

APPROVED BY SENATE
04/26/2021

: COMPUTING FUNDAMENTALS, CERT

In Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)
2. 1434 Head (namato@illinois.edu; vmaresh@illinois.edu; egunter@illinois.edu)
3. KP Committee Chair (bsnewell@illinois.edu; danko@illinois.edu; kcp@illinois.edu; jmakela@illinois.edu)
4. KP Dean (candyd@illinois.edu)
5. University Librarian (jpwilkin@illinois.edu)
6. Grad_College (agrindly@illinois.edu; jch@illinois.edu; lowry@illinois.edu)
7. Provost (kmartens@illinois.edu)
8. Senate EPC (bjlehman@illinois.edu; moorhouz@illinois.edu; kmartens@illinois.edu)
9. Senate (jtempel@illinois.edu)
10. U Senate Conf (none)
11. Board of Trustees (none)
12. IBHE (none)
13. DMI (eastuby@illinois.edu; aledward@illinois.edu; dforgacs@illinois.edu)

Approval Path

1. Thu, 04 Feb 2021 17:30:28 GMT
Deb Forgacs (dforgacs): Approved for U Program Review
2. Fri, 05 Feb 2021 00:11:39 GMT
Elsa Gunter (egunter): Approved for 1434 Head
3. Tue, 23 Mar 2021 18:59:16 GMT
Keri Pipkins (kcp): Approved for KP Committee Chair
4. Tue, 23 Mar 2021 19:03:30 GMT
Candy Deaville (candyd): Approved for KP Dean
5. Tue, 23 Mar 2021 19:09:21 GMT
John Wilkin (jpwilkin): Approved for University Librarian
6. Thu, 01 Apr 2021 20:04:52 GMT
Allison McKinney (agrindly): Approved for Grad_College
7. Thu, 01 Apr 2021 21:23:59 GMT
Kathy Martensen (kmartens): Approved for Provost

New Proposal

Date Submitted: Tue, 02 Feb 2021 22:58:36 GMT

Viewing:: Computing Fundamentals, CERT

Changes proposed by: Viveka Kudaligama

Proposal Type

Proposal Type:

Major (ex. Special Education)

Proposal Title:

If this proposal is one piece of a multi-element change please include the other impacted programs here. example: A BS revision with multiple concentration revisions

Establish a Campus Graduate Certificate in Computer Science

EP Control Number

EP:21.105

Official Program Name

Computing Fundamentals, CERT

Effective Catalog Term

Fall 2021

Sponsor College

Grainger College of Engineering

Sponsor Department

Computer Science

Sponsor Name

Nancy Amato

Sponsor Email

namato@illinois.edu

College Contact

Harry Dankowicz, Associate Dean for Graduate, Professional, and Online Programs

College Contact Email

danko@illinois.edu

Program Description and Justification

Provide *abrief* description and justification of the program, including highlights of the program objectives, and the careers, occupations, or further educational opportunities for which the program will prepare graduates, when appropriate.

The proposed Graduate Certificate in Computing Fundamentals prepares students who have a Bachelors (or higher) degree, but not in computing, to transition into computing careers in industry or graduate studies in computer science. The Certificate consists of an onramp (or bridging courses) in programming, data structures, and algorithms. To prepare for the transition to industry or graduate studies, students complete an independent study project and a graduate-level elective. In addition, excursions seminars provide students with breadth in computing through engaging with guest speakers, reading scientific papers, and interacting with core computing tools.

The proposed Graduate Certificate in Computing Fundamentals consists of 20 credit hours, where up to 8 credit hours transfer to graduate degree programs (Masters program codes 1SKS0112MCSU, 10KS0112MCS, 10KS0112MS, 10KS4028MS; PhD program code 10KS0112PHD) in CS. The 8 credit hours of transferrable coursework may not include the bridging courses: CS 400, CS 401, CS 402, and CS 403.

The proposed Certificate will be offered as part of the iCAN (Illinois Computing Accelerator for Non-specialists) program.

<https://cs.illinois.edu/academics/graduate/ican>

Corresponding Degree

CERT Campus Graduate Certificate

Is this program interdisciplinary?

No

Academic Level

Graduate

Will you admit to the concentration directly?

No

Is a concentration required for graduation?

No

CIP Code

11.0701 - 11.0701

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Institutional Context

University of Illinois at Urbana-Champaign

Describe the historical and university context of the program's development. Include a short summary of any existing program(s) upon which this program will be built.

Explain the nature and degree of overlap with existing programs and, if such overlap exists, document consultation with the impacted program's home department(s).

This is a new program that does not build upon any existing program. There is no overlap of this program with any existing program.

University of Illinois

Briefly describe how this program will support the University's mission, focus and/or current priorities. Demonstrate the program's consistency with and centrality to that mission.

The mission of the University and the CS department is to provide an education in computing to society at large. Unfortunately, the population makeup of undergraduate students in CS (and more generally STEM disciplines) is not representative of the demographics of Illinois. This results in a skewed representation at the graduate level and the computing industry as well. Although there is a high demand for employees in the computing field, entry into the field is difficult. The proposed Certificate program provides a strong foundation in computing fundamentals to postbaccalaureate students without a computing background so that they can enter the computing field. It is especially designed with such students in mind by building on their broad set of transferable skills (e.g., problem solving, creativity, dealing with complexity, focus) and on the knowledge such individuals bring from their respective fields. Additionally, this program's aim is to broaden participation in computing by forming a cohort whose demographics align with the state of Illinois.

State of Illinois

Indicate which of the following goals of the Illinois Board of Higher Education's Strategic Initiative are supported by this program: (choose all that apply)

High Quality Credentials to Meet Economic Demand - Increase the number of high-quality post-secondary credentials to meet the demands of the economy and an increasingly global society.

Integration of Educational, Research and Innovation Assets - Better integrate Illinois' educational, research and innovation assets to meet economic needs of the state and its regions.

Describe how the proposed program supports these goals.

There is a high demand for employees in the computing field, but entry into the field is difficult. As a result, there are not enough CS graduates to fill the high demand. The proposed Certificate program fills this gap by providing a pathway for non-computing college graduates to gain the skills and training necessary to enter into the computing industry or our top CS graduate program at Illinois.

Admission Requirements

Desired Effective Admissions Term

Fall 2021

Provide a brief narrative description of the admission requirements for this program. Where relevant, include information about licensure requirements, student background checks, GRE and TOEFL scores, and admission requirements for transfer students.

The admission requirements for this program include a bachelor's degree in a non-computing background from a regionally accredited college in the United States or a comparable degree from a recognized institution of higher learning abroad and English proficiency. The criteria for admissions rely upon two main parts: the application (academic transcripts, reference letters, resume, and short essays) and an interview (problem-solving assessment). The admission process for the proposed Certificate is a holistic evaluation of the applicant.

Describe how critical academic functions such as admissions and student advising are managed.

The Program Director will provide oversight to professional staff with additional support from program faculty, to manage the admissions process and student advising. The CS department has received approval to hire a program coordinator, but interim staff support is available in the department.

Enrollment

Number of Students in Program (estimate)

Year One Estimate

20

5th Year Estimate (or when fully implemented)

200

Estimated Annual Number of Degrees Awarded**Year One Estimate**

20

5th Year Estimate (or when fully implemented)

200

What is the matriculation term for this program?

Fall

What is the typical time to completion of this program?

2 years

What are the minimum Total Credit Hours required for this program?

20

Delivery Method**This program is available:**

On Campus and Online

Describe the use of this delivery method:

The program will be delivered on-campus and online. Online delivery will be offered in a synchronous or asynchronous format through videoconferencing technology such as Zoom and will utilize learning management systems such as Compass to disseminate materials, post videos, etc. CS department requests two dedicated program codes to differentiate the on-campus program and the online program. Program code 10KS0112NDEG currently in use at the department for the iCAN program. This can be repurposed for the on-campus program. A new program code will be required for the online program.

Budget**Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?**

Yes

Please explain/describe:

The program will require a program coordinator. This position has been requested and approved. We expect to fill it in spring 2021.

Additional Budget Information

We do not foresee any major impact on faculty hiring in the near term. The courses are already being offered and enrollments are expected to increase as a result of the proposed Certificate. Additional enrollment may require the expenditure for additional Teaching Assistants to help staff discussion sections, computing labs and office hours of CS core courses. These additional expenditures should be offset by the increase in revenue from the tuition to the instructional unit.

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/ acknowledgement from faculty, students, and/or other impacted units as appropriate.

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

We currently have two faculty dedicated to teaching classes in this program. If the enrollment increases beyond the capacity of two faculty members, additional faculty will be hired. Thus, this Certificate program will not impact faculty resources, class sizes, or teaching loads. We will need a program coordinator, and this position has been requested and approved. We expect to fill the position in spring 2021.

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

Students in the program will rely on the university library for online materials (e.g., books and research papers) and physical books. The program does not anticipate any special demands on the University Library.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

Financial Resources

How does the unit intend to financially support this proposal?

CS will oversee the proposed Certificate, directed by Teaching Professor Tiffani Williams, and will offer the required classes at least once per year.

Will the unit need to seek campus or other external resources?

No

Are you seeking a change in the tuition rate or differential for this program?

No

Is this program requesting self-supporting status?

No

Market Demand

What market indicators are driving this proposal? If similar programs exist in the state, describe how this program offers a unique opportunity for students:

The Bureau of Labor Statistics has demonstrated a need for a larger U.S. workforce in computer science. As a result, there has been a rise in coding bootcamps, MOOC certificates, and micro-credentials in order to gain entry into computing. In October 2020, Eduventures performed a market research study of our iCAN program. (The proposed Certificate will be offered as part of the iCAN program.) Eduventures analysis details the rise in competition from coding bootcamps (see attached document, pg 20). Their prediction is that coding bootcamp graduates will outnumber domestic CS master's degrees awarded in 2020. While iCAN is not a coding bootcamp, iCAN does appeal to students who may be interested in bootcamps—especially since a typical student enrolled in a coding bootcamp already possesses a bachelor's degree. Moreover, Eduventures analysis shows that non-degree/postbaccalaureate programs are likely to outpace master's degree growth in the coming years because of speed, convenience, and lower cost (see attached document, pg 21). The potential to ladder up to a master's degree is another positive factor for growth of non-degree/postbaccalaureate certificate programs.

What type of employment outlook should these graduates expect? Explain how the program will meet the needs of regional and state employers, including any state agencies, industries, research centers, or other educational institutions that expressly encourage the program's development.

Nationwide, there is a strong demand for computing experts in government and public sectors, in corporations of all sizes, in nonprofit organizations, and in colleges and universities. According to the U.S. Bureau of Labor Statistics (BLS) Occupational Outlook Handbook, employment in computer and information technology occupations is projected to grow 11% by 2029, much faster than the average for all occupations. Within computer and information technology occupations, the employment of software developers is projected to grow 22% by 2029 according to BLS.

What resources will be provided to assist students with job placement?

CS will incorporate recruiting opportunities (such as through its Corporate Connection program) for students in the proposed Certificate program. Moreover, CS will work to connect students with the Career Center at Illinois as well as Engineering Career Services.

If letters of support are available attach them here:

UIUC_iCAN Program_Final.pdf

Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

The learning objectives for the program are the following.

- Exhibit proficiency in the design, implementation, and testing of software.
- Demonstrate skills and experience working in small teams in order to solve problems; design, implement, and test code; and learn from one another.
- Apply algorithmic and theoretical computer science principles to solve computing problems from a variety of application areas.
- Demonstrate the ability to learn and develop competencies in specialized or emerging computer science fields.
- Demonstrate the ability to read, analyze, and discuss research papers.

Students will be assigned letter grades appropriate to the course subject.

Every two years we will assess whether students are meeting program goals for each course and survey alumni to measure how effective their training was for future success. These metrics will then be used to make changes to the program and evaluate if the changes are effective.

There are no licensures or certifications that the program aligns with or needs to meet.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

"Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses" (source: <https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf>). For proposals for new bachelor's degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

For new programs, attach Program of Study

GC_Computing Fundamentals_Program of Study.docx

Catalog Page Text

Catalog Page Text: Description of program for the catalog page. This is not official content, it is used to help build the catalog pages for the program. Can be edited in the catalog by the college or department.

associate dean for graduate, professional and online programs: Harry Dankowicz

overview of admissions & requirements: <https://grainger.illinois.edu/academics/graduate>

overview of grad college admissions & requirements: <https://grad.illinois.edu/admissions/apply>

college website: <https://grainger.illinois.edu/>

address: 402 Engineering Hall, 1308 W Green St, Urbana, Illinois 61801

phone: (217) 244-2745

email: enr-gpp@illinois.edu

The Graduate Certificate in Computing Fundamentals provides students with Bachelor's degree or higher in a non-computing discipline with an accelerated foundation in computing fundamentals. The Graduate Certificate requires four bridging courses in fundamentals of computing and algorithms and two excursions in computing courses. To allow flexibility and gain deeper knowledge in a computing subject of interest, students are required to complete an independent study along with a graduate-level elective.

The Graduate Certificate in Computing Fundamentals requires a minimum of 20 credit hours distributed over eight courses as follows. A course cannot be used to satisfy more than one requirement within the certificate.

Statement for Programs of Study Catalog

Graduation Requirements

Minimum Cumulative GPA:2.75 (as required for awarding of the Campus Graduate Certificate)

Minimum hours required for certificate completion: 20 hours

Students who have successfully completed this certificate may use the certificate to satisfy the following degree requirements, subject to department approval, and provided they apply and are admitted to the degree program:

- 8 hours of breadth or elective course coursework for Master of Computer Science
- 8 hours of breadth or elective coursework for Master of Science in Computer Science
- 8 hours of required or elective coursework for Master of Science in Bioinformatics: Computer Science
- 8 hours of elective coursework for PhD in Computer Science

* The 8 credit hours of transferrable coursework may not include the bridging courses: CS 400, CS 401, CS 402, and CS 403.

** A letter grade of B or above, or an S is required for transfer.

Coursework Requirements

| Code | Title | Hours |
|------------------------|---|-----------|
| Core Coursework | | 17 |
| CS 400 | Accelerated Fundamentals of Computing I (Accelerated Fundamentals of Computing I) | 3 |
| CS 401 | Accelerated Fundamentals of Algorithms I (Accelerated Fundamentals of Algorithms I) | 3 |
| CS 402 | Accelerated Fundamentals of Computing II (Accelerated Fundamentals of Computing II) | 3 |

| | | |
|------------------------------|---|-----------|
| CS 403 | Accelerated Fundamentals of Algorithms II (Accelerated Fundamentals of Algorithms II) | 3 |
| CS 491 | Seminar (Section: Seminar – Excursions in Computing I) | 1 |
| CS 491 | Seminar (Section: Seminar – Excursions in Computing II) | 1 |
| CS 597 | Individual Study | 3 |
| Additional Coursework | | 3 |
| Elective 400-level CS course | | 3 |
| Total Hours | | 20 |

EP Documentation

Attach Rollback/Approval Notices

Re_ Questions Regarding EP 21105_ Graduate Certificate in Computing Fundamentals (UPDATED).pdf

DMI Documentation

Key: 1050

From: [Amato, Nancy M](#)
To: [Pahre, Jennifer N](#)
Cc: [Lehman, Barbara J](#); [Martensen, Kathy](#); [Viswanathan, Mahesh](#); [Williams, Tiffani L](#)
Subject: Re: Questions Regarding EP 21.105: Graduate Certificate in Computing Fundamentals (UPDATED)
Date: Wednesday, April 7, 2021 11:26:44 PM
Attachments: [Outlook-qxsladdt.png](#)
[Outlook-fall2nyk.png](#)

(Note: Please consider this version - my previous response was missing the full response to question 5....)

