BUSINESS ENGAGEMENT STRATEGY
CAREER PATHWAYS – PHASE II:
COMPUTER SCIENCE AND SOFTWARE ENGINEERING, 2013-2014

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Dear Associates,

Nearly two years ago, we launched a Business Engagement Strategy born out of discussions with local business, community, and educational leaders. This strategy is a key part of U.V.U.’s overall goal “to develop a well-trained workforce and other factors critical to regional prosperity by working closely with the surrounding business community and local-level leaders.” One component of the Business Engagement Strategy (BES) is the creation of Career Pathways that will provide students with an early orientation of job and career opportunities and a map that helps them navigate well-defined pathways from high school through higher education to employment, particularly in the vibrant economic sectors of the Mountainland Region. To that end, I established the BES Career Pathways Taskforce and charged them with initiating these activities. Today I am pleased to present their work and findings in this report.

Much has been said of the critical goal of higher education in Utah to move from 39% of adults with some form of college completion to 66%, in order to meet workforce demands and foster a high quality of life and strong economy. This goal is not just about numbers of degrees. It is about aligning education to meet current and future workforce needs, increasing the level of economic innovation in our region and state thorough active and successful partnerships among business, industry, education, and community leaders, and leveraging our collective resources and talents to address serious challenges and achieve the true greatness of our community. For any seeking to accomplish such goals, I encourage serious consideration of the processes, conclusions and recommendations found in the report presented here by our BES Career Pathways Taskforce.

Sincerely,

President Matthew S. Holland
October 18, 2012
EXECUTIVE SUMMARY

The Business Engagement Strategy (BES) Career Pathway Taskforce, under the direction of Susan Thackeray, was charged by President Holland to continue its work on the BES Career Pathway Initiative and to build upon the recommendations of the high-level Career Pathway Stakeholder Team (2013 Report). The stakeholder team laid the groundwork for the development of career pathways at UVU and recommended that priority be given to the development of a career pathway for Computer Science and Software Engineering.

With funding from a Utah Cluster Acceleration Project (UCAP) grant, work was begun in fall 2013 to create two pathways in the Information Technology cluster:

- The high-school level pathway development utilized the 10-step pathways process developed by the USHE, based on the National Clusters Framework, and the Rigorous Programs of Study (RPOS) Framework Elements advanced by the U.S. Department of Education. The pathway offers certificates of proficiency in Computer Science, Information Technology, and Digital Media, delivered through UVU Concurrent Enrollment at the Advanced Learning Center in the Nebo School District. Students completing the certificates will accumulate credit hours that will count toward UVU certificates and graduation requirements. Identify gaps, issues, and challenges of developing pathways.

- The adult-level career pathway creates a new model for pathway development in the state. This pathway offers two non-credit certificates of proficiency delivered through UVU Community & Continuing Education: Level 1 – Beginning Software Testing Non-Credit COP and Level 2 – Advanced Software Testing Non-Credit COP. The courses were developed through a partnership between UVU academic programs and representatives of business and industry. DWS assisted in determining critical areas of workforce need and will assist with job placement.

While the curriculum for these programs has been developed, the efforts to implement and evaluate the courses are ongoing. Those forwarding this proposal recommend that UVU continue support of the business community through these ongoing efforts in college and career pathway development and implementation. We also recommend that UVU continue to strengthen community education programs through aligned efforts between community education and academic departments.
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I. OVERVIEW

UVU BUSINESS ENGAGEMENT STRATEGY

Utah Valley University (UVU) launched the Business Engagement Strategy (BES) in 2011, designed to serve as a guide for the University’s interface and engagement with the business community in its service area. The comprehensive strategy was formulated through discussions with local business, community, and educational leaders invested in aligning regional resources for economic and business development. One of the seven priority strategies of the BES is the development of career pathways that provide students with a clear sequence of educational experiences connecting secondary to postsecondary training leading to meaningful employment. The BES Career Pathways Stakeholder Team – consisting of business partners, content experts, and administrators and counselors from secondary and postsecondary education – was formed to lay the groundwork for the development of career pathways at UVU.

As was reported in the UVU Business Engagement Strategy Career Pathways Report issued in 2013, the initial pathway development was led by UVU and focused on Digital Media. Through the efforts of a ground-level partnership team (the UCAP Digital Media Pathway Partnership), a state-wide career pathway in Digital Media has been established and validated by industry, and gaps in the pathway have been identified. Furthermore, a well-defined educational pathway was developed for students in the Mountainland Region (UVU’s service area) providing a connection between secondary programs and the digital media certificates and degrees offered at UVU.

In the Conclusions & Recommendations section of the 2013 report, the BES Career Pathways Stakeholder Team made a series of recommendations that will be acted on over the next few years. Recommendation #9 indicated that UVU should formally develop additional career pathways following the 10 elements identified in the U.S. Department of Education’s Rigorous Programs of Study, and indicated that priority should be given to the development of a career pathway for Computer Science and Software Engineering. This recommendation has led to the creation of several related programs and associated pathways within the Information Technology career cluster, including pathways in Computer Science. This effort will be the subject of this report.

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CAREER PATHWAYS

Since the UVU Business Engagement Strategy report was issued in 2013, the importance of career pathways has continued to emerge both nationally and in Utah. A recent report issued by the National Career Pathways Network and the Institute for a Competitive Workforce highlights the increasing importance of career pathways and underscores the critical role that employers and business leaders are playing in their development. The publication’s title, *Thriving in Challenging Times: Connecting Education to Economic Development through Career Pathways*, emphasizes the importance of education, business and industry, and economic development partners working together to design and implement career pathways.

One of the goals of the UVU BES is the development of a well-trained workforce. The BES sees higher education as a partner with business and industry in retaining and increasing the number of jobs available for Utah workers. Key to this effort is the establishment of a strong educational pipeline that moves prepared, motivated students through well-designed educational and training programs into jobs that meet workforce needs. This educational pipeline, however, needs to be strengthened. High school dropout rates are high for some groups of students. Many students are not performing up to their potential because they are not interested, motivated, or challenged. The transition rate from secondary to post-secondary education is lower than it should be (Utah ranks 23rd in the nation for 18-24 year olds enrolled in college), and postsecondary completion rates are currently too low to meet projected workforce needs both nationally and in Utah.

One of the solutions is the creation and support of well-designed career pathways that get students involved early in areas that are of interest to them and that prepare them with the professional skills and education that will qualify them for current jobs and professions. Such pathways would also include adults who need job and career training. The previously cited publication *Thriving in Challenging Times* has issued the following Call to Action.

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4 *Thriving in Challenging Times—Connecting Education to Economic Development through Career Pathways*, A joint publication of the National Career Pathways Network and the Institute for a Competitive Workforce, an affiliate of the U.S. Chamber of Commerce, p. 11.

