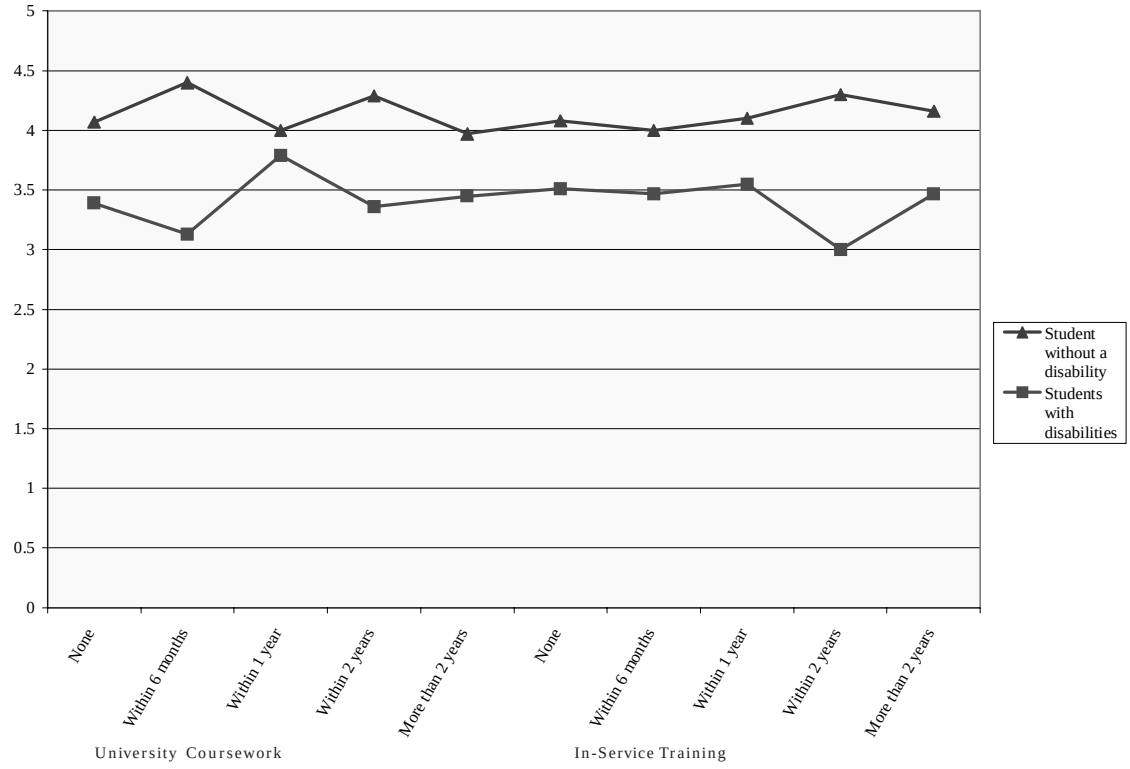
Summary of Indiana CTE Instructors' Ratings of Social Fit by Gender, Age, and Education Level



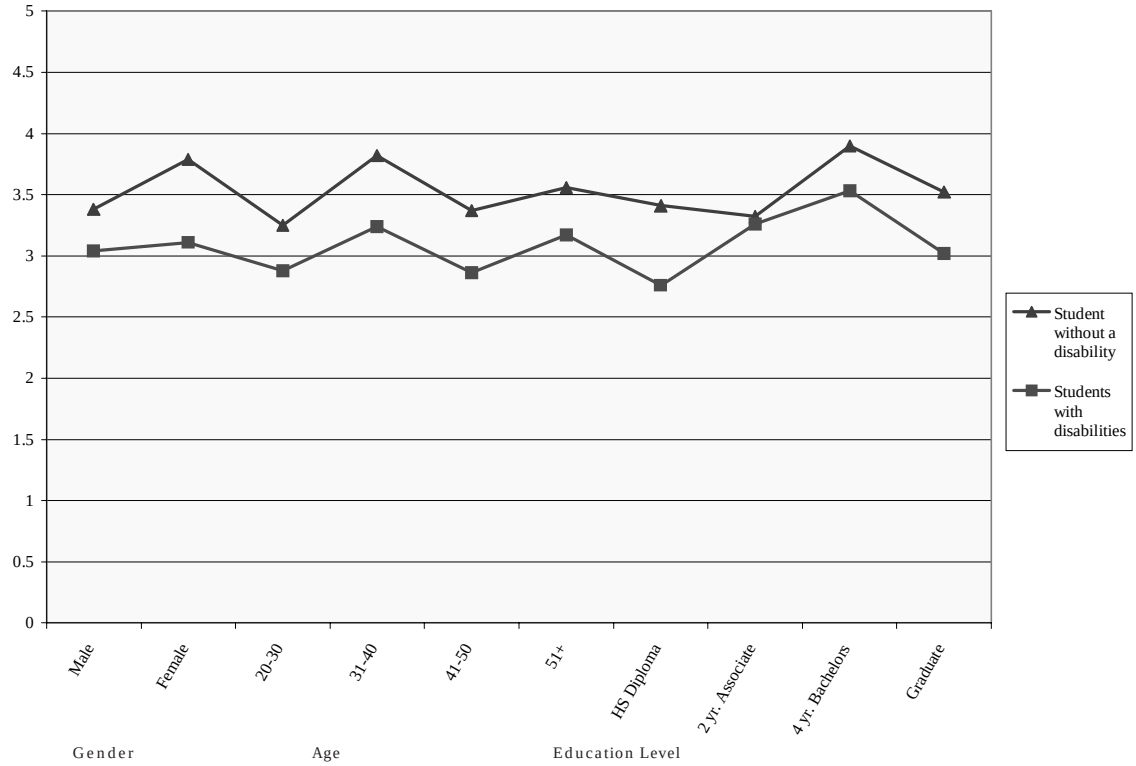
Summary of Indiana CTE Instructors' Ratings of Social Fit by Years in Current Position and Years in Education



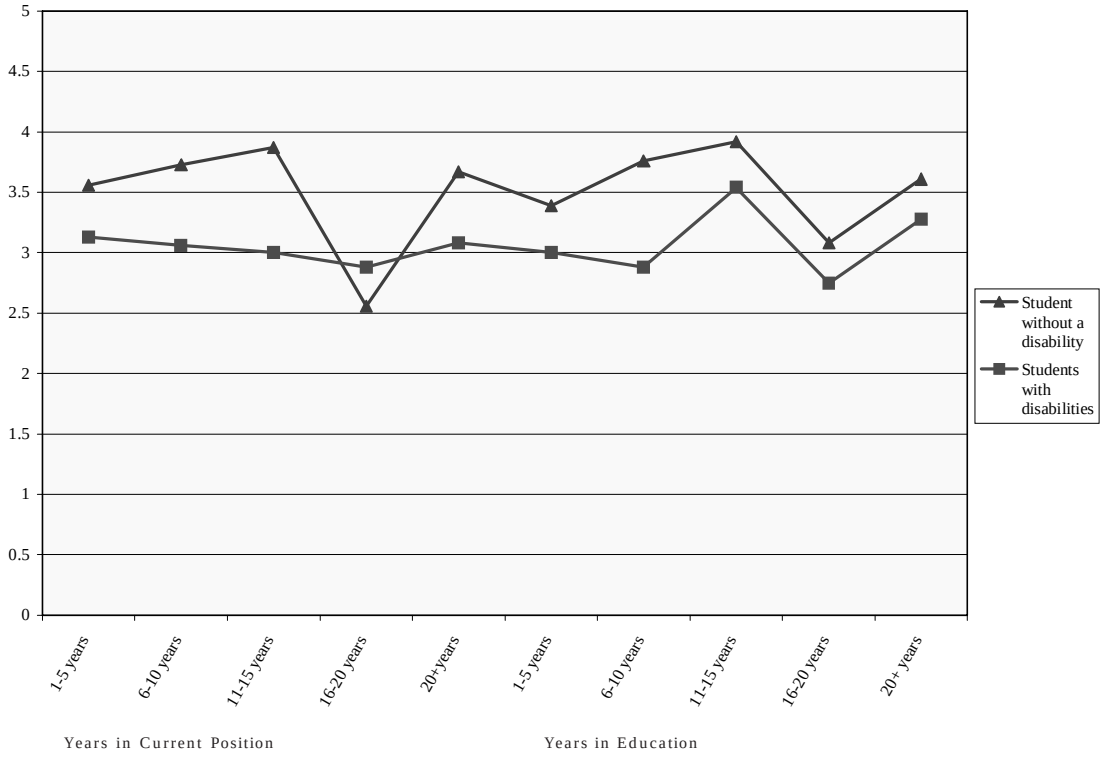
Summary of Indiana CTE Instructors' Ratings of Social Fit by Years in University Coursework and In-Service Training



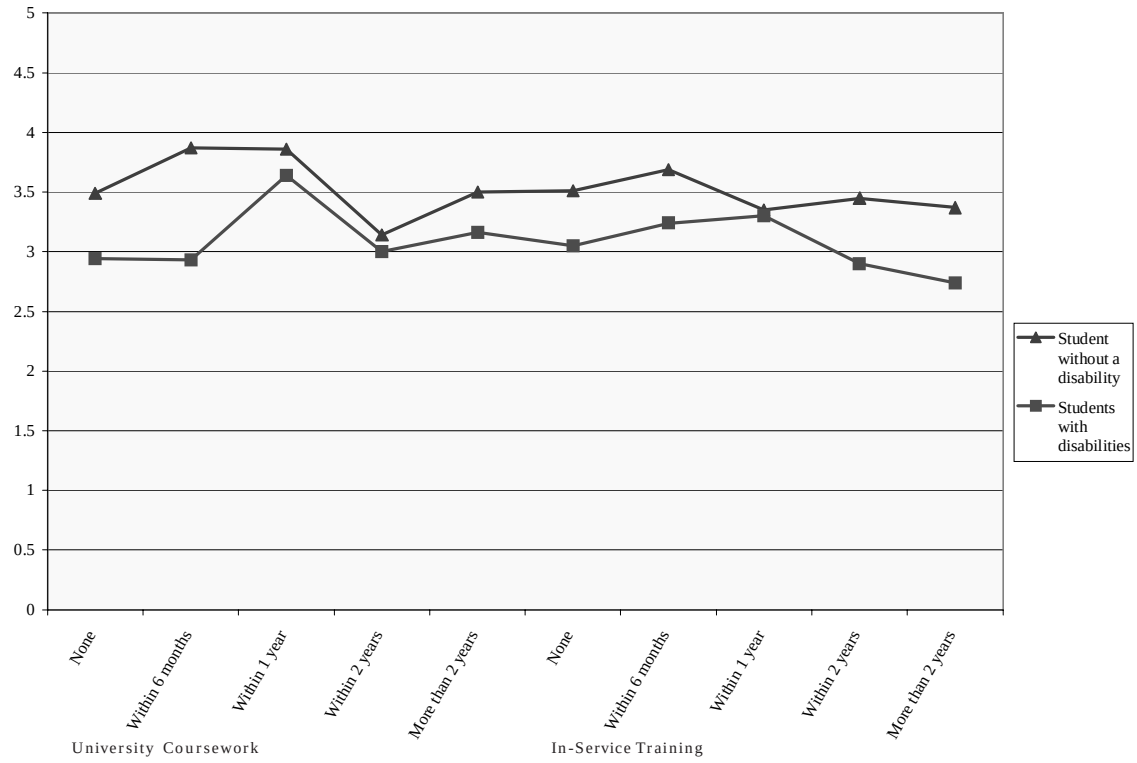
Summary of Indiana CTE Instructors' Ratings of Similar Academic Attainment by Gender, Age, and Education Level



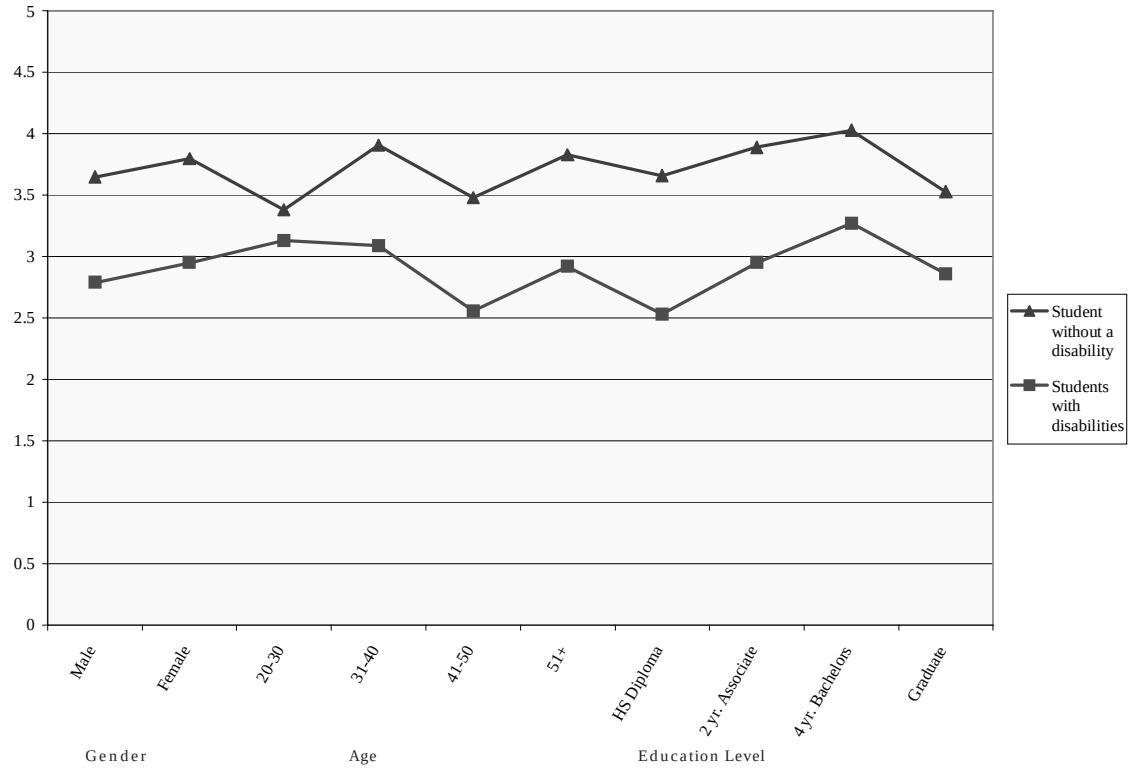
Summary of Indiana CTE Instructors' Ratings of Similar Academic Attainment by Years in Current Position and Years in Education