Hi Jennie,

Thank you again for prompt consideration of our proposal. We are glad to hear you all are as excited by the program as we are.

I've copied the questions below and followed them with our responses. I'm also copying Mahesh Viswanathan, our Associate Head for Academics, and Tiffani Williams, our Director for Onramp Programs. Tiffani has developed the iCAN curriculum and courses, and is one of the primary instructors in the program. If you have questions, hopefully one of the three of us can answer them, and if we cannot we'll find someone who can. Please let me know if you'd like to set up a meeting to talk through any of this.

-Nancy

1. We note that this is a 20-hour program, contemplating two years of completion time. This seems burdensome for a certificate; it is more in line with a Master's degree. One member of my committee worries about the cost, particularly as the proposal notes that the program will specifically target people from diverse backgrounds. Can you offer some perspective on why the program requires 20 hours?

Response: The iCAN curriculum is designed for completion in one year, 3 semesters (fall, spring, summer). In the proposal, we were required to enter the longest length of time (2 years) to complete the program and not the average length of time (1 year). The longest length of time is based on the maximum time requirement for a Campus Graduate Certificate.

The minimum number of credit hours required for a Campus Graduate Certificate is 12 hours. The iCAN program is 8 hours over the minimum requirement. We believe these additional hours over the minimum requirement offers a credential that provides depth and breadth in computing fundamentals from a top 5 computer science department. Moreover, the additional 8 hours can be applied towards a graduate degree in computer science.

The iCAN curriculum is modeled after Northeastern's 16-hour Align program (<https://bit.ly/2OuxfPn>). The Align bridging program does not lead to a credential. As a result, Align students have the foundation to enter Northeastern's 32 credit hour MSCS degree program. (4 hours of the Align program transfer to the MSCS.) In general, students with little or no background in computing do not have the CS background to be admitted to CS graduate programs. Bridging programs like iCAN

and Northeastern Align provide a pathway to a Masters or PhD degree in computer science.

In terms of cost, since the iCAN program will offer a Campus Graduate Certificate, it is expected that iCAN students will have access to federal financial aid. The iCAN program is working with corporate and philanthropic partners to offer scholarships. For example, the iCAN program has received a \$325K donation from FaceBook.

2. Only 8 hours of credits will transfer if students wish to pursue a master's degree. What is the reason for this?

Response: There are 12 hours of CS bridging courses (CS 400, CS 401, CS 402, CS 403), which cannot be used for graduate credit in CS. The remaining 8 hours of the iCAN program can be used for graduate credit. Thus, 8 out of 20 (or 40%) credits are transferable for graduate credit in CS.

In comparison, 4 out of 16 hours (or 25%) of Northeastern Align's bridging credits are transferable for graduate credit in CS.

3. This certificate is already listed on the iCAN website and applications for fall 2021 are open. Yet, this proposal is not yet approved. This sometimes happens when staff in units get ahead of the process. Is that what happened here?

Response: Currently, the iCAN program offers a "little c" certificate, which is approved at the department level. There are relatively few restrictions or requirements on "little c" certificates. As such, "little c" certificates are not transcriptable nor eligible for federal financial aid.

Our proposal is for a "big C" certificate or Campus Graduate Certificate, which comes with a number of benefits that include being transcriptable as well as access to federal financial aid.

Our pilot cohort, which started in Fall 2020, is for a "little c" certificate. We expect to have our first graduating class in Summer 2021.

4. Large enrollment is expected downstream (200 by the fifth year). How will the administrative burden be managed—is there approval to hire a coordinator?

Response: We are currently interviewing for a iCAN Program Specialist/Coordinator and Academic Specialist (Job ID: 138975). We expect to have this person on board in May 2021.

5. Multiple required courses (CS 400-403) are listed as not existing yet, but it looks in CIM like they were all recently approved. (It seems to me that this is a simple timing issue.) The proposal says that no additional resources are needed because these courses are already being taught (but it is not clear if that is true for CS 400-403). If these are

new courses, are instructors lined up to teach them.

Response: The material for the CS 400-403 courses has been first taught in CS 498 courses in Fall 2020 and Spring 2021 by Profs. Yael Gertner and Tiffani Williams. Starting in Fall 2021, both professors will be able to offer their previously taught CS 498 courses as regularly scheduled CS 400-403 courses. Thus, we do not see any additional resources required for teaching these courses.

On 4/7/21 12:58 PM, Pahre, Jennifer N wrote:

Nancy,

Thank you for your very prompt reply. I look forward to your response, and we can certainly chat on Friday if further clarification would be helpful.

All best,

Jennie

I ILLINOIS

College of Law

Jennifer N. Pahre

Director of Undergraduate Studies

Assistant Teaching Professor

University of Illinois College of Law

504 East Pennsylvania Avenue

Champaign, Illinois 61820

Pronouns: She/her/hers

Under the Illinois Freedom of Information Act (FOIA), any written communication to or from University employees regarding University business is a public record and may be subject to public disclosure.

From: Amato, Nancy M <namato@illinois.edu>

Sent: Wednesday, April 7, 2021 12:55 PM

To: Pahre, Jennifer N <jpahre@illinois.edu>

Cc: Lehman, Barbara J <bjlehman@illinois.edu>; Martensen, Kathy

<kmartens@illinois.edu>

Subject: Re: Questions Regarding EP 21.105: Graduate Certificate in Computing Fundamentals

Hi Jennie,

Thanks for your interest/support - we are excited about iCAN as well. We'll read your questions carefully and prepare a response - I'll try to get back to you by

tomorrow. It might be helpful for us to also discuss them in case there are any questions based on our written response and I'd be happy to set up a time to talk tomorrow or Friday if you would find that useful. Please let me know.

-Nancy

On 4/7/21 12:47 PM, Pahre, Jennifer N wrote:

Dear Professor Amato,

I hope your week is going well.

I'm currently the head of Subcommittee A of the Senate Educational Policy Committee. Our subcommittee was assigned the task of reviewing EP.21.105, the proposal is to create a new graduate certificate in Computing Fundamentals.

The subcommittee is firmly in favor of the proposal. We think that broadening CS training so that non-CS majors can be ready to enter CS fields is an excellent undertaking.

Several members of my subcommittee had a few questions, and as you are the listed sponsor, I'm reaching out for your thoughts. If possible, I would like to address these questions before the next meeting (on Monday), to facilitate the proposal's swift approval.

1. We note that this is a 20-hour program, contemplating two years of completion time. This seems burdensome for a certificate; it is more in line with a Master's degree. One member of my committee worries about the cost, particularly as the proposal notes that the program will specifically target people from diverse backgrounds. Can you offer some perspective on why the program requires 20 hours?
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The proposal says that no additional resources are needed because these courses are already being taught (but it is not clear if that is true for CS 400-403). If these are new courses, are instructors lined up to teach them.

I look forward to your response and thank you in advance for your kind assistance.

Best regards,

Jennie Pahre

I ILLINOIS

College of Law

Jennifer N. Pahre

Director of Undergraduate Studies

Assistant Teaching Professor

University of Illinois College of Law

504 East Pennsylvania Avenue

Champaign, Illinois 61820

Pronouns: She/her/hers

Under the Illinois Freedom of Information Act (FOIA), any written communication to or from University employees regarding University business is a public record and may be subject to public disclosure.

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Nancy M. Amato
Abel Bliss Professor and Head, Department of Computer Science

University of Illinois at Urbana-Champaign
2232 Siebel Center, 201 N. Goodwin Ave., Urbana IL 61801
+1-217-333-3426, namato@illinois.edu
head@cs.illinois.edu (for scheduling or administrative contact)
+++++

PS. I have multiple openings for postdocs - pls share with your students
and others: <http://cobotfactory.web.illinois.edu/>

PPS. Check out iCAN (Illinois Computing Accelerator for Non-Specialists),

a 1-year program for non-computing college graduates. A bridge to a career
in tech or grad studies. Applications for our second cohort are open now!

<http://cs.illinois.edu/ican>

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+++++
Nancy M. Amato
Abel Bliss Professor and Head, Department of Computer Science
University of Illinois at Urbana-Champaign
2232 Siebel Center, 201 N. Goodwin Ave., Urbana IL 61801
+1-217-333-3426, namato@illinois.edu
head@cs.illinois.edu (for scheduling or administrative contact)
+++++

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<http://cs.illinois.edu/ican>

PROGRAM OF STUDY

Requirements

| | | |
|------------------------------|---|-----------|
| Core Coursework | | 17 |
| CS 400 | Accelerated Fundamentals of Computing I | 3 |
| CS 401 | Accelerated Fundamentals of Algorithms I | 3 |
| CS 402 | Accelerated Fundamentals of Computing II | 3 |
| CS 403 | Accelerated Fundamentals of Algorithms II | 3 |
| CS 491 | Seminar – Excursions in Computing I | 1 |
| CS 491 | Seminar – Excursions in Computing II | 1 |
| CS 597 | Individual Study | 3 |
| Additional Coursework | | 3 |
| Elective 400-level CS course | | |
| Total Hours | | 20 |

Other Requirements and Conditions (may overlap)

Minimum Cumulative GPA: 2.75 (as required for awarding of the Campus Graduate Certificate)



Membership matters.

Illinois Computer Accelerator for Non-Specialists (iCAN) Non- Degree Program

University of Illinois – Urbana Champaign

October 2020



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About the Study



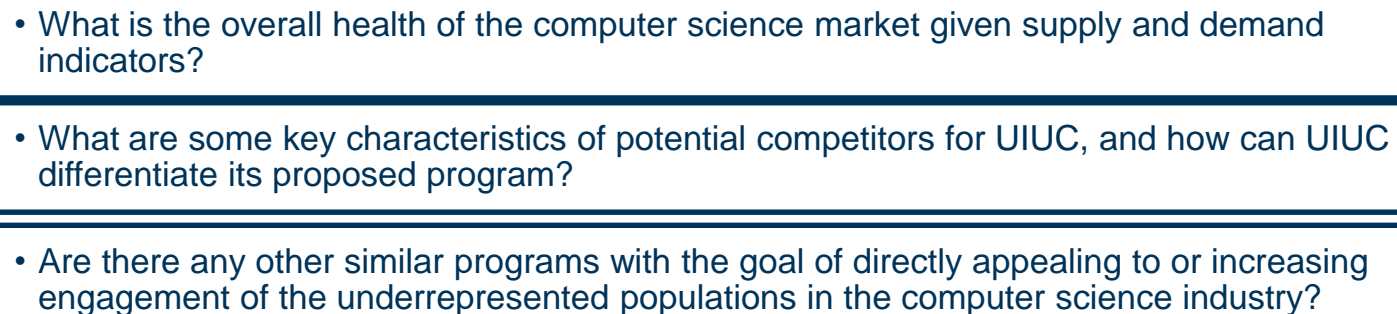
Project Background

University of Illinois at Urbana Champaign (UIUC)
Urbana-Champaign, IL

PROGRAM: Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

UIUC recently launched the iCAN (Illinois Computer Accelerator for Non-Specialists) non-degree program, which will enroll its first set of students in the 2020-2021 academic year. The program is a three semester (fall, spring, summer), full-time non-degree program. Students will receive a “computer fundamentals certificate” upon completion, as well as a number of graduate-level computer science credits. The program will be offered on UIUC’s Urbana-Champaign campus, but eventually in Chicago as well as via an online format. Although the program was designed to be face-to-face, it will be offered via distance learning in the upcoming academic year because of COVID-19. Targeted to students with a bachelor’s degree, the program is designed for students without a computer science-related background who are interested in learning more about the field or making a career switch. The program also focuses on broadening participation in computer science and aims to focus on populations that are underrepresented in computer science (i.e., women, Black/African American and Latinx groups). The first two semesters of iCAN act as an on-ramp. The third semester acts as an off-ramp, which includes a group research project with a faculty member or a project related to industry depending on the students’ intended outcomes. The third semester will be offered either as a group research project with a faculty member or a project related to industry depending on the students’ intended outcomes. Program outcomes are envisioned as two pathways: 1) graduate degree (Masters or PhD) in computer science; or 2) entry-level tech role.

The key research questions addressed in this study are:

- 
- What is the overall health of the computer science market given supply and demand indicators?
 - What are some key characteristics of potential competitors for UIUC, and how can UIUC differentiate its proposed program?
 - Are there any other similar programs with the goal of directly appealing to or increasing engagement of the underrepresented populations in the computer science industry?

Methodology

Eduventures leveraged the following data sources to investigate the market for this program:

encoura
Eduventures®
Research



Program Demand

Eduventures consulted the National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS) database to analyze national degree conferral and provider trends for the years 2014-2019, as reported to the Classification of Instruction Program Codes (CIP Codes). Analyzed CIP codes for this study can be found on slide 6. The region for this study is defined as the following states: Iowa, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. Eduventures also provided insights from previous research to gain further insights into the market.

Competitive Landscape

Eduventures consulted IPEDS degree completions data for the selected CIP codes to identify institutions nationally and regionally reporting relevant post baccalaureate certificates and provided their 2019 conferrals, compound average growth rate (CAGR), year-over-year growth rate, program name, whether their program targets those without a computer science background, and whether the program seeks to increase access in the field. The study focuses on postbaccalaureate certificates as these are the credential that most closely aligns to the iCAN program. Eduventures also conducted a targeted web scan to identify additional providers and included examples of relevant courses or programs from MOOC platforms, as well as master's degree programs in line with iCAN.

Competitive Insights

Leveraging a web scan and program demand data from IPEDS, Eduventures identified aligned or relevant programs to provide competitive analysis. Information collected in this review includes information on modality, program structure, whether graduate credits are earned, admissions information, curriculum notes, pricing, target audience, marketing themes, career outcomes and curriculum details.

Labor Market Demand

Eduventures analyzed projected growth for SOC codes aligned to the iCAN program in order to provide additional insights into the viability of the proposed program. Relevant SOC codes can be found on slides 7-8.

Prospective Adult Survey

Eduventures analyzed proprietary data from the Eduventures June 2020 Adult Prospect Survey to learn more about adult prospective students interested in certificate programs (undergraduate and graduate). Eduventures relied on national data (n=2,270) as well as data on adults who said they were interested in returning to school for a certificate program (n=124).

Methodology

Eduventures examined the following CIP Codes related to the iCAN program to assess degree conferral and provider trends:

| CIP Codes | Program Description |
|--|--|
| Computer and Information Sciences (11.0101) | A general program that focuses on computing, computer science, and information science and systems. Such programs are undifferentiated as to title and content and are not to be confused with specific programs in computer science, information science, or related support services. |
| Computer Science (11.0701) | A program that focuses on computer theory, computing problems and solutions, and the design of computer systems and user interfaces from a scientific perspective. Includes instruction in the principles of computational science, computer development and programming, and applications to a variety of end-use situations. |

The CIP codes selected above were chosen as Eduventures analysis shows that institutions tend to use both CIP codes for computer science-aligned programs. It is important to note that Eduventures research has found that programs related to computer science, cybersecurity, and information technology are all reported to these CIP codes.