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II. REPORT ON UCAP SUPPORT FOR IT PATHWAY DEVELOPMENT

In fulfilling the commitment to develop career pathways made in the BES, UVU applied for a grant through the Utah Cluster Acceleration Partnership (UCAP). UCAP is comprised of key stakeholders including the Department of Workforce Services (DWS), Governor’s Office of Economic Development (GOED), Utah System of Higher Education (USHE), and Utah State Office of Education (USOE), among others. Through its annual grant competition, funding was awarded to UVU to complete the career pathway development for Computer Science and Software Engineering in the Mountainland Region. The grant was awarded in the fall of 2013 and work on the project was completed by June 30 of 2014. The implementation of the UCAP grant resulted in the completion of the following deliverables that were set forth in the grant proposal.

1. **Develop certificates in IT fields to respond to regional workforce needs.** A major goal of the UCAP grant was to create new certificates that prepare workers with skills required to satisfy several current labor needs. After working with faculty in the departments of Computer Science, Information Technology, and Digital Media, and with representatives from business, industry, and DWS, the following new certificates have been developed:

   a. **High-School-Level Certificates of Proficiency (COP) in the IT Cluster** – Certificates focus on secondary education students and are delivered through UVU Concurrent Enrollment:
      - COP in Computer Science
      - COP in Information Technology
      - COP in Digital Media.

   These certificates, created in conjunction with the Nebo School District, will be available at the Advanced Learning Center (ALC) in Springville, Utah. Students from high schools within the Nebo district will be chosen to participate and part of the student’s day will be spent at the ALC, taking courses that will lead to the targeted COPs. Through the Concurrent Enrollment Program students will accumulate credit hours that will count toward UVU academic certificates and degrees. The COPs and the pathway were piloted in this project with the intent of later implementation in other school districts.

   b. **Adult-Level Non-credit Certificates of Proficiency in Software Testing** – Certificates focus on adult training and are delivered through UVU Community & Continuing Education:
      - Level 1: Beginning Software Testing Non-Credit COP
      - Level 2: Advanced Software Testing Non-Credit COP

   These certificates in software testing were requested by business and industry, working through DWS, to meet workforce demand. The certificate training...
programs will be delivered through the Community & Continuing Education Office at UVU. The certificates will be available to the general public, to adults referred by companies or by DWS, or through adult education units through the school districts.

2. **Advance the IT career pathways** (secondary to post-secondary) associated with the above high school-level certificates; Develop an IT career pathway for adult learners (certificate to work) in Software Testing, associated with the above adult-level certificates. A report of progress on these pathways is contained in sections III and IV of this report.

3. **Develop these career pathways using a facilitator.** A facilitator was used to coordinate the work between UVU faculty, department chairs, the Community & Continuing Education unit, school districts, and DWS. Gary Wixom, Assistant Commissioner for Career & Technical Education at the Utah System of Higher Education, served as the facilitator. He previously served as facilitator for the Digital Media Pathway development.

4. **Coordinate the development of high school Certificates of Proficiency with school district administration and faculty.** The development of the Computer Science Pathway was discussed with each of the school districts within the Mountainland Region. After an analysis of the courses being offered throughout the region, the decision was made to pilot test the pathway and the High School Certificates of Proficiency using the Advanced Learning Center located within the Nebo School District. Implementing the pathway throughout the Mountainland region is the ultimate goal.

5. **Develop and implement a Rigorous Program of Study (RPOS) pilot within the Mountainland Region,** delivering three Certificates of Proficiency to high school students enrolled in the RPOS. During the development of the UVU Business Engagement Strategy, and the creation of the Digital Media Pathway, a decision was made to adopt the framework for the RPOS approach for the implementation of a pathway (see page 11 for a description of RPOS). Multiple planning meetings were held with key personnel from public and higher education to determine course alignment. The planning team was comprised of the Advanced Learning Center principal, advisor, district and post-secondary Career and Technical Education directors, the university and regional pathway facilitators. Department chairs for Computer Science, Digital Media and Information Technology were included in subsequent planning meetings to effectively develop viable certificates that lead to degrees and careers.

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GARY WIXOM, WHO SERVED AS THE CAREER PATHWAYS FACILITATOR ON THIS PROJECT, WAS RECENTLY AWARDED THE ASSOCIATION FOR CAREER AND TECHNICAL EDUCATION’S (ACTE) 2014 LIFETIME ACHIEVEMENT AWARD. THE LIFETIME ACHIEVEMENT AWARD IS PRESENTED ANNUALLY TO DISTINGUISHED ACTE MEMBERS WHOSE CONTRIBUTIONS HAVE MADE A SIGNIFICANT IMPACT ON THE FIELD OF CTE AT STATE, REGIONAL, AND NATIONAL LEVELS. DR. WIXOM CURRENTLY SERVES AS ASSISTANT COMMISSIONER FOR CTE EDUCATION IN THE UTAH SYSTEM OF HIGHER EDUCATION. (HTTP://HIGHEREDUTAH.ORG/)
Using the RPOS approach, a group of students have been identified at the Nebo School District that will participate in a RPOS designed to lead the students through their high school required curriculum and concurrently through one or more of the high school certificates of proficiency. As the students work through the program of study, they will accumulate credit at the high school and also credit at Utah Valley University. Students who complete the pathway will earn 15 to 25 credits at the University.

6. **Connect the Degree Maps available on the new UVU website to the Utah Majors Guide and occupational information and current job openings.** In July of 2013, the Regents charged the institutions with several completion related goals. One of those tasks was to provide degree maps or plans on their websites that provide details of a program of study for the students to follow. The Utah System of Higher Education has sponsored the utahmajors.org site for the last 10 years, which allows a student to search for a specific major at a USHE institution and be linked to information about that major and the requirements for completing a certificate or degree. In the past, these links led to a variety of places, department websites, or catalog pages. With the introduction of the degree maps on the UVU website, plans are underway to link the Majors Guide to the degree maps (see page 15). The UCAP grant and this pathway project has provided a foundation for this work, and the links should be completed by the end of this academic year.

7. **Contract with Computer Science faculty for the development of Non-credit Certificates of Proficiency focused on training of adults.** Having faculty involved in the development of the Certificates of Proficiency for adults was essential. After working with the Department Chair, a contract was established between two Computer Science faculty members to help develop the Certificates. The faculty worked closely with a business and industry advisory committee as described below. After the industry representatives validated the components of the certificates, the curriculum was organized into two distinct non-credit certificates of proficiency.

8. **Work with representatives from business and industry to validate the curriculum supporting the adult Certificates of Proficiency.** Representatives from several of the large software companies in Utah County participated in the assessment and validation process for the components of the adult Certificates of Proficiency. The representatives identified foundational skills in software testing as well as the essential skills necessary for success in both entry-level and advanced-level positions.
They also reviewed the curriculum and assessed how well it met the needs of their companies (or similar companies), offering suggestions for improvement.

