

Case study: Microsoft Azure Cloud experiences in teaching at Haaga-Helia University of Applied Sciences

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Abstract: In November 2019 the digital innovation hub for cloud-based services (DIHUB) project was started, which is co-funded by the Erasmus+ Programme of the European Union. DIHUB's aim is to setup a European wide knowledge cluster on cloud-based technologies and services for the needs of innovation development, education and the generation of new start-ups (Aunimo, 2022; Aunimo et al., 2021).

This paper presents a case study on how learning offerings involving the use of Microsoft Azure materials, laboratories and certifications can be designed, piloted and implemented in an institution of higher education. The focus was on using Azure cloud services in part of the teaching curriculum for the degree programme in Business Information Technology at Haaga-Helia. The Azure study offering development was partly possible by being part of the DIHUB project. Developing a cloud curriculum, piloting new courses belonging to the curriculum and gathering feedback from them were important activities of the project (Aunimo et al., 2022).

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1. Introduction

Digital Technology is changing at an ever-rapid pace and it can be difficult to keep on top of all the new developments. One of the key areas of this change is the use of cloud computing for delivery of essential computing services over the internet such as servers, storage, databases, networking, software, analytics and artificial intelligence. The main big three companies that offer cloud computing platform services are Amazon Web Services (AWS), Microsoft Azure and Google's Cloud Platform (GCP).

Between 2017 and 2020 employers in the USA have posted over 790,000 jobs requiring cloud computing skills, with employer demand for cloud professionals increasing nearly 150% during this timeframe (Duke Learning Innovation, 2021). Therefore, it is essential students have some understanding of how cloud computing works, so they try to gain industry-related cloud computing skills to help them find cloud computing jobs both in the present and the future (Careerera, 2021).

In previous studies in the delivery of cloud computing, the key conclusions have been that technology is novel and affordable for small business operations (Olakunle et al., 2022). Also, cloud computing has been attracting more attention in recent times because it shifts on how skills and IT resources are provisioned (Rekik et al., 2019). In some education organizations, the focus is on the study of individual cloud platforms, while others involve the study of the theoretical foundations of cloud technologies. For example, at Harvard University, students study a course in Fundamentals of Cloud Computing by learning the key features of the Microsoft Azure platform as a service (Harvard University, 2022). At the University of Helsinki, students take the Cloud Computing Fundamental AWS course, to prepare students for the advanced AWS Developer Associate Certification (University of Helsinki, 2018).

At Middlesbrough College cloud computing is taught in a conceptual method where students design and develop cloud infrastructures for different business scenarios. The students learn through active blended learning and lab-based activities. The students are assessed by a mixture of assignments and examinations at all levels (Middlesbrough College, 2022).

This paper is organized as follows. After this introduction there will be a brief introduction of the importance of cloud technologies in education and the second section will outline the aims of this case study. The third section discusses the methodology for this case study. The fourth section presents results and discusses the findings. Lastly, section five presents the conclusions and limitations of the study.

2. Aim of the study

At the start of the autumn semester 2021 Haaga-Helia's Digital Business department started the pilot of two Azure Fundamentals-level courses with Microsoft MSLE Institute Program. Haaga-Helia joined the MSLE Institute program at start of 2021 as a full member.

The key aims of this case study pilot were:

1. How to use the MS Azure Portal for Microsoft cloud business services in teaching?
2. How to teach artificial intelligence and the used of AI services using MS Azure?
3. How to support DIHUB's aim in setup of a European wide knowledge cluster on cloud-based technologies and services?

The new pilot Azure courses; AZ-900 and AI-900 were incorporated into two Haaga-Helia academic ICT Business courses each worth 5 ECTS credits, to offer students in these classes the possibility to acquire certification in Microsoft Azure Fundamentals certifications. These two classes were selected as their student enrolment numbers were small, which made it easier for the instructors to pilot the certifications for the first time. The course instructors also had access to the official Microsoft instructor support materials on the MSLE learning download center portal (<https://aka.ms/LDC>), which is designed to support instructor's delivery of the courses to students. The most common method for course topic creation at Haaga-Helia, is the instructor creating the content, but for these two Foundation Azure courses the learning materials are created by Microsoft. For any MSLE Foundation courses the instructor doesn't have to be certified to deliver the course, although the MSLE recommends instructors obtain a certification.