Methodology

Eduventures examined the following SOC Codes aligned to the iCAN program:

| CIP Codes | Program Description |
|--|---|
| Computer and Information Research Scientists (15-111) | Conduct research into fundamental computer and information science as theorists, designers, or inventors. Develop solutions to problems in the field of computer hardware and software. |
| Computer and Information Systems Managers (11-3031) | Plan, direct, or coordinate activities in such fields as electronic data processing, information systems, systems analysis, and computer programming. Excludes "Computer Occupations" (15-1211 through 15-1299). |
| Computer Network Architects (15-1241) | Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning, including analysis of capacity needs for network infrastructures. May also design network and computer security measures. May research and recommend network and data communications hardware and software. Excludes "Information Security Analysts" (15-1212), "Computer Network Support Specialists" (15-1231), and "Network and Computer Systems Administrators" (15-1244). |
| Computer Network Support Specialists (15-1152) | Analyze, test, troubleshoot, and evaluate existing network systems, such as local area networks (LAN), wide area networks (WAN), cloud networks, servers, and other data communications networks. Perform network maintenance to ensure networks operate correctly with minimal interruption. Excludes "Computer Network Architects" (15-1241) and "Network and Computer Systems Administrators" (15-1244). |
| Computer Programmers (15-1131) | Create, modify, and test the code and scripts that allow computer applications to run. Work from specifications drawn up by software and web developers or other individuals. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information. |
| Computer Systems Analysts (15-1211) | Analyze science, engineering, business, and other data processing problems to develop and implement solutions to complex applications problems, system administration issues, or network concerns. Perform systems management and integration functions, improve existing computer systems, and review computer system capabilities, workflow, and schedule limitations. May analyze or recommend commercially available software. |

Methodology

Eduventures examined the following SOC Codes aligned to the iCAN program:

| CIP Codes | Program Description |
|--|--|
| Database Administrators (15-1242) | Administer, test, and implement computer databases, applying knowledge of database management systems. Coordinate changes to computer databases. Identify, investigate, and resolve database performance issues, database capacity, and database scalability. May plan, coordinate, and implement security measures to safeguard computer databases. Excludes "Information Security Analysts" (15-1212) and "Database Architects" (15-1243). |
| Information Security Analysts (15-1122) | Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. Assess system vulnerabilities for security risks and propose and implement risk mitigation strategies. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses. Excludes "Computer Network Architects" (15-1241). |
| Network and Computer Systems Administrators (15-1142) | Install, configure, and maintain an organization's local area network (LAN), wide area network (WAN), data communications network, operating systems, and physical and virtual servers. Perform system monitoring and verify the integrity and availability of hardware, network, and server resources and systems. Review system and application logs and verify completion of scheduled jobs, including system backups. Analyze network and server resource consumption and control user access. Install and upgrade software and maintain software licenses. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software. Excludes "Information Security Analysts" (15-1212), "Computer Network Support Specialists" (15-1231), and "Computer User Support Specialists" (15-1232). |
| Software Developers (15-1132) | Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems, and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team. |
| Web Developers (15-1134) | Develop and implement websites, web applications, application databases, and interactive web interfaces. Evaluate code to ensure that it is properly structured, meets industry standards, and is compatible with browsers and devices. Optimize website performance, scalability, and server-side code and processes. May develop website infrastructure and integrate websites with other computer applications. Excludes "Special Effects Artists and Animators" (27-1014). |

Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

Executive Summary



Key Findings

- **Program demand shows overall growth in computer science market with small number of certificates, though non-degree market shows strong potential.** Overall, the computer science market has shown growth in the last few years with bachelor's and master's degrees dominating the market. Though the certificate market is small, declines in master's degrees in the field and multiple indicators for future non-degree market growth point to strong potential. The recent growth of non-degree programs (particularly bootcamps) as well as Eduventures projections for growth of non-degree programs are especially key for iCAN.
- **An overview of the competitive landscape shows few providers that specifically target those without a computer science background and none that focus on increasing access to underrepresented populations.** NCES IPEDS data and a targeted web scan show few higher education providers with relevant non-degree programs, and MOOC platforms offer few relevant programs or courses. Eduventures analysis does reveal a handful of master's degree programs that are in line with iCAN's proposed format, as well as a new school (College of Computing) being launched by MIT that may act as a competitor in the future.
- **Competitive analysis shows marketing focus on programs' target audience and entry to master's program, but career outcomes are not detailed.** Almost all the examined programs are offered on-campus with only one having an online modality. UIUC's pricing for in-state students is on the low end of the examined competitors but the out-of-state cost is on the high end. Marketing themes generally focus on the idea of career advancement, as well as entry to a master's program, but detailed information on career outcomes is not typical. Curriculum offerings have little flexibility for students in coursework selection with several programs offering choice in one or two elective courses.
- **Labor market points to bachelor's degree as point of entry for aligned occupations and projects almost all occupations to have above average growth with computer programmers as exception.** Both nationally and regionally*, computer programmers are projected to have negative growth with the regional market showing a faster decline in growth for the occupation. Information security analysts and software developers are two occupations that show especially strong growth, though growth for software developers is a bit slower at the regional level.
- **Adult learners show increased preference for online study in light of the COVID-19 pandemic, as well as focus on career advancement and affordable, customizable programs.** Analysis of adult prospects' modality preferences shows an increase in preference for online during COVID-19 and a sustained interest when prospects are asked about their preferences in the future (when COVID is believed to no longer be a factor). Earning more money is important for certificate prospects, as well as getting a better job in their field or switching careers. Affordable tuition and fees, as well as interactions with faculty, are other important factors for adult prospects interested in certificate programs.

*UIUC's broader region is defined as the following states: Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, Wisconsin

Recommendations

Although iCAN appears to be a unique offering in the current market, trends in both the computer science and non-degree markets show strong potential for the program, especially paired with solid labor market projections and the strong connection to career outcomes within the program. As iCAN considers next steps for the program, Eduventures offers the following recommendations:

- **Monitor trends in master's and non-degree markets in computer science.** Eduventures analysis shows that there has been a recent decrease in master's degrees in computer science programs, as well as projected growth for the general non-degree market. Although this decrease is related to a number of factors, including a decrease in international students, it is also likely driven by students interest in shorter, less costly options, which is evidenced by interest in computer science bootcamp programs.
- **Emphasize focus on increasing access as key program differentiator.** None of the programs that Eduventures reviewed in this study note that they focus on increasing access in the computer science field for underrepresented groups. This is a unique component of the iCAN program and one that stakeholders should use as a key differentiator for iCAN. Currently, the program website notes this aspect of iCAN, but it should be further detailed in marketing and recruitment materials.
- **Continue to highlight benefits of studying at UIUC, especially to demonstrate value of program.** The iCAN website clearly states the program's target audience, as well as highlights the benefits of studying at UIUC, such as faculty involvement and academic and career advising. These program features are especially important because they clearly differentiate iCAN from other competitors such as bootcamps or MOOC offerings, which offer a less costly option for students
- **Specific career outcomes of iCAN are key and set the program apart from master's bridge programs.** Other programs in line with iCAN tend to focus on a pathway to a master's degree as the key outcome of the program, noting credits can be transferred into the credential. The fact that iCAN focuses on this pathway is key and will help to differentiate the program, especially for certificate prospects that are focused on career advancement. Clearly listing these outcomes on the program website, such as by including relevant job titles and income potential, is one way to emphasize this aspect of the program.
- **Planned online modality will help to draw additional students.** The iCAN stakeholders plan to offer the program at an additional location, as well as via an online modality in the future. Based on the preferences of adult prospects, this option will help to draw additional students, especially as the preference this modality may continue to have even beyond the impact of COVID-19.

Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

Program Demand



Program Demand. An introduction to the overall computer science and certificate markets.

First, in order to provide insights on the larger computer science market, Eduventures provides data from IPEDS- the primary source for degree conferral and certificate completion data from U.S. colleges and universities.

The following slides provide data and analysis for the aligned CIP codes* in this study for the following market levels:

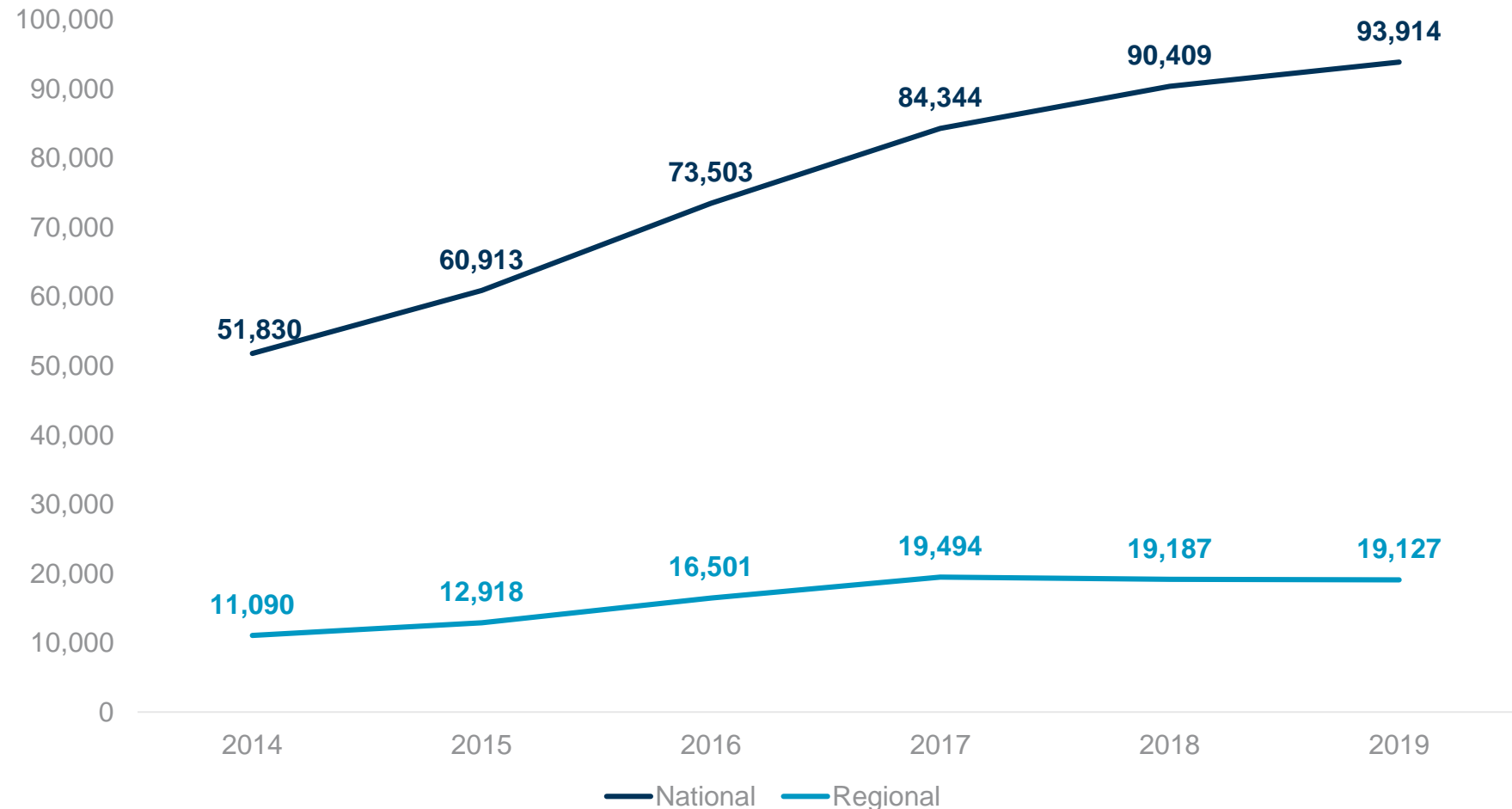
- All conferrals and completions for degree and non-degree credentials (at both the national and regional levels) to provide a high-level look at the computer science market
- Breakdown of all 2019 conferrals/completions by program type (at both the national and regional levels) to provide a high-level look at the computer science market
- Post-baccalaureate completions (at both the national and regional levels) to provide insights on the most closely aligned credential to the iCAN non-degree program. It is important to note that non-degree completions data is not comprehensive due to reporting issues in NCES IPEDS, see slide 19 for more information on this
- Master's conferrals (at both the national and regional levels) since one of iCAN's stated program outcomes is a computer science master's degree

*See slide 6 for more information on CIP codes used in this study. As stated on slide 10, conferrals/completions for these CIP codes likely include computer science, cybersecurity, and information technology programs.

Program Demand: All Computer Science aligned conferrals/completions show strong growth in larger market.

In order to examine the larger market for Computer Science, Eduventures looked at conferrals/completions for all degrees reported to the two aligned CIP codes at the national and regional levels.

All Conferrals/Completions

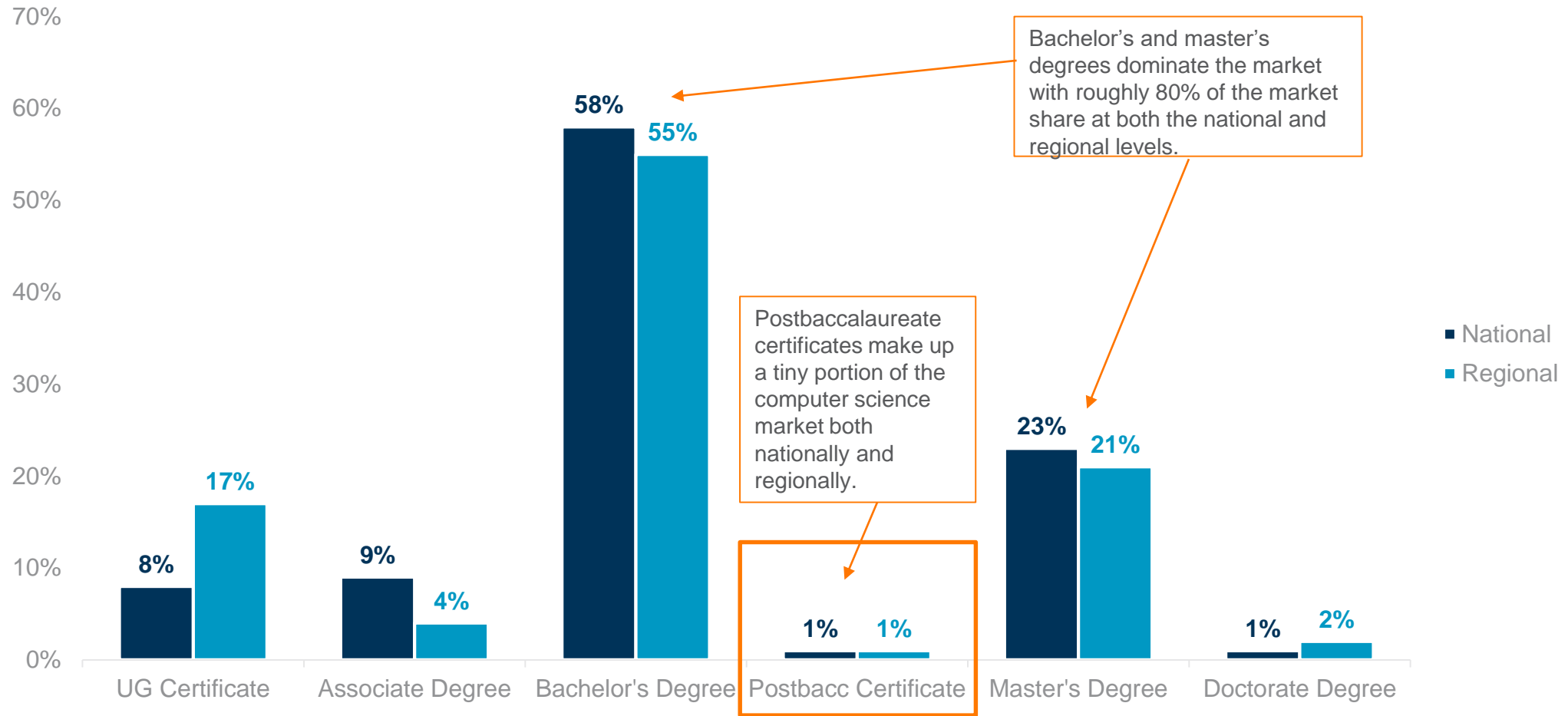


- **2014-2019 National Conferral/Completions CAGR*:** 13%
- **2014-2019 Regional Conferral/Completions CAGR*:** 12%
- Overall, both the national and regional markets for computer science saw conferral/completions growth when looking at all degree levels.
- The national market shows consistent growth with especially strong growth between 2014 and 2017. The regional market also saw strong growth during this time period though there was a flattening between 2017 and 2019 with a slight decrease in conferrals between 2018 and 2019.