9. **Incorporate Work Keys into the Adult Certificates of Proficiency.** ACT WorkKeys® has been incorporated into the adult non-credit certificates. WorkKeys is a job skill assessment tool used by educators to prepare students for the workplace and by businesses to verify workplace skills of potential employees. WorkKeys assessments award National and Workforce Readiness Certificates (NCRC) to validate students’ workforce-readiness skills. (For more discussion of WorkKeys, see page 21.)

This deliverable coordinates with the Utah Certified Work Ready Communities initiative, a statewide effort to certify workforce preparation through NCRCs and to strengthen the state’s economic viability. The Utah Certified Work Ready Communities leadership team is comprised of leaders from the Governor’s Office of Economic Development, the Economic Development Corporation of Utah, the Utah College of Applied Technology, USHE, DWS, several school districts, and local business leaders.6

10. **Finalize UVU as an authorized Work Keys National Career Readiness Center and testing site** for the Applied Mathematics, Locating Information, Reading for Information, and Talent assessments. UVU has finalized arrangements to become an authorized Work Keys National Career Readiness Center and Testing site.

11. **Develop and equip a mobile computer lab providing computer workstations to support on and off-site delivery of the developed Adult Certificates of Proficiency.** Providing the adult certificate training in a non-traditional manner required being able to deliver the training in more than one location convenient for the business partners, and for DWS clients. Laptop computers were purchased and configured so that they can be transported to provide training at various off-site locations. The laptops are stored at Community & Continuing Education. They can be checked out and taken to various locations to provide the training. The computers are also configured with the appropriate software needed to provide the training. A mobile cart is used to secure the laptops and laptop bags are used to transport the computers.

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To create the new IT career pathways for secondary students, project leaders followed the same processes as those used in the creation the BES Digital Media project. In particular, both have followed the 10-step process developed by the Utah System of Higher Education, based on the National Clusters Framework (see the USHE Career Pathway Development Guide). Each step is described in Figure 1 below and discussed in the sections that follow.

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<th>Description</th>
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<td>Apply Framework Concepts</td>
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<td>Connect Pathway to Occupations &amp; Jobs</td>
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<td>Implement the Pathway</td>
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<td>8</td>
<td>Convene Student Focus Groups</td>
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<td>9</td>
<td>Evaluate the Pathway</td>
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<td>10</td>
<td>Refine the Pathway</td>
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Figure 1: USHE’s Ten Step Process for Career Pathway Development
1. ANALYZE THE CLUSTER AND PATHWAY COMPONENTS

The National Career Clusters Framework has organized programs of study into 16 clusters subdivided into career pathways. Computer Science and Software Engineering in general fall into the Information Technology Cluster, although supporting skills are also found in the Science, Technology, Engineering and Mathematics Cluster.

Figure 2 shows the national pathways that have been identified within the Information Technology Cluster. Computer Science and Software Engineering are not clearly identified within this model, but fall within these pathways.

The Utah Valley University College of Technology and Computing currently offers the following programs of study within these pathways.

**CERTIFICATE OF COMPLETION**
One-Year Certificate, Network Administration
One-Year Certificate, Programmer

**ASSOCIATE DEGREES**
Associate of Applied Science (AAS) in Computer Science; emphasis areas:
- Computer Engineering
- Computing & Networking Science
Associate of Science/Arts (AS/AA) in Computer Science

**BACHELOR OF SCIENCE DEGREES**
Bachelor of Science (BS) in Computer Science; emphasis areas:
- Computer Engineering, emphasis
- Computer Networking, emphasis
- Computer Science, emphasis
- Database Engineering, emphasis
Bachelor of Science (BS) in Software Engineering
2. IDENTIFY KEY PERSONNEL

Susan Thackeray, Director of Career and Technical Education (CTE) at UVU, served as the lead on the creation of the IT career pathways. In fall 2011, President Matthew S. Holland appointed Ms. Thackeray as the project lead for UVU’s Business Engagement Strategy—Career Pathways Taskforce. Through her work with the state and regional CTE programs, and her efforts directing the creation of the previous career pathway in Digital Media, Ms. Thackeray has established a strong working relationship among area school districts, DWS, and UVU’s College of Technology and Computing, representatives of business and industry.

As the development of a successful career pathway depends on getting the right people involved, key stakeholders were contacted for the preparation of the IT career pathways and representatives were designated who would serve on a pathway committee. Personnel from the following organizations were involved in the pathway development:

**SECONDARY EDUCATION**
- Regional CTE Pathway Coordinator
- CTE Directors from:
  - Alpine School District
  - Nebo School District*
  - North Summit School District
  - Park City School District
  - Provo School District
  - South Summit School District
  - Wasatch School District
- Advanced Learning Center (Nebo)

**POSTSECONDARY EDUCATION**
- Utah Valley University
  - CTE Director
  - Computer Science Chair
  - Digital Media & Information Chair
  - Pathway Facilitator (Wixom)
- Mountainland Applied Technology College
* Nebo School District was chosen for the pilot implementation, but other districts had input.

The role of all stakeholders was essential to pathway development. Representatives from the secondary districts advised on the initial parts of the pathway and on the advising of students who might enter the pathway. Postsecondary educators collaborated in the creation of courses to be taught through Concurrent Enrollment; they will also deliver education in the degree programs at UVU that are part of the designated pathways. Representatives of business and industry have previously assisted in aligning UVU’s curriculum with workforce needs.

Initial coordination took place with the Career and Technical Education Directors from each of the school districts within the Mountainland Region. Follow-up meetings were held with individual directors. Nebo School District, with its existing programs at the Advanced Learning Center (ALC) emerged as the best choice for the pilot of a Rigorous Programs of Study in these career areas. Meetings were then held with the administrators at the ALC followed up with meetings between the faculty at the ALC and UVU department chairs and faculty. The result was the creation of the certificates of proficiency in Computer Science, Information Technology and Digital Media to provide the high school students at the ALC a direct pathway to certificates and degrees at UVU.
3 & 4. ANALYZE CURRICULUM AND IDENTIFY CURRICULUM GAPS

The cluster and pathway components of Computer Science and Software Engineering were identified and the components were linked to and aligned with the secondary and postsecondary offerings in the Mountainland Region. Existing courses being offered in the secondary school districts were identified and matched with programs of study at UVU. Existing concurrent enrollment opportunities through UVU were also identified. Through discussions between administrators and faculty at both levels, additional options for concurrent enrollment courses were identified and proposed for this project.

The Mountainland Region school districts each have a unique approach to offering courses that are the foundation for a career pathway in Computer Science and Engineering. Courses at the districts were identified and initially mapped to the Computer Science and software engineering certificates and degrees at UVU. After discussions with the CTE Directors from the region, a decision was made to create three Certificates of Proficiency that high school programs could flow through concurrent enrollment and articulation agreements.