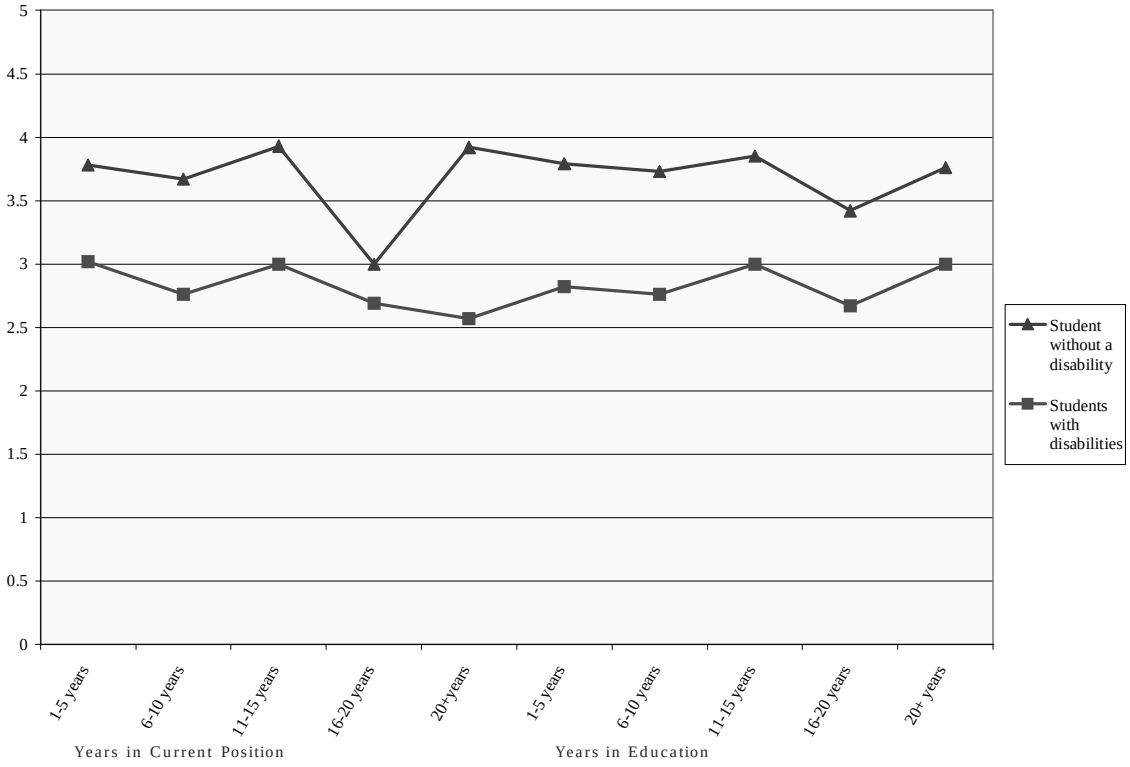
Summary of Indiana CTE Instructors' Ratings of Similar Academic Attainment by University Coursework and In-Service Training



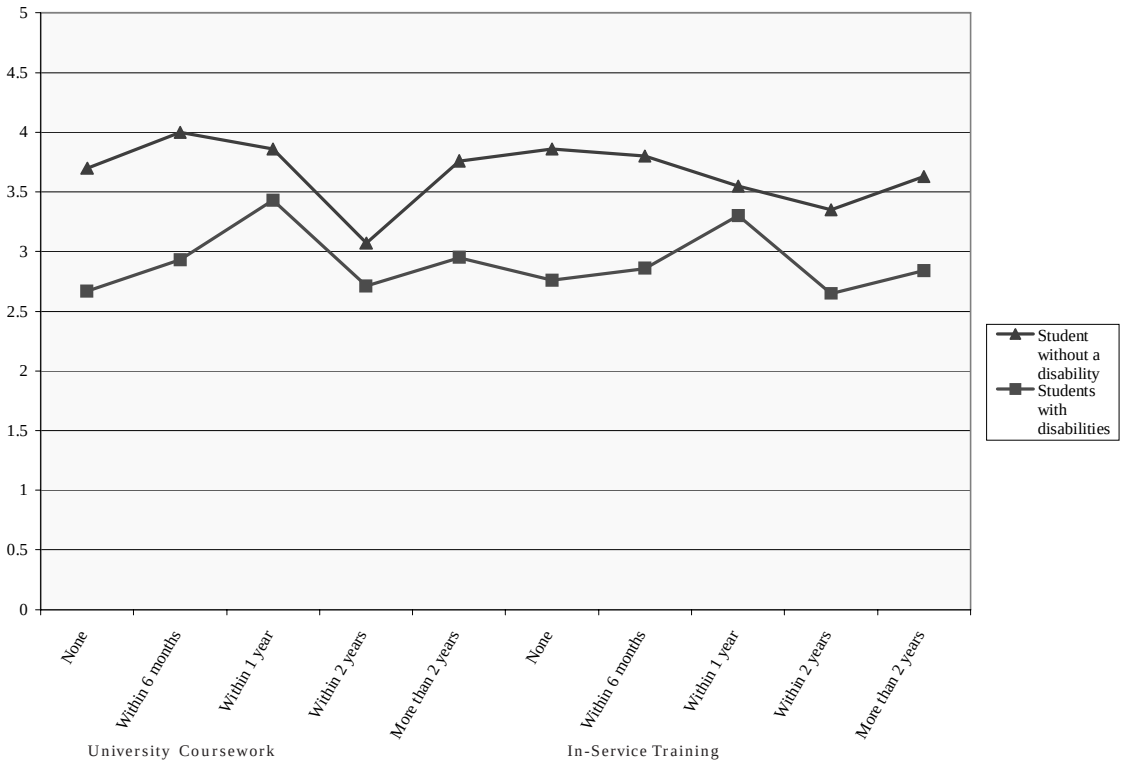
Summary of Indiana CTE Instructors' Ratings of Occupational Skill Competencies by Gender, Age, and Education Level



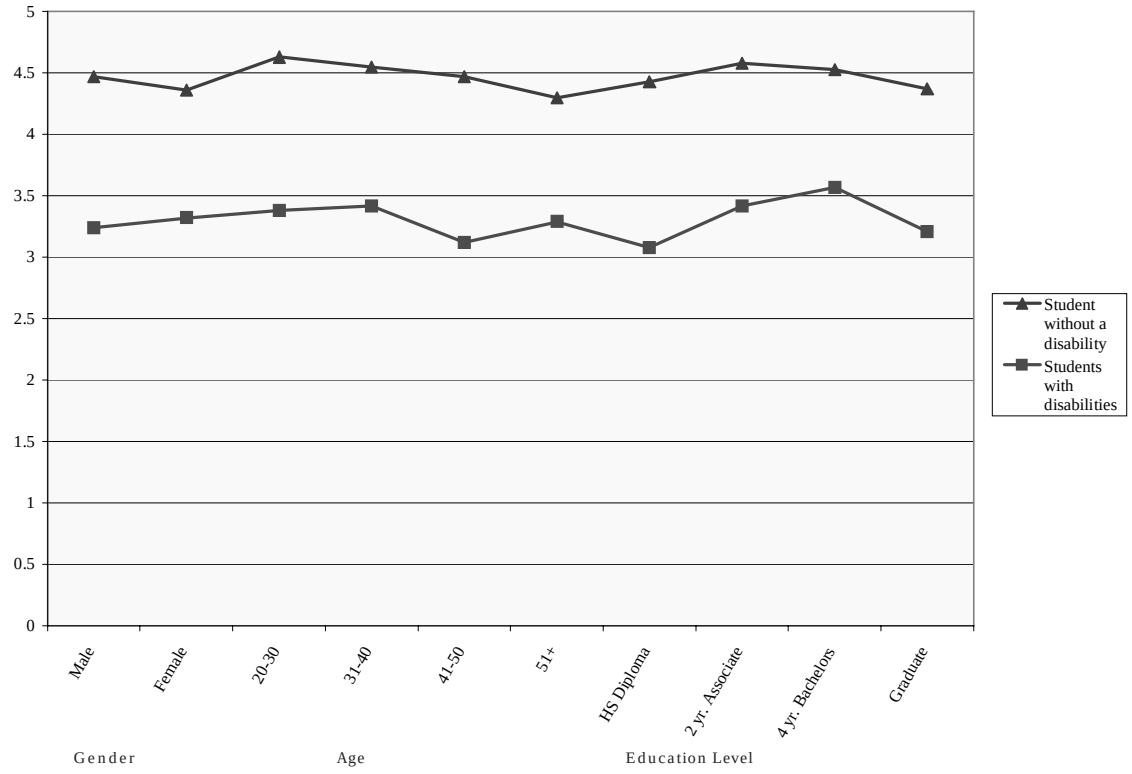
Summary of Indiana CTE Instructors' Ratings of Occupational Skill Competencies by Years in Current Position and Years in Education



Summary of Indiana CTE Instructors' Ratings of Occupational Skill Competencies by University Coursework and In-Service Training



Summary of Indiana CTE Instructors' Ratings of Potential Post-School Employability by Gender, Age, and Education Level



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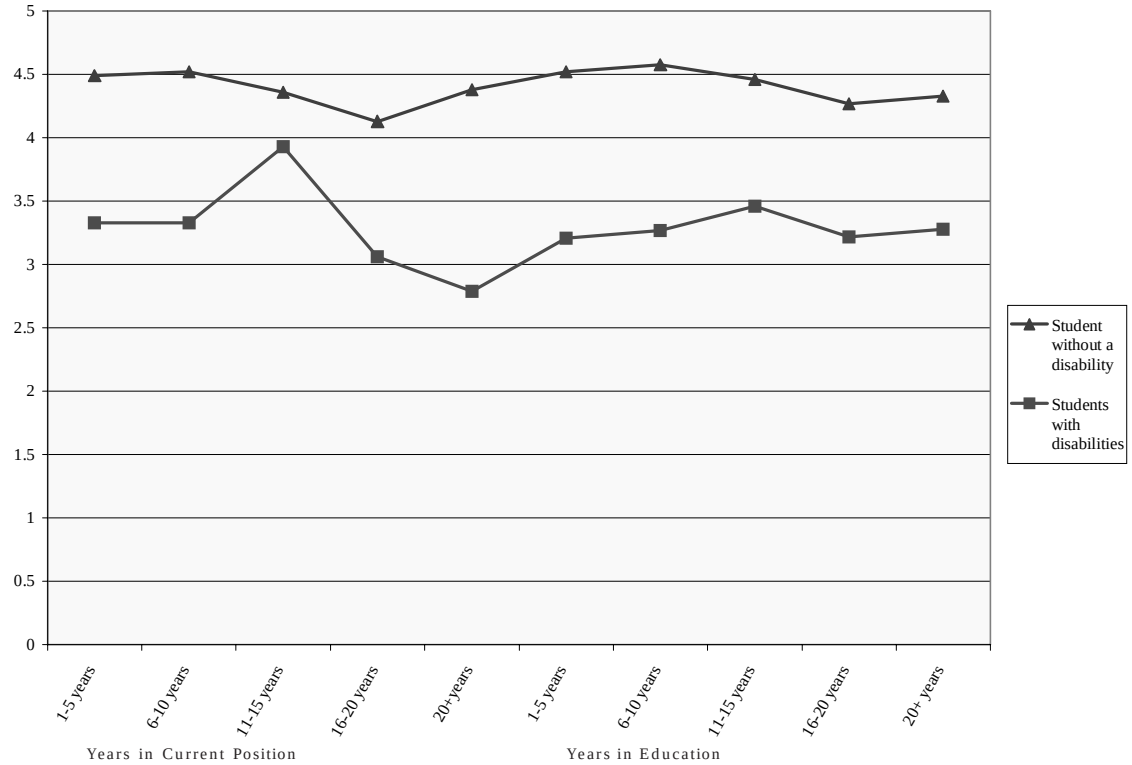
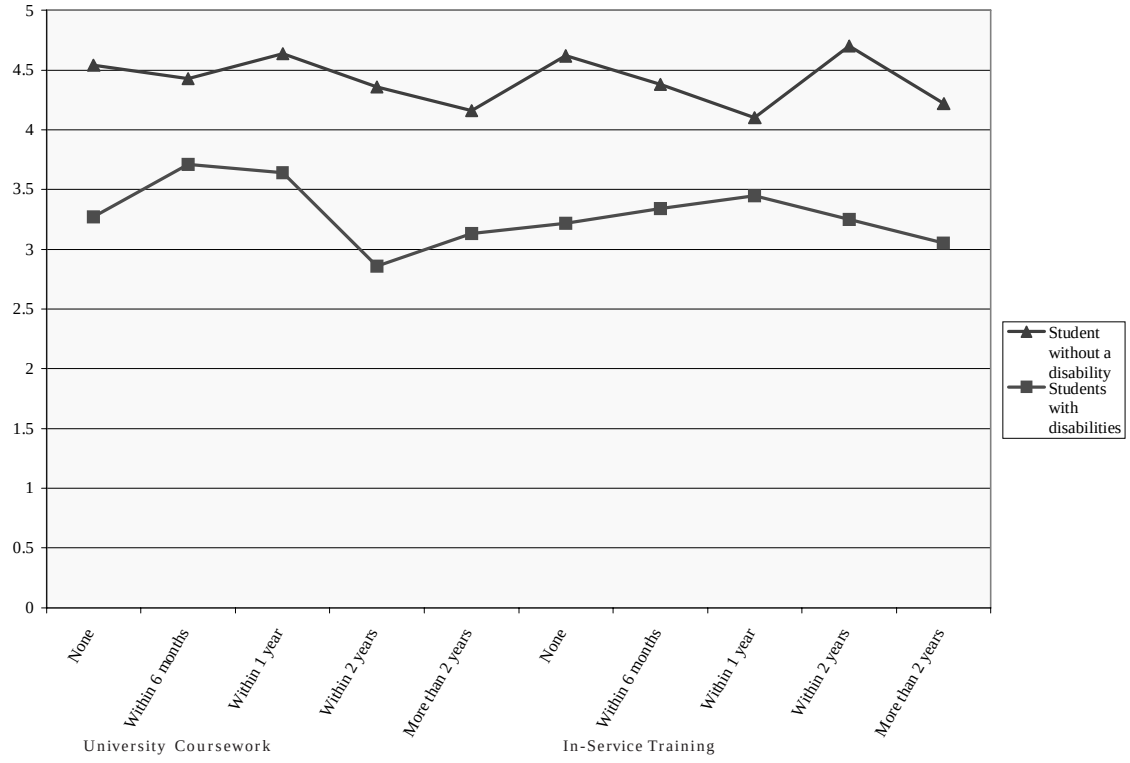


Summary of Indiana CTE Instructors' Ratings of Potential Post-School Employability by University Coursework and In-Service Training



Executive Summary: The Toolbox Revisted: Paths to Degree Completion From High School Through College

by Clifford Adelman, Office of Vocational and Adult Education, U.S. Department of Education

The Toolbox Revisited is a data essay that follows a nationally representative cohort of students from high school into postsecondary education, and asks what aspects of their formal schooling contribute to completing a bachelor's degree by their mid-20s. The universe of students is confined to those who attended a four-year college at any time, thus including students who started out in other types of institutions, particularly community colleges.