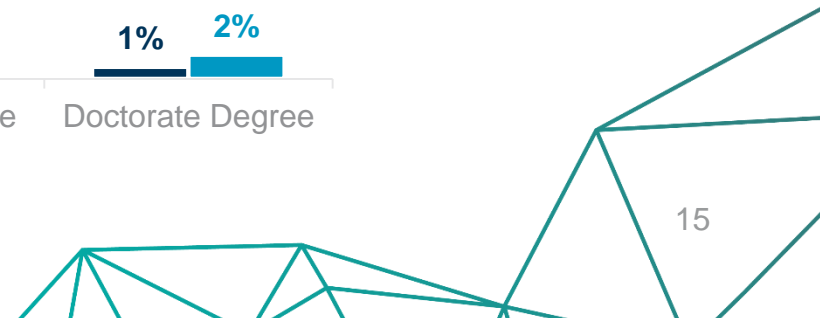
Program Demand: All computer science conferrals/completions show that bachelor's and master's degrees dominate market.

Next, Eduventures reviewed conferrals/completions for all degree levels for the aligned CIP code in 2019.

2019 Computer Science Conferrals/Completions by Degree Type*



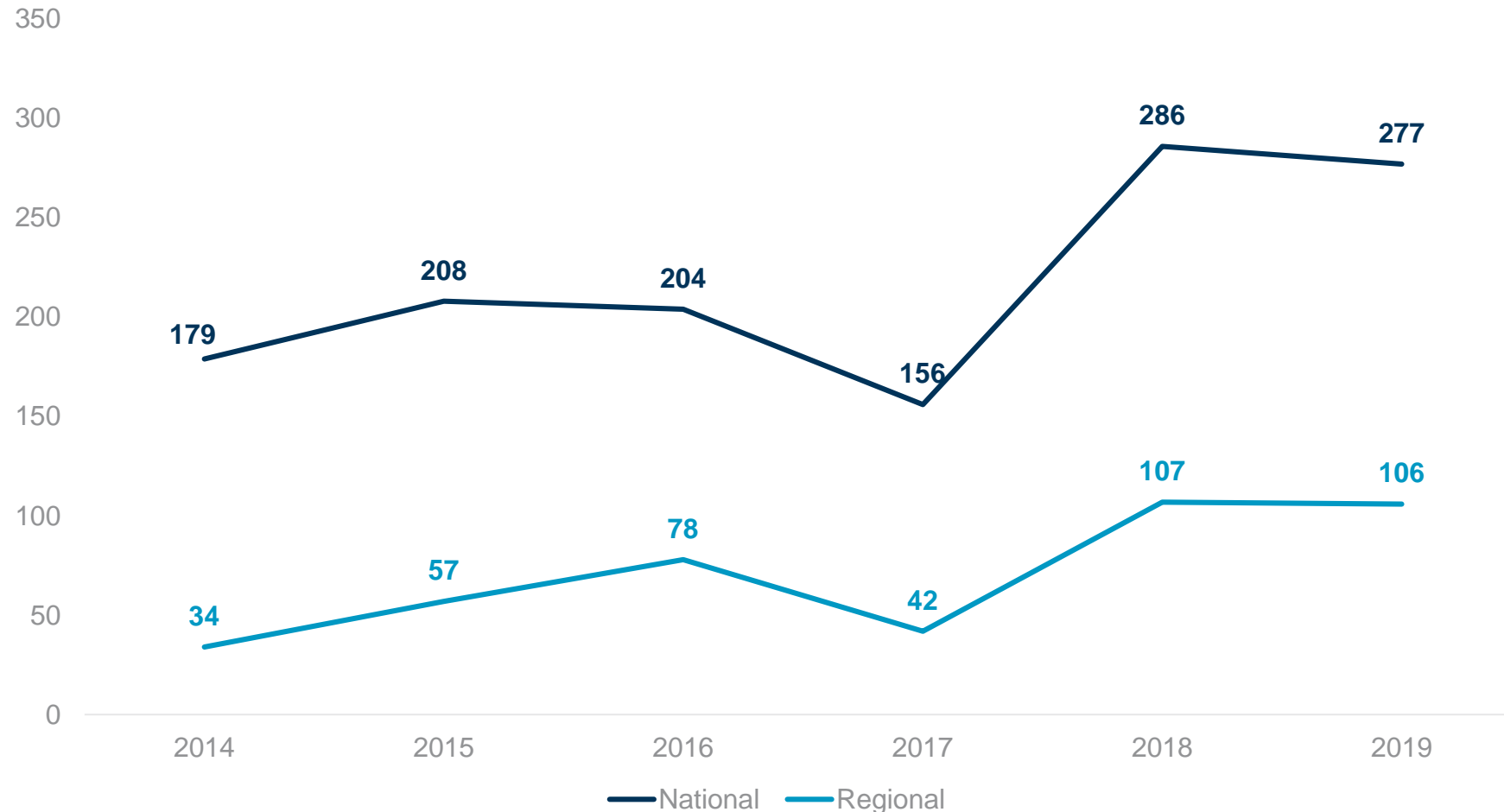
Source: NCES IPEDS through Emsi
All for-credit program conferrals or completions reported to the two aligned CIP Codes: Computer and Information Sciences (11.0101); Computer Science (11.0701)
*Percentages add up to greater than 100% due to rounding
^Undergraduate certificates defined as "Award of less than 1 academic year" and "Award of at least 1 but less than 2 academic years" in IPEDS
Region defined as the following states: IA, IL, IN, KY, MI, MN, MO, OH, WI



Program Demand: Postbaccalaureate certificate market is small but growing, especially at regional level.

Eduventures also analyzed completions for postbaccalaureate certificates at the national and regional levels as these most closely align the iCAN program.

Computer Science Postbaccalaureate Certificate Completions



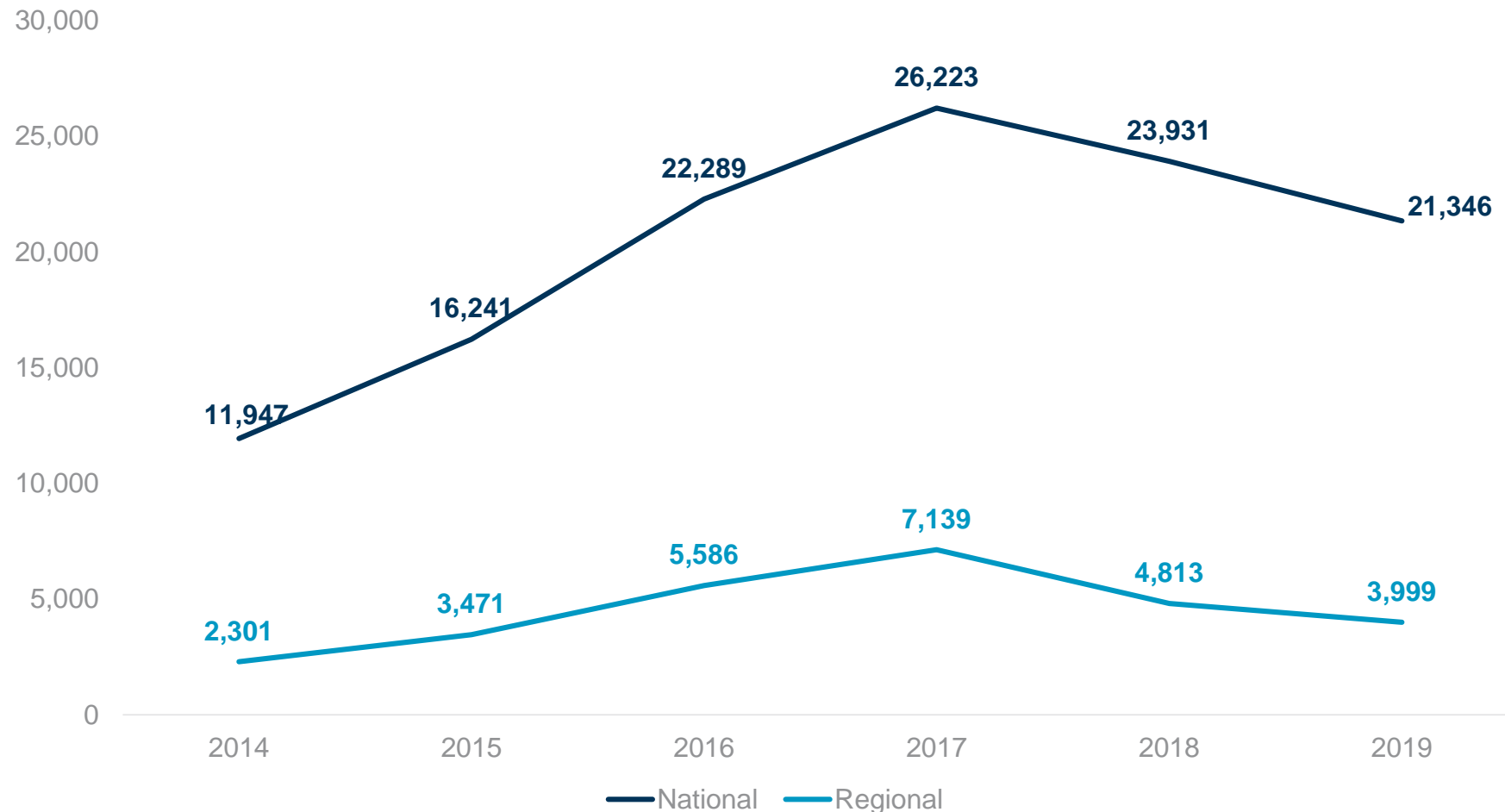
- **2014-2019 National Completion CAGR*:** 9%
- **2014-2019 Regional Completion CAGR*:** 26%
- Eduventures analyzed completions for the postbaccalaureate certificate market as this credential aligns most closely to the iCAN program. It is important to note that NCES IPEDS does not capture the entire certificate market (please see slide 19 for more details).
- Completions for aligned postbaccalaureate certificates also show overall growth for both the national and regional markets, though the number of completions is small for both with some volatility in reported completions.
- Regional completion CAGR far outpaced national CAGR significantly, though again the number of completions was small.

Source: NCES IPEDS through Emsi
Postbaccalaureate certificate completions reported to the two aligned CIP Codes: Computer and Information Sciences (11.0101); Computer Science (11.0701)
*Compound Annual Growth Rate
Region defined as the following states: IA, IL, IN, KY, MI, MN, MO, OH, WI

Program Demand: Master's market shows rapid growth then conferral declines in recent years.

Eduventures also analyzed completions for master's degree at the national and regional levels as this is a program outcome of interest for the iCAN program.

Computer Science Master's Completions



- **2014-2019 National Completion CAGR*:** 12%
- **2014-2019 Regional Completion CAGR*:** 12%
- Eduventures also reviewed the computer science master's market since iCAN stakeholders indicated this as a potential program outcome for students.
- Overall, there has been growth in master's conferrals in computer science for both the national and master's market, though recent trends show a decline in conferrals.
- For both the national and regional markets, there was very strong growth between 2014 and 2017 followed by declines in 2018 and 2019. This could signal that the computer science master's market has tapped out and is now in decline.

Program Demand. Further insights on computer science non-degree market.

Since the non-degree market is difficult to track and requires other approaches to gauge market size, the next three slides focus on research that Eduventures has conducted related to both measuring the certificate market, as well as insights on the market for computer science certificates specifically.

The following three slides include insights from various Eduventures publications related to program demand for iCAN:

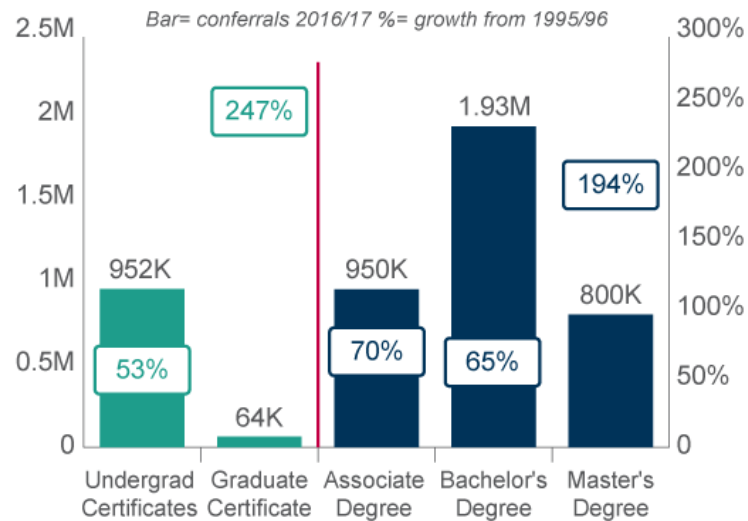
- Wake Up Call on how NCES IPEDS data does not capture the entire certificate market
- Wake Up Call on recent computer science market trends with a focus on the certificate market and the role of bootcamps
- Report on graduate enrollment projections and the role of the non-degree credential

Program Demand: IPEDS reporting on certificate data is incomplete.

Eduventures analysis, including this [Wake Up Call from 2018](#), has long shown that certificate reporting to NCES IPEDS does not capture all completions, which could explain the low number of Computer Science certificates reported.

Eduventures analysis of IPEDS data shows growth for undergraduate certificates over the last twenty years, although bachelor's degrees saw stronger growth and still dominates the market in terms of size.

Nice Work Certificates,
but Degrees Still Win?



Source: Eduventures analysis of IPEDS data.
Data spans four, two and less-than-two year schools that report to IPEDS.

Our reading of the [current IPEDS reporting rules](#) is that all schools that participate in the federal student aid program are required to report enrollments and completions on all credit-bearing programs, including certificates, regardless of length.