Since the high school offerings differ throughout the region, a decision was made to Implement a Rigorous Program of Study (RPOS) in Computer Science, Software Engineering and Digital Media at the Advanced Learning Center located in the Nebo School District. Although the Advanced Learning Center was created only a couple of years ago, the environment at the center, including the interest of the administration, credentials and experience of the faculty, and the number of and sequence of courses fit nicely into the framework of an RPOS program.

Curriculum gaps existed in a number of areas that could be resolved through UVU concurrent enrollment courses. Faculty at the high school level and faculty from the University are working on that alignment. One of the challenges that many of the school districts face is the lack of qualified instructors to teach in the Information Technology and Computer Science area. UVU is now providing professional development activities focused on upgrading existing teachers to be qualified in these areas.

5. APPLY FRAMEWORK COMPONENTS

During the development of the UVU Business Engagement Strategy, and the creation of the Digital Media Pathway, a decision was made to adopt the framework for the Rigorous Programs of Study (RPOS) approach for the implementation of pathways. RPOS is a structured approach for delivering academic and career and technical education to prepare students for postsecondary education and career success that utilizes a framework of 10 supporting elements viewed as instrumental for creating and implementing a high quality, comprehen-
A program of study is a sequence of instruction based on recommended standards of knowledge and skills, consisting of coursework, co-curricular activities, worksite learning, service learning and other learning experiences. A national effort is underway to develop programs of study that deliver rigorous and relevant curriculum to prepare students for success in the 21st century.

In 2011, six states, including Utah, were awarded grants from the OCTAE (then OVAE) to pilot test the development of a Rigorous Program of Study. Utah’s project is designed to enhance career and technical education offerings in health care. The pilot project was successful in providing direction to a cohort of student moving through a designated program of study in their high school courses in the Ogden School District with concurrent enrollment connections at Weber State University.

The RPOS is built on the following 10 elements of the national framework. Table 3 lists those components and summarizes how they were applied for this project.

**TABLE 1: RIGOROUS PROGRAM OF STUDY — 10 FRAMEWORK ELEMENTS**

<table>
<thead>
<tr>
<th>Framework Element</th>
<th>What Has Been Done</th>
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<tbody>
<tr>
<td>1. Legislation and Policies — Federal, state, and local legislation or administrative policies promote POS development and implementation.</td>
<td>Existing state policies support Career and Technical Education and the development of career pathways.</td>
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<tr>
<td>2. Partnerships — Ongoing relationships among education, business, and other community stakeholders are central to POS* design, implementation, and maintenance.</td>
<td>Utah delivers CTE through well-defined service delivery regions. Relationships between educators at the secondary and postsecondary levels are well established.</td>
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<tr>
<td>3. Professional Development — Sustained, intensive, and focused opportunities for administrators, teachers, and faculty foster POS design, implementation, and maintenance.</td>
<td>Through the federal Perkins CTE funds, administrators and faculty have been trained in the development of programs of study leading to complete educational pathways.</td>
</tr>
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<td>4. Accountability and Evaluation Systems — Systems and strategies to gather quantitative and qualitative data on both POS components and student outcomes are crucial for ongoing efforts to development and implement POS.</td>
<td>Utah has implemented the Utah Data Alliance, connecting public education data, higher education data, and the Department of Workforce Services data together. This provides for data supported decisions.</td>
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<tr>
<td>Framework Element</td>
<td>What Has Been Done</td>
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<tr>
<td><strong>5. College and Career Readiness Standards</strong> – Content standards that define what students are expected to know and be able to do to enter and advance in college and/or their careers comprise the foundation of a POS.</td>
<td>The Utah State Board of Education and the Utah State Board of Regents have agreed on a set of College and Career Readiness Standards. These standards are helping to drive changes in graduation requirements.</td>
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<td><strong>6. Course Sequences</strong> – Non-duplicative sequences of secondary and postsecondary courses within a POS ensure that students transition to postsecondary education without duplicating classes or requiring remedial coursework.</td>
<td>Using Utah’s Concurrent Enrollment program, courses at the secondary and postsecondary are aligned where appropriate and 30,000 students each year participate in articulated sequences that help eliminate duplication.</td>
</tr>
<tr>
<td><strong>7. Credit Transfer Agreements</strong> – Credit transfer agreements provide opportunities for secondary students to be awarded transcripted postsecondary credit, supported with formal agreements among secondary and postsecondary education systems.</td>
<td>Through Utah’s Concurrent Enrollment program students receive credit both at the high school and at UVU. University credit is placed on the transcript and follows students through their academic program of study.</td>
</tr>
<tr>
<td><strong>8. Guidance Counseling and Academic Advising</strong> – Guidance counseling and academic advisement help students to make informed decisions about which POS to pursue.</td>
<td>Utah has an advanced guidance and counseling program distributed throughout the state. Academic advisement is provided by higher education at individual institutions.</td>
</tr>
<tr>
<td><strong>9. Teaching and Learning Strategies</strong> – Innovative and creative instructional approaches enable teachers to integrate academic and technical instruction and students to apply academic and technical learning in their POS coursework.</td>
<td>Applied learning has been a focus in Utah CTE programs for many years. Online courses and hybrid courses are being developed and delivered across the state.</td>
</tr>
<tr>
<td><strong>10. Technical Skills Assessments</strong> – National, state, and/or local assessments provide ongoing information on the extent to which students are attaining the necessary knowledge and skills for entry into and advancement in postsecondary education and careers in their chosen POS.</td>
<td>Technical Skill Assessments are incorporated into the high school programs of study. Higher Education is using third party and industry certifications where they are available.</td>
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*In this table, POS refers to Program of Study.*
Note: Due to the short time-frame dictated by the UCAP grant, the full implementation of the 10 steps were not completed over the six month period of the project, but will continue over the next year. The full implementation of the pathway will include further connection to occupations and jobs available at the end of the pathway. Focus groups will be held to help evaluate the pathway success, and ongoing refinement of the process will take place. The following 5 items of the Career Pathway Development Model are in progress or are planned to be completed at a later date, as appropriate to the model.

6. CONNECT PATHWAY TO OCCUPATIONS AND JOBS

Web Development. More and more information on career development and career opportunities is becoming available on the web. In Utah we have been focusing on bringing this type of information to the web for the last 10 years. One of the first websites to provide educational career advisement was AdviseUtah, which led to UtahMentor, and now to Utah Futures. The Utah Majors Guide has been providing information on certificate and degree requirements at the USHE institutions for eight years and has just recently been updated. Each USHE institution has a website with information highlighting their individual offerings. What has been missing is a connection between these sites and interlinking career information, degree requirements, with current job information.

