

# Creating Pathways to Information Technology Careers through High School Career and Technical Education Programs

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## 1. Goals of the project

The Creating Pathways to IT Careers Project is a research partnership between Western Michigan University (WMU), the Illinois State Board of Education (ISBE), and a Research-to-Practice Team consisting of business and practitioner stakeholders. The purpose of this project is to determine factors that influence enrollment, completion, and employment experiences of high school females and other underrepresented groups in Career and Technical Education-Information Technology (CTE-IT) programs. Using population data collected by the Illinois State Board of Education regarding enrollment in secondary and postsecondary education and post-school employment, the project is investigating preparation for IT careers in the following areas: (a) counselor and teacher support strategies provided in high schools to recruit and retain students in CTE-IT programs; (b) student and school characteristics that influence CTE-IT program enrollment, school-directed work experience, and program completion; and (c) the influence of student and school characteristics and support strategies on employment and/or enrollment in postsecondary education in an IT field.

This research utilizes population data on students enrolled in CTE-IT programs collected by the Illinois State Board of Education (ISBE). ISBE datasets contain information on more than 300,000 students annually enrolled in CTE programs, including approximately 10,000 students enrolled in CTE-IT programs. Data for 10 school years, 1996 through 2005, have been analyzed through three specific studies. Cohort analyses include cross-sectional (year-by-year) and over-lapping four-year longitudinal panels.

## 2. Primary activities

Project activities include three studies and dissemination of findings. A description of the

general focus of each study, activities to date, and proposed activities follow.

### 2.1. Study 1:Teacher and counselor activities

The focus of Study 1 is to identify career counseling and student support strategies implicated in the research literature to recruit and retain female students in IT career programs, and to determine the extent to which secondary education guidance counselors and CTE-IT instructors in Illinois are aware of and use the implicated practices. We conducted a survey of school counselors working with students in grades 6 - 12 in Illinois public schools (N=2,900) and CTE-IT teachers (N=1,784) through parallel mail and web-based formats. Content of the surveys was derived from three sources: (a) specific career counseling and student support strategies implicated in the research literature, (b) counselor competencies outlined by the American School Counselor Association (ASCA), and (b) information regarding recruitment and retaining female students in IT career and related programs provided by National Partnerships in Equity (NAPE).

The surveys consisted of five sections. Section one focused on participants' work setting and caseload or course load. Sections two through five focused on career assessment activities, career planning activities, recruitment and support for students in STEM areas and nontraditional occupations, and respondent demographic information, respectively.

### 2.2. Study 2:Enrollment in CTE-IT programs

The focus of Study 2 is to determine the influence of student-level and school-level variables (including the strategies identified in Study 1) on enrollment, work-related, and completion experiences of four student groups (females and males, with and without disabilities) in CTE-IT programs. These analyses utilize the ISBE data sets and include cross-year and longitudinal investigations. Research questions focus on

determining the individual characteristics (e.g., gender, presence or absence of a disability, ethnicity, academic or economic disadvantage) and school characteristics (e.g., kind of school, geographical region, use of research-implicated strategies) of students who: (a) enroll in high school CTE-IT programs in Illinois, (b) participate in CTE-IT work experience, and (c) complete CTE-IT programs; and how such factors influence student completion of an IT curriculum.

In addition to those provided through previous research initiatives, ISBE has provided project staff with ISIS enrollment datasets for SY 2000 – 2001, 2001 – 2002, 2002 – 2003, 2003 – 2004, and 2004 – 2005 (which brings total data range to 1996 – 2005). Each dataset includes student and program demographic information and enrollment records for 300,000+ students. To date, we have analyzed over 2.7 million student records.

In addition to writing the extensive SAS programs to read and process the annual data sets, accounting for any changes in ISBE file structures, we established criteria for three sets of longitudinal student panels: (a) students who appear in ISIS datasets in each of four years ascending by grade (i.e., 9th, 10th, 11th, 12th); (b) students who appear in ISIS datasets in each of four years, and (c) students who appear in ISIS datasets in at least three of four years. We merged student records from the annual datasets to produce the three kinds of panels for seven cohorts of students (1996 – 1999, 1997 – 2000, 1998 – 2001, 1999 – 2002, 2000 – 2003, 2001 – 2004, and 2002 – 2005).

To analyze factors associated with enrollment, completion, and co-op work experience, we conducted logistic regression analyses with each of the 21 panels. Also, through much consultation with ISBE and IOES staff, we are continuing to develop a new “concentrator” outcome variable (as compared to “completer” variable), that will better describe students’ extent of concentration in a CTE-IT curriculum.