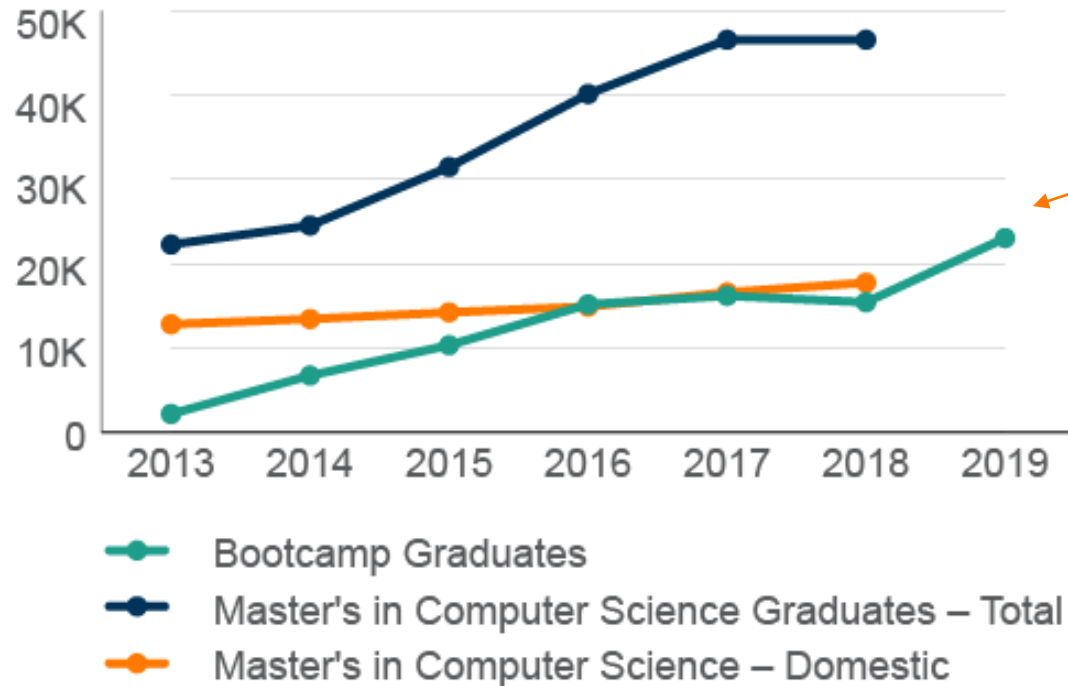
But it is not hard to find examples of schools with lots of certificate programs but zero or few completions reported to IPEDS. University of Wisconsin, Madison [offers](#) about 60 certificate programs but reported zero certificate completions—undergraduate or graduate—in 2016/17. East Carolina University [lists](#) about 70 “U.S. Department of Education Approved Certificate Programs” but reported that only 72 people completed a certificate in 2016/17.

Although institutions are required to report certificate completions, it is easy to find examples of institutions not doing so. MOOC and micro-credentials further confuse the market. It is important to keep this in mind when reviewing certificate completions to IPEDS as additional programs are likely not being reported.

The rise of MOOC certificates and other so-called micro-credentials muddies the water yet further. Coursera, edX and Udacity have moved away from free courses to a focus on paid certificates and degrees. These platforms do not disclose very much about certificate enrollment or conferrals. But with hundreds of certificates available and an audience in the tens-of-millions, a six-figure annual conferral volume is not far-fetched. In 2017, Udacity says it had more than [50,000](#) nanodegree students. Other scaled-up companies, such as Lynda.com, Pluralsight, and Udemy, offer certificates of their own.

Program Demand: Eduventures analysis details the rise in competition from coding bootcamps in the computer science market.

Coding Bootcamps vs. Master's in Computer Science
(Number of Graduates 2013-2019)



Source: Course Report and NCES. "Computer Science" includes all master's conferrals under the two-digit CIP code "Computer and information sciences and support services." Course Report data shows simple year-over-year growth but notes same-school growth as 37% in 2019. Bootcamp graduates narrowly exceeded the domestic master's total in 2016 but then lost ground.

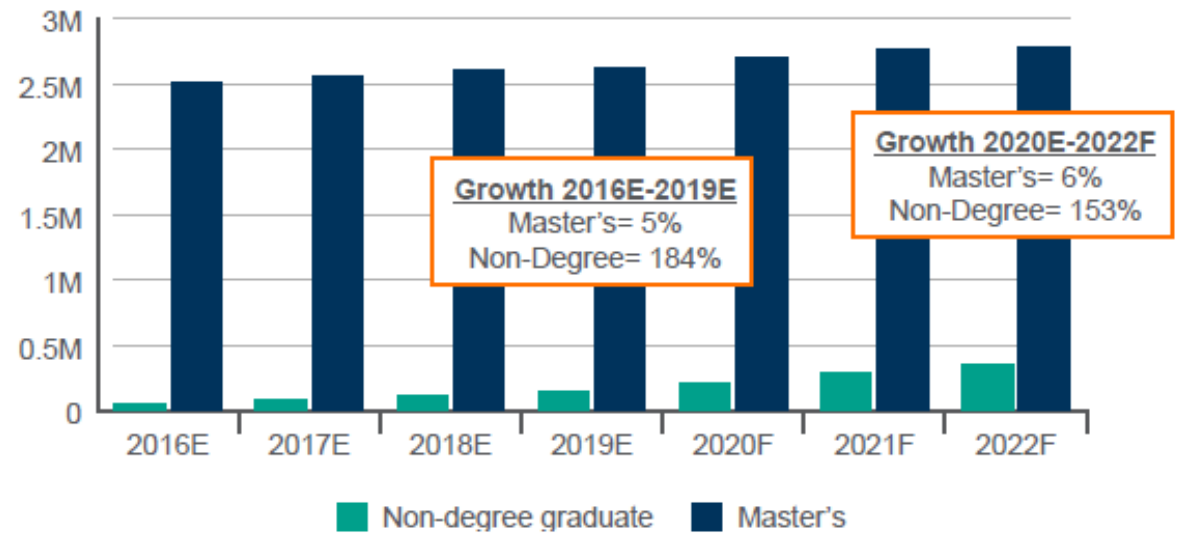
- A Wake Up Call article published by Eduventures' Chief Research Officer in January 2020 titled [Higher Education Predictions for 2020: Recession Certificates, and Computer Science](#) includes analysis on recent computer science master's trends.
- One prediction states that coding bootcamp graduates will outnumber domestic master's degrees awarded for the first time in 2020.
- Though domestic master's degree awards have continued to rise, their growth does not match that seen by the total market that was mostly driven by international demand from 2014-2017, which leveled off in 2018.
- Both the decline in computer science master's conferrals and the potential for bootcamps are important for iCAN stakeholders to consider. It will be important for UIUC to consider both differentiation and adaption.
 - Differentiation: what can iCAN offer that a bootcamp cannot? (e.g. access to career services, more in-depth coursework)
 - Adaption: what popular features from a bootcamp can a master's program adopt? (e.g. shorter off-ramps, affordability)

Program Demand: Non-degree program growth likely to outpace master's degree growth in coming years.

- Eduventures recently published a report on graduate enrollment projections titled *Fall 2020 Enrollment Scenarios: Part 4, Graduate Enrollment*, which looked at growth for the domestic master's market and the potential impact of the non-degree market.
- Although the master's degree market has always competed with non-degree credentials that are shorter and lower cost, the competition in this space has grown significantly with several new providers entering the market in recent years.
- Although both the master's and non-degree markets will receive a boost in enrollment as a result of COVID-19, Eduventures predicts that economic retraction and uncertainty will increase the appeal of non-degree alternatives, which offer speed, convenience, and low price. Indeed, we predict that the master's market will ultimately begin to shrink.
- It is important to note that these markets need not be exclusive, especially with the potential to ladder up to a master's degree from a non-degree credential.

Figure 3. Catching Up Fast, but a Long Way to Go

Estimated(E) Domestic Master's and Non-Degree Graduate Enrollment (2016-2019) and Forecasts(F) (2020-2022)



Source: Eduventures estimates modeling IPEDS and non-degree provider data. Non-degree graduate enrollment is defined as the number of U.S. residents with a bachelor's degree but no higher enrolled in a for-credit or noncredit non-degree program offered by a U.S. college or university. Non-degree and master's estimates are both 12-month unduplicated headcount.

Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

Competitive Landscape



Competitive Landscape. A closer look at potential competitors.

The next section of this report takes a closer look, quantitatively and qualitatively, at potential competitors for the iCAN program. Eduventures leveraged both NCES IPEDS data and programmatic websites to conduct this analysis.

Eduventures focused on the competitive landscape in four layers:

1. Top providers for computer science postbaccalaureate certificates (the credential that most closely aligns with the iCAN program), nationally and regionally, as reported to NCES IPEDS. Eduventures provided details on 2019 completions, 2018-19 year-over-year growth, and 2014-19 CAGR, as well as whether the program targets prospects with a non-computer science background and whether the program focuses on increasing access to underrepresented populations. Eduventures did not include any information technology, cybersecurity, or similar certificate programs.
2. Providers found via a targeted web scan for similar programs and via a web scan of the top twenty providers of computer science master's programs (identified via NCES IPEDS), as well as whether the program targets prospects with a non-computer science background and whether the program focuses on increasing access to underrepresented populations.
3. Other potential competitors that offer computer science master's programs that target those with no computer science or programming background.
4. MOOC platform (Coursera, edX) courses or programs worth consideration as competitors for the UIUC iCAN program.

Competitive Landscape: National postbaccalaureate certificates show mostly small completion rates with no stated focus on increasing access.

| Provider | Certificate Completions (2019) | Growth % YOY (2018-19) | Completion CAGR 2014-19 | Program Name (Website Link) | Does program target those without CS background? | Focus on increasing access for underrepresented populations in CS? |
|---|--------------------------------|------------------------|-------------------------|--|--|--|
| University of Wisconsin-Madison | 70 | 13% | N/A** | Certificate in Computer Sciences | Yes - Only for Wisconsin undergraduates enrolled in non-computer science certificate | Not listed |
| Seattle University | 37 | 3% | N/A** | Computer Science Fundamentals Graduate Certificate | Yes - No programming knowledge or experience required, any bachelor's degree accepted | Not listed |
| Kennesaw State University | 28 | 155% | N/A** | Graduate Certificate in Computer Science Foundations | No - Program targets computer science students or working professionals in field | Not listed |
| Drexel University* | 13 | 30% | N/A** | Online Certificate in Computer Science *** | Yes - Program suitable for those with a bachelor's in a non-computer science field | Not listed |
| Virginia Commonwealth University | 9 | 50% | -39% | Baccalaureate Certificate in the Fundamentals of Computing | Yes - Only for those with non-technical backgrounds, VCU undergraduates can enroll | Not listed |
| University of Texas at San Antonio | 7 | 250% | N/A** | Coding Bootcamp *** | Yes - Technical background not required | Not listed |
| New Jersey Institute of Technology | 6 | -25% | -250% | Certificate in Computer Science | Unclear - Notes skills gained are relevant for computer science professionals | Not listed |
| Missouri University of Science & Technology* | 6 | -50% | 15% | Graduate Certificate in Computational Intelligence | No - Program is for students with engineering background | Not listed |
| University of Massachusetts-Dartmouth* | 3 | 50% | N/A** | Computer Science Graduate Certificate | Somewhat - Students with non-computer science background have required pre-req coursework | Not listed |
| Tufts University | 2 | 100% | N/A** | Post-Baccalaureate or Certificate in Computer Science | Depends on program - Postbacc program requires one comp science course, certificate for com science professionals | Not listed |

- Eduventures reviewed the top ten postbaccalaureate certificate programs as reported to IPEDS in 2019 that offer relevant programs. Overall, completions were low with the exception of the top few providers, though many programs show short-term growth. Most programs also appear to be newer and began reporting conferrals in the last couple of years.
- There were mixed findings for programs that target those without a computer science background with four of the top ten specifically targeting this population. No program includes language that shows their goal is to increase access to computer science for underrepresented populations.
- Though the Wisconsin program has the highest number of conferrals, it is only available for enrolled undergraduate students and is more akin to a minor versus a separate degree program.

Source: NCES IPEDS through Emsi.

Post baccalaureate certificate completions as reported to the two aligned CIP Codes: Computer and Information Sciences (11.0101); Computer Science (11.0701)

Only computer science programs were included in this analysis, information technology and cybersecurity programs were excluded.

Bold orange font=Located in UIUC's region; Region defined as the following states: IA, IL, IN, KY, MI, MN, MO, OH, WI

*Program offered via online modality

**Did not report completions in 2014

^Also offers [Distributed Computing graduate badge](#); ***It is unclear if completions the UTSA is reporting align to this program or not as UTSA offers several potentially relevant certificates, but this program most closely related to computer science

Competitive Landscape: Few regional postbaccalaureate certificates found and only Wisconsin has significant number of completions.

| Provider | Certificate Completions (2019) | Growth % YOY (2018-19) | Completion CAGR 2014-19 | Program Name (Website Link) | Does program target those without CS background? | Focus on increasing access for underrepresented populations in CS? |
|--|--------------------------------|------------------------|-------------------------|--|---|--|
| University of Wisconsin-Madison | 70 | 13% | N/A** | Certificate in Computer Sciences | Yes- Only for Wisconsin undergraduates enrolled in non-computer science certificate | Not listed |
| Missouri University of Science and Technology* | 6 | -50% | 15% | Graduate Certificate in Computational Intelligence | No- Program is for students with engineering background | Not listed |
| Grand Valley State University | 1 | -100% | -37% | Software Engineering Graduate Badge[^] | No- Program requires evidence of programming skills | Not listed |

- Only three providers were found in UIUC's region that reported completions for a computer science postbaccalaureate certificate. Of these providers, Wisconsin had the highest number of completions with 70 in 2019.
- Only Wisconsin targeted prospects with a non-computer science background, though their program appears to only be for Wisconsin undergraduate students enrolled in a non-computer science bachelor's degree. The other two providers offer certificates for those with computer science or programming backgrounds.
- In line with the national market, none of the examined providers include any language on their websites on increasing access for underrepresented populations.

Source: NCES IPEDS through Emsi.

Region defined as the following states: IA, IL, IN, KY, MI, MN, MO, OH, WI

Note: Only computer science programs were included in this analysis, information technology and cybersecurity programs were excluded

Post baccalaureate certificate completions as reported to the two aligned CIP Codes: Computer and Information Sciences (11.0101); Computer Science (11.0701)

*Program offered via online modality

**Did not report completions in 2014

[^]Also offers [Distributed Computing graduate badge](#)



Other Competitors: Web scan reveals few additional relevant programs again with no focus on increasing access.

- Eduventures also conducted a web scan to find relevant programs in computer science not reported to IPEDS, including a scan of the top 20 national providers of master's degrees in the field. An additional nine programs of interest were identified.
- Programs were generally certificates targeting those without a background in computer science, though Columbia and NYU both offer "bridge" type programs that provide introductory coursework in the field and prepare for a master's degree.
- In line with previously examined programs, none note any focus on increasing access to underrepresented populations.

| Provider | Program Name (Website Link) | Does program target those without CS background? | Focus on increasing access for underrepresented populations? |
|----------------------------------|--|---|--|
| Boston University | Certificate in Computer Science | Unclear - Target audience not listed but coursework may be advanced | Not listed |
| Columbia University | CS@CU MS Bridge Program in Computer Science | Yes - Program targets those without any background in field, can be a bridge to master's program | Not listed |
| Harvard Extension School | Programming Certificate | Yes - Program designed for those with little or no computer programming experience | Not listed |
| Loyola University Chicago* | Computer Science Certificate | Somewhat - Program notes no experience required but that coursework is "rigorous" | Not listed |
| New York University | PAC Program of Introductory Courses | Yes - Targets those without any background in field who wish to enter a master's program | Not listed |
| North Carolina State University* | Computer Programming Certificate | Yes - Targets those who wish to change careers or learn more about the field | Not listed |
| Northeastern University | Computer Science, Graduate Certificate | Yes - Program targets those who wish to advance skills or move on to master's degree (program complete prereqs for Northeastern's master's degree) | Not listed |
| Stanford University Online* | Foundations of Computer Science Graduate Certificate | Somewhat - Bachelor's degree in any field but some programming background required | Not listed |
| University of Miami | Post Baccalaureate Certificate in Computer Science | Yes - Designed for those with a bachelor's in a non-computer science field | Not listed |

Other Competitors: Master's programs that target those with no computer science background may also act as competitors to iCAN.

| Provider | Program Name (Website Link) |
|-----------------------------|--|
| MIT | Not yet launched, new College of Computing started by large gift with goal of addressing "opportunities and challenges" of computing |
| Northeastern University | Align MS in Computer Science |
| University of Pennsylvania* | Master of Computer and Information Technology |

The MIT Stephen A. Schwarzman College of Computing aims to address the opportunities and challenges presented by the ubiquity of computing — across industries and academic disciplines — perhaps most notably illustrated by the rise of artificial intelligence.