Each course enabled Haaga-Helia students to prepare for taking optional certifications with Microsoft, as part of Haaga-Helia's commitment with participation in the Microsoft Learn for Educators Institute program.

3. Methodology

By participating in the Microsoft Learn for Educators Institute program (MSLE) Haaga-Helia was allocated a personal training program manager, who provided online guidance and support meetings to instructors for delivery of the courses. The meetings were used to discuss the requirements of the courses, process for designing of the content and implementation of the courses. In addition to the MSLE program manager support, feedback was collected from students at the end of the course implementation.

In addition to the Microsoft Fundamentals study pilots, Haaga-Helia became an authorized test centre with CertiPort, that allow certifications to take place with an authorized exam proctor. The GMetrix.net platform (GMetrix, 2022) was used to run practice questions and test simulations in preparation for the certifications with CertiPort. Out of the 12 possible Microsoft Fundamental courses it was decided to select the following two courses, as they were the closest match in terms of course content, for two ICT courses already in place at Haaga-Helia:

1. **Microsoft Azure Cloud Fundamentals ICT8TF052:** Microsoft Learn Azure Fundamentals AZ-900, Senior Lecturer Harri Ahola (Haaga-Helia University of Applied Sciences, 2022b)
2. **Basics of AI BIG8TN001-3015:** Microsoft Azure AI Fundamentals AI-900, Senior Lecturer Darren Trofimczuk (Haaga-Helia University of Applied Sciences, 2022a)

The implementations for both Microsoft Azure AI Fundamentals (AI-900) and the Microsoft Azure Cloud Fundamentals (AZ-900) courses were split over 12 weeks (Autumn was only 8 weeks and was extended to 12 weeks during Spring 2022), with a weekly 3hr – 4hr online workshop in Microsoft Teams facilitated by the course instructor. Students were also provided with online lab tasks in an Azure portal using their authenticated Microsoft student account, in addition to online study materials provided by the instructor and Microsoft’s learning portal. Before the start of each class students had to submit a diary of lab task evidence and their topic course material notes. Near the final stages of the implementation students had to complete at least two online training tests using GMetrix and submit their score percentages evidence to the course instructors. In the final week of the implementation students were offered the chance to take a certification exam using CertiPort.

The pilot implementation of Azure Fundamentals – Microsoft Azure Cloud Fundamentals – ICT8TF052-3001 had the following strict passing and grading requirements:

Labs and MS MyLearn content	30 %
AZ-900 practice certification or optional AZ-Certification exam score	20 %
Written Exam	50 %

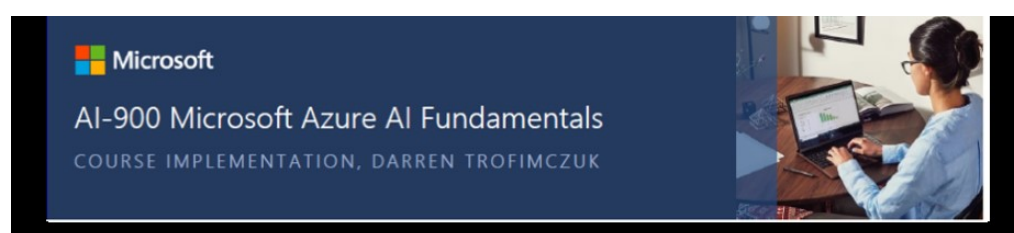
Grading

< 50 %	Score: 0
50-59	Score: 1
60-69	Score: 2
70-79	Score: 3
80-89	Score: 4
90-100	Score: 5

Figure 1: Grading requirements for the course ICT8TF052-3001 instructed by Ahola.

