Improving Graduate Skills through an Innovative Industry-Collaboration Pedagogy: Going beyond the traditional unit-delivery

Richa Awasthy

University of Canberra, Australia, Richa.awasthy@canberra.edu.au

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IMPROVING GRADUATE SKILLS THROUGH AN INNOVATIVE INDUSTRY-COLLABORATION PEDAGOGY: GOING BEYOND THE TRADITIONAL UNIT-DELIVERY

Richa Awasthy
Information Technology and Systems, Faculty of Science and Technology
University of Canberra, Australia
Richa.awasthy@canberra.edu.au

Abstract:
This paper presents a descriptive case study of a unit embedding an innovative pedagogical approach that incorporates industry-collaboration interventions of different extent to work towards the goal of improving graduate skills and creating industry-ready graduates at the University of Canberra. In collaboration with Amazon Web Services (AWS), one of the largest Cloud providers, the Enterprise and Cloud Computing unit experimented with embedding industry-developed content in one of the units. The approach demonstrates that incorporating education, industry-relevant active learning, and certification will help enhancing student learning experience, improving graduate skills, preparing our students for success in the job market, and increasing employability. It is an example for higher education academics of a transferable approach for designing effective programs for other popular Information Technology (IT) specialisations such as Artificial Intelligence (AI) and Data Science, and disciplines collaborating with industry.

Keywords: university-industry collaboration, industry-relevant education, bootcamp, industry certification, graduate skills, industry readiness

I. INTRODUCTION

There is a widely acknowledged gap between Information Technology (IT) education and the requirements of industry (Simmons and Simmons 2010, Almi, Rahman et al. 2011, Malik and Venkatraman 2017, Garousi, Giray et al. 2019). Many initiatives are being taken globally to close this gap (Kapil 2014, Awasthy, Flint et al. 2017, Vijayalakshmi, Patil et al. 2018, Haamann and Basten 2019). These include collaboration between universities and industry to provide students with professional experience. Within the Australian higher education context, there has been a long-standing commitment to encouraging such collaboration to improve the performance of business and higher education (Dunne and Rawlins 2000, Winterton and Turner 2019). Despite these commitments, a serious shortage of skilled graduates continues (Prikshat, Montague et al. 2020). Employers express dissatisfaction regarding the graduate skills (McGunagle and Zizka 2020) citing that Computer Science courses primarily focus on theoretical concepts. Often, academics may lack resources for providing practical hands-on experience to a diverse group of students with different levels of skills. This can result in students graduating without the skills and experience required to be successful in industry. Given the current and emerging challenges that higher education sector is facing with the rapid growth in student numbers and an increasingly diverse student cohort, there is an increasing need to focus on teaching practices in collaboration with industry for effective student learning outcomes (James, Baik et al. 2015), and bridging the gap in demand and supply of skilled IT graduates. Higher education institutions continuously need to develop curriculums that are relevant to contemporary technological advancements and industry practices for graduates to be future ready. Such curriculum development to address the concern regarding graduate skills is possible by involving industry experts in design and development of curriculum.
This paper presents the experience with the designed pedagogical approach for improving graduate skills and enhancing student learning through industry collaborations for formal education and certification. The piloted approach aims to create future-ready graduates, and help addressing the outlined concerns regarding skilled graduates. The approach has its foundation in the teaching philosophy that learning takes place through the active behaviour of the student. In developing this approach, the researcher has employed scholarly evidence relevant to learning and teaching, her own research results related to university-industry collaboration, diverse experience in industry, and unit-convening experience in higher education. The approach has evolved to its current form based on the observations and experiences with past offerings of the unit, student involvement through feedback, and high impact and effective practices recognised in the existing literature. The independent components within the approach provide flexibility for it to be implemented in different units. However, we will discuss the approach primarily in the perspective of the Enterprise and Cloud Computing unit as the most relevant case study.