Degree Maps. As a part of the UVU UCAP grant, plans were developed to provide this missing connection. In July of 2013, the Utah State Board of Regents charged the USHE institutions with a completion agenda focused on getting more students to complete a degree or certificate (that can produce a livable wage). One of these completion charges was for the institutions to create degree maps and to publish those maps on their websites.

The new Utah Majors Guide (utahmajors.org) gives students the opportunity to choose a major that they are interested in and to investigate which USHE institutions offer certificates and degrees in that career area. Upon choosing an institution, they are presented with information about the USHE institution and the career pathways that are offered. Upon choosing a pathway, they see the certificate and degrees that are offered and when a certificate or degree is chosen, they are presented with a link to an advising page for that program of study. At the present time, the advising link goes to a department site with specific information, or to the catalog pdf page detailing requirements for the programs of study.

UVU is currently redesigning its website. The new website will include the new degree maps or plans that will detail the requirements that students must have to complete to be awarded the degree (see Figure 3 on page 14). In addition to the degree map, additional career information about that program of study will be available, giving the student a more complete planning tool for their educational program.
grant, a connection will be made between the Utah Majors Guide, and the new UVU institutional website. When the advising page link is activated on the Utah Majors Guide site, the link will connect directly to the new degree map on the UVU site. The degree map is designed to provide a variety of career pathway information along with the specific requirements for the certificate and degree.

Adding the Workforce Connection. The final connection needed in the career pathway information is to link the degree map to current job and occupational information. Working with the Department of Workforce Services, links will be added to the degree maps at UVU that will connect to the information that is available on state and national Workforce Services websites. This connection will provide students with information detailing working conditions, salary information and to current job openings. The work on the website connections is currently underway and should be completed by spring of 2015.
7. IMPLEMENT THE PATHWAY

During the 2014/15 academic year, the pathway beginning at the high school level and connection to the University will be fully implemented. Plans are now underway for the initial cohort of adults that will go through the Software Testing sequence.

8. CONVENE STUDENT FOCUS GROUPS

Plans are being made to convene student focus groups at both the secondary and postsecondary level to assess the success of the pathway during the 2014/15 academic year.

9. EVALUATE THE PATHWAY

At the end of the 2014/15 academic year, an evaluation will take place that will include surveys of the administrators and the faculty involved in the program, as well as students and employers. In addition, in three and five years, the BES Career Pathways Stakeholder Team will reconvene to evaluate the progress of the new pathways and make recommendations. (This team is the high-level team that made the recommendation to establish career pathways in Computer Science and Software Engineering in the UVU Business Engagement Strategy Career Pathways Report.)

10. REFINE THE PATHWAY

The pathway will be refined based upon the future input of the student focus groups, pathway evaluators, and BES Career Pathways Stakeholder Team.
IV. REPORT ON THE CREATION OF A NEW ADULT IT PATHWAY (Certificate to Work)

NEED FOR ADULT CAREER PATHWAYS

As described previously, the model used in the IT Pathway Development marries the 10-step process developed by the USHE, based on the National Clusters Framework, with the Rigorous Programs of Study 10 Framework Elements advanced by the U.S. Department of Education’s Office of Career, Technical and Adult Education (OCTAE). It should be noted that both the National Clusters Framework and the Rigorous Programs of Study models focus on CTE pathways for high school students rather than on adult education; however, most of their methods are broad based and inform adult career pathways. OCTAE sees the need to expand these strategies to be more specifically inclusive of adults. The Department of Education’s Strategic Plan for 2011-2014 includes the following: 1) expand career pathway systems for adults in collaboration with Federal partners and the private sector; and 2) scale the Rigorous Programs of Study, thereby improving career skills for all students.5

OCTAE’s strategies align with the efforts of the UCAP/BES project to create an adult pathway to employment utilizing a stackable series of Software Testing Certificates. Steps in the process of pathway creation are similar to those for the secondary pathways, but differ slightly, as described later in this section.

NEED FOR NON-CREDIT CERTIFICATE PROGRAMS AT UVU

At the Utah Valley Chamber of Commerce Executive Summit held on September 18th, 2013 the common theme from each speaker was that industry needs are not being met by educational entities. Speakers indicated that industries have to go outside of Utah to find quality employees specifically in the engineering and technical areas. The state’s academic programs cannot respond quickly to industry needs because of the policies and processes in place regarding the creation of new academic programs, which take two to three years to gain approval. The non-credit model forwarded by Community & Continuing Education strengthens UVU’s business engagement commitment by allowing UVU to be responsive to industry needs and fill gaps that academic programs cannot fill immediately.

Creating a robust certification model at UVU will benefit students, faculty, and the community. Credit students who are enrolled in an academic program may be eligible for working-level certifications that could directly connect to their academic program. Faculty will have the opportunity to create and deliver curriculum in their expertise area. Non-credit and academic programs can work in tandem rather than against each other; this partnership could strategically identify key certifications based on faculty expertise. This may help retain excellent faculty by compensating them for developing and implementing curriculum. Finally, the certifications will assist with economic development as industry hires students from UVU who are receiving certifications. Carnevale, Rose, & Hanson (2012) found that most certificate holders actually receive 20% higher income than those individuals who just have high school education.7

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The Computer Software Testing Pathway is an adult certification-to-work pathway. Certificates of Proficiency in Software Testing will prepare participants for immediate employment. Targeted adults include those at the beginning level who may need to train or re-train for a career; it also includes those training for the advanced level that may already have a degree or work experience in computer software but require additional skills in software testing. At this point, the programs are not stackable to credit programs at UVU, but they could give an entry-level person the skills required to be accepted into a degree program. The programs were designed by faculty in the UVU Computer Science program so that they might, in the future, be granted credit in a degree program.

The process of creating this adult certification-to-work pathway is somewhat different than the 10-Step USHE Career Pathway Model for secondary students described earlier (Figure 1). As this is a first attempt at creating an adult pathway within the USHE system, the procedures followed are documented here. As adult pathways become more robust, the model will also become more robust.

INITIAL PROCESS FOR ADULT CAREER PATHWAY DEVELOPMENT

1. Establish Policies
2. Identify a Workforce Training Need
3. Identify Key Personnel
4. Identify Specific Workforce Training Gaps
5. Develop Workforce Training Curriculum
6. Validate Workforce Training Curriculum
7. Integrate Workforce Readiness Standards within the Pathway
8. Provide Opportunities for Adult Remediation
9. Connect Pathway to Occupations and Jobs
10. Implement the Pathway
11. Convene Student Focus Groups
12. Evaluate the Pathway
13. Refine the Pathway
1. ESTABLISH POLICIES – CREATING A CULTURE AT UVU FOR NON-CREDIT CERTIFICATE PROGRAMS AT UVU

During the last 10 years as Utah Valley State College transitioned to Utah Valley University, some policies and procedures that were once in place were changed or lost as the focus of the institution changed. In particular, policies and procedures at UVU that support business and industry through the development of certificates and customized training were let go, but are now being reconsidered, and in some cases redefined or re-established. At issue has been the consideration of whether or not UVU will offer non-credit certificates through Community & Continuing Education (CCE), and if so, how this will be done.