Break into tech—without a background in computer science

Through a cohort-based learning model, the Align Master of Science in Computer Science (MSCS) provides a supportive community of engaged peers. Academic bridge courses prepare students of any undergraduate discipline for graduate level coursework that includes program design, computer systems, and software development—as well as a range of electives that allow you to tailor the degree to your personal and professional goals.

The Master of Computer and Information Technology (MCIT) program is a rigorous graduate-level program that gives talented students who have no prior experience in Computer Science an opportunity to embark on a highly successful career in computing and technology, often in coveted interdisciplinary roles or even in purely technical software development positions. The MCIT program stems from a belief that advanced computer science coursework for people with undergraduate degrees in other diverse fields leads to highly successful career paths. Our graduates and their careers today stand as strong proof to this philosophy. Within the realm of academia, pursuing further advanced study in computer science is also an option open to MCIT graduates.

Although full master's degrees, Eduventures identified other providers that offer master's in computer science programs which target those with no background in the field, as well as a new school at MIT that may act as a future competitor for UIUC. Notably, no programs list a focus on increasing access to computer science for underrepresented populations.

Source: Institutional and Programmatic Websites
*Also offered online via Coursera, program website available at this link.

Other Competitors: MOOC platform Coursera offers few relevant programs with little similarity to iCAN, though they have a low pricepoint and short time to completion.

Coursera - Relevant Courses

| Provider | Program | Reported Outcomes | Enrollment Data |
|--------------------------|---|---|--|
| Arizona State University | Master's – <i>Online Master's in Computer Science</i> | <ul style="list-style-type: none"> Not available, though program website lists various outcomes available to students along with career services support | <ul style="list-style-type: none"> Not listed |
| University of Michigan | Specialization - <i>Programming for Everybody (Getting Started with Python)</i> | <ul style="list-style-type: none"> 39% start a new career after completing courses 39% get a tangible career benefit 12% got a pay increase or promotion | <ul style="list-style-type: none"> 1,891,004 already enrolled |
| University of London | Specialization - <i>Introduction to Computer Programming</i> | <ul style="list-style-type: none"> 56% start a new career after completing courses 42% get a tangible career benefit | <ul style="list-style-type: none"> 34,018 already enrolled |

ASU's program is only for students who currently hold bachelor's in computer science or a related field, but students without the appropriate background may complete a MasterTrack Certificate that helps students meet the prerequisites for the program. More details [available here](#).

A review of Coursera offerings did not reveal many options in line with iCAN. ASU offers a master's in computer science, which does not target those without a computer science background and is similar to UIUC's program on Coursera. Michigan and London offer brief, certificate-like programs that show high enrollment numbers.

Source: <https://www.coursera.org/>.
'Already Enrolled' = Starting Soon



Other Competitors: MOOC platform edX offers more options than Coursera targeting prospects without a relevant background.

edX - Relevant Courses

| Provider | Program | Enrollment Data |
|-------------------------------|---|---|
| Georgia Tech | Certificate - <i>Professional Certificate in Introduction to Python Programming</i> | • Not listed |
| Harvard University | Certificate - <i>Professional Certificate in Computer Science for Web Programming</i> | • Not listed |
| Harvard University | Course - <i>CS50's Introduction to Computer Science</i> | • 2,455,872 already enrolled |
| Harvey Mudd College | Course - <i>MyCS: Computer Science for Beginners</i> | • Not listed, course is currently not available |
| MIT | Course - <i>Introduction to Computer Science and Programming Using Python</i> | • 1,263,351 already enrolled |
| New York University | Bachelor's - <i>MicroBachelors Program in Computer Science Fundamentals</i> | • Not listed |
| Stanford University | Course - <i>Computer Science 101</i> | • 39,984 already enrolled |
| University of Texas at Austin | Master's - <i>Master's Degree in Computer Science</i> | • Not listed |

Eduventures also examined offerings at edX which reveals several options representing a mix of certificates, courses, and degree programs (bachelor's and master's). NYU's micro-bachelor's offering is especially interesting as it provides undergraduate-level coursework in the field, which is in line with iCAN's offering. Offerings from Harvard and MIT see particularly strong enrollments.

Though a bachelor's level program, this option may appeal to prospects who wish to start from a lower level of instruction in the field. The program targets those without a background in the field.

Similar to ASU's program offered via Coursera, UT's program requires that students have a bachelor's in computer science or related, although exceptions may be made. More details [available here](#).

Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

Competitive Insights



Competitive Insights: Competitors chosen for analysis.

| Institution | Program Name (Website Link) | Modality Notes | Rationale for Selection |
|--------------------------|--|--|--|
| Columbia University | CS@CU MS Bridge Program in Computer Science | Unclear | <ul style="list-style-type: none"> • Similarity to iCAN program • Target audience and program outcomes in line with iCAN • Unique program approach |
| Drexel University | Online Certificate in Computer Science | 100% online modality | <ul style="list-style-type: none"> • Similarity to iCAN program • Target audience and program outcomes in line with iCAN • Online modality |
| Harvard Extension School | Programming Certificate | Unclear | <ul style="list-style-type: none"> • Some similarity to iCAN program • Target audience in line with iCAN |
| Seattle University | Computer Science Fundamentals Graduate Certificate | On-campus, part-time program that meets twice a week | <ul style="list-style-type: none"> • Solid conferral rates, top provider of post baccalaureate certificates • Similarity to iCAN program • Target audience and program outcomes in line with iCAN |
| Tufts University | Postbaccalaureate in Computer Science | On-campus, full-time program | <ul style="list-style-type: none"> • Similarity to iCAN program • Target audience and program outcomes in line with iCAN |

- Eduventures selected five programs to gain insights into the market. The selection was based on similarity to the iCAN program (target audience, program outcomes), as well as other factors like uniqueness of program and conferrals rates.
- Modality varied with some programs not giving clear information and others meeting on-campus. Drexel is the only examined program that offers their program via 100% online modality.
- Columbia's program, though different from iCAN, is titled and marketed differently than other examined programs and is worth considering.

Competitive Insights: Program characteristics show programs are usually one year and often lead to master's degrees.

| Institution | # of Credits | Graduate Credits Earned? | Program Length | Admissions Notes |
|--------------------------|--------------|---|--|--|
| Columbia University | 14-17* | Yes- Students can go on to the MS program at Columbia upon completion | One year- Summer/fall/spring part-time study | No computer science or programming experience required, only bachelor's degree |
| Drexel University | 15^ | Yes- Students can enroll in master's program upon completion | One year- Fall/winter/spring/summer program (10-week quarters) | No computer science or programming experience required, only bachelor's degree |
| Harvard Extension School | 4 courses | Yes- Courses taken are for graduate credit but cannot be applied to technology master's degree | 1.5 years- Average number of years it takes to complete certificate | No application required, only enrollment in aligned courses |
| Seattle University | 18-24** | Yes- Students can enroll in master's program upon completion | ~One year- Winter/spring/summer/fall/winter (Boot camp in first winter, may be waived for students with experience) | No computer science or programming experience required, only bachelor's degree |
| Tufts University | 14-17^^ | Yes- Students can enroll in master's program upon completion though undergraduate level coursework does not count towards master's | One year- Program can be completed in two semesters or full-time study or spread out | Bachelor's and one college-level introductory computer course |

- A review of program characteristics reveals that the number of credits ranges from 14-24, depending on curriculum. Harvard Extension School does not include the number of credits but its four required courses are in line with the other providers.
- All programs appear to grant credit for graduate coursework and note that students can move into their master's degree program upon completion. Interestingly, Harvard Extension School notes their coursework is for graduate credit but that students cannot apply it towards a technology-related master's degree at the school.
- Time to completion was typically about one year but often included three or four semesters of study. Admissions typically required just a bachelor's degree with only Tufts requiring a college-level computer science course.

Source: Institutional and Programmatic Websites

*14 credits for students with a technical background, 17 for those without as they are recommended to take an additional math course

^Program notes it is a 12-credit certificate but curriculum page lists 15-credits

**Two bootcamp courses are equal to six credits, which is not required for all students but is helpful for students with no background in computer science. Program is 18 credits without bootcamp

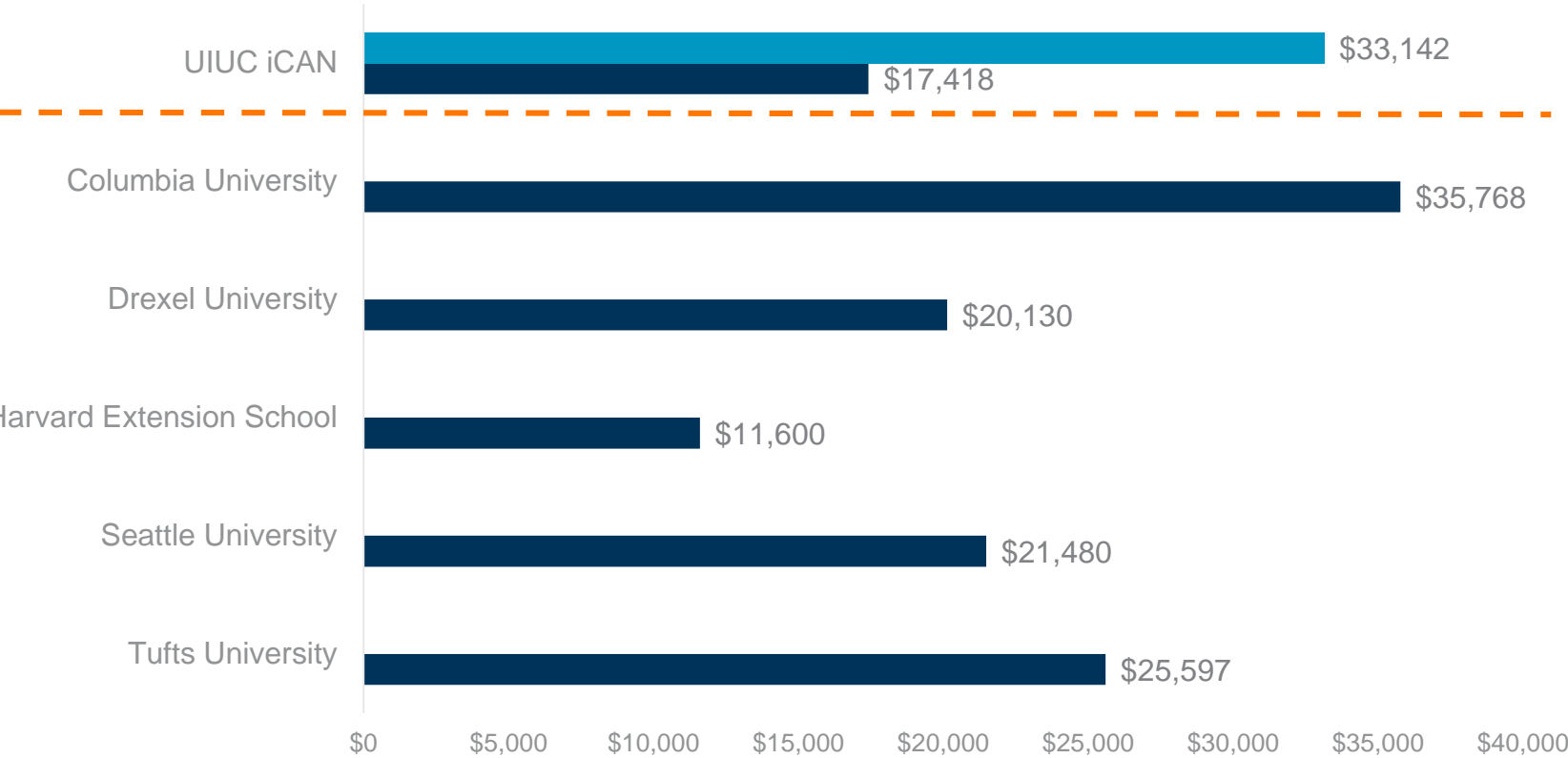
^^Number of credits depends on specific coursework selection

Competitive Analysis: Tuition insight* reveals iCAN in-state in line with most programs, but out-of-state cost higher than almost all.



Estimated total tuition of examined programs range from between roughly \$11,000 and \$36,000 with most falling towards the middle of the range. Harvard Extension School had the lowest total estimated cost while Columbia had the highest cost.

Estimated Total Tuition**



| Providers | # of Credits | Pricing per Credit |
|--------------------------|--------------|---|
| Columbia University | 17^ | \$2,104 |
| Drexel University | 15 | \$1,342 |
| Harvard Extension School | Not listed | Not listed – only average cost provided |
| Seattle University | 24^^ | \$895 |
| Tufts University | 17*** | <ul style="list-style-type: none"> Undergrad-level: \$690 Grad-level: \$1,697 |

Source: Program and Institutional Websites
 *Tuition per credit includes stated tuition per credit without additional fees (e.g. Student Financial Fee) unless otherwise noted. Eduventures analyzes tuition by base per credit to ensure an aligned comparison among all competitors. Tuition is for both in-state and out-of-state students unless otherwise noted.
 **Please note that the purpose of this pricing data is to provide initial insight into the competitive pricing landscape; additional differences and variances may arise should Eduventures conduct a deeper pricing analysis on this data, though Eduventures estimates that these variances would be slight.
 ^Although the program can be completed with 14 credits for those with a non-technical background, Eduventures provides the cost for the 17 credit option for those without a background in the field
 ^^Without bootcamp coursework, program is 18 credits but Eduventures provides the total estimated cost of the program with the bootcamp courses
 ***In line with other examined programs, Eduventures selected the higher number of credits for this particular program and also estimated tuition at the highest possible cost (two undergrad level and three grad level courses)

Competitive Insights: Target audience

| Institution | Target Audience Notes |
|--------------------------|--|
| Columbia University | <ul style="list-style-type: none"> Those without a computer science background or programming experience Those who wish to enter the field of technology |
| Drexel University | <ul style="list-style-type: none"> Those who wish to refresh a resume or gain new skills Those who wish to enter a master's program in a related field |
| Harvard Extension School | <ul style="list-style-type: none"> Those with little to no computer programming or language experience |
| Seattle University | <ul style="list-style-type: none"> Working professionals who wish to make a career change to the tech field Anyone with a bachelor's degree |
| Tufts University | <ul style="list-style-type: none"> Those who wish to advance or change careers Those preparing for graduate school |

The CS@CU MS Bridge Program in Computer Science offers prospective applicants from non-computer science backgrounds, and those without programming experience, the opportunity to acquire the knowledge and skills necessary to build careers in technology. Some funding will be available for eligible admits. Contact our team [via email](#) with inquiries about your future with the CS@CU MS Bridge Program! Please also visit our [FAQ](#) page for more information.

