



NORTH DAKOTA
UNIVERSITY SYSTEM
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Education Pathways in Information Technology: Presentation to the Interim Higher Education Committee

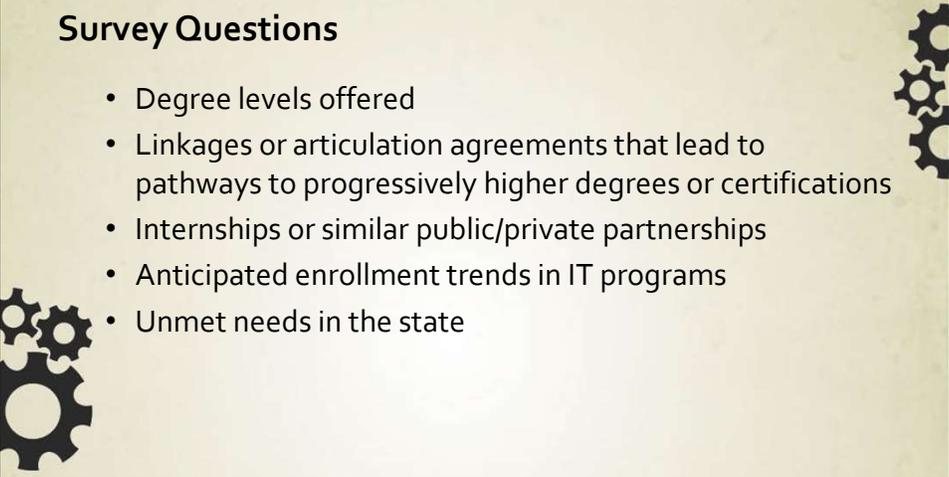
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Information Technology & Related Programs

Survey Questions

- Degree levels offered
- Linkages or articulation agreements that lead to pathways to progressively higher degrees or certifications
- Internships or similar public/private partnerships
- Anticipated enrollment trends in IT programs
- Unmet needs in the state



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Summary of Findings
Associate and Less Than Two-Year Certificate Programs

Program Name	Enrollments Fall 2015	Graduates 2015	Projected Enrollment Trend
Cybersecurity and Computer Networks (BSC)	53	11	Increase
Web Page Development and Design (BSC)	14	4	Unchanged
Computerized Office Management (DCB)	4	7	Decrease
Information Technology – WebDesign (DCB)	1	0	Decrease
Information Technology – WebMaster (DCB)	2	0	Decrease
Information Technology (DCB)	4	1	Decrease
Information Technology (LRSC)	11	1	Unchanged
Information and Communications Technology (NDSCS) <ul style="list-style-type: none"> • Web Developer • Web Design • IT Forensics and Security • Information Technology Support • Information Systems Administrator 	57	7	Increase
Information Technology (WSC)	15	7	Increase

Associate and Less Than Two-Year Certificates

Articulation and Linkages for Career Progression

- All programs have some or all of the following components (general education coursework, common course numbering, specific agreements) to facilitate transfer within the NDUS
 - Common [general education requirement transfer agreement](#) (GERTA)
 - Common course numbering in [computer information systems](#) and [computer science](#)
 - Program to program agreements ([example](#))
- Most of the certificate programs fulfill the first year of an Applied Associate Degree program
- VCSU, WSC, DCB, LRSC and Turtle Mountain Community College are members of the *Northern IT Consortium*: shared instructional resources
- Campus/program specific articulation agreements with MN colleges/universities

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Associate and Less Than Two-Year Certificates

Industry Certification for Career Progression

Some programs lead to business/industry certification such as:

- CompTia A+
- Microsoft C++
- Microsoft Client
- Microsoft Server
- Microsoft Server Infrastructure
- SAP Associate Certificate Examination
- Cisco
- Cisco Certified Network Associate Routing and Switching
- Cisco Certified Entry Networking Technicians
- CompTia Security+ (cybersecurity)
- CCNA Security (cybersecurity)