The Core Question, Data Source, and Legacy

The core question is not about basic "access" to higher education. It is not about persistence to the second term or the second year following postsecondary entry. It is about completion of academic credentials—the culmination of opportunity, guidance, choice, effort, and commitment.

To answer the question, *The Toolbox Revisited* uses the most recently completed of the national grade-cohort longitudinal studies conducted by the National Center for Education Statistics. This study, known as the NELS:88/2000, began with a national sample of eighth-graders in 1988. They were scheduled to be in the 12th grade and graduate from high school in 1992. They were followed through December 2000. In addition to regular interviews with these students, the data set on which this essay draws includes the critical components of high school and college transcripts, and the transcript data are the principal sources for the academic history observed.

The Toolbox Revisited was designed as a replication of a noted previous study published by the U.S. Department of Education, *Answers in the Tool Box: Academic Intensity, Attendance Patterns, and Bachelor's Degree Attainment* (1999), hereinafter referred to as "the original *Tool Box*," which based its analysis on a national cohort of high school students who were scheduled to graduate in 1982, and who were followed through 1993. The question naturally arose as to whether the hypotheses and analyses based on that cohort's history would hold up in the story of the slightly overlapping 1992–2000 period.

We have learned a great deal in a very short time from numerous initiatives of states and private foundations to prepare high school students better for higher education, and from major federal stimuli under the *No Child Left Behind* legislation to jump start the process of academic momentum prior to high school. One of the reasons for examining the academic history of the NELS:88/2000 cohort is that its students attended high school after the wave of reforms in the 1980s that followed the critique of U.S. education offered by the seminal report, *A Nation at Risk* (1983), and, hence, may provide some clues as to the likely outcomes of current reform efforts.

Much has changed in other ways, too, since the High School Class of 1982 (the subjects of the original *Tool Box*) moved through their scheduled 12th grade and through postsecondary education. A dramatically higher proportion of high school seniors of all race/ethnicity groups continue their education, though access gaps remain (Wirt et al. 2005, indicator 22). Postsecondary attendance patterns among traditional-age students have become far more complex, with nearly 60 percent of undergraduates attending more than one institution, and 35 percent of this group crossing state lines in the process; community college transfer rates rising nearly 10 percentage points; one out of eight undergraduates based in four-year institutions using community colleges to fill in pieces of their curriculum, and another eight percent "swirling" back and forth between the four-year and two-year sectors. Dual-enrollment while in high school, credit-by-examination, and use of summer terms all added to the dynamic mix of time and space that marked student pathways in the 1990s.

With all this change, we still measure something called "college graduation rates" with anachronistic formulas that do not track students through increasingly complex paths to degrees. As a result, we do not understand what is really going on. The dominant language accompanying analyses bemoaning putatively low graduation rates is a language of "attrition," with students labeled "at risk" or "minimally college-qualified," and leaking out of "pipelines."

This study looks at student histories derived from transcript records in a different way and with a different tone. It follows the student, not the institution, because it is the *student's* success that matters to families—and to the nation. It allows the maximum length of postsecondary time for the High School Class of 1992, 8.5 years, for students to earn degrees no matter how many institutions they attend. It notes that

if the history of the Class of 1982 were truncated at 8.5 years, there has been a decent improvement in bachelor's degree attainment among non-incidental students (those who earned more than 10 credits, i.e. "made a go of it") who attended a four-year college at any time (from 60 to 66 percent). It is natural to ask how this happened, to identify the moments and aspects of schooling that may have made a difference, and to reflect on what might make the most difference in the future for narrowing degree-completion gaps by race/ethnicity. In that task, *The Toolbox Revisited* looks for the features of academic history that are realistically subject to change by institutions whose principal business is the generation, preservation, and dissemination of knowledge. While acknowledging that for degree-completion rates to improve, students themselves must respond, and that their response does not occur in a vacuum, the features of student histories that are the domain of this inquiry do not include social and psychological variables attendant on the passage from adolescence to adulthood.

It is important to note that, as was the case for the original *Tool Box*, the student universe for *The Toolbox Revisited* constitutes roughly half who reach the 12th grade (table 1). It does not include students who failed to graduate from high school, those who earned General Education Diplomas (GEDs), those who had not enrolled in any postsecondary institution by the age of 26, and those who entered the postsecondary system but never attended a bachelor's degree-granting institution. The resulting demographics are slightly more female, slightly less minority, less with a second language background, and a higher socioeconomic status distribution than the cohort as a whole (table 2).

Organization

We learned from critiques of the original *Tool Box* to sort the chronology of events with greater care. There are seven steps in the analysis of *The Toolbox Revisited*, each of which involves a collection of variables that are investigated in terms of the degree to which they help us explainbachelor's degree completion for the population of students under investigation:

Step 1: Demographic background and high school history.
Step 2: Postsecondary entrance (timing and type of institution).
Step 3: First postsecondary year history (curriculum and performance).
Step 4: Factors of financing postsecondary education in the early years.
Step 5: Postsecondary attendance patterns.
Step 6: Extended postsecondary history (curriculum and performance).
Step 7: Final model, with complete academic history.

This essay also takes an important pause outside the steps of the core statistical model to consider the characteristics of student progress through the *second* year following postsecondary entry.

As each step of the statistical model of student history is set forth, it is pointed out where the results are similar to the findings of the original *Tool Box* with its earlier population, and where they diverge. All seven steps are subsequently assembled together in one place (table 29) so that the reader can observe the factors that have *consistently* contributed to degree completion.

Principal Stories and Guidance

This executive summary offers themes, highlights, and implications of the data for those who comment on secondary and higher education and make decisions about institutional or system policy—editorial writers, legislators, researchers, education administrators.

Two national longitudinal studies, a decade apart, have told similar stories. When the second story reinforces the first—and sheds even more light—something has to be right, and it behooves us to pay attention. Both of them provide support for current efforts to improve the quality of high school curricula and the participation in those curricula of ever larger proportions of students. Both of them provide guidance for college and community college processes likely to lead students to degree completion.

Some of what was learned from the original *Tool Box* was taken to heart at the secondary school level, and, in some respects, we are seeing positive results in academic curricular participation in high schools. But counting Carnegie units[1] in English or science is not the same as describing and validating what students have learned, and whether that learning links smoothly to the performance expectations of the postsecondary world. *The Toolbox Revisited* says we have more to do, that the bulk of our task lies both after the college matriculation line, and in communication and outreach between postsecondary institutions and high schools. How do we learn what we have to do? By following students in the richness and complexity of their postsecondary histories.

Curriculum, Starting in High School, and Continuing

However complex students' attendance patterns, the principal story line leading to degrees is that of content. What one learns is what one studies, and what one brings to economic and community life. The story starts in high school, but merely crossing the bridge to college or community college doesn't mean the story is over. Furthermore, the bridge is not always aligned with the road on the other side.

The academic intensity of the student's high school curriculum still counts more than anything else in precollegiate history in providing momentum toward completing a bachelor's degree. At the highest level of a 31-level scale describing this academic intensity (see Appendix F), one finds students who, through grade 12 in 1992, had accumulated:

- 3.75 or more Carnegie units of English
- 3.75 or more Carnegie units of mathematics
- highest mathematics of either calculus, precalculus, or trigonometry
- 2.5 or more Carnegie units of science *or* more than 2.0 Carnegie units of core laboratory science (biology, chemistry, and physics)
- more than 2.0 Carnegie Units of foreign languages
- more than 2.0 Carnegie Units of history and social studies
- 1.0 or more Carnegie Units of computer science
- more than one Advanced Placement course
- no remedial English; no remedial mathematics

These are minimums. In fact, students who reached this level of academic curriculum intensity accumulated much more than these threshold criteria (see table F1), and 95 percent of these students earned bachelor's degrees (41 also percent earned master's, first professional, or doctoral degrees) by December 2000.

Provided that high schools offer these courses, students are encouraged or required to take them, and, in the case of electives, students *choose* to take them, just about everybody could accumulate this portfolio. Unfortunately, not all high schools present adequate opportunity-to-learn, and some groups of students are excluded more than others. Latino students, for example, are far less likely to attend high schools offering trigonometry (let alone calculus) than white or Asian students. Students from the lowest socioeconomic status (SES) quintile attend high schools that are much less likely to offer any math above Algebra 2 than students in the upper SES quintiles (table 6). If we are going to close gaps in preparation—and ultimate degree attainment—the provision of curriculum issue has to be addressed. In recent years, colleges and community colleges have begun to provide these courses to high school students, and distance learning provides additional options if students have access to the technology. The hypothetical consequences of participating in curriculum configurations approaching that illustrated above for Latino degree completion rates, in particular, are stunning (table 32).

There is a quantitative theme to the curriculum story that illustrates how students cross the bridge onto and through the postsecondary landscape successfully. The highest level of mathematics reached in high school continues to be a key marker in precollegiate momentum, with the tipping point of momentum toward a bachelor's degree now firmly above Algebra 2. But in order for that momentum to pay off, earning credits in truly college-level mathematics on the postsecondary side is *de rigeur*. The world has gone quantitative: business, geography, criminal justice, history, allied health fields—a full range of disciplines and job tasks tells students why math requirements are not just some abstract school exercise. By the end of the second calendar year of enrollment, the gap in credit generation in college-level mathematics between those who eventually earned bachelor's degrees and those who didn't is 71 to 38 percent (table 21). In a previous study, the author found the same magnitude of disparity among community college students in relation to earning a terminal associate degree (Adelman 2005a). The math gap is something we definitely have to fix.

A dominant feature of academic histories that cannot really be assessed until the end of the second year following college entry is the extent to which students successfully completed credits in a range of "gateway" courses. It is at this point that the postsecondary curricular story line fully emerges, with ratios of participation in the "gateways" between those who ultimately earned degrees and those who did not running 6:1 in American literature, 4:1 in general chemistry, and more than 3:1 in precalculus, micro/macroeconomics, introduction to philosophy, and world civilization (table 20). These gaps in curricular participation argue for academic administrators to identify their key gateway courses and regularly monitor participation.

College and community college expectations for their first-year students in those gateway courses—expressed through

examinations, paper and laboratory assignments—need to be more public. Examples such as those offered by the American Diploma Project in its report, *Ready or Not: Creating a High School Diploma That Counts* (2004), should be shared with larger audiences than policymakers and others who habitually read such reports. Parents should see those assignments even if they don't understand them; high school teachers should ponder them to assess whether their exiting students are likely to be prepared; and, most importantly, high school students have got to see them as road signs to their next education destination. *The Toolbox Revisited* advocates making these examples part and parcel of admissions packets, publicity brochures, and Web sites. There is risk in this: Some students may be scared away. But there is no better way to enhance articulation and preparedness than to display what students can expect.

Postsecondary Benchmarks

In both colleges and community colleges, the curriculum story line intersects attendance patterns and performance in ways that set benchmarks for academic advisement and intervention:

- Less than 20 credits by the end of the first calendar year of enrollment (no matter in what term one started, whether summer, fall, winter, spring) is a serious drag on degree completion. The original *Tool Box* told the same story. It is all the more reason to begin the transition process in high school with expanded dual enrollment programs offering true postsecondary course work so that students enter higher education with a *minimum* of 6 additive credits to help them cross that 20-credit line. Six is good, 9 is better, and 12 is a guarantee of momentum.
- We falsely believe that beginning students drop out of higher education in appalling numbers by the end of their scheduled first academic year of attendance. In fact, about 90 percent of traditional-age beginning students turn up somewhere (maybe not at the first school attended) and at some time (maybe not in the fall term) during the subsequent calendar academic year (which we measure as July 1 through June 30). However impressive this percentage, the *quality* of persistence counts more, and, for a third of these students, the quality of persistence leaves much to be desired (table 17). *The Toolbox Revisited* urges that institutions monitor and report the quality (as much as the fact) of persistence.
- More than 60 percent of the students in the sample under investigation enrolled during summer terms. Undergraduates are not only more geographically mobile, but have shattered observance of the traditional academic calendar. Summer term credits are more than metaphors for high octane persistence: Earning more than 4 credits during those terms held a consistently positive relationship to degree completion, and gave African-American students, in particular, a significant boost in hypothetical graduation rates (table 32). College and community college administrators can be very creative in expanding the use of summer terms.