The examination fee for each AZ-900 and AI-900 exam is usually set at \$99, but these fees are exempted for students when vouchers codes are activated by the course instructor in the MSLE. Each student uses the exam voucher when taking the exam in the official CertiPort test centre, which required students to create an official Microsoft Certification profile with their personal detailed information. This sharing of student personal contact details for external organization (Microsoft and CertiPort) was the reason we decided to require only GMetrix.net practice exams as part of the course grade. Gemetrix.net do not require students to share their personal information with practise test centre and we can use university emails as logins for students.

The pilot implementation of Microsoft Azure AI Fundamentals – BIG8TN001-3014 had the following strict passing and grading requirements:



Certification for Academic Credit

Studying this course makes up 60% of the course weight for one of the study options for Basics of AI - BIG8TN001-3014:

Assessment 1 (30%):

- Completion of Module 1 – 5 learning (notes of learning + 1 lab task for each module evidence)

Assessment 2 (30% weight):

- 2 practice tests (average score will be used to determine grade for Basics of AI course)
- 2 training tests - voucher codes will be generated by instructor

AND

OPTIONAL AI-900 CERTIFICATION EXAM WITH MICROSOFT (note - exam date TBC - 30th or 31st March)

Figure 2: Grading requirements for the course, BIG8TN001-3014 instructed by Trofimczuk.

4. Result/findings and argumentation

The feedback from students was collected as a series of questions at the end of the course using Haaga-Helia’s official electronic feedback tool called Peppi, which is sent to all student emails as a reminder at the end of the course. The feedback is spilt into a series of questions with a grading scale answer option for each and a section at the end for students to write their general course feedback. All student feedback is collated into the Peppi feedback system for the course teacher, so an analysis of the results can take place and can be shared with program directors.

4.1 Azure AI Fundamentals AI-900

Table 1. Basics of AI course BIG8TN001-3014 student results December 2021

Numbers of students enrolled	Number Passed (5 ETCS Credits)	Average score (scale 1-5)	Certification Exam Entries	Certification Passed
6	4	4.18	2	0

For the Azure AI Fundamental course student feedback was mostly positive and many felt they had improved on their understanding of Artificial Intelligence concepts and how to use the Microsoft Azure platform. As the course progressed some students felt the course required more study time than they initially anticipated and began to struggle keeping up with the weekly study materials and lab tasks, so there were three students who gave up studying the AI-900 option. Near completion of the implementation most students opted to take the training test, rather than take optional official Microsoft Certification exam. For those students who submitted diary notes and lab evidence for all five AI module topics, were awarded the 5 ECTS credits for completing the Haaga-Helia Basics of AI BIG8TN001-3015 course.

In total there were two students from the class who decided to take the certification with Microsoft. These two students unfortunately didn't pass as their scores were just below (68% and 61%) the 70% pass requirement for the AI-900 certification. In any future courses a more thorough guidance description will be provided, to help ensure students who choose to study the AI-900 course are much better aware what they are getting themselves into before agreeing to take this study option. It is also advisable that students who study Microsoft AI Azure Fundamentals have some background knowledge preferably in computing technology, as the student group used in this pilot group were third semester students studying the International Business Degree program.

4.2 Microsoft Azure Cloud Fundamentals AZ-900

Table 2. Microsoft Azure Cloud Fundamentals course ICT8TF052 student results December 2021

Numbers of students enrolled	Number Passed (5 ETCS Credits)	Average score (scale 1-5)	Certification Exam Entries	Certification Passed
22	12	3.75	11	7

Autumn 2022 implementation "Microsoft Azure Cloud Fundamentals – ICT8TF052-3001" was the first pilot course to implement the full Azure Fundamentals official certifications preparation course at Haaga-Helia in co-operation with Dithub and MSLE Institute. This first pilot implementation was scheduled for 8 calendar weeks with minimum 3-4 hours weekly face to face teaching using Teams video conferencing and Teams for education tooling e.g., "Teams Student Workbooks". The student had to book at least same amount of time per week for studying on their own using the "Learn-Microsoft" official documentation portal and provided "Azure for Students" Azure-subscription to do the 20+ compulsory hands-on labs.