Drexel's online Certificate in Computer Science program provides basic theory, programming, and other technical skills. It's perfect for bachelor's-prepared students who want to refresh a resume and tackle new challenges. You'll build the skills needed in modern computing and related areas, many of which are fast-growing sectors with demand for tech-savvy workers.

The Career Change Certificate in Computer Science Fundamentals helps motivated professionals develop the skills they need to start a career in the region's thriving tech industry.

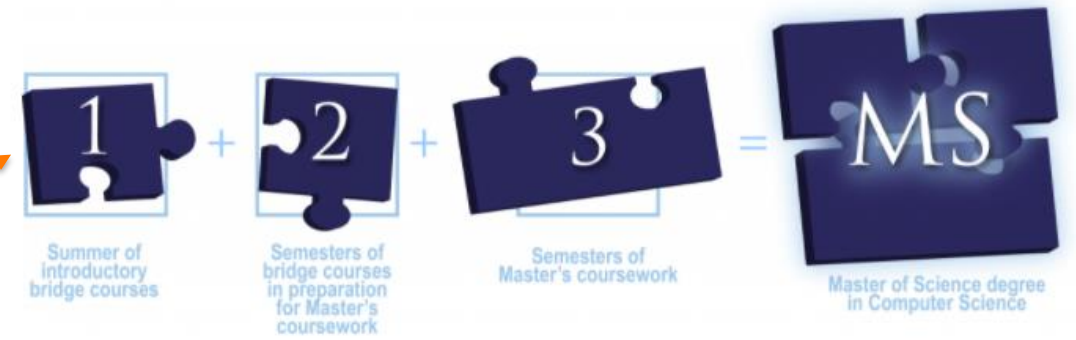
» **No programming knowledge or experience required.** Anyone with a bachelor's degree from an accredited institution is eligible to apply.

The program is particularly well-suited for individuals preparing to re-enter the workforce, mid-level professionals looking to move into the field of computer science, and those preparing for graduate school. Accepted students are required to develop an individualized plan of study with their adviser, based on their academic history and professional goals.

Target audience typically noted those without a computer science background who are looking for a career change or advancement. Seattle emphasized their focus on working professionals.

Competitive Insights: Marketing themes

| Institution | Marketing Notes |
|--------------------------|--|
| Columbia University | <ul style="list-style-type: none"> • Customizable curriculum based on students' interest • Pathway to master's degree program • Faculty involvement in program from computer science department |
| Drexel University | <ul style="list-style-type: none"> • Gain new skills in field to advance career • Entry point to master's degree in related field • Strong career outcomes with salaries listed • Online modality for working professionals |
| Harvard Extension School | <ul style="list-style-type: none"> • Range of skills gained through the program • Flexibility of program with no application process • Low cost of program |
| Seattle University | <ul style="list-style-type: none"> • Program is for those who wish to make a career change to the tech field • Flexible program for working professionals • Faculty involvement from those with extensive experience in the field • Potential to enroll in master's degree program following completion of certificate |
| Tufts University | <ul style="list-style-type: none"> • Flexible program for students with range of potential outcomes including enrolling in master's program • Application can be for certificate or joint certificate/master's program • Enrollment in "same high quality courses" as Tufts undergraduates and graduates |



Learn the fundamentals of computer programming and language. Through this professional graduate certificate, you gain an understanding of the techniques and tools necessary for software engineering, database management, or website development.

Marketing themes vary by program with most focusing on career outcomes or skills gained. The pathway to a master's degree was another common theme.

Is the post-baccalaureate available as an evening or weekend program?

No, one of the biggest advantages of Tufts' post-baccalaureate program over other similar programs is that you will be in the same high-quality courses as other Tufts undergraduate and graduate students. As a result, we offer only a few courses in the evenings and none on the weekends. You can view our course schedules for past years on our web site to determine whether our courses will fit your schedule.

Source: Institutional and Programmatic Websites



Competitive Insights: Outcomes

Employment in computer and technology occupations is on the rise with 557,100 new jobs on the horizon by 2026. Having skills in these areas is valuable and may help you become more marketable in the following sectors:

- Computing and Security Technology
- Technology
- Data Science
- Health Informatics
- Library and Information Science Systems

| Institution | Outcomes Notes |
|--------------------------|--|
| Columbia University | <ul style="list-style-type: none"> Vague note on careers in technology Computer science MS program at Columbia |
| Drexel University | <ul style="list-style-type: none"> Notes skills from program can help or advance career Lists potential fields to use skills and salary outcomes of aligned job titles |
| Harvard Extension School | <ul style="list-style-type: none"> Skills gained via the program are clearly listed Notes that program is helpful introduction to master's degrees |
| Seattle University | <ul style="list-style-type: none"> General notes on entering technology field for career Master's program is general outcome with 89% of graduates taking that path |
| Tufts University | <ul style="list-style-type: none"> Career advancement or career change Entrance into graduate school |

TECHNOLOGY GRADUATE DEGREES

If you are are interested in pursuing a master's in information management systems or software engineering, you may find that this certificate serves as a helpful introduction. While many courses for this certificate do not apply toward these degrees, they do provide the foundational knowledge needed to succeed in these programs.

»» Bridge into the [MSCS program](#) - since 2017, 89% of Certificate students went on to enroll in the master's program

Though career benefits were frequently noted, clear outcomes were not generally given besides the potential for entering a master's program. Drexel had the most details on specific career outcomes with sectors, roles, and salary information provided.

Competitive Insights: Curriculum notes

| Columbia University | Drexel University | Harvard Extension School | Seattle University | Tufts University |
|--|---|--|--|--|
| <p>Required (4):</p> <ul style="list-style-type: none"> Intro to CS and Programming in Java Data Structures Advanced Programming Discrete Mathematics <p>Recommended Math Foundational Course (choose 1):</p> <ul style="list-style-type: none"> Computer Science Theory Fundamental of Computer Systems | <p>Required (4):</p> <ul style="list-style-type: none"> Introduction to Programming Data Structures and Algorithm Systems Basics Introduction to Software Design <p>Electives (1) Sample:</p> <ul style="list-style-type: none"> Introduction to Artificial Intelligence Developing User Interfaces Programming Languages Machine Learning Web Services and Mobile Architectures | <p>Two Tracks in Program:</p> <p>Track 1: Computer Science:</p> <p>Required (3):</p> <ul style="list-style-type: none"> Intensive Introduction to Computer Science Data Structures Elective of choice from group <p>Track 2: Computer Science and Java:</p> <p>Required (3):</p> <ul style="list-style-type: none"> Introduction to Computer Science Using Java I OR Great Ideas in Computer Science in Java Introduction to Computer Science Using Java II Data Structures Elective of choice from group | <p>Bootcamp (2 courses):</p> <ul style="list-style-type: none"> Required for those who have not completed programming coursework Programming I Programming II <p>Required (6):</p> <ul style="list-style-type: none"> Database Systems Special Topics: Data Structures Object-Oriented Concepts Computing Systems Principles I Algorithms Computing Systems Principles II | <p>Required (3):</p> <ul style="list-style-type: none"> Data Structures Discrete Math Elective of choice from group <p>Required (choose 2):</p> <ul style="list-style-type: none"> Computer Architecture and Assembly Language Programming Programming Languages Algorithms Theory of Computation |

Most programs had a set of somewhat similar core courses with a couple offering flexibility in electives or via pathways.

Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

Labor Market Demand



Labor Market Demand: Aligned occupations shows range of positions and bachelor's degree as most common degree for entry.

| SOC | Description | Illustrative Examples | Typical Education Needed for Entry |
|---------|--|--|------------------------------------|
| 15-1111 | Computer and Information Research Scientists | Computational Theory Scientist; Control System Computer Scientist; Programming Methodology and Languages Researcher | Master's Degree |
| 11-3031 | Computer and Information Systems Managers | Chief Technology Officer; Information Technology Systems Director; Management Information Systems Director | Bachelor's Degree |
| 15-1241 | Computer Network Architects | Computer Network Engineer; Network Designer; Network Developer | Bachelor's Degree |
| 15-1152 | Computer Network Support Specialists | Network Diagnostic Support Specialist; Network Support Technician; Network Technician | Associate's Degree |
| 15-1131 | Computer Programmers | Applications Programmer; Computer Language Coder; IT Programmer; Systems Programmer | Bachelor's Degree |
| 15-1211 | Computer Systems Analysts | Applications Analyst, Data Processing Systems Analyst, Information Systems Analyst, Systems Architect | Bachelor's Degree |
| 15-1242 | Database Administrators | Database Programmer, Database Security Administrator | Bachelor's Degree |
| 15-1122 | Information Security Analysts | Computer Security Specialist; IT Risk Specialist; Network Security Analyst | Bachelor's Degree |
| 15-1142 | Network and Computer Systems Administrators | Network Analyst, Network Coordinator, Wide Area Network Administrator | Bachelor's Degree |
| 15-1132 | Software Developers | Computer Applications Engineer; Computer Systems Engineer; Mobile Applications Developer; Software Applications Architect; Software Engineer; Systems Software Developer | Bachelor's Degree |
| 15-1134 | Web Developers | Intranet Developer; Web Applications Developer; Web Architect | Associate's Degree |

Eduventures examined illustrative job titles and typical education needed for entry into relevant occupations. These occupations give insights into specific positions potentially available to graduates of the program. Additionally, bachelor's degrees are the usual degree of entry into these occupations. This will be helpful for the iCAN program, which will equip bachelor's degree holders with relevant skills for many of these positions.

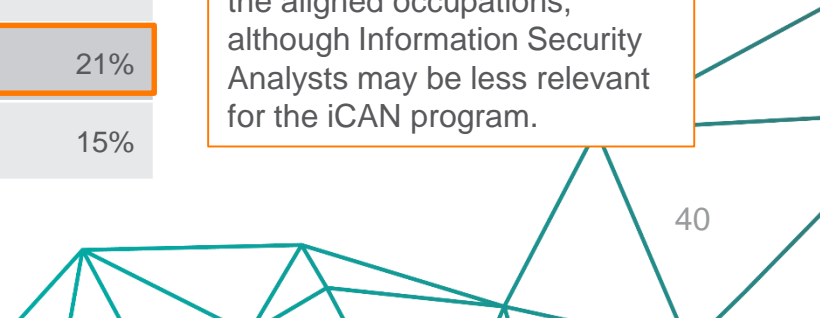
Labor Market Demand: Nationally, aligned occupations show projected growth in line or above the average.

Occupational Data: National

| SOC | Description | 2020 Jobs | 2030 Jobs | 2020-2030 Change | 2020-2030 % Change |
|---------------|--|-------------|-------------|------------------|--------------------|
| All SOC Codes | All Occupations | 155,302,211 | 167,265,136 | 11,962,925 | 8% |
| 15-1111 | Computer and Information Research Scientists | 34,190 | 40,329 | 6,139 | 18% |
| 11-3031 | Computer and Information Systems Managers | 448,267 | 506,047 | 57,780 | 13% |
| 15-1241 | Computer Network Architects | 154,805 | 166,940 | 12,135 | 8% |
| 15-1152 | Computer Network Support Specialists | 201,519 | 219,081 | 17,562 | 9% |
| 15-1131 | Computer Programmers | 197,137 | 191,522 | -5,615 | -3% |
| 15-1211 | Computer Systems Analysts | 600,704 | 664,100 | 63,396 | 11% |
| 15-1242 | Database Administrators | 126,900 | 142,071 | 15,171 | 12% |
| 15-1122 | Information Security Analysts | 134,534 | 172,657 | 38,123 | 28% |
| 15-1142 | Network and Computer Systems Administrators | 360,404 | 388,479 | 28,075 | 8% |
| 15-1132 | Software Developers | 1,462,399 | 1,767,284 | 304,885 | 21% |
| 15-1134 | Web Developers | 152,821 | 176,027 | 23,206 | 15% |

Computer Programmers is the only occupation that shows projected declines in growth of all the examined occupations.

Information Security Analysts and Software Developers had the fastest projected growth of the aligned occupations, although Information Security Analysts may be less relevant for the iCAN program.



Labor Market Demand: In line with the national market, aligned occupations are generally similar to or exceed the regional average.

Occupational Data: Regional

| SOC | Description | 2020 Jobs | 2030 Jobs | 2020-2030 Change | 2020-2030 % Change |
|---------------|--|------------|------------|------------------|--------------------|
| All SOC Codes | All Occupations | 32,255,707 | 33,445,463 | 1,189,756 | 4% |
| 15-1111 | Computer and Information Research Scientists | 3,093 | 3,619 | 526 | 17% |
| 11-3031 | Computer and Information Systems Managers | 80,054 | 86,822 | 6,768 | 8% |
| 15-1241 | Computer Network Architects | 27,004 | 27,901 | 879 | 3% |
| 15-1152 | Computer Network Support Specialists | 43,183 | 44,847 | 1,665 | 4% |
| 15-1131 | Computer Programmers | 36,367 | 33,572 | -2,795 | -8% |
| 15-1211 | Computer Systems Analysts | 138,073 | 144,356 | 6,283 | 5% |
| 15-1242 | Database Administrators | 22,301 | 24,032 | 1,731 | 8% |
| 15-1122 | Information Security Analysts | 21,002 | 26,156 | 5,154 | 25% |
| 15-1142 | Network and Computer Systems Administrators | 64,687 | 67,196 | 2,509 | 4% |
| 15-1132 | Software Developers | 259,424 | 299,008 | 39,584 | 15% |
| 15-1134 | Web Developers | 27,429 | 29,892 | 2,463 | 9% |

Computer Programmers also had a projected decline in jobs and is the only aligned occupation to show negative growth.

The regional market again shows that Information Security Analysts had the strongest growth of aligned occupations, though Software Developers has slower projected growth.

Illinois Computer Accelerator for Non-Specialists (iCAN) Non-Degree Program

Prospective Adult Students



Adult Prospective Students- Findings from Eduventures June 2020 Adult Prospect Survey.

Eduventures launched a survey in June 2020 to over 2,000 prospective adult students in order to capture insights into their preferences following the outbreak of COVID-19 in March 2020. Over the following four slides, insights into relevant questions are provided.