Student Uses of Time

The example of summer-term credits, particularly in combination with the complex multi-institutional attendance patterns, underscores another theme of *The Toolbox Revisited*: Student uses of time in undergraduate careers are now more important than their uses of place. In other words, *when* students do something academic has a more significant relationship to degree completion than *where* they do it. For example:

- For the High School Class of 1982 (the subjects of the original *Tool Box)*, timing of entry to postsecondary education never rose to a level of statistical significance in the analysis, whereas variables for the type of institution first entered played inconsistent but positive roles in explaining degree completion. A decade later, with a higher proportion of high school students continuing to college, the situation was reversed (table 13). What this means is that recruitment efforts have to insure that students enter postsecondary education immediately following high school graduation. The longer students wait, the less likely they will finish a degree.
- The only characteristic of the first institution of attendance to be admitted to statistical analysis was selectivity, but it never rose above the threshold of significance. Quite frankly, one isn't worried about degree completion for the 5 percent of traditional-age undergraduates who enter highly selective colleges. One is more concerned with the rest of the river—particularly the 78 percent who start in either nonselective four-year colleges or open-door community colleges.
- The original *Tool Box* study declined to confront part-time status and its effects. If one is using transcripts as evidence, there are a number of problems in determining

which students are part-time and when. *The Toolbox Revisited* found a way around these problems to mark whether a student's enrollment intensity *ever* fell into part-time status, i.e., less than 12 credits per semester or its equivalent. Part-time attendance by whatever means, as Carroll (1989) labeled it, proved "hazardous" to degree completion health (table 24; table 29).

- In longitudinal studies extending for as long a period of postsecondary time as does the NELS:88/2000 (8.5 calendar years), a student is allowed stop-out periods totaling one semester or its equivalent (e.g., two quarters), exclusive of summer terms, and still be considered "continuously enrolled." Continuous enrollment is a factor of attendance patterns, and another marker of the student's use of time. It proves to be overpowering: with 16 other variables in play, continuous enrollment increases the probability of degree completion by 43 percent (table 27). The original *Tool Box* offered the same message, arguing for assiduous monitoring of student stop-out periods. Put another way: Keep the student continuously enrolled, even part-time (less damaging than excessive stop-out periods).

Purposeful Migration Versus "Swirling"

The complexity of student postsecondary enrollment patterns, already a notable phenomenon for the population under study in the original *Tool Box*, accelerated in the subsequent cohort. The construction of the NELS:88/2000 postsecondary transcript files took advantage of what we learned from more sophisticated institutional and state system tracking studies of the 1990s; hence, some new attendance pattern variables were available and others (those describing different kinds of multi-institutional attendance) refined.

What we found for the students of the 1992-2000 period was this:

- Formal transfer from a community college to a four-year college and formal transfer from one four-year college to another were positively associated with degree completion, but wandering from one school to another was not.

In fact, the nomadic multi-institutional attendance behavior increasingly known as 'swirling,' held a significant and negative relationship to degree completion (table 24, table 39). These statements are a very simple untangling of complex realities.

The basic question asked of the transcript data—did a student attend only one school or more than one?—begins a process of inquiry to determine *how* the student attended second and third institutions. Given very taut definitions of what transfer means, we are advised to ensure that multi-institutional attendance is purposeful and productive. For that, we require much better student tracking systems than we currently possess, and regular contact with students in motion.

Student Academic Performance

More than the original *Tool Box*, *The Toolbox Revisited* recognizes that the path of student academic performance, marked by grades, is a reflection of quality of effort, and pays off. It starts in high school: Academic curriculum participation is still the strongest of the precollegiate momentum indicators, but between the 1980s and 1990s, class rank/GPA moved markedly ahead of senior year test scores in its contribution to students' overall "Academic Resources" index, a composite indicator of high school curriculum intensity, class rank/GPA, and senior year scores on a 90-minute exam best described as a mini, enhanced SAT (see p. 16 and Glossary).

This story continues on the postsecondary side of the matriculation line:

- Earning grades that place one in the top 40 percent of first-year GPA for the whole cohort is a strong—and positive—contributor to academic momentum, and remains in the account of degree completion throughout the histories of both the class of 1982 and the class of 1992 (table 15).
- The theme of quality-of-student-effort, reflected in grades, is strengthened when the canvas covers the student's entire undergraduate career. In the original *Tool Box*, the variable describing the *trend* in students' GPA had only two reference points: first calendar year and final GPA. For *The Toolbox Revisited*, there are three such points: first calendar year GPA, cumulative GPA for the first two calendar years, and GPA as of the last date of attendance, whether or not a degree was earned. A rising trend in grades fits with attainment (table 25), contributing positively and significantly (table 26).

A Story Twice Told Should Be a Story to Which We Listen

Both the original *Tool Box* and *The Toolbox Revisited* revealed that one of the most degree-crippling features of undergraduate histories is an excessive volume of courses from which the student withdrew *without penalty* and those the student re-

peated. We set this up as a ratio, and marked those who withdrew from or repeated 20 percent or more of their course attempts. Doing so cuts the probability of completing a degree in half (table 27)!

The withdrawals counted here are not "drop" grades that apply during standard drop-and-add periods at the beginning of terms. They are the result of institutional policies that allow withdrawals without penalty after the drop-and-add period. No-credit repeats are standard fare in remedial courses, but when they reach destructive levels the question arises as to how many times an institution allows a student to repeat a course. Think of it this way: Every non-penalty withdrawal and no-credit repeat means that a seat in a course is not available to someone else. Add those seats up, and admission to an institution may not be available to someone else. Excessively lax withdrawal and repeat policy, then, ultimately blocks general access. And in terms of degree completion, such policies do students no favors.

What Does Not Count in the Account of Completion?

- Students' education "anticipations" (the consistency and level of their vision of how far they will get in school) were not significant at any step of the logistic account for the High School Class of 1992. This is a change from the position of the "anticipations" variable in the original *Tool Box*, where it ducked in and out of significance. The new message is more clear: Among students who attend a four-year college at some time, expectations are distinctly secondary to one's uses of academic time and to one's academic performance.
- Whereas grants and student work-study were modestly significant contributors to degree momentum at *early* stages of students' postsecondary careers in the history of the High School Class of 1982, the data on finance mechanisms for the High School Class of 1992 are poor, and the results inconclusive. Analysts are directed instead to the Beginning Postsecondary Students longitudinal studies, which contain detailed financial aid data (but skeletal information on high school histories and postsecondary course work).
- Of student demographic characteristics, only one—socioeconomic status—was significantly associated with degree completion, though in a modest manner. Gender and race/ethnicity were never significant in the logistic narrative, even though some *indirect* effects of these key demographic characteristics would probably be found in other statistical models. When each race/ethnicity group was treated as an independent variable, the basic story did not change.
- Both a dichotomous variable marking any remedial work in the first calendar year of attendance, and an elaborate variable describing types and extent of remediation over the course of a student's entire undergraduate career were employed in the analysis, but to no avail. The same procedure was used in the original *Tool Box*, where the variables were admitted to the statistical model but did not reach the threshold of significance. Sufficient numbers of students who took remedial classes successfully moved through them so that remediation did not make a strategic difference in degree completion.
- Half of the students in the sample for *The Toolbox Revisited* who earned bachelor's degrees changed their major along the way. It was natural to ask whether change-of-major had any influence on degree attainment. It did not, principally because, with few exceptions, community college transfer students come in to the four-year institution from a general studies program and automatically are classified as "change-of-major" the minute they enter a specific program at the four-year school.

Students as Active, Responsible Participants

The Toolbox Revisited does not treat students as passive creatures whose fate is wholly molded by schools and colleges. It demonstrates that, within the population of traditional-age students who attend a four-year college at any time (obviously including community college transfers), we *can* improve graduation rates and close some of the gaps in completion by race/ethnicity and socioeconomic status. But it also argues that there is a limit to what we can realistically do unless students respond to highly targeted advice and prodding.

The analysis of *The Toolbox Revisited* identifies features of academic history that are most tractable in terms of second party intervention. But there is also something we might dub "first party intervention." Once the modest echoes of socioeconomic status are accounted for, each step of academic history offers *students* a set of decisions that require the commitment of time and effort likely to yield the return of earning a degree. Pro-

vided there is opportunity, the choices made by students, beginning with high school curriculum and quality of effort in high school, allow subsequent leverage. Entering a postsecondary institution directly from high school, earning 20 or more credits in the first calendar year of enrollment, and performing well enough in that first calendar year to fall in the top 40 percent of a GPA distribution build on previous academic investments, and are all signs of commitment.

Subsequent choices that may not be reflected in a bounded period of time, such as excessivecourse withdrawals, prove to be poor decisions with negative returns, breaking accumulated momentum. Other configurations of choice, including summer-term credit generation, meeting the challenge of college-level mathematics, effort required to yield a rising GPA, and most of all, remaining continuously enrolled, all reflect continuing leverage of attainment. This is what academic momentum is all about. While these choices do not take place in a social and psychological vacuum, this is a story about the intersection of student choice with the structuresof opportunity offered by institutions whose first order of business is the distribution of knowledge. It is not a story about growing up, although that happens along the way.

Degree Completion: How High Can We Go? How Much Can the Gaps Be Closed?

In Part V of *The Toolbox Revisited*, three different national longitudinal studies conducted during the 1990s are set side-by-side, so as to demonstrate a remarkable degree of agreement on the rate of bachelor's degree completion for students who started out in four-year colleges (granted, that is only part of the broader universe addressed in this essay). Looking at the concordance of these three sources (table 30), it is fair to say that:

- A third of traditional-age students who started in a four-year college earned a bachelor's degree from the same school in the "traditional" four-year period.
- Between 54 and 58 percent earned the degree from the same school in which they began within six years of entry.
- When the option of earning a degree from a different four-year college than the one in which these students commenced study, the six-year completion rates are in the 62–67 percent range.
- Only the NELS:88/2000 extends the time period for earning a degree beyond six years; at 8.5 years, its degree completion rate for students who started in a four-year college approaches 70 percent.

However, it is unfortunate to note that despite increased participation of minority students to postsecondary education over the past quarter century, the gap in bachelor's degree completion between whites and Asians, on the one hand, and Latinos and African-Americans, on the other, remains wide.

What Features of Academic History Might Close the Gaps, and By How Much?

The data-driven exercise in Part V of *The Toolbox Revisited* can be characterized as "reasoned speculation." From the NELS:88/2000, we start with a degree completion gap between whites and Asians vis-a-vis African-Americans of 15 percent; and with reference to Latinos, 22 percent. We go back through our analysis and ask what factors:

(a) consistently contributed to bachelor's degree completion at all stages of the model in which they were "in play," and
(b) were most subject to change by external parties with little-to-modest—but creative— effort that might improve the portrait of degree completion.

Five factors stand out, four of which affect small populations in which minority students are over-represented. Small populations can add up. These factors are:

1. **First-year credit generation**, i.e., the goal of making sure that postsecondary students end their first calendar year of enrollment with 20 or more additive credits.
2. The problem of **excessive no-penalty withdrawals and no-credit repeats**, which affect 10 percent of the cohort. Institutional policy and advising can cut the incidence of withdrawals and repeats in half.
3. **Use of summer terms**. Strategic enrollment management can move more sections of high demand courses into summer terms, offer credit-bearing internships in summer terms, and engage in other creative initiatives that will also smooth out the utilization of institutional resources over what has become an "academic calendar year."
4. **No delay of entry.** This is a matter of recruitment strategy among high school students whose commitment to postsecondary education is less than fervid. The later they show up, the more their postsecondary fate is in jeopardy.
5. **The high school curriculum component of "Academic Resources."** This is not a case of "little-to-modest" effort or a small population. It is a megawork inprogress, much of which depends on students' reading skills on entering high school. If students cannot

read close to grade level, the biology textbook, the math problems, the history documents, the novel—all will be beyond them. And if high schools are not offering a full academic curriculum, there is little hope.

But with those five factors in mind, and assuming full student response and success, *potential* degree completion rates were hypothesized based on the records of NELS:88/2000 high school graduates by race/ethnicity (table 32) and socioeconomic status quintile (table 34). Virtually every one of these factors contributed to closing degree completion gaps, but none more than high school academic curriculum participation—which, to repeat, is criterion-referenced, hence, open to everyone to rank at or near the top. For African-American students, the combination of moving into the top 40 percent of the high school academic curriculum intensity index plus earning more than four credits during postsecondary summer terms would lower the degree completion gap vis-a-vis white and Asian students from 15 percent to 6 percent. For students from the lowest socioeconomic status quintile, moving into the top 40 percent of the academic curriculum intensity index and entering postsecondary education directly from high school would improve degree completion from 36 to 59 percent. For Latino students, the same steps would improve degree completion from 45 to 69 percent. Does that mean that future degree completion rates will look like those in tables 32 and 34 if everyone meets the criteria on all five counts? No; not everybody will make it. But the tables suggest just where the improvements could be dramatic—and for whom.

Messages to Students and Commentators

Student responsibility (the intersection of choice with opportunity) is a major theme of *The Toolbox Revisited* in a way that was only implicit in the original *Tool Box*. The essay concludes with some recommendations for students, who are partners in their own education fate, who shouldn't wait around for someone else to do something for them, and who are rarely addressed in studies of attainment.

The concluding messages also reflect on the dissonant data of public discourse on high school graduation rates, college attrition rates, and college graduation rates, examples of consequent "scare stories" that do not help us identify and address real problems, and a plea for creativity and cooperation in developing better student tracking systems. These messages also urge a considerable change in the language we use in describing what happens to students from a negative rhetoric that assumes passivity to one that respects students as active players, seeking and discovering paths to their education goals.

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Endnotes

1 A Carnegie unit is the basic credit system for U.S. secondary schools. It is generally recognized as representing a full year (36-40 weeks) in a specific class meeting four or five times per week for 40-50 minutes per class session (Martinez and Bray 2002).

Concluding Messages: The Toolbox Revisted: Paths to Degree Completion From High School Through College

by Clifford Adelman, Office of Vocational and Adult Education, U.S. Department of Education

Compared to its predecessor, *Answers in the Tool Box*, the preponderance of the *Toolbox Revisited* story has been on the postsecondary side of the matriculation line. Implicitly, it calls on colleges, universities, and community colleges to be a great deal more interventionary in the precollegiate world, to be more self-reflective about the paths they offer from high school through their own territories. It also calls on them both to fortify their institutional research capacities and integrate them more intimately with academic advising and course scheduling. As noted above, we are witnessing measurable ferment on the high school side of the passage, and as the principles of the *No Child Left Behind* legislation move beyond grade 8, we will see more. The higher education sector cannot sleep through these changes.