The approach has been implemented in the Enterprise and Cloud Computing unit in partnership with Amazon Web Services (AWS) to embed different forms of industry collaboration interventions in the unit, which led to holistic experience for the students undertaking IT degrees at the university. The curriculum for the unit was redesigned to integrate the collaborative interventions, lab activities, and assessments in the unit delivery to provide required skills and experience to students for future-ready workforce. The benefits of the approach are multi-faceted including increased student engagement, enhanced learning experience, opportunity for students to work closely with industry experts for gaining skills in the Cloud Computing field, mentoring, networking, and access to job opportunities specific for the students attending the specialised bootcamp sessions.

The potential impact of the pedagogical approach is equipping our students with future-ready skills, meeting the industry expectations from our graduates, increasing their employability, and enhancing the university’s reputation as an institution with a focus on creating future-ready graduates.

This paper presents the processes and results of implementing this approach for integration of collaborative interventions. It provides example for higher education academics of how collaborative interventions can be integrated at various stages of a unit to enhance student learning experience, improve their skills, and increase their employability.

The structure of this paper is as follows: Section II outlines the purpose of the approach; in Section III we describe the design, delivery and implementation of the approach in the Enterprise and Cloud Computing unit at the University of Canberra; Section IV discusses the benefits of the approach; in Section V we present the preliminary evaluation of the approach; in Section VI we discuss the implications of our work; and finally, we present the overall conclusions and future work in Section VII.

II PURPOSE OF THE PEDAGOGICAL APPROACH

The main purpose of the approach is to improve skills and industry-readiness of graduates by enhancing student engagement and learning through industry collaboration for embedding industry-relevant content in course-curriculum. The objectives towards this aim are:

- Creating an application-oriented unit by integrating industry collaboration and industry-relevant content into the Enterprise and Cloud Computing unit at various stages.
- Introducing students to state-of-the art technologies using the theoretical and practical content created by AWS, largest Cloud Service provider (Richter 2023).
- Capitalizing on existing enthusiasm around applied aspects of Cloud Computing on campus with students by integrating it into a formal unit offering.
• Providing students with an experience that is closely related to real-world industry experience, and thus enhancing their learning experience and future work-readiness.

• Investigating the impact of industry-collaboration interventions in enhancing student-learning.

• Investigating the impact of the approach in preparing students for industry certifications and increasing student employability.

• Identifying the possibility to provide recommendations for an impactful-teaching practice that has been designed, implemented, and tested.

III DESIGN, DELIVERY, AND IMPLEMENTATION OF THE APPROACH

The Enterprise and Cloud Computing unit is offered to the Bachelor of Information Technology students. The unit delivery involves the following: A semester consists of twelve weeks of course delivery. Each week a two-hours lecture is delivered on-campus to the enrolled students. Recording of the lecture is available for later reference by the students or the students who could not attend the live session. During the week, there is a practical computer lab session to facilitate deeper understanding of the topics covered during the weekly lecture. These practical sessions are of one-hour duration for a group of twenty students. Each week there are assessments associated with the concepts covered so far to enable continuous learning among the students. In addition to the weekly assessments, helping students to gauge their progress, there is an end of semester assessment for students to demonstrate the knowledge, critical thinking, and analytical skills. The Cloud Computing platform in use for the unit is Amazon Web Services (AWS).

Through iterative design of the pedagogy, the approach has evolved over the years to its current form as depicted in Figure 1. As depicted in the figure, the approach consists of three forms of collaborative interventions and associated assessments grounded in scholarly practices. These interventions of various degrees integrating industry collaboration are described below.

INTERVENTION 1: INTRODUCTION OF SPORADIC INTERVENTION

The traditional lectures based on the theories in textbooks may lack the alignment with contemporary advancements in technology and practices in industry (Chew, Ng et al. 2023). There is an increased emphasis on utilising the networks with industry to support the universities’ role in training the graduates to be future-ready (Chew, Ng et al. 2023). Guest lectures have potential to enhance students’ learning experience (Goldberg, Cariapa et al. 2014). As a first and simple step, the approach utilises the industry practitioners and experts as guest lecturers, and investigates its impact on enhancing student learning. Guest lecturer in the context of this paper is a subject matter expert or experienced practitioner from an external organisation such as IT industry or Australian Government. We term this intervention as sporadic as the guest lectures can be organised at any week of unit delivery during the semester. This intervention has been implemented in the Enterprise and Cloud Computing unit with external stakeholders including AWS, Google, IBM, and Australian Government as depicted in Figure 1. The number of guest lectures varies from unit to unit according to the relevance of the topic to the unit and availability of the industry expert. Table 1 provides the examples of the guest lectures and the collaborating organisations. During the semester maximum two guest lecturers were invited to deliver the unit-related content with its relevance to industry practices. The remaining content was delivered by the unit convenor, who also facilitated the computer labs/tutorials discussed further. Such an arrangement provided flexibility to introduce the industry-relevant perspective and experience in the unit while maintaining the unit-delivery aligned with the unit outline and learning outcomes. The Canvas site of the unit was used to inform the students about the guest lectures, and reminding them through announcement closer to the scheduled day.
Students were also informed that there is an assessment item associated with the delivered guest lectures.