The recognition that non-credit certificates do have a place within the university constitutes a change in the institutional culture that has been significant and now has the support at all levels of the administrative structure. CCE has created a process for approving and implementing non-credit certificates of proficiency (see Figure 4) that has been validated by the President’s Cabinet, Strategic Engagement Council, and Academic Affairs Council. The process is now implemented using a partnership between the units of CTE and CCE.

CCE is working to identify the most agile and innovative approach to meeting the educational needs of local industry, social and public sector entities. In this context, CCE is moving to a modified decentralized or hybrid approach. The approach allows one office to coordinate all administrative processes, guidelines, logistics, and the exchange of money. The academic department coordinates the subject matter, content, and instruction. This model promotes buy-in and support from academic departments, fosters collaboration, eliminates duplication of services, maintains efficiencies, creates quality assurance with offerings, and maintains UVU’s brand of integrity.

2. IDENTIFY A WORKFORCE TRAINING NEED

Business and Industry representatives and DWS approached CTE and identified skills that the workforce was lacking in the software testing industry. CTE provided the list to the UVU Computer Science academic department.

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CCE Non-Credit Certificate* Flow Chart

CCE process:
- Meet with business or academic department to determine needs
- Identify the best option (credit or non-credit, certificate, certification, special course)
- Needs assessment (DWS)
- Work with MATC
- Criteria (industry demand, Adult Career Pathway, Unique Education Mission)
- Consult with Senior Director of Community Colleges
- Initial contact with academic department

Academic Departments are consulted and invited to participate; the departments are given first right of refusal.

*Note: CP1 is defined as fewer than 30 credit hours, fewer than 900 clock hours, and less than 1 year in length (see R01).

CCE Business Partnerships Working Group with approvals by: President’s Cabinet, 2/28/14; Strategic Engagement Council, 3/24/14; Academic Affairs Council, 4/8/14; Updated 8/13/14.

FIGURE 4: CCE NON-CREDIT CERTIFICATE FLOW CHART
3. IDENTIFY KEY PERSONNEL

The Senior Director of Community & Continuing Education, Alexis Palmer, served as lead on this project in collaboration with Susan Thackeray, Director of Career and Technical Education. Dr. Gary Wixom of USHE served as facilitator. Under Ms. Palmer’s direction, the key personnel for this project were identified. They included the following:

**UVU DEPARTMENT OF COMPUTER SCIENCE** – the department chair identified two faculty members who were a good fit for developing the curriculum.

**BUSINESS & INDUSTRY REPRESENTATIVES** – assisted in aligning education with workforce needs; they also assisted in reviewing the curriculum of newly created courses.

- Dell Computer
- DigiCert
- Xactware
- Church of Jesus Christ of Latter-day Saints, Family Search Division
- Ancestry.com

**UTAH DEPARTMENT OF WORKFORCE SERVICES**

4. IDENTIFY SPECIFIC WORKFORCE TRAINING GAPS

Existing programs of study in the UVU Computer Science and Software Engineering programs were analyzed to determine how a non-credit curriculum could be developed to support an adult pathway. As a result, a decision was made to create new non-credit Certificate of Proficiency in the area of Software Testing that would serve business and industry needs directly.

5. DEVELOP WORKFORCE TRAINING CURRICULUM

Developing the Software Testing Certificates was a joint effort between industry and the Computer Science Department. The following were some of the key elements of this effort:

- Business and industry partners identified specifications that were central to individuals who might be eligible for employment. DWS facilitated a conversation with Xactware and DigiCert about their needs for individuals seeking employment in the Software Testing field. Xactware and DigiCert provided specifications that were needed and provided the list to CTE. CTE met with CCE and the Computer Science department to discuss curriculum necessary to meet workforce demands.

- The two faculty members from Computer Science used the specifications generated by business and industry partners as their guiding document in the development of the certificate.
• The participating faculty met with CTE and CCE on a regular basis. They identified an outline, topics, delivery method, courses, learning outcomes, and objectives for each course.

• The faculty worked closely and met multiple times with representatives from business and industry. Three working sessions were with the faculty and representatives from business and industry to help create the outline and topics that were essential to the software testing certificates. The faculty facilitated the meetings and worked through the specifications to begin identifying the outline, topics, delivery method, courses, learning outcomes, and objectives.

6. VALIDATE WORKFORCE TRAINING CURRICULUM

The curriculum was reviewed and validated by the Computer Science academic chair. The academic chair evaluated the curriculum based on rigor, quality, and learning outcomes. Additionally, representatives from DWS and CCE met with industry representatives to review the curriculum. Industry representatives evaluated the curriculum based on how it met their company’s needs. Changes were made based on their suggestions and presented to the academic chair again for approval.

7. INTEGRATE WORKFORCE READINESS STANDARDS WITHIN THE PATHWAY

The adult career pathway will be strengthened by adding a layer of credentials through the use of ACT WorkKeys® with National Career Readiness Certifications (NCRC). NCRC is a portable, nationally-recognized credential that clearly identifies an individual’s skills through assessments called WorkKeys, which measure foundational skills in the key areas of Reading for Information, Applied Math, and Locating Information (cognitive skills required for most jobs), and a soft skills through a Talent assessment. Individuals take the assessments and receive the National Career Readiness Certificate based upon their scores. Businesses use the assessments to determine if a job applicant has the soft skills necessary to perform a specific job. NCRC certification offers additional credentialing that will assist adult workers in obtaining jobs.

8. PROVIDE OPPORTUNITIES FOR ADULT REMEDIATION

Courses for the Level 1 Certificate are focused on digital literacy and computer comprehension. These are basic level courses to help prepare students for the content-heavy courses. The new non-credit certificates also include the remedial work that may be necessary for some participants to be successful job applicants through the use of KeyTrain, a component of the WorkKeys program. When WorkKeys tests indicate that a student needs additional work in one of the assessed areas, KeyTrain provides accelerated and contextualized remediation for each
skill level in an easily accessible online format. Training is provided in Reading for Information, Locating Information, and Applied Math (suited to adult learners who have been away from school).

9. CONNECT PATHWAY TO OCCUPATIONS AND JOBS

Working with the regional DWS offices (One-Stop Centers), students will be supported to apply for occupations and jobs for which they receive training through the Computer Software Training Pathway. DWS will be aware of when classes begin and end and of the participants in the classes whom they referred. All participants will be made aware of DWS services.