To Students as Agents of Their Own Futures

Beyond that fundamental banner of institutional fortification, there are three sets of messages impelled by both studies. The first set is for entering high school students who, when asked, blithely shrug that "of course I'm going to finish college."

1. Just because you say you will continue your education after high school and earn a college credential doesn't make it happen. Wishing doesn't do it; preparation does! So . . .
2. Take the challenging course work in high school, and don't let anyone scare you away from it. Funny thing about it, but you learn what you study, so if you take up these challenges, your test scores will inevitably be better (if you are worried about that). If you cannot find the challenge in the school's offerings, point out where it is available on-line, and see if you can get it that way. There are very respectable Web sites offering full courses in precalculus, introductory physics, humanities, music theory, and computer programming, for example.
3. Read like crazy! Expand your language space! Language is power! You will have a lot less trouble in understanding math problems, biology textbooks, or historical documents you locate on the Web. Chances are you won't be wasting precious credit hours on remedial courses in higher education.
4. If you don't see it now, you will see it in higher education: The world has gone quantitative: business (obviously), geography, criminal justice, history, allied health fields—a full range of disciplines and job tasks tells you why math requirements are not just some abstract school exercise. So come out of high school with more than Algebra 2, making sure to include math in your senior year course work, and when you enter higher education, put at least one college-level math course under your belt in the first year–no matter what your eventual major.
5. When you start to think seriously about postsecondary options, log on to college and community college Web sites and look not so much for what they tell you of how wonderful life is at Old Siwash, but what they *show* you of the kinds of assignments and examination questions given in major gateway courses you will probably take. If you do not see these indications of what to expect, push! Ask the schools for it! These assignments and questions are better than SAT or ACT preparation manuals in terms of what you need to complete degrees.
6. See if your nearest community college has a dual-enrollment agreement with your school system, allowing you to take significant general education or introductory occupational courses for credit while you are still in high school. Use a summer term or part of your senior year to take advantage, and aim to enter higher education with at least six credits earned this way—preferably more.
7. You are ultimately responsible for success in education. You are the principal actor. The power is yours. Seize the day—or lose it!

Given the story lines of *The Toolbox Revisited,* it is obvious that students are partners in their own education fate, and shouldn't wait around for someone else to do something to them or for them.

Public Discourse, Part 1: Dissonant Data and Their Discontents

The second set of messages is for those who engage in public discourse on education in general, secondary-to-postsecondary transitions, and ultimately, degree completion rates (with all stops in-between). We have some problems here.

Foremost among these problems is the sheer volume of dissonant statistics that are thrown around about student

progress, and all the labels of "at risk," "minimal college-qualified," and "failure" that get pasted to populations in the process. The "at risk" labeling default has gone so far as to turn students into "patients," whose "illnesses" must be diagnosed and followed up with early intervention, intensive intervention, and continuous intervention (Seidman 2005, p. 298) that may even continue after graduation—and for "a modest fee" (p. 299). The data dissonance and deficit language cloud perceptions and preclude constructive policy. We all have considerable cleaning up to do.

On any given day, the public will be offered a half-dozen different statistics on high school graduation rates, college-enrollment rates, college completion rates, grades, and time-to-degree. The data will appear in respectable academic journals in articles that were reviewed by peers who often are experts on statistical technique and (at best) novices on the data sources. Or they will appear in publications and on Web sites of respectable organizations, even though they were never reviewed by anyone outside the organization. Anything that appears between respectable covers is taken as authoritative, and once it moves into the mainstream press and onto the home pages, we read the headlines but not the footnotes. Inference runs rampant.[54]

For any of these statistics, we never ask who is in the denominator: that is, who are we counting, and who are we not counting—and how? As a consequence, what often pours out are scare stories that make for good press and bad policy. The bad data-driven scare story, in fact, has become the preferred narrative. We are scared by stagnant high school graduation rates over a 30 year period during which the size of the grade cohorts declined significantly then expanded dramatically with the baby boom echo, and during which we witnessed increased immigration from countries with mandatory school attendance ages much lower than ours. By an alternative view, it's amazing we have maintained a stable high school graduation rate (the quality of high school curriculum aside). The same alternative view could be advanced with reference to rates of postsecondary credentialing: It's remarkable we are maintaining the same degree-granting rates in the face of significantly higher enrollments (unless, of course, we are awarding an excess of cheap degrees).

Dissonance By Age and Season: A Plea for Honest Tracking

The source of many unnerving postsecondary stories is one of the most grievous errors in analyses of student progress: including in the denominator students who started their postsecondary careers at age 29, 36, or 47 along with the mass of students who entered the postsecondary universe at age 18 or 19. Common sense says that a 19-year-old and a 31-year-old are on completely different life trajectories, and the national data from the Beginning Postsecondary Students longitudinal studies back up the common sense. When the newspaper story uses the term, "college students," most adults think of their children, not their brother-in-law or their coworker. Community and four-year college administrators know the difference, and provide academic programs, scheduling and services for those different populations.

But what are they to do when the press and the news Web sites complain that nearly half of entering students do not return for their second year or that the graduation rate is *only* 50 percent (thus assuming everyone else is a dropout), and they are called before legislative committees and boards of trustees to explain? There is an enormous difference by age at entry to the postsecondary system in these measures, and an even greater distortion when one restricts the definitions of what it means to "return to" or "graduate from" to those who started in the fall term, full-time, and who came back to or earned a degree from the same school. That denominator knocks out half of traditional-age students from the calculation, and denies the realities of geographic mobility that the Bureau of the Census—let alone NCES longitudinal studies—has documented for the 20-something population (Schachter 2004; Adelman 2005b). Policies designed to "retain" students who have already moved to another state or who are *de facto* ghosts by not being included in the retention denominator in the first place are, at best, wastes of energy.

What is *not* a waste of energy is the task of developing more universal and efficient student tracking systems, and recapturing the headlines from the mongers of scare. There are those who will not accept NCES national longitudinal studies on the grounds that they are samples (no matter how scientific the sampling design), that we can only afford to start one every 6 or 10 years, and then have to wait for people to age and accumulate academic history by which time, the grievance goes, "the data are old." Impatient to simulate instant longitudinal cohorts, they impute sequences of data from different sources and with denominators that include "projections,"

and produce shock data that cannot be validated by any sensible reference points, e.g., that only 18 percent of ninth-graders will earn an associate or bachelor's degree within the subsequent ten years (National Center for Public Policy and Higher Education 2004).[55]

But even the best of state tracking systems and the services of the independent National Student Clearinghouse information system that currently (2005) covers about 2900 institutions (and cites a burgeoning interest in including high schools in the universe), will not produce the wealth of information that a NELS:88/2000 or a Beginning Postsecondary Students study yield. This essay cannot recommend policy in these matters, but it can recommend creativity and cooperation, serious reading of the papers and reports from Florida's tracking system (e.g.,Whitfield and Howat 1999; Goodman, Latham, Copa, and Wright 2001; Goodman, Copa, and Wright 2004; Johnson, Coles, and Thomas 2004), and reflection followed by activistic innovation, and will wager that the long-term results look better than the scare stories assume.

Public Discourse, Part 2: The Language We Use

Language does more than reflect reality—it creates reality as well. There are considerable problems with the language used in describing what happens to students in our education system, and our choice of terms sets boundaries and colors of reality. The boundaries and colors, in turn, condition the terms of policy. Let us illustrate with a few paired terms. These are contrary rhetorics, and this study frankly admits to taking sides in their contention. But it does so in order to urge a positive tone that, not so by-the-way, legislators, superintendents of schools, college presidents and other leaders would prefer to use. The language of leadership is a "can do" language, not a punitive rhetoric.

"Attrition" versus "Persistence."

When "attrition" is the governing term, we worry about students who (it appears) leave school or college, and seek explanations for departure that have included theories of organizational turnover (Bean 1983) and failures of academic and social integration (Tinto 1987). At the first sign of exit—even though the student may return—we turn to negativity. There has to be something wrong here, we say. The student was "at risk," the institution did not respond—we witness a cycle of blame.

When "persistence" is the governing term, we take our directions from students. What did they do that resulted in attainment? What structures of opportunity do we need to offer so that future students can follow the same paths? What do we think works? Can we test it out? This is a far more positive approach. This essay endorses it: Drop "attrition," embrace "persistence"!

"Retention" versus "Persistence."

Institutions "retain"; students "persist." If our language is governed by "retention" all we see are institutions determined to hold on to students, keeping them in places that may be unproductive, at all costs, and for the sake of their public ratings. If our language follows student "persistence," on the other hand, we see those individuals making a series of rational choices that take advantage of the opportunities offered by institutions so as both to discover true interests and reach productive ends. Tinto would not object if the rhetoric of leaving an institution was turned into a saga of discovery. Students may go elsewhere; they may take extended time off from higher education; but ultimately they may judge the change as positive and not a result of failure (Tinto 1987, pp. 132–33). In the rhetoric of "retention," students are passive: Something is done to them, and that "something" assumes a deficit model. Under the rhetoric of "persistence" they are actors shaping their fate, with a model of success in mind. Wouldn't anyone rather have success?

"Pipelines" versus "Paths."

As Bach et al. (2000) noted—and others have followed—there is no linear path to a degree, particularly for students who start out in community colleges. The default "pipeline" metaphor, used to describe presumably linear learning experiences and environmental sequences, is wholly inadequate to describe student behavior. Pipelines are unidirectional closed spaces, and under the "pipeline" metaphor students are passive creatures (as in "retention") swept along or dropping out of the space completely through leaks at the joints. But student behavior doesn't look like that at all: It moves in starts and stops, sideways, down one path to another and perhaps circling back. Liquids move in pipes; people don't.

At the high school level, for example, a student can acquire momentum in science through a combination of statistics and biology, on the one hand, or physics and calculus, on the other. These are different paths, but who is to say that, once in a four-year or community college, these students could not move in very different directions? The students entering a community college with the statistics and biology background thinking they were heading for further study in allied health fields could easily discover business and computer

programming, and transfer to a four-year college to pursue an academic program in management information systems with both quantitative background and empirical habits of mind born of study in the life sciences. The paths to degrees offer many such intersections.

Under the "pipeline" metaphor, we look for easy (sometimes glib) causalities along a single line of explanation. "Paths," on the other hand, allow for multiple analyses and discoveries of tools that suggest (but do not predict) productive routes to education goals. This essay obviously endorses "paths."

Reiterations

Virtually all reviewers of drafts of this study recommended a concluding reiteration of its major themes and conclusions. Three configurations of themes and conclusions stand out in response:

First, there was a story about curriculum, the content of schooling, that was compelling in its secondary school dimensions in the original *Tool Box*, and is even more compelling now on both secondary and postsecondary stages. What you study, how much of it, how deeply, and how intensely has a great deal to do with degree completion. All of this is common sense, but requires equitable execution with emphasis on primary tools, which in this story means that:

- Secondary schools must provide maximum opportunity-to-learn, by which we mean not merely course titles, but course substance. If we seek better preparation for any kind of postsecondary education—occupational, professional or traditional arts and sciences—we have to ratchet up the challenge of content.
- Postsecondary institutions have got to be active players and reinforcers at the secondary school level—particularly in partnership with schools that are not providing or inspiring students—with opportunity to learn at those ratcheted-up levels of content. Pep talks, family visits, recruitment tours, and guidance in filling out application and financial aid forms are not enough.
- Indeed, the first year of postsecondary education has to begin in high school, if not by AP then by the growing dual enrollment movement or other, more structured current efforts (for examples, see Hughes, Karp, Fermin and Bailey 2005). If all traditional-age students entered college or community college with a minimum of 6 credits of "real stuff," not fluff, their adaptation in the critical first year will not be short-circuited by either poor placement or credit overload.

Second, this curriculum story, joined by nuances of attendance patterns that turn out to have significant leverage, continues into higher education. These features of the saga of degree completion are rarely attended to, and all provide tools to enhance completion rates.

- It's not merely getting beyond Algebra 2 in high school any more: The world demands advanced quantitative literacy, and no matter what a student's postsecondary field of study—from occupationally-oriented programs through traditional liberal arts—more than a ceremonial visit to college-level mathematics is called for.
- Academic advisers and counselors have to target every first-time student for at least 20 additive credits by the end of the first calendar year of enrollment. We saw the same consequences in the original *Tool Box*, though now we understand better that the chances of making up for anything less than 20 credits diminish rapidly in the second year. Community colleges have some special challenges here, given increasing rates of transfer among traditional-age students. With 6 credits of dual-enrollment course work, even part-time students can reach 20 redits in the first calendar year, and community colleges enroll the bulk of traditional-age part-time students.
- Excessive no-penalty withdrawals and no-credit repeats appear to do irreparable damage to the chances of completing degrees. This phenomenon was also observed in the original *Tool Box*. Twice advised, institutions might think very seriously about tightening up, with bonuses of increased access and lower time-to-degree.
- More than incidental use of summer terms has proven to be a degree-completion lever with convincing fulcrum. It's part of the calendar-year frame in which students are increasingly participating. Four-year and community colleges can entice students into fuller use of summer terms with creative scheduling.

Third, in contrast to their treatment in the mass of literature on academic progress, students are explicit, rather than implicit, in *The Toolbox Revisited*. They are respected adults playing large roles in their own destinies. What we call "variables" are not bloodless abstractions: they are signs of what students do; and our messages are about where and when the green lights and caution lights will flash along the paths toward degrees. While we trust that school and college actions will not leave them behind, they

have equal responsibilities.

Legacy

These are limited beginnings of change in the terms of the enterprise with which any reader of this document is concerned. They are honest terms and do not pretend to predict, rather help us draw a background tapestry against which we can judge just how well we are doing for our children as they cross the cusp of adulthood. The terms derive from the story; the story derives from the wisdom of the U.S. Department of Education in establishing and maintaining its longitudinal studies; and our subsequent discussions and enlightenment derive from the leadership of the National Center for Education Statistics in executing those studies and providing us with archives of information that are the envy of other nations. All of this constitutes an unmatchable legacy.