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Associate and Less Than Two-Year Certificates

Public and Private Business Relationships

- Internships are commonly available and required for some programs
- Community colleges are members of the *ND Information Council*
- Associate and certificate programs approved by the *ND Department of Career and Technical Education* have advisory committees composed of representatives of business and industry and meet at least twice a year
- NDUS community colleges report relationships with public and private organizations such as:

- Marco Equipment
- True IT
- High Points Network
- Codelation
- Myriad Mobile
- Fargo Moorhead Connect (includes Microsoft, Blue Cross, & RDO)
- Greater Fargo Moorhead EDC IT Task Force

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Associate and Less Than Two-Year Certificates

Campus Feedback Regarding IT Program Trends

- Difficulty exists recruiting qualified students into this program area
- There is a lack of awareness among students of the excellent and diverse employment opportunities with an associate degree in information technology or related field
- Courses and programs related to cybersecurity are expanding among campuses at all levels
- Campuses cited difficulty finding qualified faculty to fill cybersecurity positions

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Summary of Findings

Baccalaureate Programs and Post-Baccalaureate Programs

Program Name	Enrollments Fall 2015	Graduates 2015	Projected Enrollment Trend
Computer Science (DSU)	38	12	Increasing
Computer Technology Management (DSU)	15	9	Unchanged
Computer Information Systems, BS (MaSU)	15	2	Pending*
Computer Information Systems, BAS (MaSU)	0	2	Pending*
Applied Business Information Technology (MiSU)	9	2	Decrease
Applied Business Information Technology-Certificate (MiSU)	0	2	Unchanged
Management Information Systems (MiSU)	52	9	Unchanged
Computer Science (MiSU)	74	4	Increase
Computer Engineering (NDSU)	137	14	Unchanged
Management Information Systems (NDSU)	98	18	Decrease
Digital Enterprise-Post Baccalaureate (NDSU)	20	0	Unchanged
Computer Science (NDSU)	397	49	Increase

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Summary of Findings
Baccalaureate Programs and Post-Baccalaureate Programs (continued)

Program Name	Enrollments Fall 2015	Graduates 2015	Projected Enrollment Trend
Computer Science (UND)	253	32	Increase
Geographic Information Science – Post Baccalaureate (UND)	30 undergrad 39 grad	23	Increase
Information Systems (UND)	55	8	Unchanged
Computer Information Systems (VCSU)	16	8	Unchanged
Technology Education (VCSU)	13	7	Unchanged
Business Process Integration Management (VCSU) 	12	0	Increase
Software Engineering (VCSU) 	15	0	Increase
Customer Relationship Management - Certificate (VCSU)	0	0	Unchanged
Enterprise Applications - Certificate (VCSU)	0	0	Unchanged

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Baccalaureate Programs of Study

Articulation and Linkages for Career Progression

- Transferable general education requirements, common course numbering, and program specific articulation agreements facilitate progression between and among ND institutions
- Two computer information systems programs at MaSU placed on inactive status; difficulty attracting and retaining qualified faculty; possibly transitioning to a collaborative cybersecurity program instead
- Many four-year programs have individual agreements with ND, MN, and tribal colleges for specific IT programs
 - Many programs are designed for students to progress directly into a master's program following completion of the baccalaureate degree
 - Some of the programs facilitate teacher licensure as k-12 technology educators in North Dakota

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Baccalaureate Programs of Study

Public and Private Business Relationships

- Many students are offered paid internships/co-op opportunities; similarly senior capstone requirements may include projects with public/private partners
- Most programs require an internship or co-op experience as part of the curriculum
- Over 70 specific business partners cited by campuses

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Reported Relationships with Business and Industry...