![Diagram](image)

**Figure 1**: Innovative pedagogical approach with industry collaboration for improving graduate skills (The images and logos used in the figure are under the copyright of the corresponding organisations).

**Table 1**: Guest lectures under sporadic intervention 1

<table>
<thead>
<tr>
<th>Topic</th>
<th>Collaborating industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Systems Architecture</td>
<td>Google</td>
</tr>
<tr>
<td>Data visualization</td>
<td>ACT Government</td>
</tr>
<tr>
<td>Cyber-security in operations</td>
<td>ACT Government</td>
</tr>
<tr>
<td>Leadership</td>
<td>IBM</td>
</tr>
</tbody>
</table>

The purpose of the guest lectures was to introduce the students to the practical and real-world relevance of the topics being covered in the unit. Students were encouraged to maintain the sessions interactive by asking questions or clarifications, if any, with the guest lecturer during the sessions. The industry experts guide the students regarding the applied side of the knowledge they are gaining in the unit, and what other skills are required to solve real-world problems in industry. For example, the session ‘Cyber-security in Operations’ introduced students to practical application of IT and Cloud security concepts. The guest lectures emphasized the industrial and application-oriented perspective to the theoretical IT concepts.

It is to be noted that during COVID, we included e-guests or virtual guest lecturer to overcome the disruption to face-to-face teaching. This had potential for enhancing student learning by bringing expertise from a different geography to virtual classroom, which would not have been possible otherwise due to logistics reasons.
Assessment method

Reflective practice is effective in continuous learning (Schon 1984, Moon 2013, Dybå, Maiden et al. 2014). Hence, in order to assess the learning associated with the guest lectures, a reflective piece of assessment was introduced in the unit. Students needed to submit a reflection on the value of the guest lectures for their learning and enhancement of perspectives. The weightage of the assessment is 10%.

INTERVENTION 2: APPLICATION OF CONTINUOUS INTERVENTION - INTEGRATION OF INDUSTRY-RELEVANT CONTENT DEVELOPED BY INDUSTRY EXPERTS

It is important for academics to ensure that course-curriculum is updated to incorporate relevant advancements in technology by discussing with industry experts and employers (Milke, Paul et al. 2015, Lase 2019). There is an increased engagement from industry in designing curriculum to improve the alignment of learning outcomes with the demands and requirements of the employers (Khuong 2016, Ha 2022). Participation of industry in designing the curriculum of the unit can enhance the quality of education, skills development, and graduate-employability significantly (Chen, Lu et al. 2020, Borah, Malik et al. 2021). One way to achieve such engaging curriculum design is by integrating the content developed by industry into university course.

University of Canberra experimented its first integration of industry-developed applied Cloud Computing content in the Enterprise Cloud Computing unit by embedding the lecture and lab material developed by Amazon Web Services (AWS). With Cloud Computing gaining more popularity, relevance and interest among the students, this unit was the most relevant candidate for application of continuous intervention over the semester. Taking advantage of the flexibility of the program content being organized in the unit, the convenor built upon the base curriculum to add more practice using a variety of real-world problems as applications for the unit’s cloud computing foundations.

Industry provided access to industry-relevant content to the academic and the students

The academic designed and developed an industry-relevant Cloud Computing unit using the Applied Cloud Computing content that was developed by industry partner, AWS, to be delivered over the semester. The following learning outcomes are intended from the unit.