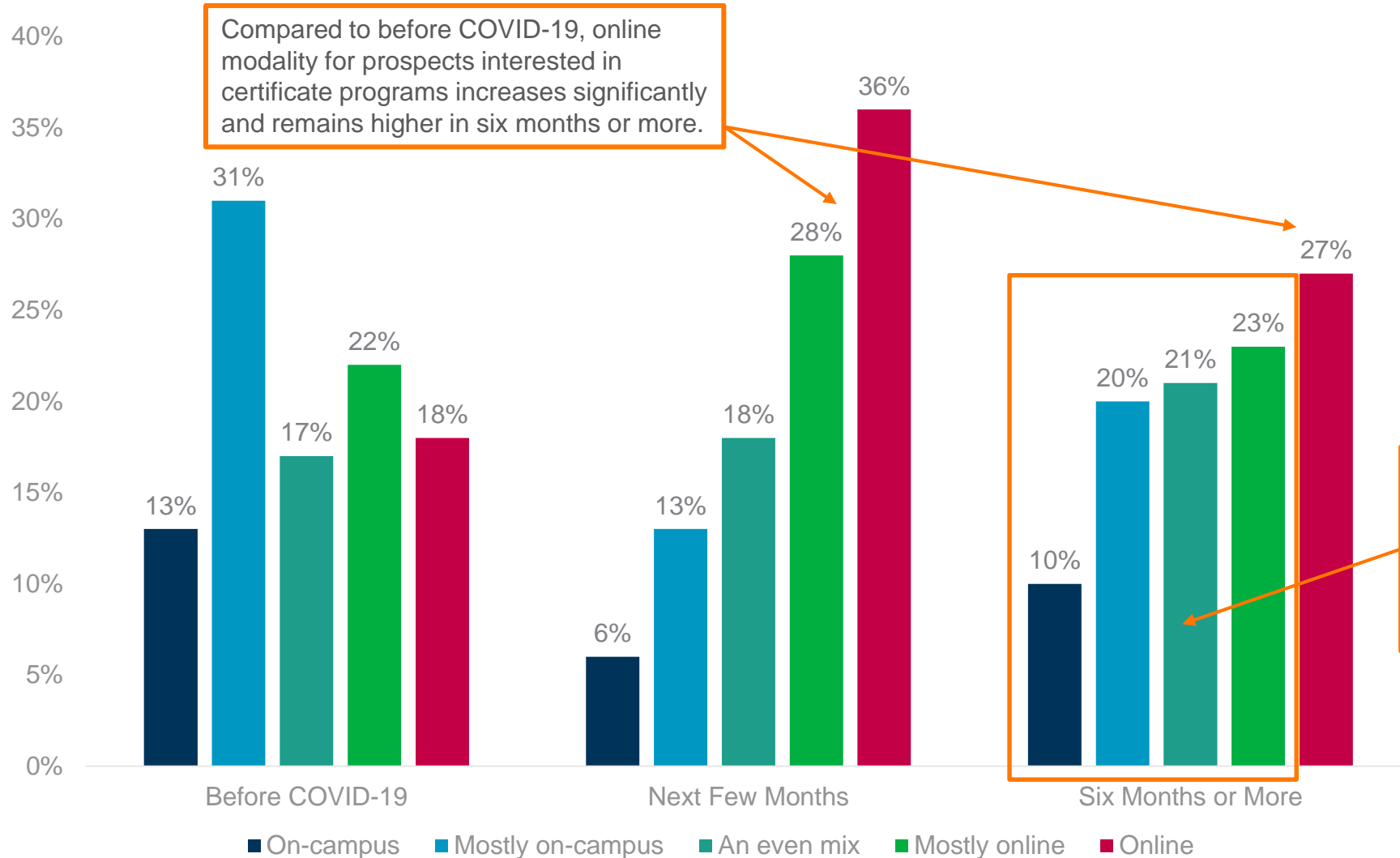
In order to gain more insights into potential prospects for the iCAN program, Eduventures included responses from adult prospects interested in undergraduate or graduate certificates (n=124 respondents) and compared their responses to the entire sample of all prospective adults (n=2,270).

To gauge modality preferences (slide 44), Eduventures asked a series of three questions to measure change in modality preferences from adult prospects prior to COVID-19, over the next few months, and in six months or more (when the outbreak may have passed). For the other questions (on slides 45-47), Eduventures included insights on responses from the 2019 survey where relevant.



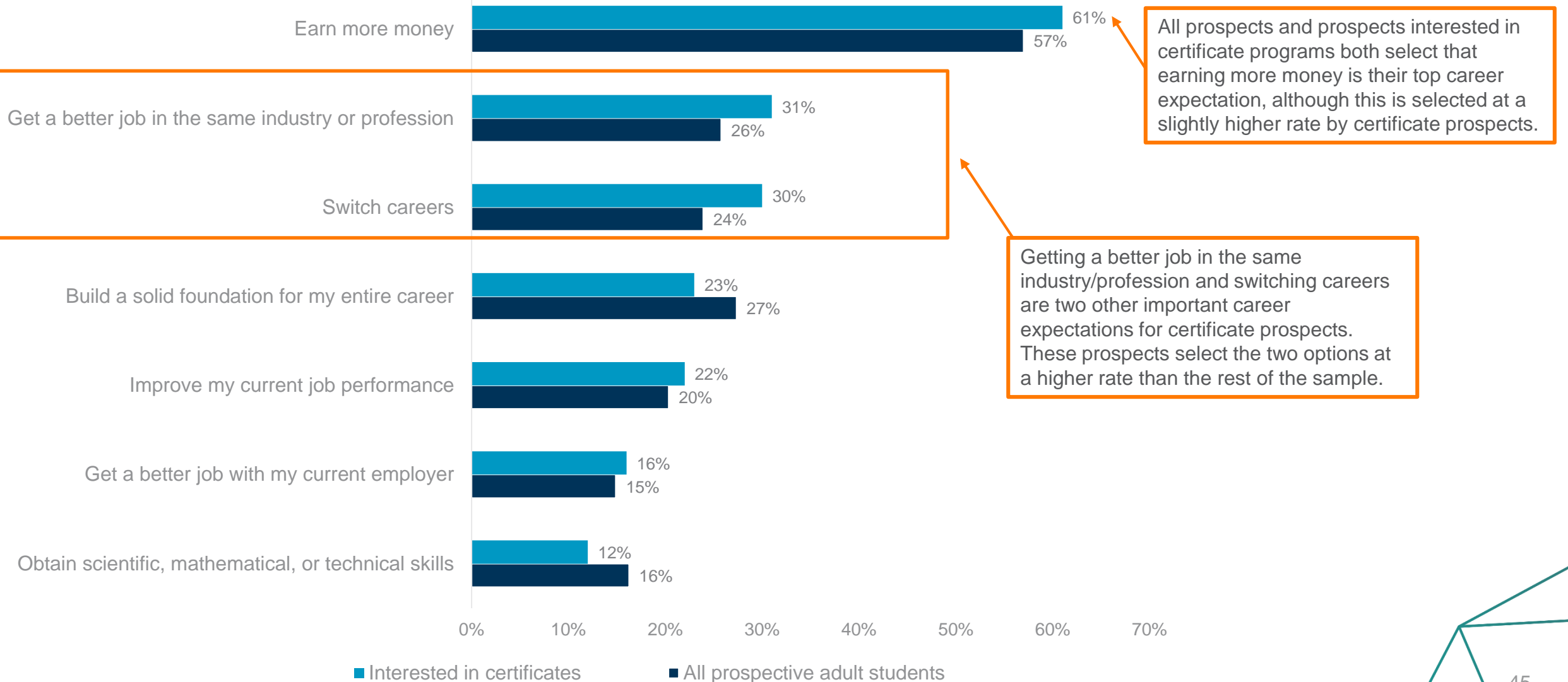
Adult Prospective Students: Strong increase in online modality preference during COVID and potentially beyond COVID.

If you were to enroll in a college or university, how would you prefer to participate?



Prospective Adult Students: Earning more money is the top career expectation for certificate prospects, though getting a better job or switching careers are other top expectations.

Q) What are the top three career expectations you have for continuing your education?



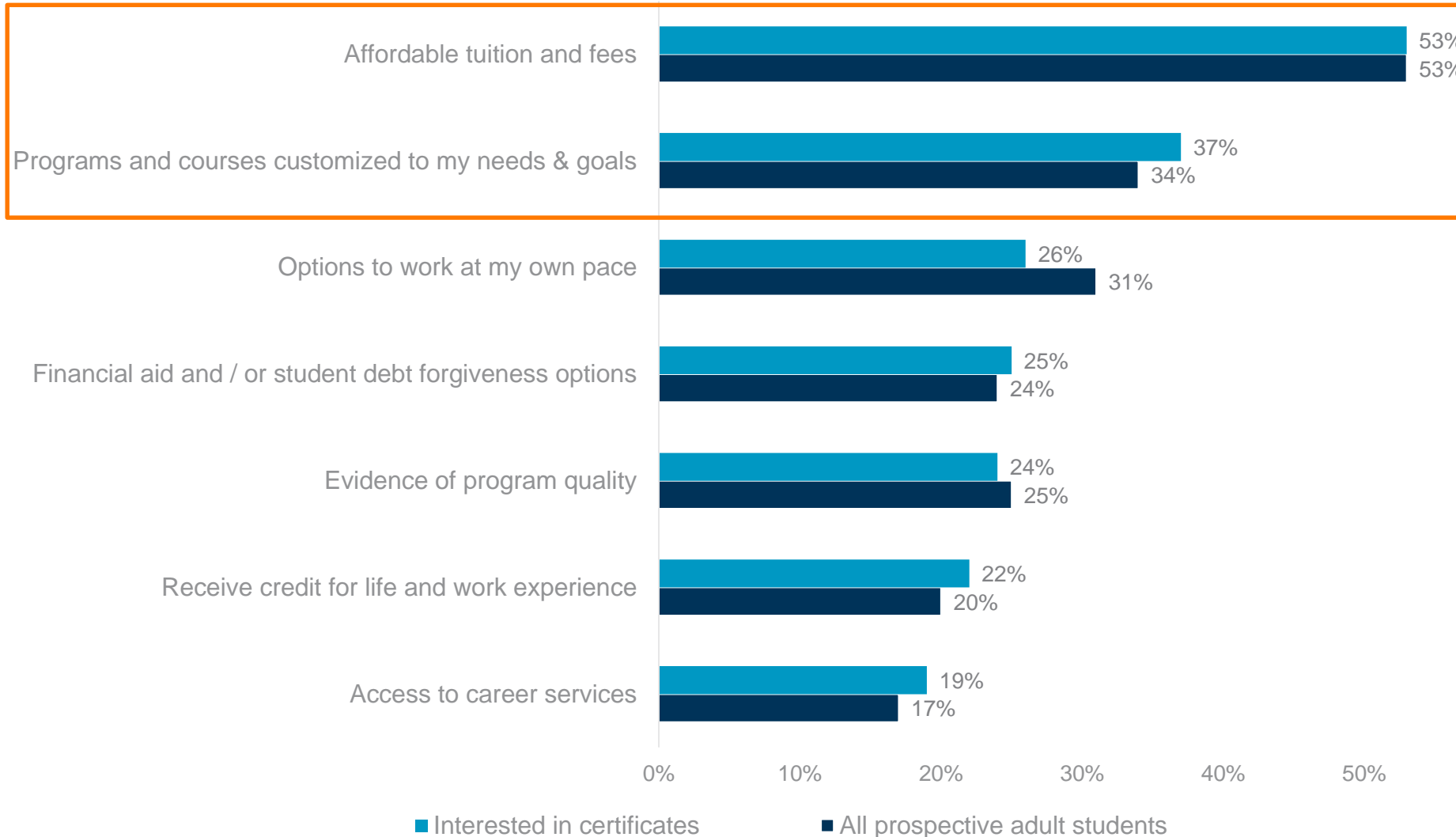
All prospects and prospects interested in certificate programs both select that earning more money is their top career expectation, although this is selected at a slightly higher rate by certificate prospects.

Getting a better job in the same industry/profession and switching careers are two other important career expectations for certificate prospects. These prospects select the two options at a higher rate than the rest of the sample.



Prospective Adult Students: While affordable tuition and fees is the top feature, customizable content is also important.

Q) What are the top three features you care about the most when selecting a degree or certificate program?

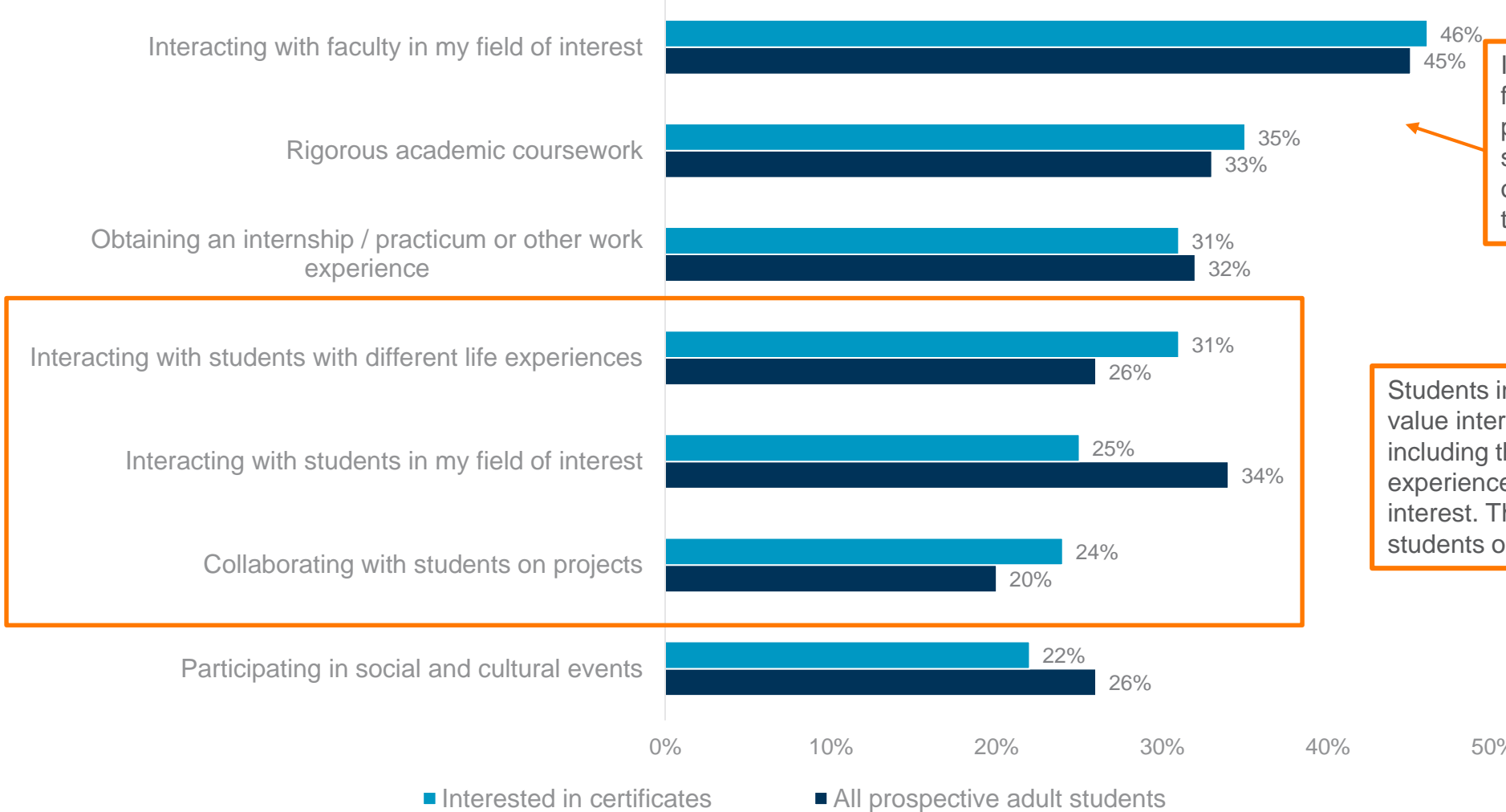


Affordable tuition and fees are the top feature for both the entire sample, as well as for adult prospects interested in certificate programs. Customized programs and courses are the other top feature for both populations, although prospects interested in certificate programs select this option at a slightly higher rate.



Prospective Adult Students: Faculty interactions is the most important experience, followed by academically rigorous coursework.

Q) What are the top three experiences you expect to learn the most from while continuing your education?



Interacting with faculty is the top experience for prospects interested in certificate programs, which is in line with the national sample. Rigorous academic coursework and obtaining an internship/practicum are other top experiences.

Students interested in certificate programs value interactions with other students, including those with different life experiences and those in their field of interest. They also value collaborating with students on projects.



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