ACIST Medical Systems • Andersen Corporation • Applied Engineering Inc. • Appareo Systems, LLC • ArcaSearch • Baanyan Software Services, Inc. • Basin Electric Power Cooperative • BAVE Technologies Inc. • BeMobile Verizon Wireless • Blue Cross Blue Shield of ND • Bobcat/Doosan • Border States Electric Supply • BPro Inc Cargill Inc. • Central Power • Cisco Systems, Inc. • Comcast • Dakota Gasification Co. • Deloitte & Touche LLP • Digi-Key (Thief River Falls, MN) • DISTek Integration, Inc. • Doosan Information & Communications America • Electric Squirrels • Emerson Process Management - Process Systems & Solutions • eTek IT Services • Fast Enterprises • LLC Flatirons Solutions (Boulder, CO) • Genius Minds LLC • Genus Technologies LLC • infoNERO • Intelligent InSites • John Deere • John Deere Electronic Solutions • Johns Hopkins Center for Talented Youth • KDV • Landis+Gyr • Leidholm Technologies • Maverick Software Consulting • Microsoft Corporation • Moorhead Public Service • NASA-Kennedy Space Center • National Information Solutions Cooperative • NDSU Information Technology Services • NDSU Upper Great Plains Transportation Institute • NetScout Systems, Inc. • North Dakota Center for Persons with Disabilities • Onsharp, Inc. • Open Access Technology Int'l, Inc. • Oracle • Pearson VUE • ProValid LLC • Renee Systems, Inc. • SA Tech/Resnet • SAP University Alliance • Savvy Computer Solutions, Inc. • Sensible • Souris River Telephone Communications • Tactical Network Solutions (Columbia, MD) • The Toro Company • TMI Hospitality • Trinity Health • TrueIT UTC Aerospace Systems • TSQ System • UND College of Engineering and Mines • Unigo Inc. • STEM Internal • Local city government offices and hospitals

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Baccalaureate Programs of Study

Campus Feedback Regarding Program Trends

- Courses and programs related to cybersecurity are expanding among campuses at all levels
- Campuses are searching for qualified faculty to fill cybersecurity positions
- Some campuses who have qualified faculty to teach cybersecurity are teaching overloads—seeking funds for this potential growth area

“We believe it is important to the IT industry to prepare teachers in k-12 to interest students in this career path and provide necessary critical thinking and introductory knowledge....”
Survey Response from VCSU

Summary of Findings Master's and Doctoral Programs

Program Name	Enrollments Fall 2015	Graduates 2015	Projected Enrollment Trend
Master's - Information Systems (MiSU)	64	34 master's	Increase
Master's and Doctorate – Computer Science (NDSU)	98	11 master's 1 doctorate's	Increase
Master's and Doctorate – Software Engineering (NDSU)	114	1 post bacc. 28 master's 3 doctorate's	Unchanged
Master's and Doctorate – Electrical and Computer Engineering (NDSU)	73	10 master's 12 doctorate's	Increasing
Master's and Doctorate – Computer Science (UND)	34	6 master's	Increasing
Master's – Technology Education – Concentration (VCSU)	30	11	Unchanged

NDUS Programs Aligning With High Need IT Job Categories in North Dakota

High Need SOC Code	High Need SOC Title	CIP Code	Corresponding CIP Title/NDUS Offerings
15-1132	Software Developers, Applications	11.0102	Artificial Intelligence
		11.0103	Information Technology**
		11.0104	Informatics
		11.0201	Computer Programming/Programmer, General**
		11.0202	Computer Programming, Specific Applications
		11.0701	Computer Science**
15-1133	Software Developers, Systems Software	11.0102	Artificial Intelligence
		11.0103	Information Technology**
		11.0104	Informatics
		11.0201	Computer Programming/Programmer, General**
		11.0202	Computer Programming, Specific Applications
		11.0401	Information Science/Studies**
15-1142	Network and Computer Systems Administrators	11.0101	Computer and Information Sciences, General**
		11.1001	Network and System Administration/Administrator
		11.1003	Computer and Information Systems Security/Information Assurance
15-1151	Computer User Support Specialists	11.1006	Computer Support Specialist.
15-1152	Computer Network Support Specialists	11.0201	Computer Programming/Programmer, General**
		11.0501	Computer Systems Analysis/Analyst**
		11.0701	Computer Science**
		11.0901	Computer Systems Networking and Telecommunications**
		11.1001	Network and System Administration/Administrator
		11.1002	System, Networking, and LAN/WAN Management/Manager**
		11.1003	Computer and Information Systems Security/Information Assurance
		11.1006	Computer Support Specialist