10. IMPLEMENT THE PATHWAY

These certificates will be available for DWS clients, potential applicants of Xactware and DigiCert and adults in the fall of 2014. Students register through Community & Continuing Education. Course instructors include UVU faculty and industry experts. Registration fees will be paid by the student or funded through DWS. Additionally, CCE has work training scholarships and short-term intensive training funds that are available for the student.

11. CONVENE STUDENT FOCUS GROUPS

After the first cohort participates in the courses associated with the certificate they will participate in a focus group addressing the following questions:

- Have student learning outcomes been achieved?
- Is the course content of high quality?
- Were students who complete the training programs able to advance in their position at their current job or to become employable in the Software Testing field?
- Are the courses affordable and are there sufficient resources to meet the needs of low-income students or potential students?

12. EVALUATE THE PATHWAY

The information from the student focus group will be provided to the instructors who taught the courses, Computer Science department chair and faculty, and the original group from industry who originally assisted in creating the certificate. The stakeholders will take the information to determine changes that need to be made.

13. REFINE THE PATHWAY

The pathway will be evaluated each year to determine additional programs that may need to be implemented. Part of refining the pathway is creating a seamless transition from the non-credit certificate to a baccalaureate degree in Computer Science. Additional evaluation will be conducted through the Community College Programs Advisor Board. Board members will assist UVU in identifying similar needs of multiple companies to support new certificates.
LONG-TERM ASSESSMENT OF ADULT CAREER PATHWAYS

The 2014 report *Advancing Career and Technical Education in Career Pathways Systems Integrated Model,* suggests that the failure to plan and align adult career pathways with CTE pathways designed for secondary students leads to inefficiency and confusion among stakeholders. It sets forth strategies aimed at "greater alignment in terms of efficiency, replicability and adaptability, alignment of resources and incentives, and clear signals to educational institutions, employers, and students about the road ahead."

In national terms, adult career pathways would provide entry-level access to adults as well as exit points to well-paying jobs and/or stepping stones to continued higher education opportunities. A full adult career pathway would provide access to remedial resources tailored to adult needs. It would be designed to accommodate working individuals who desire to increase their skills, as well as unemployed or displaced workers who desire to become trained in a specific occupation. Like a career pathway for secondary students, an adult career pathway would provide multiple entry and exit points with certificates and degrees that can lead to family-sustaining jobs. It would include a network of counselors, academic advisors, human resources personnel, and job locating experts, who could help individuals select the right career pathway for them, succeed in educational programs, and find suitable employment related to the pathway. In fact, ideally, there would be only one career pathway in a given field with entry points for both secondary students and adult students.

Figure 5, above, appears in *Advancing Career and Technical Education in Career Pathways Systems Integrated Model* and depicts how traditional CTE Career Pathways and adult career pathways can align to establish a Comprehensive Career Pathways System.
In local terms, the non-credit certificated model forwarded by the UVU CCE could serve as a pathway to UVU’s academic programs, particularly for adult students. This model is in line with a 2012 report released by the Center on Education and the Workforce at Georgetown University entitled, *Certificates: Gateway to Gainful Employment and College Degrees* which indicated that certificates can be a pipeline for academic programs (see insert). The report indicates that two out of every three workers who have a certificate and a college degree, received the certificate prior to obtaining a college degree, an indication that certificates can serve as a stepping stone on the way to a college degree.

The model is also in line with USHE’s HigherEd Utah2020 initiative, which aims to have 66% of Utahns with a post-secondary degree or certificate by the year 2020. Certificates that target high-demand, livable-wage jobs are part of that 66%. They address real workforce needs and can serve as a bridge for many adults to higher education.

Faced with declining enrollments and the challenges of addressing multiple missions, other institutions of higher education across the nation are re-thinking their approach to certification programs and finding success in the effort. Similarly, certificate pursuing adults could have a positive impact on UVU.

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**CERTIFICATES – GATEWAY TO GAINFUL EMPLOYMENT AND COLLEGE DEGREES**

In America, the postsecondary certificate has become a cost-effective tool for increasing postsecondary educational attainment and gainful employment. Certificates are . . . are expanding rapidly in response to a wide range of educational and labor market demands.

Certificates vary widely in their benefits, but have the capacity to raise the country’s global educational standing by both encouraging further education and degree completion as well as by providing gainful employment.

Certificates with economic value are cost-effective, partly because they are the quickest education and job training awards offered by American higher education. Certificates almost always take less than two years to complete, and more than half take less than one year. They also often pay off more than two-year degrees and sometimes pay off more than four-year degrees.

These bite-sized educational awards also provide the on-ramp to college education and middle-class jobs for low-income, minority and immigrant Americans who are often the first in their families to attend college. For incumbent workers, certificates can be the most effective way to catch up, keep up and get ahead in their chosen field. For the unemployed and underemployed, certificates can offer a jumpstart in the labor market.

Certificates are relatively cheap, can be completed quickly, sometimes lead to industry-based certifications (occupational licensing), and are the fastest-growing postsecondary credential awarded over the past several decades.

In an economy in which the lockstep march from school to work has been replaced by lifelong learning, certificates provide flexible learning modules that fit wherever necessary in an increasingly non-linear education and training system.

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11 Anthony P Carnevale, Stephen J. Rose, Andrew R. Hanson, 2012, *Certificates: Gateway to Gainful Employment and College Degrees*, Georgetown University Center on Education and the Workforce.
V. CONCLUSIONS AND RECOMMENDATIONS

With the support of UVU and funding from UCAP, and through partnership with secondary education, two new career pathways have been created. The Rigorous Programs of Study (RPOS) pathway that targets high school students is supported through UVU Concurrent Enrollment courses. The Adult Career Pathway is supported through UVU Community & Continuing Education programs and DWS. Both pathways support the identified needs of business and industry. The efforts to implement and evaluate these programs are ongoing. Those forwarding this proposal recommend that UVU continue support of the business community through these ongoing efforts in college and career pathway development and implementation. The following related recommendations are also forwarded:

- UVU’s Computer Science and Digital Media Departments should consider refining current curriculum based on the gaps identified by faculty during the development process of the non-credit curriculum.

- UVU should continue to work with the State CTE Coordinator and district CTE coordinator to extend the new high school-level IT pathway to other districts beyond the pilot (at the Advanced Learning Center in the Nebo School District) as resources for qualified teachers become available.

- UVU should continue to strengthen community education programs through aligned efforts between community education and academic departments.

- UVU should be responsive to business and industry needs by creating non-credit certificates.

- The new non-credit adult certificates should be articulated into credit programs in order to provide a career pathway that includes a post-secondary degree.

- In order to more fully benefit adult learners and Utah Valley University, a policy should be adopted that allows for-credit courses to be facilitated through Community & Continuing Education (CC&E) if they are part of a career pathway and have been developed by the academic faculty.