The main motivation for Haaga-Helia to pilot the new Azure courses were to decide whether to adopt MSLE Institute Azure courses (Microsoft's current offering for Academic Institutions contains over dozen cloud certification courses from fundamentals to Associate level certification – see link to Azure Certification poster (Azure Certifications, 2022). If the MSLE courses pilot proves successful, it would then complement the existing full AWS certification course offering (AWS certifications, 2022) from fundamentals up to professional level, which have been standard inclusion in ICT bachelor curriculum for three years at Haaga-Helia. The Microsoft Cloud certified students and professionals are in really high demand on job markets in Finland, where Azure has a lead position in public cloud offerings, and we have seen a high demand on Azure certifications by our students and our SME partners in the ongoing Dithub-project.

5. Analysis and Discussion

This section will be arranged into three sub-headings and use the key aim questions, specified at the start the case study, as their headings. The findings from the pilot case study will be used to answer the research questions.

5.1 How to use the MS Azure Portal for Microsoft cloud business services in teaching?

This first pilot of Microsoft Azure Cloud Fundamentals 5 ECTS course was positive. Initially 22 students starting, 12 students passing with a grade and 7 of them were granted the official AZ-900 certifications. The student feedback for the implementation was mostly positive and students found it extra motivating to have the opportunity to study industry recognized certifications. Students found the lectured topics to be interesting and vital for the coming work role as ICT/Cloud specialists. Most of the students subscribed for more advanced cloud courses on Azure and AWS, couple of the students even continued their cloud specialist studies as bachelor thesis workers in our cloud laboratory.

Based on these Azure and AI Fundamentals pilot courses, and the received student feedback during them, we have extended the 2022 Azure and AI Fundamentals implementations to be 12 calendar weeks and to include foundational networking, virtualisation and AI primers as extra material added to the Microsoft official certification materials.

5.2 How to teach artificial intelligence and the used of AI services using MS Azure?

At the start of the Autumn 2022 semester the AI-900 preparation course will be offered as an intensive 10-week course option track in the Basics of AI course- implementation (Haaga-Helia University of Applied Sciences, 2022). In this implementation 40 enrolment spaces will be available for students to sign up from a bigger range of degree groups such as the campus online students. The hope is a higher number of students choose to take the Microsoft Certification exam scheduled for the fall of 2022, after they finish completing the study materials embedded inside the Basics of AI course.

5.3 How to support DIHUB's aim in setup of a European wide knowledge cluster on cloud-based technologies and services?

As of Spring 2022 both Microsoft Azure Cloud Fundamentals (AZ-900) and Microsoft Azure AI Fundamentals (AI-900) have been adopted to be part of standard ICT curriculums of Haaga-Helia leading to cloud specialists work roles. The partnership between Haaga-Helia and MSLE Institute has evolved into totally new heights with piloting of official Associate level certification courses e.g., Azure Cloud Administrator AZ-104 including the use of Microsoft Skillable labs. We have also hired more instructors to teach more cloud courses both on AWS and Microsoft Cloud Academies.

6. Conclusions

This paper described which courses from the vast offering have been proven to be a good starting point when an educational institution wishes to extend its course offerings on cloud technologies focusing on AI. The selected courses are: Microsoft Azure Fundamentals and Microsoft Azure AI Fundamentals, both worth 5 ECTS credits. Student feedback was generally positive, and one lesson learned was an extension of a few extra weeks on top of the 8 weeks recommended study time suggested by Microsoft, would be extra beneficial for the students studying the Azure AI Fundamentals course. The reasoning behind a few weeks' extra weeks study time, was because students generally felt there was too much study material to get through in an 8-week study

period. In addition, it was found that a preparatory course on Azure AI could be offered to a wider range of students – including also non-IT students. 260
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References 266