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Endnotes

54 For example, consider the following statement in a respectable publication: "One of the key reasons that low income students have such low completion rates in postsecondary education is that many work long hours in order to be able to afford college. They struggle to balance work with part-time enrollment in college..." (Allen, Goldberger, and Steinberg 2004, p. 22). The data source for this assertion is the National Postsecondary Student Aid Study of 2000, a one-year snapshot that includes no "completion rate" data. Analyses of the NPSAS 2000 data files show that the statement does not reach the threshold of justification unless one divides the population by age bracket. At that point, one finds that, and among traditional-age students (presumably the group referenced by the scare), poor kids are no more likely to be working longer hours at their jobs than anyone else, though they are more likely to use their wages for education expenses. That, at least, is an honest statement- for a snapshot population. And it is not what we really would want to know.

55 There has never been a national longitudinal study of ninth-graders. But we do have a national longitudinal study of eighth-graders--the

NELS:88/2000-- with transcripts, not imputations, projections, and dubious math. If we follow these eighth-graders, including high school dropouts, all the way through to age 26, ultimately 34 percent earned either an associate or bachelor's degree (see the full account offered in Appendix L, table L12). That percentage at least puts us in range of doing better. If we accept the putative (and utterly false) 18 percent, we risk abandoning all hope and effort.

Exhibit 1.

Tables Referenced in the Executive Summary and Concluding Messages of *The Toolbox Revisted: Paths to Degree Completion From High School Through College*

Table 1.

From Macro to Micro: Contraction of the Universe of 1988 Eighth-Graders to the Universe Subject to Analysis in *The Toolbox Revisited*

Description of Universe	Percent	Descending weighted N[a]
A. Initial universe of 1988 eighth graders	100.0	2.93M
B. Of (A), those who were inthe 12th grade in 1992	83.6 (0.98)	2.45M
C. Of (B), those who continued to postsecondary education at any time through December 2000	81.7 (1.28)	2.0M
D. Of (C), those who presented complete high school transcripts, test scores,[b] complete postsecondary transcript records, and socioeconomic status information	80.5 (1.01)	1.61M
E. Of (D), those who attended a four-year college at any time	73.5 (1.00)	1.19M
Net percentage of 1988 eighth-graders in the universe	41	1.19M
Net percentage of 1992 12th-graders in the universe	51	1.19M

[a]Like other NCES longitudinal studies, the NELS:88/2000 cohort is a stratified sample, in which each student is assigned a weight to represent other similar students in the cohort (see Curlin, Ingels, Wu, and Heuer 2000).

[b] See definition of SRTSQUIN in Glossary.

NOTES: Standard errors are in parentheses.

SOURCE: National Center for Education Statistics: NELS:88/2000 postsecondary transcript files (NCES 2003-402 and Supplement).

Table 2.

For Each of Four Definitions of the Universe of Students in the NELS:88/2000, Percentage Distribution by Gender, Race/Ethnicity, Socioeconomic Status Quintile, and Second Language Background

Demographic variable	1988 eighth-graders	All 1992 survey participants	All 1992 12th-graders who entered postsecondary education	1992 12th-graders who attended a four-year college at any time and met other criteria to be subjects of this study[a]
Gender				
Men	49.7 (1.01)	49.9 (0.83)	46.5 (0.93)	48.8 (1.27)
Women	50.3 (1.01)	50.1 (0.83)	53.5 (0.93)	51.2 (1.27)
Race/ethnicity				
White	71.7 (1.50)	71.5 (1.30)	74.9 (1.29)	78.2 (1.31)
African-American	12.9 (1.26)	12.7 (0.94)	10.3 (0.90)	9.4 (1.03)
Latino	10.5 (0.87)	10.4 (0.84)	9.1 (0.88)	7.0 (0.72)
Asian	3.5 (0.32)	3.7 (0.31)	4.8 (0.43)	4.7 (0.42)
American Indian	1.4 (0.43)	1.7 (0.55)	0.7 (0.23)	0.6 (0.18)
Second language background				
Nonnative speaker of English	8.6 (0.68)	10.1 (0.83)	10.0 (0.90)	7.4 (0.67)
Native speaker of English from a second language household	3.3 (0.33)	2.7 (0.21)	2.4 (0.23)	2.2 (0.28)
Socioeconomic status quintile				
Highest quintile	21.3 (0.92)	21.1 (0.88)	29.1 (0.88)	38.5 (1.52)
2nd quintile	20.8 (0.79)	21.0 (0.69)	25.3 (0.88)	26.4 (1.24)
3rd quintile	20.7 (1.10)	19.8 (0.68)	20.2 (0.73)	17.7 (0.85)
4th quintile	19.6 (0.83)	19.2 (0.66)	15.4 (0.61)	11.7 (0.59)
Lowest quintile	17.6 (0.93)	18.9 (0.85)	10.0 (0.73)	6.8 (0.50)

[a] 12th-graders with known socioeconomic status and high school records (transcripts and test scores), who graduated from high school by December 1996, and attended a four-year college at any time.

NOTES: Standard errors are in parentheses. Columns for gender, race/ethnicity, and socioeconomic status quintile may not add to 100.0 percent due to rounding.

SOURCE: National Center for Education Statistics: NELS:88/2000 postsecondary transcript files (NCES 2003-402 and Supplement).

Table 6.

Percentage of 1992 12th-Graders Who Attended High Schools that Offered Courses[a] in Statistics, Trigonometry, and Calculus, by Race/Ethnicity, and Socioeconomic Status Quintile

	Percentage attending high schools that offered:		
Demographic group	Calculus	Trigonometry	Statistics
Race/ethnicity			
White	58.6 (1.67)	76.9 (1.29)	27.7 (1.62)
African-American	50.8 (4.14)	67.0 (3.90)	19.5 (2.71)
Latino	44.6 (4.04)	59.9 (3.55)	18.2 (2.44)
Asian	61.3 (4.31)	71.9 (3.61)	30.1 (3.94)
Socioeconomic status quintile			
Highest quintile	71.6 (1.93)	83.1 (1.64)	34.0 (2.30)
2nd quintile	56.2 (2.32)	73.2 (2.13)	27.1 (2.01)
3rd quintile	54.1 (2.39)	71.4 (2.33)	24.9 (1.92)
4th quintile	49.3 (2.46)	70.3 (2.28)	20.3 (1.80)
Lowest quintile	43.5 (2.86)	63.7 (2.66)	18.5 (2.06)

[a] Responses are based on surveys of school administrators and math teachers of NELS students in 1990. Where the administrator did not answer the question, the math teachers did not indicate that they taught the subject, and students did not earn any credits inthe subject, the calculation assumes that the school did not offer the subject. This approach may underestimate the percentage of high schools offering the subjects at issue.

NOTES: Standard errors are in parentheses.

SOURCES: National Center for Education Statistics: NELS:88/94 (NCES 96-130), and NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402).

Table 13.

Logistic Account of Factors Associated with Earning a Bachelor's Degree in the History of 1992 12th-Graders Who Attended a Four Year College at Any Time: Postsecondary Entry Phase.

Variable	Parameter estimate	Adjusted standard error	*t*	*p*	Delta-p
Intercept	-4.2124	0.6588	2.02	0.01	
Academic Resources quintile	**0.5541**	**0.0715**	**3.54**	**0.01**	**0.1283**
Socioeconomic status quintile	**0.2859**	**0.0643**	**2.03**	**0.10**	**0.0662**
Education expectations	0.3462	0.2032	0.78	*	*
No delay of entry	**0.9161**	**0.2224**	**1.88**	**0.10**	**0.2121**
Selectivity of first institution	0.4470	0.2301	0.89	*	*
Acceleration of credits	0.1904	0.1196	0.73	*	*
Race	-0.4709	0.2130	1.01	*	*
Gender	-0.4627	0.1540	1.37	*	*
Parenthood	-0.9639	0.4597	0.96	*	*

* Variables did not meet threshold criterion for statistical significance.

NOTES: Statistically significant variables are highlighted in bold. Standard errors adjusted by root design effect = 2.19. $G^2 = 5060.17$; $df = 4913$; $G^2/df = 1.030$; X^2 (df) = 1101.0 (9); pseudo $R^2 = 0.2127$; percent concordant predicted probabilities = 78.5

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 Supplement.).

Table 15.

Logistic Account of Factors Associated with Earning a Bachelor's Degree in the History of 1992 12th-Graders Who Attended a Four Year College at Any Time: First Postsecondary Year Performance

Variable	Parameter estimate	Adjusted standard error	*t*	*p*	Delta-p
Intercept	-3.5834	0.6054	3.33	0.01	
Academic Resources quintile	**0.3419**	**0.0699**	**2.75**	**0.01**	**0.1283**
Socioeconomic status quintile	**0.2879**	**0.0569**	**2.84**	**0.01**	**0.0662**
Education expectations	0.4040	0.1794	1.27	*	*
Selectivity of first institution	0.4059	0.1979	1.15	*	*
No delay of entry	0.8153	0.2779	1.65	*	*
Low credits in first year	**-1.5299**	**0.1669**	**5.15**	**0.001**	**-0.3372**
First-year grades	**0.9919**	**0.1541**	3.62	**0.01**	**0.2186**
College-level math in first year	0.3603	0.1479	1.37	*	*
Any first-year remediation	0.4963	0.1722	1.62	*	*
Race	-0.3471	0.1906	1.02	*	*
Gender	-0.3414	0.1372	1.40	*	*
Parenthood	-1.0277	0.3965	1.46	*	*

* Variables did not meet threshold criterion for statistical significance.

NOTES: Statistically significant variables are highlighted in bold. Standard errors adjusted by root design effect = 1.78. $G^2 = 4411.64$; $df = 4764$; $G^2/df = 0.926$; X^2 (df) = 1516.37 (9); pseudo $R^2 = 0.2893$; percent concordant predicted probabilities = 83.3

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 Supplement.).

Table 17.

Percentage of 1992 12th-Graders with Complete Postsecondary Records Who Persisted in Postsecondary Education from Their First Calendar Year of Enrollment to a Second Calendar Year, by Type of Institution First Attended, and of Those Who Persisted, Percentage with Lagging First-Year Performance

				Of those who persisted, first-year performance indicators:	
Student group	Persisted	Earned one-year certificate	Did not persist	Less than 20 credits	In lowest GPS quintile
All 12th-graders	89.7 (0.57)	0.9 (0.13)	9.4 (0.55)	33.2 (1.12)	17.4 (0.81)
Type of first institution					
Four-year college	95.2 (0.59)	0.1 (0.03)	4.7 (0.59)	15.9 (0.91)	15.2 (0.86)
Comm. college	84.0 (1.12)	0.4 (0.10)	15.6 (1.11)	60.7 (1.93)	21.5 (1.76)
Other sub-baccalaureate	71.5 (3.06)	14.8 (2.52)	13.7 (2.01)	31.4 (5.17)	11.9 (2.70)
All with standard high school diploma by December 1996 who attended a four-year college at any time	95.8 (0.50)	0.1 (0.03)	4.2 (0.50)	21.9 (0.98)	15.5 (0.88)
Type of first institution					
Four-year college	95.2 (0.59)	0.1 (0.03)	4.7 (0.59)	15.9 (0.91)	15.2 (0.86)
Comm. college	97.9 (0.87)	2.1 (0.87)	#	44.0 (2.93)	15.7 (2.72)
Other sub-baccalaureate	Low N[a]	Low N[a]	Low N[a]	Low N[a]	Low N[a]

Rounds to zero.

[a] reporting standard not met.

NOTES: Standard errors are in parentheses. Row totals for the three persistence/retention columns may not add to 100.0 percent due to rounding. Weighted N for all 12th-graders with complete postsecondary records: 1.88M; for all 12th-graders with complete postsecondary records who attended a four-year college at any time and who earned a standard high school diploma by December 1996: 1.38M

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 and Supplement).

Table 20.

Of 1992 12th-Graders Who Earned a Standard High School Diploma by December 1996 and Attended a Four-Year College at Any Time, Course Participation Rates by the End of the Second Year Following Initial Enrollment in Postsecondary Education, by Ultimate Degree Status

	Percentage of students who earned credits by the end of the second year following initial enrollment.	
Course	Earned bachelor's	Did not earn bachelor's
English composition	82.3 (1.03)	53.4 (1.40)
General psychology	61.5 (1.18)	32.2 (1.19)
General biology	35.2 (1.24)	12.4 (0.87)
Introduction to sociology	34.4 (1.12)	19.6 (1.08)
U.S. history surveys	32.6 (1.22)	14.9 (0.97)
Micro/macroeconomics	30.3 (1.14)	9.3 (0.88)
General chemistry	30.1 (1.05)	7.5 (0.74)
College algebra	26.7 (1.20)	13.9 (0.94)
U.S. government	25.3 (1.12)	10.4 (0.74)
Calculus	23.7 (1.11)	3.2 (0.43)
Precalculus	22.4 (0.95)	5.8 (0.68)
Oral communication	20.4 (1.03)	11.0 (0.72)
Introduction to philosophy	18.9 (1.05)	5.0 (0.49)
Literature: general	18.9 (1.03)	5.0 (0.56)
Spanish: intro and intermed	18.8 (1.01)	5.9 (0.61)
Western civilization	17.0 (0.93)	6.5 (0.62)
Introduction to computing[a]	15.8 (0.90)	10.9 (0.81)
Introductory accounting	15.7 (0.81)	7.2 (0.56)
Statistics (mathematics)	14.4 (0.79)	3.7 (0.68)
World civilization	12.1 (0.93)	4.0 (0.50)
General physics	12.1 (0.83)	2.3 (0.42)
Public speaking	11.2 (0.78)	6.2 (0.67)
Music appreciation	10.9 (0.84)	3.8 (0.45)
Drama criticism/history	10.7 (0.73)	2.9 (0.46)
American literature	10.3 (0.71)	1.7 (0.28)

[a] This is not "introduction to computer science."

NOTES: Standard errors are in parentheses. Weighted N for bachelor's recipients = 935k; for those who did not earn bachelor's = 513k. All row estimate comparisons are significant at $p<.05$.