- Ultimately, we envision that high-school level pathways and adult-level pathways will converge into a single pathway for each job cluster with various entry and exit points.

- UVU should continue to develop the Career Pathways that have been identified as a priority during the Business Engagement process.
APPENDIX A: SECONDARY-LEVEL IT CERTIFICATES OF PROFICIENCY

The following course work will be required for the secondary-level Certificates of Proficiency that will be offered through the Rigorous Program of Study program at the Advanced Learning Center in Springville, Utah (Nebo School District).

### TABLE 2: COMPUTER SCIENCE CERTIFICATE OF PROFICIENCY — ALC TO UVU ACADEMIC YEAR 2014/15

<table>
<thead>
<tr>
<th>High School Course</th>
<th>UVU Course Required</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL EDUCATION Required Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Arts 12 CE</td>
<td>ENGL1010—Introduction to Writing</td>
<td>3</td>
</tr>
<tr>
<td>Algebra 2 CE, or Pre-calculus Elective CE</td>
<td>MATH1010—Intermediate Algebra (pre-req. Algebra II or Secondary 3), or MATH1050—College Algebra</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td><strong>COMPUTER SCIENCE Required Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Programming I CE</td>
<td>CS 1030 Foundations of Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>Computer Programming I CE</td>
<td>CS 1400 Fundamentals of Programming</td>
<td>3</td>
</tr>
<tr>
<td>Computer Programming II CE</td>
<td>CS 1410 Object-Oriented Programming *Prerequisite for CS 2420</td>
<td>3</td>
</tr>
<tr>
<td>Concurrent enrollment course under development CE</td>
<td>CS 2420 Introduction to Algorithms and Data Structures</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Required Credits</strong></td>
<td></td>
<td>19</td>
</tr>
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</table>
# Table 3: Digital Media Certificate of Proficiency — ALC to UVU Academic Year 2014/15

<table>
<thead>
<tr>
<th>High School Course</th>
<th>UVU Course Required</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL EDUCATION Required Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Arts 12 CE</td>
<td>ENGL1010—Introduction to Writing</td>
<td>3</td>
</tr>
<tr>
<td>Algebra 2 CE, or Pre-calculus Elective CE</td>
<td>MATH1010-Intermediate Algebra (pre-req. Algebra II or Secondary 3), or MATH1050-College Algebra</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td><strong>DIGITAL MEDIA Required Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimedia I-Design/Dev CE</td>
<td>DGM1110-Digital Media Essentials</td>
<td>3</td>
</tr>
<tr>
<td>Video Production 2 CE</td>
<td>DGM2110-Digital Motion Picture Essentials</td>
<td>3</td>
</tr>
<tr>
<td>Web Development I CE</td>
<td>DGM2120-Web Essentials</td>
<td>3</td>
</tr>
<tr>
<td>Concurrent enrollment course under development CE</td>
<td>DGM2130-Digital Audio Essentials</td>
<td>3</td>
</tr>
<tr>
<td>3D Animation CE</td>
<td>DGM2210-3D Modeling and Animation Essentials</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Total Required Credits</strong></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>High School Course</td>
<td>UVU Course Required</td>
<td>Credit</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>GENERAL EDUCATION Required Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language Arts 12 CE</td>
<td>ENGL1010—Introduction to Writing</td>
<td>3</td>
</tr>
<tr>
<td>Algebra 2 CE, or Pre-calculus Elective CE</td>
<td>MATH1010-Intermediate Algebra (pre-req. Algebra II or Secondary 3), or MATH1050-College Algebra</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>7</td>
</tr>
<tr>
<td><strong>INFORMATION TECHNOLOGY Required Courses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intro to Infotech CE</td>
<td>INFO 1120-Information Systems and Technology Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>Computer Programming I CE</td>
<td>INFO 1200-Computer Programming I for IS/IT</td>
<td>3</td>
</tr>
<tr>
<td>Linux Fundamentals CE</td>
<td>IT 1510 Introduction to System Administration—Linux/UNIX</td>
<td>3</td>
</tr>
<tr>
<td>Concurrent enrollment course under development CE</td>
<td>IT 1600 Computer Architecture and System Software</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><strong>Total Required Credits</strong></td>
<td>19</td>
</tr>
</tbody>
</table>
APPENDIX B: ADULT-LEVEL CERTIFICATES OF PROFICIENCY IN SOFTWARE TESTING

The Software Testing Non-Credit Certificates are facilitated by UVU’s Community & Continuing Education department. The courses in the certificate programs are taught by faculty and industry experts. There are two certificate levels available: the Beginning Software Testing Non-Credit Certificate and the Advanced Software Testing non-Credit Certificate. Each certificate includes courses designed to prepare individuals to be hired for software testing positions at various technical companies.

TABLE 5: SOFTWARE TESTING CERTIFICATE OF PROFICIENCY – ADULT LEVEL

<table>
<thead>
<tr>
<th>Required Course</th>
<th>Objectives</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL 1: Beginning Software Testing Non-credit Certificate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction to Software Testing Careers</td>
<td>• Identify software testing careers</td>
<td>4 Hours</td>
</tr>
<tr>
<td></td>
<td>• Explore the software Testing non-credit certificate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Complete Acuplacer, WorkKeys, Interest Profiler, and Career Cluster Inventory Assessments</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites in Software Testing</td>
<td>• Successful Navigate the Windows system</td>
<td>30 Hours</td>
</tr>
<tr>
<td></td>
<td>• Utilize the proper writing techniques for reports, memos, and evaluations</td>
<td></td>
</tr>
<tr>
<td>Introduction to Software Testing</td>
<td>• Learn why it is necessary to test software</td>
<td>20 Hours</td>
</tr>
<tr>
<td></td>
<td>• Understand the role of the tester in the development process and the different types of tests and testing environments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Identify terms, definitions, and principles used in the software testing field</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Understand the psychological factors that influence the success of testing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recognize different career options</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 5: SOFTWARE TESTING CERTIFICATE OF PROFICIENCY – ADULT LEVEL

<table>
<thead>
<tr>
<th>Required Course</th>
<th>Objectives</th>
<th>Duration</th>
</tr>
</thead>
</table>
| **Principles of Software Testing**    | • Develop a test plan, design, implement and execute software test cases using a variety of testing methodologies, and evaluate and report on the results of their tests  
• Work with several different types of tests and testing environments  
• Utilize risk analysis techniques | 70 Hours |
| **LEVEL 2: Advanced Software Testing Non-credit Certificate** | • Explain why automated testing is useful  
• Understand the circumstances under which automated testing should be done  
• Identify and explain the purpose of a framework  
• Write groups of automated tests using an industry standard framework and a high-level programming language such as Python  
• Organize and execute a structure test suite  
• Focus of course on the test of web applications | 5 Months |