- Understanding the fundamental concepts of Cloud Computing and its applications;
- Comprehending the technical capabilities and benefits of cloud computing for a business;
- Developing an understanding of various service deliverable models, enabling technologies and mechanisms, cloud architectures, privacy issues, quality and metrics;
- Applying current technologies for working with clouds;
- Assessing the challenges faced by cloud deployments, and how they can be addressed; and
- Analysing and evaluating cloud solutions.

Table 2 outlines the lecture and computer lab topics aligned with achieving the above learning outcomes. Weekly lectures of two-hour duration are conducted each week during the semester except for Week 8, which is the teaching break.
Richa Awashy

Improving Graduate Skills through Innovative Pedagogy

Students’ learning is influenced by the recommended academic textbooks. Hence, the unit convenor covered the theoretical concepts in the unit and used the content developed by industry as a complement to it during the lecture. The convenor ensured through careful deliberations that the industry-relevant and practical content is aligned with the theory being taught to the students in the IT degree. Hence, the students can appreciate and build connection between the learnt theory and its practical application for IT industry.

Table 2: Syllabi of the Enterprise and Cloud Computing unit under intervention 2 integrating industry-developed content.

<table>
<thead>
<tr>
<th>Lecture Topic</th>
<th>Lab topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cloud concepts overview</td>
<td>Registration to the AWS training portal</td>
</tr>
<tr>
<td>Cloud economics</td>
<td>Accessing VitalSource Bookshelf</td>
</tr>
<tr>
<td>AWS infrastructure overview</td>
<td></td>
</tr>
<tr>
<td>2 Enabling technologies of Cloud Computing</td>
<td>Introduction to AWS Identity and Access Management (IAM)</td>
</tr>
<tr>
<td>3 Cloud Computing Models</td>
<td>Working with Elastic Beanstalk</td>
</tr>
<tr>
<td>AWS Global infrastructure</td>
<td></td>
</tr>
<tr>
<td>4 Cloud-ready design principles</td>
<td>Creating an EC2 instance</td>
</tr>
<tr>
<td>AWS Compute services</td>
<td></td>
</tr>
<tr>
<td>5 Networking and content delivery</td>
<td>Build your Virtual Private Cloud(VPC) and launch a Web Server</td>
</tr>
<tr>
<td>6 Cloud security</td>
<td>AWS Lambda</td>
</tr>
<tr>
<td>Cloud security mechanisms</td>
<td></td>
</tr>
<tr>
<td>Service level agreements</td>
<td></td>
</tr>
<tr>
<td>7 Cloud Storage services</td>
<td>Cloud-based security groups</td>
</tr>
<tr>
<td>8 Cloud Databases</td>
<td>Build a database(DB) server and interact with your DB using an app</td>
</tr>
<tr>
<td>9 Cloud architecting</td>
<td>Scale and load balance your architecture</td>
</tr>
<tr>
<td>Well-architected framework</td>
<td></td>
</tr>
<tr>
<td>10 Cloud computing case study 1</td>
<td>Deploy a Web Application on AWS</td>
</tr>
<tr>
<td>11 Cloud computing case study 2</td>
<td>Making Your Environment Highly Available</td>
</tr>
</tbody>
</table>

Industry provided access to our students to labs hosted in AWS Cloud platform

Computer labs or tutorials are the primary means to supplement skills development through application of theoretical concepts (Van der Meij and van der Meij 2013). The labs are also important to gauge the knowledge and understanding of students about the concepts covered during the weekly lectures in the unit. Various IT units in the school utilize the computer lab environment in the university for the lab sessions for demonstration and application of understanding of the concepts by the students. However, these labs may not be suitable for specific contexts such as hosting of applications on Cloud or demonstrating demand-based scaling-up/down. Hence, the unit convenor had limitations regarding demonstration of practical application of Cloud Computing to enhance student-learning. Access to the labs hosted on the AWS Cloud platform helped overcome the limitation, and
provided students an ability to experience the practical application of cloud-computing concepts.