SOURCE: National Center for Education Statistics: NELS:88/2000 postsecondary transcript files (NCES 2003-402 and Supplement).

Table 21.

Of 1992 12th-Graders Who Earned a Standard High School Diploma by December 1996 and Attended a Four-Year College at Any Time, Participation Rates in Lower-Divsion Course Category Aggregates and Average Number of Credits Earned in Each Aggregate by the End of the Second Year Following Enrollment in Postsecondary Education, by Ultimate Degree Status

	Earned bachelor's degree by December 2000		**Did not earn bachelor's degree by December 2000**	
Course aggregate[a]	Percentage completing credits	Average credits earned	Percentage completing credits	Average credits earned
College-level writing	84.5 (0.95)	4.96 (.046)	68.8 (2.05	4.83 (.091)
Oral communication	35.6 (1.21)	3.38 (.054)	26.2 (1.59)	3.15 (.080)
Computer-related	24.5 (1.03)	3.42 (.057)	17.2 (1.52)	3.31 (.091)
Intro biological sciences	42.1 (1.25)	5.21 (.088)	22.3 (1.53)	4.96 (.160)
Intro physical sciences	40.2 (1.15)	7.46 (.142)	15.8 (1.33)	5.79 (.223)
College-level mathematics	70.5 (1.20)	6.30 (.103)	37.5 (1.87)	5.34 (.225)
Core history	56.0 (1.27)	3.04 (.132)	34.6 (1.82)	4.13 (.099)
General psychology	61.5 (1.18)	3.33 (.030)	42.0 (1.95)	3.32 (.082)
Micro/macroeconomics	30.3 (1.14)	4.69 (.088)	13.1 (1.35)	3.86 (.112)
Humanities except literature	38.2 (1.24)	4.20 (.140)	19.1 (1.50)	3.55 (.124)
Literature	45.1 (1.30)	4.48 (.087)	19.8 (1.39)	3.84 (.144)
Core social sciences	62.6 (1.27)	4.57 (.080)	42.8 (1.85)	4.22 (.115)
Visual/graphic arts	17.3 (0.96)	5.12 (.230)	10.1 (0.98)	5.47 (.488)
Foundation business	19.9 (0.88)	5.17 (.120)	14.2 (1.41)	4.86 (.227)

[a]For a listing of courses under each aggregate, see Appendix 1.

NOTES: Standard errors are in parentheses. Weighted N for those who earned bachelor's degrees: 935k; for those who did not earn bachelor's degrees: 513k.

SOURCE: National Center for Education Statistics: NELS:88/2000 postsecondary transcript files (NCES 2003-402 and Supplement).

Table 24.

Logistic Account of Factors Associated with Earning a Bachelor's Degree in the History of 1992 12th-Graders Who Attended a Four Year College at Any Time:

Postsecondary Attendance Patterns

Variable	Parameter estimate	Adjusted standard error	*t*	*p*	Delta-p
Intercept	-4.6208	0.7114	3.68	0.001	
Academic Resources quintile	**0.3648**	**0.0773**	**2.67**	**0.02**	**0.0804**
Socioeconomic status quintile	**0.2790**	**0.0621**	**2.55**	**0.05**	**0.0615**
Education expectations	0.5165	0.1985	1.47	*	*
No delay of entry	**0.9468**	**0.3064**	**1.75**	**0.10**	**0.2087**
Selectivity of first institution	0.5176	0.2155	1.36	*	*
First-year grades	**0.9295**	**0.1687**	**3.12**	*	**0.2049**
College math in first year	0.3121	0.1608	1.10	*	*
Any first-year remediation	0.3261	0.1876	0.99	*	*
Low credits in first year	**-1.1934**	**0.1853**	**3.65**	**0.001**	**-0.2712**
Classic community college transfer	**0.9518**	**0.2252**	**2.40**	**0.05**	**0.2097**
Four-to-four transfer	**0.7020**	**0.2271**	**1.75**	**0.10**	**0.1547**
Multiple schools	**-0.7509**	**0.1908**	**2.23**	**0.05**	**-0.1655**
Summer-term credits[a]	**0.6517**	**0.0866**	**4.26**	**0.001**	**0.1436**
Ever part-time	**-1.6067**	**0.1551**	**5.87**	**0.001**	**-0.3545**
Race	-0.3481	0.2096	0.94	*	*
Gender	-0.2955	0.1498	1.12	*	*
Parenthood	-0.8677	0.4246	1.16	*	*

* Variables did not meet threshold criterion for statistical significance.

[a] Set in three bands: 0, 1-4, and more than 4

NOTES: Statistically significant variables are highlighted in bold. Standard errors adjusted by root design effect = 1.76. $G^2 = 3749.31$; $df = 4759$; $G^2/df = 0.788$; X^2 (df) = 1984.37(17); pseudo $R^2 = 0.3813$; percent concordant predicted probabilities = 88.1

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 Supplement.).

Table 25.

Three Trends in Postsecondary Grade Point Average (GPA) of 1992 12th-Graders Who Attended a Four-Year College at Any Time Through December 2000 and Offered Complete Postsecondary Records, by GPA at Three Points in Time, Average Undergraduate Time, and Percentage Earning Bachelor's Degree

	Average GPA					
GPA trend	First calendar year	First two calendar years	At the end of undergraduate career	Average elapsed undergrad time	Percentage earning bachelor's degree	**Percentage of all in group**
Rising	2.43 (0.30)	2.64 (0.28)	2.93 (0.18)	4.76 (0.57)	73.5 (1.80)	**37.0 (1.09)**
Flat	2.72 (0.25)	2.63 (0.27)	2.73 (0.26)	4.79 (0.59)	65.5 (1.63)	**43.9 (1.10)**
Falling	3.09 (0.29)	2.90 (0.29)	2.70 (0.30)	4.92 (0.81)	63.8 (2.38)	**19.1 (0.89)**

NOTES: Standard errors are in parentheses. Column for percent of all in group may not add to 100.0 percent due to rounding. Weighted Ns: rising GPA = 415k; flat GPA = 486k; falling GPA = 215k.
SOURCE: National Center for Education Statistics: NELS:88\2000 Postsecondary Transcript Files (NCES 2003-402 and Supplement).

Table 26.

Logistic Account of Factors Associated with Earning a Bachelor's Degree in the History of 1992 12th-Graders Who Attended a Four Year College at Any Time:

Extended Postsecondary Performance

Variable	Parameter estimate	Adjusted standard error	*t*	*p*	Delta-p
Intercept	-5.8188	0.7996	4.12	0.001	
Academic Resources quintile	**0.3147**	**0.0799**	**2.23**	**0.05**	**0.0667**
Socioeconomic status quintile	**0.3066**	**0.0628**	**2.77**	**0.02**	**0.0650**
Education expectations	0.3825	0.2075	1.04	*	*
No delay of entry	0.7798	0.3208	1.38	*	*
Selectivity of first institution	0.4103	0.2225	1.04	*	*
Any first-year remediation	0.2969	0.1920	0.88	*	*
Low credits in first year	**-1.0822**	**0.1957**	**3.13**	**0.01**	**-0.2294**
Classic transfer	**0.8391**	**0.1273**	**2.12**	**0.05**	**0.1779**
Four-year to four-year transfer	**0.7192**	**0.2285**	**1.78**	**0.10**	**0.1525**
Multiple schools	**-1.0523**	**0.2005**	**2.97**	**0.01**	**-0.2231**
Summer-term credits[a]	**0.5299**	**0.0900**	**3.34**	**0.01**	**0.1123**
Ever part-time	**-1.6696**	**0.1599**	**5.92**	**0.001**	**-0.3539**
Cumulative college math credits[a]	**0.5456**	**0.0994**	**3.11**	**0.01**	**0.1157**
Trend in grades	**0.5813**	**0.1119**	**2.94**	**0.01**	**0.1232**
First-year grades	**1.1619**	**0.1860**	**3.54**	**0.01**	**0.2463**
Gender	-0.3518	0.1578	1.26	*	*
Parenthood	-0.9058	0.4318	1.19	*	*

* Variables did not meet threshold criterion for statistical significance.

[a] Set in three bands: 0, 1-4, and more than 4

NOTES: Statistically significant variables are highlighted in bold. Standard errors adjusted by root design effect = 1.76. $G^2 = 3355.32$; $df = 4632$; $G^2/df = 0.745$; X^2 (df) = 1965.7(18); pseudo $R^2 = 0.3984$; percent concordant predicted probabilities = 89.3

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 Supplement.).

Table 27.

Logistic Account of Factors Associated with Earning a Bachelor's Degree in the History of 1992 12th-Graders Who Attended a Four Year College at Any Time:

Final Factors, with Complete Academic History

Variable	Parameter estimate	Adjusted standard error	*t*	*p*	Delta-p
Intercept	-7.6637	0.8827	4.89	0.001	
Academic Resources quintile	**0.2766**	**0.0847**	**1.84**	**0.10**	**0.0583**
Socioeconomic status quintile	**0.2974**	**0.0685**	**2.45**	**0.05**	**0.0627**
Education expectations	0.4162	0.2211	1.06	*	*
No delay of entry	0.7848	0.3515	1.26	*	*
Selectivity of first institution	0.4436	0.3432	1.03	*	*
First-year grades	**1.1020**	**0.1119**	**3.14**	**0.01**	**0.2323**
Low credits in first year	-0.6553	0.2165	1.71	*	*
Classic comm. college transfer	0.7186	0.2488	1.63	*	*
Four to four transfer	0.6832	0.2509	1.53	*	*
Multiple schools	**-0.7306**	**0.2174**	**1.89**	**0.10**	**-0.1540**
Summer-term credits[a]	**0.5628**	**0.0553**	**3.25**	**0.01**	**0.1186**
Ever part-time	**-1.1739**	**0.1009**	**3.71**	**0.01**	**-0.2474**
Cumulative college math credits[a]	**0.4993**	**0.1075**	**2.62**	**0.02**	**0.1053**
Trend in grades	**0.5879**	**0.1211**	**2.74**	**0.02**	**0.1240**
WRPT ration[b]	**-2.3078**	**0.4246**	**3.06**	**0.01**	**-0.4865**
Continuous enrollment	**2.0601**	**0.2211**	**5.25**	**0.001**	**0.4343**
Gender	-0.3233	0.1715	1.06	*	*
Parenthood	-0.8511	0.4627	1.04	*	*

* Variables did not meet threshold criterion for statistical significance.

[a] Set in three bands: 0, 1-4, and more than 4

[b] Ratio of withdrawal (W) and no-credit repeat (NCR) grades to all grades received.

NOTES: Statistically significant variables are highlighted in bold. Standard errors adjusted by root design effect = 1.76. $G^2 = 2993.12$; $df = 4595$; $G^2/df = 0.651$; $X^2(df) = 2260.53(18)$; pseudo $R^2 = 0.4382$; percent concordant predicted probabilities = 91.8.

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 Supplement.).

Table 29.

Seven Steps of a Logistic Regression Model with Bachelor's Degree Attainment by Age 26 or 27 as the Outcome for 1992 12th-Graders Who Attended a Four-Year College at Any Time

	Background		Entry		First Year		Financing		Attendance Patterns		Extended Performance		Final Factors	
	Param.[1]	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p
Intercept	-4.28		-4.21		-3.58		-3.59		-4.70		-5.85		-7.94	
Academic Resources	0.644***	0.1492	0.554***	0.1283	0.342***	0.754	0.336*	0.075	0.371*	0.081	0.312*	0.066	0.277~	0.058
Anticipations	0.627		0.346		0.404		0.339		0.553		0.386		0.416	
SES quintile	0.291~	0.0675	0.286~	0.0662	0.288***	0.0635	0.290*	0.065	0.282*	0.062	0.307**	0.065	0.297*	0.063
Race/ethnicity	-0.409		-0.471		-0.347		-0.350		-0.370		X		X	
Gender	-0.463		-0.463		-0.341		-0.338		-0.280		-0.349		-0.323	
Parenthood	-1.576		-0.964		-1.027		-1.029		-0.913		-0.933		-0.851	
1st institution was selective			0.447		0.406		0.396		0.493		0.399		0.444	
No delay entry			0.916~	0.2121	0.815		0.785**	0.175	0.980~	0.216	0.825		0.785	
Acceleration		0.190			X		X		X		X		X	
Low credits					-1.53+	-0.337	-1.52+	-0.338	-1.19+	-0.263	-1.058**	-0.175	0.655	
1st-year grades					0.992***	0.2186	0.988**	0.221	0.916***		1.148***	0.243	1.102**	0.232
1st-year remediation					0.496		0.497		0.319		0.295		X	
1st-year college math					0.360		0.367		0.318		X		X	
Work-study							0.179		X		X		X	
Multiple schools									-0.751*	0.166	-1.052	-0.223	-0.731~	-0.154
Classic transfer									0.952*	0.208	0.839*	0.178	0.719	
Summer credits									0.654+	0.144	0.530***	0.112	0.563***	0.119
Ever part-time									-1.61+	-0.354	-1.67+	-0.353	-1.17***	-0.247
Four-to-four transfer									0.702~	0.155	0.719~	0.152	0.683	
GPA trend											0.566**	0.119	0.588*	0.124
Cumulative college math											0.521*	0.110	0.499**	0.105
WRPT ratio[a]													-2.31***	-0.487
No stop													2.02+	0.426

Table 29, continued.

Seven Steps of a Logistic Regression Model with Bachelor's Degree Attainment by Age 26 or 27 as the Outcome for 1992 12th-Graders Who Attended a Four-Year College at Any Time

	Background		Entry		First Year		Financing		Attendance Patterns		Extended Performance		Final Factors	
	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p	Param.	Delt-p
Root design effect	2.17		2.19		1.78		1.78		1.76		1.76		1.76	
G^2	5315.44		5060.17		4411.64		4396.88		3749.31		3452.61		2993.12	
df	4919		4913		4764		4763		4759		4632		44595	
G^2/df	1.081		1.030		0.926		0.923		0.788		0.745		0.651	
X^2 (df)	1074.9 (5)		1101.0 (9)		1516.4 (11)		1519.1 (12)		1984.2 (17)		1965.7 (17)		2260.5 (18)	
Pseudo R^2	0.204		0.213		0.289		0.292		0.381		0.398		0.438	
Percent concordant probabilities predicted	77.5		78.5		83.3		83.4		88.1		89.3		91.8	

[1] Param. = Parameter; Delt-p = Delta-p

[a] Ratio of withdrawal (W) and no-credit repeat (NCR) grades to all grades received.