### **2.3. Study 3: Post-secondary experiences**

The focus of Study 3 is on the post-secondary experiences of students in relation to their levels of concentration in CTE-IT programs. Research questions pertain to investigating the extent to which individual-level and/or school-level factors influence employment or postsecondary education in an IT field. Study 3 will utilize data gathered by ISBE through access to several external data sets, such as those related to military and government

employment, state unemployment compensation, and postsecondary education enrollment.

We have negotiated initial data release agreements with ISBE and the University of Northern Illinois, ISBE’s agent for access to several of the post-secondary databases. No results from study 3 are yet available; future activities include final acquisition of post-secondary outcome data, development of data processing programs to establish the interface between enrollment and outcome data, and development of data analysis programs.

## **3. Primary results to date**

### **3.1. Study 1: Teacher and counselor activities**

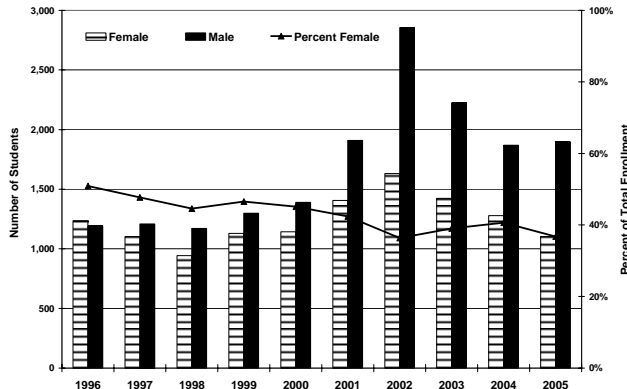
Survey response format was chosen by the respondent. After adjustment of the target population with information provided by school principals and elimination of declined or unusable responses, the net response rate for counselors and teachers was 40.7% and 36.3%, respectively. Approximately one-fourth of the counselors and over one-third of the teachers responded on-line. Approximately 75% of the counselors and 70% of the CTE-IT teachers were female.

Content of section four focused specifically on counselor and teacher use of recruitment and support activities associated with student involvement in occupations non-traditional for their gender, and specifically female enrollment in STEM areas. As indicated in Table 1, generally less than one-third of the respondents in each group were involved in curriculum or materials review for gender or ethnic bias, although many of the same individuals thought that such activities were within the scope of their jobs. Approximately half of the counselors actively recruited female students to courses or programs in the STEM areas, yet less than one-third of the CTE-IT teachers did so. Disturbingly, few counselors or teachers provided role models, mentors, or support groups for their STEM or non-traditional occupation students. Almost 40% of the CTE-IT teachers indicated that enrollment in NT programs was *not at all* emphasized in their school, whereas 55% indicated it was emphasized somewhat.

### **3.2. Study 2: Enrollment in CTE-IT programs**

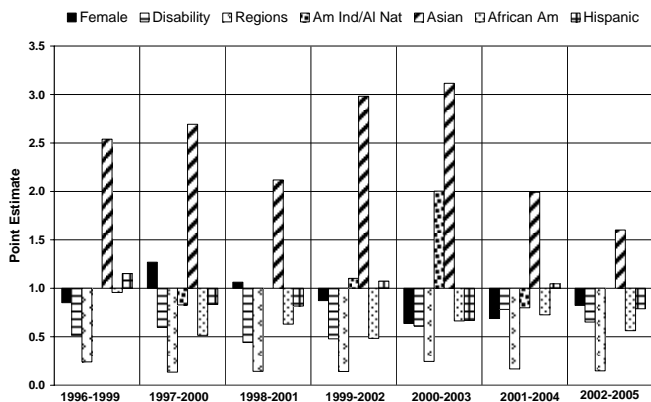
Cross sectional (year by year) analyses indicate changing enrollments in IT related programs over the past 10 years. Combined enrollment in the Computer Operations and Programming Cluster, Computer Programming, and Business Networking and

Telecommunications programs (CIP codes 521200, 521202, and 521204) has increased from 1996, although it appears to have peaked in 2002 (see Figure 1). Female enrollment has declined in these programs from around 50% to less than 40% of total enrollment.



**Figure 1. Enrollment in IT-specific CTE programs by gender from 1996 - 2005**

Analyses of the seven student cohorts (students with four years of records, by increasing grade) also indicate interesting relationships between enrollment and student and school characteristics. Figure 2 features a plot of the point estimates from the logistic regression analyses regarding the following comparisons: females to males; students with a disability to students without; students of various ethnicities to Caucasian, not Hispanic, students; and all other regions of the state to Chicago.