1. Aunimo, L. (2022). Dithub created cloud services study contents. E-Signals. <https://esignals.fi/en/category-en/r-d/dithub-created-cloud-services-study-contents/> 267
268
2. Aunimo, L., Brkljacic, M., Lintilä, T., Camara, A., & Mrsic, L. (2022). CURRICULUM DEVELOPMENT FOR CLOUD SERVICES: ANSWERING THE NEEDS OF THE JOB MARKET. EDULEARN 2022 Proceedings, 4197–4202. <https://doi.org/10.21125/edulearn.2022.1005> 269
270
271
3. Aunimo, L., Hytönen, J., Ahola, H., Hokkanen, H., & Häkkinen, K. (2021). THE DIHUB MODEL FOR LEARNING AND INNOVATING. INTED2021 Proceedings, 9993–9998. <https://doi.org/10.21125/inted.2021.2086> 272
273
4. AWS certifications. (2022). AWS certification offerings. https://aws.amazon.com/training/?nc2=sb_tc 274
5. Azure certifications. (2022). Azure certification offerings. <https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE2PjDI> 275
6. Careerera. (2021). Why Are Cloud Computing Jobs In Serious Demand Today? <https://www.careerera.com/blog/why-are-cloud-computing-jobs-in-serious-demand-today> 276
277
7. Datamation. (2021). Top Cloud Service Providers & Companies of 2021. <https://www.datamation.com/cloud/cloud-service-providers/> 278
279
8. Duke Learning Innovation. (2021). <https://learninginnovation.duke.edu/blog/2021/05/3-reasons-to-learn-cloud-computing-today/> 280
281
9. GMetrix. 2022. <https://www.gmetrix.net> 282
10. Haaga-Helia DIHUB. (2022). <https://www.haaga-helia.fi/en/rdi-projects/dithub-digital-innovation-hub> 283
11. Haaga-Helia University of Applied Sciences. (2022a). Basics of AI. https://opinto-opas.haaga-helia.fi/course_unit/BIG8TN001 284
12. Haaga-Helia University of Applied Sciences. (2022b). Microsoft Azure Cloud Fundamentals. https://opinto-opas.haaga-helia.fi/course_unit/ICT8TF052 285
286
13. Harvard University, 2022. Fundamentals of Cloud Computing with Microsoft Azure. <https://online-learning.harvard.edu/course/fundamentals-cloud-computing-microsoft-azure> 287
288
14. Microsoft Learn Azure AI Fundamentals. (2022). <https://docs.microsoft.com/en-us/learn/certifications/azure-ai-fundamentals/> 289
15. Microsoft Learn Azure Fundamentals. (2022). <https://docs.microsoft.com/en-us/learn/certifications/exams/az-900> 290
16. Middlesbrough College. (2022). IT and Computing. <https://www.mbro.ac.uk/career-choices/it-computing-and-digital-technologies> 291
292
17. Olakunle Jayeola, Shafie Sidek, Azmawani Abd Rahman, Anuar Shah Bali Mahomed, & Jimin Hu. (2022). Cloud Computing Adoption in Small and Medium Enterprises (SMEs): A Systematic Literature Review and Directions for Future Research. *International Journal of Business and Society* (pp 226-243). Universiti Malaysia Sarawak. <https://doi.org/10.33736/ijbs.4610.2022> 293
294
295
296
18. Rekik, M., Boukadi, K., & Ben-Abdallah, H. (2019). An end-to-end system to enhance business process performance through new outsourcing to the cloud strategies. *International Journal of Business and Systems Research* (pp 1–20). Inderscience Enterprises Ltd. <https://doi.org/10.1504/IJBSR.2019.10016500> 297
298
299
19. University of Helsinki. (May 31 2018). Cloud Computing Fundamentals: AWS. <https://courses.helsinki.fi/en/data20003/122093146> 300
301