As the largest Cloud service provider, AWS considers it as a priority to empower the next generation of cloud computing professionals. AWS provided student-centered and self-directed learning spaces (Wright 2011), computer labs, hosted on AWS with detailed guidelines for every task required by the applied Cloud Computing unit. The labs were designed to engage students and facilitate active learning so that student participation and learning is increased. These labs provided students flexibility and opportunity to apply their learning in an environment simulating a real-world experience. The educator is available to guide the students, address their concerns in timely manner, and support their learning as they progress through the lab activities. Such a learning experience increased students’ motivation to complete their weekly lab tasks in a consistent manner by the task deadline and enhanced their learning as evident in their performance in the activities.

In addition to access to the labs on AWS, students gained access to VitalSource Bookshelf that hosts course materials. It provides offline access via mobile applications with synchronized browsing and allows students to take notes directly in the course materials. Such self-directed learning space on VitalSource motivated students to advance their learning.

Our continued engagement with AWS opened path for Intervention 3, intensive collaboration in the form of Bootcamp, detailed further.

Assessment method

The academic developed assessment methods to help students monitor their performance and succeed. Assessment items were modified to align with the lectures and computer lab content and activities. The assessment included grading of the weekly labs so that students could be motivated to complete their tasks in a consistent and timely manner leading to achieving the learning objectives. In addition, a weekly quiz was designed for knowledge check associated with the weekly lecture and gaining automatic feedback for responses after quiz completion date.

INTERVENTION 3: EXTENSION TO INTENSIVE INTERVENTION - GOING BEYOND THE UNIT DELIVERY

Industry certifications offer a way for academic programs to remain up-to-date with industry demands (Shim, Gottipati et al. 2021). Certifications are becoming an important aspect of creating industry-ready graduates as integration of IT certifications into curriculum can improve graduate skills, and competency (White 2007). Certifications have a potential to enhance the employability of graduates as they reflect the technical skills and competency. Certification is also an indication to employers that a graduate is committed to continued professional development to remain abreast with advancements in a particular technology. In addition, certifications can raise the institution's profile as an industry-collaborator for graduate skills. Hence, an intensive collaboration intervention was designed in the form of one-week Bootcamp free of cost for students in collaboration with the industry partner AWS. The purpose of the Bootcamp was to motivate and prepare students for industry certification.

The Bootcamp was organised at the university in collaboration with the industry partner AWS for providing an intensive Cloud Computing sessions to our students. The bootcamp was a mix of online and face-to-face components. Online session on the day one was attended by more than 50 students, where students learnt the foundations of cloud computing. Day two of the event was focused on Artificial Intelligence (AI) and Machine Learning (ML), where two face-to-face hands-on workshops were delivered by AWS experts. Students enjoyed working with generative AI and ML. Day three was an opportunity for our students to apply the skills learnt so far in the AWS Jam session facilitated by the AWS facilitator who delivered the
hand-on experience. Students had to solve various AWS challenges in the Jam. Many students won AWS merchandise prizes for solving the challenges.

The bootcamp provided our students an opportunity to upskill, gain advantage for AWS Cloud Practitioner Certification, and network with external stakeholders.

IV BENEFITS OF THE PEDAGOGICAL APPROACH

The pedagogical approach offered several benefits for students, educators, university and industry partners. The benefits include improved student engagement and learning, industry-relevant education, preparation for industry certification, access to job opportunities, careers panels, and interview at Amazon, and educator upskilling.

Students completed the Cloud Computing modules for each week to learn how to apply the principles in the self-directed labs. They approached the applications of theoretical concepts in a way that they could visualize the feature they were implementing by seeing the outcome of their efforts in real time in the AWS Cloud labs, which will be typically missing in a traditional lab. They were able to identify if things went wrong, made changes and tried it again. Such practical and active learning space increased student engagement considerably. The learning improved success prospects of the students in the AWS certification exam.

Continuous feedback and evaluation kept students motivated. The lab content was developed and provided by AWS. Hence, the educator could focus their time and energy on ensuring students were supported and evaluated effectively. The faculty could regularly gauge student progress throughout the unit and help identify areas for support and improvement for students in the diverse cohort.

The industry-developed content helped in making the curriculum more industry-relevant and up-to-date with industry practices. The lecture and lab content was designed with a broad set of problems for students to tackle in order to simulate real-world challenges and experiences that graduates may face at the workplace. Such learning space has potential to increase industry-readiness of graduates.