**Figure 2. Point estimates regarding likelihood of student enrollment in specific CTE-IT programs**

Applying a 95% confidence interval, results indicate that since 2002, females have been

significantly less likely than males to enroll in the CTE-IT programs named previously. Students of Hispanic ethnicity are equally likely as Caucasian students to enroll, whereas students of Asian ethnicity are more likely. Black students are significantly less likely to enroll. Where you go to school also matters—students across Illinois are much less likely to enroll in these programs than students in Chicago, which is probably indicative of program availability.

#### 4. Next steps and key open research questions

Our next steps include establishing the programs and analyses to interface the results of Study 1 (counselor and teacher activities) with the enrollment data in Study 2. Open research questions include the effects of counselor and teacher activities on student enrollment in IT and non-traditional occupational programs.

In addition, we will proceed with the post-secondary data acquisition to investigate the relationships between Study 1 variables, enrollment experiences, and postsecondary education and/or enrollment in an IT field.

#### 5. Dissemination of project findings

Our project team includes an ethnically and gender diverse group of faculty and graduate students representing special education; evaluation, measurement, and research; counselor education; career and technical education; educational technology; and business information systems. Our Research-to-Practice Team (RTPT), which meets annually, consists of business and practitioner stakeholders who contributed to survey development and implementation, and continue to be involved in evaluating and interpreting findings, developing dissemination strategies, and disseminating project results. The National Alliance for Partnerships in Equity has worked with project staff to compile the strategies regarding support for females in nontraditional occupations. In addition, project staff have both met and communicated regularly with ISBE personnel to ensure validity and reliability in project activities and to solve problems. We have presented at several state and national conferences and are developing a “webinar” for the National Dissemination Center for Career and Technical Education. A project website has been developed, to which study findings will be posted, at: [www.wmich.edu/ccrc](http://www.wmich.edu/ccrc).

**Table 1. Counselor and teacher activities recruiting and supporting students in STEM and nontraditional occupational areas**

	School Counselor						CTE-IT Teacher					
	Do the activity			Within job scope			Do the activity			Within job scope		
	n	Yes	%	n	Yes	%	n	Yes	%	n	Yes	%
<b>Review career planning materials and practices for:</b>												
Gender bias and/or "representation"	673	240	35.7	674	403	59.8	307	81	26.4	251	92	36.7
Racial or ethnic bias and/or "representation"	665	241	36.2	671	402	59.9	307	73	23.8	253	86	34.0
<b>Review curriculum and instructional materials for:</b>												
Gender bias and/or "representation"	675	165	24.4	670	251	37.5	307	102	33.2	250	113	45.2
Racial or ethnic bias and/or "representation"	668	158	23.7	665	245	36.8	304	94	30.9	247	108	43.7
<b>Provide specific information about non-traditional careers and/or programs for:</b>												
Students	684	498	72.8	677	574	84.8	306	167	54.6	258	166	64.3
Parents/Guardians	670	296	44.2	667	434	65.1	297	37	12.5	231	57	24.7
Educators	660	227	34.4	658	348	52.9	295	39	13.2	227	49	21.6
Administrators	652	172	26.4	654	312	47.7	293	29	9.9	225	46	20.4
<b>Conduct professional development regarding:</b>												
Gender and/or ethnic bias	681	102	15.0	670	246	36.7	305	44	14.4	239	51	21.3
NT careers and/or programs	686	119	17.4	670	274	40.9	303	44	14.5	239	57	23.9
Sexual harassment prevention	674	186	27.6	676	289	42.8	298	65	21.8	243	74	30.5
<b>Actively recruit:</b>												
Females to courses and/or programs in the STEM areas (science, technology, engineering, math)	676	348	51.5	668	413	61.8	305	93	30.5	243	98	40.3
Students for CTE programs non-traditional for their gender	674	318	47.2	666	399	59.9	300	93	31.0	233	99	42.5
<b>Provide role models and/or mentors for:</b>												
Females enrolled in the STEM areas	676	179	26.5	664	294	44.3	303	62	20.5	234	79	33.8
Students enrolled in CTE programs Non-traditional for their gender	669	166	24.8	667	292	43.8	300	69	23.0	234	85	36.3
<b>Provide support groups, peer counseling, or other support strategies for:</b>												
Females enrolled in the STEM areas	672	128	19.1	671	278	41.4	306	23	7.5	236	33	14.0
Students enrolled in CTE programs Non-traditional for their gender	667	120	18.0	669	273	40.8	303	29	9.6	234	38	16.2
<b>Identify:</b>												
STEM area work opportunities in the community for female students.	672	170	25.3	667	263	39.4	300	47	15.7	232	56	24.1
Nontraditional work opportunities in the community for students	667	182	27.3	666	266	39.9	300	63	21.0	235	69	29.4

*Note.* Respondents were asked to indicate whether or not they did the activity and whether they considered the activity to be within the scope of their job.