

**Title:** Report on 2022 ALTA small grant “Technical and educational guidelines for personalising assessments through assessment-as-learning in cybersecurity.”

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**Abstract:**

This report retrospectively outlines the successful implementation of ‘assessment-as-learning’ in cybersecurity education, highlighting the shift from traditional exam formats to more practical and personalised assessment methodologies.

**Introduction:**

Traditional exams, especially during remote learning during the pandemic, were identified as ineffective for cybersecurity education. The project aimed to supplement/replace these with assessments contributing to active learning and skill application.

**Collaborating Institutions:**

Monash University, the University of New England, RMIT University, and the University of Wollongong joined forces, sharing diverse cybersecurity curricula and insights. Diverging assessments were implemented and promoted in multiple units/subjects across these four different universities in different disciplines. The below table shows how each university participated in this project:

	#Units	Surveys	Ethics approval	#Diverging assessments developed	#RA employed	Share of funding received
Monash	3	yes	yes	6	1	yes
UNE	2	yes	yes	3	1	yes
RMIT	1	yes	yes	2	1	yes
UoW	1	no	no	1	0	yes

Please note that UoW was initially not part of the project but since CI Nan Li moved from the University of Newcastle to UoW towards the end of the project, the duration

of the project was extended. In addition, they could develop a diverging assessment but have not conducted any student survey yet.

### **Project Objectives:**

The project aimed for the below two broader objectives:

1. The goal was to transform assessment methods, making them more reflective of real-world cybersecurity challenges.
2. A blend of personalisation, randomisation, and practical tasks supplemented/replaced traditional exams.

### **Achievements:**

The project marked a significant improvement in the alignment of assessments with practical cybersecurity skills. Students demonstrated a deeper understanding and enhanced practical application capabilities. The initiative led to an increase in peer-to-peer learning and overall student engagement in cybersecurity topics.

There was a notable reduction in the reliance on traditional, invigilated exams, which also diminished concerns about academic integrity. The new diverging assessment format eased the burden of exam preparation and marking for educators.

A list of achieved results is given below:

1. Three papers are published in high-quality computer science education conferences:
  - a. Amin Sakzad, David Paul, Judy Sheard, Ljiljana Brankovic, Matthew P. Skerritt, Nan Li, Sepehr Minagar, Simon, and William Billingsley, "Diverging Assessments: What, Why, and Experiences". To appear in ACM SIGCSE TS 2024. <https://doi.org/10.1145/3626252.3630832>
  - b. Sepehr Minagar, Amin Sakzad, Guido Tack, Carsten Rudolph, and Judy Sheard, "ALAN: Assessment-as-Learning Authentic tasks for Networking" To appear in ACM SigCSE TS 2024. <https://doi.org/10.1145/3626252.3630774>
  - c. Sepehr Minagar and Amin Sakzad, "Automatic Problem Generation for CTF-Style Assessments in IT Forensics Courses", ITiCSE 2023:

Proceedings of the 2023 Conference on Innovation and Technology in Computer Science Education V. 1 June 2023, Pages 229–235, <https://doi.org/10.1145/3587102.3588788>

2. Two more papers are in preparation to be submitted to similar venues:
  - a. William Billingsley, Ljiljana Brankovic, Nan Li, David Paul, Amin Sakzad, and Matthew P. Skerritt, “Diverging Assessments Experience Student Surveys and Analysis”, Submitted to ITiCSE 2024.
  - b. Amin Sakzad, Judy Sheard, and Tom Chandler, “Invigilated End-of-Semester Summative Assessment versus Simple In-Semester Authentic Assessments”,
3. A 1-hr workshop was held at Monash University introducing “Diverging assessments”.
4. A Monash “Be Inspired” page about “diverging assessment”:  
<https://www.monash.edu/learning-teaching/TeachHQ/be-inspired/assessment-examples/diverging-assessment-assessment-as-learning>

### **Implementation Overview:**

Spanning from April 2022 to Dec 2023, the project involved an iterative process of developing, implementing, and refining new assessment strategies. This included securing ethics approvals, conducting initial surveys, developing new assessment formats, and maintaining the revised assessments across the participating institutions. Regular evaluations and feedback sessions ensured continuous improvement and alignment with educational goals.

### **Conclusion:**

The successful completion of the project led to the publication of comprehensive educational and technical guidelines. These guidelines have since influenced the broader field of cybersecurity education. The project's legacy includes a shift towards more dynamic and effective teaching and assessment methodologies in cybersecurity, potentially impacting educational approaches in other technical disciplines.