The AWS Cloud Practitioner Certification is a globally recognized certificate. Attending the Bootcamp provided our students basic understanding of IT services and their uses on AWS Cloud, knowledge of core AWS services and use cases, billing and pricing models, security concepts, and how cloud impacts businesses. Such knowledge and learning helped students in preparation for the certification exam.

Eligible students received certification vouchers during the Bootcamp. As noted by the AWS consultant, “Congratulations to the first 18 students who have completed (all knowledge checks and labs) the AWS Academy Cloud Foundations class who received a 100% exam voucher worth about AUD$130.”. For all the other students who attended the Bootcamp and planned to sit the exam, AWS provided a 50% exam voucher through the educator, demonstrating their commitment to empowering the next generation of cloud computing professionals.

Participants of the Bootcamp gained exclusive access to job openings at AWS. AWS Bootcamp students were invited to attend a virtual Careers Panel, including senior managers and solution architects from AWS. The panel discussed the open roles for interns and graduates in their departments along with giving an overview of their own roles and experiences at AWS. The event also provided details for applying for these roles so that the students could be identified as the Bootcamp program student through the process. Students who attended the Bootcamp and passed the AWS Certified Cloud Practitioners exam qualified for an interview with Amazon.

The approach provided a mechanism to the educator to invest their time creatively, experiment with flipped-classroom, and implement self-directed learning. The educator upskilled and became AWS-accredited educator in one of the most sought-after technology -
Cloud Computing. As an AWS-accredited educator, the educator’s professional credibility is increased. The experience with the approach can be extended to various other advanced technologies.

V PRELIMINARY EVALUATION
In order to demonstrate the effectiveness of the pedagogical approach, we present the results and observations from the preliminary evaluation of the approach.

FEEDBACK FROM STUDENTS REGARDING THE GUEST LECTURES
Students were informally surveyed to investigate their perceptions for the benefits of guest lectures and to assess the impact on their learning. It was observed that students recognise the importance of industry experts as guest lecturers. The students responded constructively regarding the guest lecture and suggestions for improvement. For example:
“Lectures equip students with both useful theoretical and practical information by academics and guest speakers”
“Include more sessions by guest speakers”
It became evident that students are gaining value out of the guest lectures by industry experts, and welcome closer collaboration with industry for practical application of the skills they learnt during the lectures. The closer collaboration was achieved through application of the continuous intervention integrating industry-developed content in the curriculum.

FEEDBACK FROM STUDENTS REGARDING THE CONTINUOUS INTERVENTION
Overall, the students expressed satisfaction regarding benefits from the structure of a curriculum that came from an industry expert, AWS, and focused on a leading technology, Cloud Computing. The labs available in the Cloud environment increased student engagement due to access and availability from off-campus locations.

FEEDBACK FROM STUDENTS REGARDING THE INTENSIVE INTERVENTION - THE BOOTCAMP
A survey titled ‘ACT Education AI/ML Bootcamp’ was conducted by AWS at the end of the event where average satisfaction score for the event in 2023 was 91.8%. A sample comment in the feedback is:
“Great experience. The organisers were amazing and were really accommodating. The content was also really engaging and informative, with some interesting and engaging practical activities.”
Our inference, from the formal and informal feedback, is that integration of industry collaboration interventions outlined in the approach in a university course will provide significant value to our graduates, university, and employers.

VI DISCUSSION
It is imperative for higher education institutions to ensure that education meets industry expectations. The presented approach is an innovative collaboration at the University of Canberra with a global industry partner, AWS, in a leading technology - Cloud Computing. It
presents UC as a university collaborating with industry partners to increase the relevance and strength of their curricula. Hence, it contributes to enhancing the university’s reputation as a sought-after place for graduate skills.

The pedagogical approach presented makes contribution to enhancing teaching by providing a mechanism to keep university course updated with advancement in technology and industry requirement. Integrating industry perspective and industry-developed content enhances the industry-relevance of the course. In addition, the educators have access to resources to upskill themselves and deliver a course in a more practical and student-centric manner. The approach implemented the high-impact and effective teaching practices such as concern for student learning, clear goals and intellectually-stimulating content, appropriate assessment items, timely and constructive feedback, and student-centric learning (Smith and Baik 2021).