NOTES: Keys to significance levels ~ = .10; * = .05; ** = .01; + = .001. X = variable did not meet criterion to be carried forward.

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 and Supplement).

Table 30.

Bachelor's Degree Completion Rates for Students Who Began in Four-Year Colleges According to Three Different National Longitudinal Studies of the 1990s

	Percent completing bachelor's degree		
Bachelor's degree completion modes	NELS:88/2000 1992-2000	Cooperative Institutional Research Project (CIRP) 1994-2000[a]	Beginning postsecondary students 1995-2001
Bachelor's from same school in 4 years	30.9 (1.14)	36.4	33.1 (1.3)
Bachelor's from a different school in 4 years	3.0 (0.30)	Not available	2.3 (0.3)
Bachelor's from same school in 6 years	52.9 (1.27)	57.6	53.7 (1.2)
Bachelor's from a different school in 6 years	11.3 (0.79)	Not available	8.1 (0.4)
Bachelor's from same school in 8.5 years.	55.3 (1.24)	60.6[b]	Not available
Bachelor's from different school in 8.5 years	14.1 (0.84)	Not available	Not available
Total degree completion:	69.3 (1.16)	60.6[b]	61.8 (1.2)

[a] As reported in Astin and Oseguera (2002). Standard errors are not available.

[b] In Astin and Oseguera, this cumulative figure includes students who were still enrolled at their institution of first attendance at the end of six years.

NOTES: Standard errors for the NELS:88/2000 and BPS95/96-2001 are in parentheses.

SOURCES: National Center for Education Statistics: NELS88/2000 Postsecondary Transcript Files (NCES 2003-402 and Supplement) and Beginning Postsecondary Students Longitudinal Study, 1995/96-2001, Data Analysis System (NCES 2003-173). Astin and Oseguera (2002).

Table 32.

Hypothetical Cumulative Consequences of Variables Critical to Bachelor's Degree Completion for 1992 12th-Graders Who Earned a Standard High School Diploma by December 1996, Attended a Four-Year College at Any Time, and Whose Postsecondary Records Were Complete, by Race/Ethnicity

Cumulative conditions	White	African-American	Latino	Asian	All
1) Baseline, no conditions	**67.6 (1.18)**	**52.1 (4.26)**	**45.4 (3.74)**	**67.9 (4.71)**	**64.6 (1.12)**
2) No delay of entry	71.0 (1.22)	54.6 (4.49)	50.5 (3.79)	68.2 (4.89)	67.9 (1.15)
3) No delay, top 40 percent of high school curriculum, and highest high school mathematics above Algebra 2	85.6 (1.50)	65.9 (8.57)	69.2 (6.33)	91.5 (1.96)	84.1 (1.40)
4) No delay, top 40 percent of high school curriculum, and more than four credits in summer terms	90.6 (1.31)	84.6 (5.95)	69.2 (8.12)	92.6 (2.27)	89.1 (1.30)
5) No delay, top 40 percent of high school curriculum, more than four credits in summer terms, and 20 or more credits in first calendar year of attendance	92.6 (1.23)	88.2 (5.28)	71.9 (9.07)	93.9 (2.16)	91.4 (1.24)
6) No delay, top 40 percent of high school curriculum, more than four credits in summer terms, 20 or more credits in first calendar year, and less than 10 percent of grades were withdrawals or no-credit repeats	95.5 (0.98)	94.3 (4.62)	79.4 (11.1)	95.3 (2.20)	94.6 (1.07)

NOTES: Standard errors are in parentheses. Weighted Ns for each cumulative steop: (1) 1.45M; (2) 1.33M; (3) 712k; (4) 621k; (5) 310k; (6) 273k.
SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402).

Appendix F.
Gradations of Academic Intensity of High School Curriculum

The following figure sets forth the 31 gradations (in descending value) of academic curriculum intensity and quality as used in the development of the Academic Resources index and variable for the NELS:88/2000 cohort. The figures in the boxes represent the minimum rounded number of Carnegie units required for the gradation on a given *row*. Where a cell is empty, there are no minimum requirements. Where a cell indicates "none" (for remedial math and remedial English), it means that no remedial work is allowed for that gradation. Where the cell for AP courses indicates zero, that means the student did not take any AP courses, not a minimum. For the NELS:88/2000 cohort, computer science was not nearly as widely offered as it is today. Therefore, computer-related credits were brought into play only to disaggregate lumps in the distribution. Total high school academic credits is an empirically-derived factor that comes into play only in the very lowest gradations.

The basic five-subject credit thresholds were constructed in the course of examining the edited, coded transcript data for students who were known high school graduates with graduation dates through Dec. 31, 1996. The editorial process paid particular attention to all cases that showed less than 16 total high school credits. Where the evidence strongly suggested dissonance with other variables in the student's record, all transcript records from that student's *school* were examined. Where no standard credit metrics were found, they were adjusted with reference to state standards for high school graduation (Medrich, Brown, and Henke 1992), and major components (e.g., mathematics, English, etc.) multiplied or divided by as much as (but no more that) two. For example, when a group of students from the same high school showed 40-45 Carnegie units in a state that required 20 for an academic diploma, the editorial process cut those 40-45 units in half-across all subjects in which they were given. The editorial process also Windsorized cases of total Carnegie unit counts above 32, adjusting the major components down one-by-one, and dropped fragmentary transcripts with less than 6 Carnegie unit counts.

As noted in the parallel appendix in the original *Tool Box:*

> These gradations of academic intensity and quality are based on the history of one national high school class that was scheduled to graduate in 1982. The next graduating class for which we possess similar data is that of 1992. While the specific number of Carnegie units, APs, and remedial indicators might change, the basic form and principles of the gradations will probably not change, the basic form and principles of the gradations will probably not change. This presentation of the possibilities of high school curricular attainment is criterion-referenced: theoretically, *everybody* can reach gradation level #1 (p. 114)

The account of curriculum for the class of 1982 had 40 gradations. This account, for the class of 1992, has 31. One implication of the shrinking number of gradations is that, in fact, more students were moving up the academic intensity ladder, clustering at high criterion-referenced levels.

Table F1 presents the actual mean number of Carnegie units earned in core academic fields, irrespective of the theoretical thresholds, for students in each of the five quintiles of academic intensity derived from the 31 more detailed gradations.

Appendix F, Figure 3.

Curriculum Components of the 31 Gradations of the High School Academic Intensity Measure of the NELS:88/2000, by Carnegie Unit Minimums

Gradation	English	Math	Science	Foreign Langs	Hist and Soc Stu	Highest Math	Remed Math	Remed English	APs	Computer Science	Total Academ Units
1	3.75	3.75	>2.0*	>2.0	>2.0	>Alg2	None	None	>1	>0	
2	3.75	3.75	>2.0	>2.0	>2.0	>Alg2	None	None	>0		
3	3.75	3.75	>2.0	>2.0		>Alg2	None	None	0	1.0	
4	3.75	3.75	3.0	>2.0	>2.0	>Alg2	None	None			
5	3.5	3.0	2.0	2.0	2.0	>Alg2	None	None	>1		
6	3.5	3.0	2.0	2.0	2.0	>Alg2	None	None	>0		
7	3.5	3.5	2.0	2.0	2.0	>Alg2	None	None	0	0.5	
8	3.5	3.0	2.0	2.0	2.0	>Alg2	None	None	0	1.0	
9	3.0	3.0	2.0	2.0	2.0	Alg2	None	None	>0		
10	3.5	3.5	2.0	2.0	2.0	Alg2	None	None	0	>0	
11	3.5	3.5	2.5	2.0	2.0	Alg2	None	None	0		
12	3.0	2.0	1.0		1.0	>Alg2	None	None	>0		
13	3.0	2.5	2.0	1.0	2.0	>Alg2	None	None	0		
14	3.0	2.5	2.0*		2.0	>Alg2	None	None	0		
15	3.0	2.5	2.0*	2.0	2.0	Alg2	None	None	0	>0	
16	3.0	2.5	2.0	2.0	2.0	Alg2	None	None	0		
17	3.0	2.5	1.0	1.0	2.0	<Alg2	None	None	0		
18	3.0	3.0	1.5	1.0	1.5	<Alg2		None			
19	2.5	3.0	1.5	1.0	1.5	Alg2	None				
20	2.5	2.5	1.5	0.5	1.0	<Alg2			0		≥ 12
21	2.5	2.5	2.0		1.0		Net 0			>0	≥ 12
22	2.5	2.5	1.0		1.0		Net 0			>0	≥ 12
23	2.5	2.0	2.0		1.5	<Alg2	Net 0				≥ 12
24	2.5	2.0	2.0		1.5	<Alg2	Net 0			1.0	

Appendix F, Figure 3, continued.

Curriculum Components of the 31 Gradations of the High School Academic Intensity Measure of the NELS:88/2000, by Carnegie Unit Minimums

Gradation	English	Math	Science	Foreign Langs	Hist and Soc Stu	Highest Math	Remed Math	Remed English	APs	Computer Science	Total Academ Units
25	2.5	2.0	1.0		0.5	Alg2	Net 0	None			
26	2.5	2.0	1.0			<Alg2	None	None			≥12
27	2.5	2.0	1.0		1.0		Net 0				
28	2.5	1.5	1.0		0.5		Net 1				
29	2.5	1.5	1.0		0.5						
30	2.0	1.0	0.5		0.5						
31											≥6

NOTES: (1) Net 1 means the sum of total mathematics credits minus remedial mathematics credits was 0.5 or less, i.e., if remedial math appeared at all on a student's transcript, it was a major presence; Net 0 means the sum of total mathematics credits minus remedial mathematics credits was more than 0.5, i.e. if remedial math appeared at all on a student's transcript, it was a minor presence.
(2) The figures in the cells for English, math, science, foreign languages, and history and social studies represent the minimum rounded number of Carnegie units required for the gradation on a given row. Where a box is empty, there are no minimum requirements.
(3) An asterisk in a cell for science credits indicates core laboratory science (biology, chemistry, and physics).
(4) The reference points for highest level of mathematics studied in high school are higher than Algebra 2 (>Alg2), Algebra 2 (Alg2), and less than Algebra 2 (<Alg2). Where there is no entry in the cell, there is no highest mathematics requirement for that row.
(5) Minimum requirements for total high school academic Carnegie units, e.g., ≥12 and ≥6, come into play only in the very lowest gradations of the curriculum distribution.
(6) When the distribution of students across these 31 levels is weighed and then aggregated to quintiles, the quintile breaks are as follows: 1-8 (highest quintile), 9-15 (2nd quintile), 16-20 (3rd quintile), 21-25 (4th quintile), and 26-31 (lowest quintile).
SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402).

Appendix F, Table F1.

Of 1992 12th-Graders with Complete High School Transcripts, Mean Carnegie Units Earned in Core High School Academic Fields, Percent of Students Whose Highest Level of High School Mathematics was Above Algebra 2, and Mean Number of Advanced Placement (AP) Courses, by Quintile of Academic Curriculum Intensity

	Core high school academic curriculum fields							
Academic curriculum intensity quintile	English	Math	Core lab science	Foreign languages	History and social studies	Computer science	Percent with highschool math above Algebra 2	Total AP courses
Highest	4.27	4.10	3.20	3.09	3.70	0.74	96.4	0.644
2nd	4.17	3.81	2.71	2.23	3.62	0.56	64.7	0.068
3rd	4.23	3.11	1.99	1.98	3.47	0.59	0	0.003
4th	4.10	2.98	1.36	0.74	3.44	0.61	0.71	0.019
Lowest	3.43	1.81	0.94	0.62	2.82	0.28	0.05	0.006

SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402).

Appendix L, Table L12.

Percentage Distribution of Final (December 2000) Education Status of 1988 Eighth-Graders, by Type and Timing of High School Diploma (if Any), and Including Those Who Did Not Earn High School Diplomas

Secondary/postsecondary status	Percent
1) Earned high school diploma by July 1992 and	
Earned at least a bachelor's degree	29.1 (0.94)
Associate degree was highest earned credential	4.7 (0.28)
Certificate was highest earned credential	2.8 (0.24)
No degree, but still enrolled in 2000	4.6 (0.33)
No degree, not enrolled in 2000	23.6 (0.79)
Never entered postsecondary education	13.1 (1.10)
2) Earned standard high school diploma *after* July 1992 and	
Earned at least a bachelor's degree	0.2 (0.12)
Associate degree was highest earned credential	0.3 (0.14)
Certificate was highest earned credential	0.2 (0.04)
No degree, but still enrolled in 2000	0.4 (0.14)
No degree, not enrolled in 2000	1.9 (0.29)
Never entered postsecondary education	1.6 (0.23)
3) Earned GEDs or certificates of attendance and	
Earned at least a bachelor's degree	0.1 (0.03)
Associate degree was highest earned credential	0.2 (0.05)
Certificate was highest earned credential	0.4 (0.14)
No degree, but still enrolled in 2000	0.8 (0.22)
No degree, not enrolled in 2000	2.8 (0.38)
Never entered postsecondary education	3.9 (0.46)
4) Others	
Did not graduate from high school, but entered postsecondary	1.0 (0.42)
Did not graduate from high school, no postsecondary	6.7 (0.65)
Indeterminable high school graduation status	1.7 (0.37)

NOTES: Standard errors are in parentheses. Percent column may not add to 100.0 due to rounding. Weight used throughtout this table is the F4BYWT with a base year (1988) flag. F4BYWT covers NELS:88/2000 students who were in both the base year (1988) sample and the 2000 follow-up survey sample. Weighted N=2.93M.
SOURCE: National Center for Education Statistics: NELS:88/2000 Postsecondary Transcript Files (NCES 2003-402 and Supplement).