**Denotes this CIP Code/Program is offered by the NDUS

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NDUS IT Programs & More...

CIP Code 11.xxxx only

- Computer & Information Sciences & Support Services
- 2% of total student enrollment

CIP Code 11.xxxx plus others

- Includes:
 - 9.xxxx Digital Enterprise
 - 13.xxxx Technology Education
 - 14.xxxx Software Engineering
 - 45.xxxx Geographic Information Science
 - 52.xxxx Computing/Office Management
- 4% of student enrollment

Major Name	N	English	Reading	Math	Science	All Four
No Major Indicated	1,155	45	28	27	26	15
Undecided	835	64	43	42	38	24
Nursing, Registered (BS/RN)	284	60	36	33	34	16
Medicine (Pre-Medicine)	224	85	69	73	70	55
Business Administration and Management, General	154	66	39	43	40	25
Engineering (Pre-Engineering), General	126	82	62	74	62	48
Agriculture, General	113	59	30	43	38	13
Elementary Education	88	70	52	49	41	32
Physical Therapy (Pre-Physical Therapy)	83	83	55	59	54	34
Therapy and Rehabilitation, General	82	85	54	59	50	30
Teacher Education, General	81	74	46	49	38	25
Mechanical Engineering	80	64	46	59	44	34
Diesel Mechanics/Technology	76	24	13	22	20	7
Accounting	75	68	51	72	59	36
Mechanics and Repairers, General	73	37	15	18	22	7
Pharmacy (Pre-Pharmacy)	71	86	70	73	65	58
Biology, General	70	83	76	67	73	51
Computer and Information Sciences, General	68	76	49	68	62	40
Computer Science and Programming	67	76	60	66	66	43
Social Sciences, General	60	75	52	42	45	28
Music, General	59	66	46	53	41	34
Veterinary Medicine (Pre-Veterinarian)	59	66	39	47	34	20
Welding Technology	57	33	14	21	12	4
Athletic Training	56	63	32	45	30	11
Dentistry (Pre-Dentistry)	53	81	60	66	57	40
Psychology, Clinical and Counseling	53	79	55	38	34	26
Art, General	52	52	37	27	21	12
Architecture, General	51	71	37	61	45	27

Note: Undecided and/or No Major Indicated are included in the table, if applicable. The former refers to students who selected the option Undecided from the list of majors. The latter refers to students who did not respond to the question.

North Dakota ACT Data
Top Planned Majors: 2015 Graduates

Information Technology Shortages

North Dakota Information Technology Services (ITD)

The following positions are difficult to fill:

- Business Intelligence
- Web Designers
- Senior Programmers/Application Developers
- Senior System Administrators

"Applicants tend to have an entry level skill set and some job experience. Sometimes we hire entry level and work on training in specific areas. Most degrees require a Bachelor's degree or allow substitution of two years of the degree requirement with additional experience."

Information Technology Shortages

North Dakota Core Technology Services (CTS)

The following positions are difficult to fill:

- System Administrators and Senior System Administrators
- Network Analysts/Network Architects
- Programmer analysts
- Web Application Developers
- Database Administrators
- Application Analysts
- Library Application Analysts
- Security

"Most of the jobs require a Bachelor's degree in computer science, information systems, engineering, or a related field. Experience with PeopleSoft and an ERP environment are two specific qualifications that are challenging to find and critical to our business processes."

Questions/Comments



For More Information:

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