Industry collaboration interventions are pedagogically critical in IT education as a means of enhancing students’ learning experiences (Valentine, Marinelli et al. 2022). The approach has helped expose students to multiple interventions and perspectives that can help bridge the gap between theory and practice in IT industry. It provided students with opportunities to engage with latest technology and industry practices, improve understanding about their future profession, and develop skills and competencies to be more effective in the classroom and future workplace. Such experience enhanced student learning and has implications on the graduate skills and employability for future workplace.

The knowledge and skills gained during the Bootcamp are valuable for students in achieving AWS Cloud Practitioner certification. The perks received during the Bootcamp are a motivation for students to complete the course and write the certification exam. The certificate is globally recognized and valued by industry. It is a great addition for students’ resume increasing their employability as many employers prefer their employees to have a relevant professional certification (Wang and D’Cruze 2019, Shim, Gottipati et al. 2021). In addition, the certified participants of the Bootcamp gained exclusive access to interview at Amazon accelerating their career prospects.

The approach provided students an opportunity to network with industry experts and AWS careers panel, who provided valuable career guidance as potential future employers. The guest lectures helped in building connections beyond the sporadic intervention. The experts showed interest in our other collaborative units. One of the experts participated in the panel of judges in the Capstone Expo (Karkhanis 2023) to engage with the students’ work more closely.

The presented approach has practical and policy implications for designing programs to create graduates that are ready for future. It has implications for any unit that involves engagement with industry, where the interventions in the approach can be utilised as a more effective way to enhance student learning outcomes in the specific area. The approach showcases a model to be adopted for other IT courses and disciplines. The interventions within the approach are independent. Hence, they can be applied in different units and adapted to the specific unit requirements. Application of those components of the approach is already evident as being implemented in other units with relevant industry partners such as Microsoft and Cisco. This indicates the relevance and value of the approach beyond the Enterprise and Cloud Computing unit. The complete approach application is being explored for another unit – Software Systems Architecture. Future work will extend the application of the approach in other disciplines and geography.

Few challenges and improvements have been identified for the approach. The industry-relevant content is for preparing students for certification and future jobs. However, not all the students in the unit attended the certification exam. This lack of participation could be due to students not having enough confidence with the exam preparation. To better prepare the students for certification exam, intensive Bootcamp was organised. However, low participation during the Bootcamp compared to the actual unit is a concern. This can be attributed to the time of organisation of the Bootcamp, which was during the semester break.
During that time, students might have travelled to their homeplaces. Hence, we are planning to organise the Bootcamp early on after the semester ends. In addition, we are discussing to add an assessment component associated with the Bootcamp participation and certification exam.

The formal evaluation of the approach is to be conducted in accordance with a pending ethics clearance. The quantitative and qualitative analyses of data to be gathered in 2023-2024 will provide rigor to the evaluation. The extensibility of the approach to other geographies will be assessed in future work. The effectiveness of this innovative pedagogical approach with industry collaboration can be further validated in future as our graduates enter the workforce.

VII CONCLUSION

The pedagogical approach presented in this paper is an example of innovative university-industry collaboration programs that make an outstanding contribution to enhancing the student learning experience at University of Canberra. It is a three-pronged approach embedding education, industry-relevant active learning, and certification for preparing industry-ready graduates. The presented example of collaborative UC-AWS partnership in Cloud-computing education is transferable for designing programs for other popular IT specialisations such as AI and Data Science. The work demonstrates that effective university-industry collaboration at various stages of a unit can help to improve the skills and industry-readiness of our graduates. The overall positive and encouraging feedback from the students regarding the approach motivates the academic to continue exploring ways to enrich students’ learning experience.

ACKNOWLEDGEMENT

We acknowledge the support of Amazon Web Services via the AWS Academy education program. This program aims to bridge the gap between industry and academia by providing higher education institutions with a free, ready-to-teach cloud computing curriculum that prepares students to pursue industry-recognized certifications and in-demand cloud jobs.

LIST OF REFERENCES


