Chapter 9
NreASAM:
Towards an Ontology-Based Model for Authentication and Auto-Grading Online Submission of Psychomotor Assessments

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ABSTRACT

Core and integral to the fourth industrial revolution, knowledge economy, and beyond is information and communication technology (ICT); more so, during and post the novel coronavirus pandemic. Yet, there exists a skills gap in ICT networking and networks engineering. Not only do students perceive ICT networking to be difficult to comprehend, lecturers and institutions grapple with the adequacy of ICT networking equipment. Real-life simulators, like the Cisco Packet Tracer, hold the promise of alternate teaching opportunities and evidenced-based environments for (higher-order) assessment. Research in the last decade on ontology for assessments have focused on taxonomy and multiple-choice questions and auto-generation and marking of assessments. This chapter extends the body of knowledge through its ontology-based model for enabling and auto-assessing performance-based and/or pseudo-psychomotor assessment. The auto-grading online submission system assists with authenticity and enables authentic and/or sustainable assessments.

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INTRODUCTION

Most importantly, what we want to avoid is using old 19th Century teaching methods on new 21st Century technologies to merely dump large volumes of undigested information down large digital diameter pipes to relatively inactive and passive learners. This pump it down a pipe analogy is the "ugly" and uncomfortable reality of online education when done poorly. Unfortunately, too often the default model of online education is just borrowing old delivery methods of teaching and supplanting them onto new online learning spaces and digital technologies with no transformative advantage. – ICDE: International Council for Open and Distance Education

Education is not the learning of facts but the training of the mind to think – Albert Einstein

Beyond a New Era

With the advent of the novel coronavirus disease 2019, known as COVID-19 (WHO, 2020), many higher education institutions (HEI) have either switched to 'online classes' or are in the process of moving to online learning/e-learning (Crawford et al., 2020). Most HEIs are prepping for and/or taking advantage of asynchronous learning (Daniel, 2020). Online learning is not entirely new, it is only being fast-tracked by the COVID-19 pandemic.

This is not just for COVID-19, it is important for the fourth industrial revolution (4IR), digital age, knowledge economy and beyond, as intentional, purposeful, strategic use of *information* is of the essence. The 4IR placed reliance on data, information processing, self-learning, automated processing and transmission. No doubt, 4IR has been viewed as the second information technology (IT) revolution (Lee et al., 2018). In addition to 4IR, the knowledge and creative economy (Craig, n.d.; Goede, 2011), are home to intelligent and smart computing.

During the COVID-19 pandemic, there were lots of remote work and activities. Upon a closer look, one will see that this is in similitude to activities in the 4IR. At the bedrock of the 4IR, knowledge and creative economy and beyond, are (communications and computer) networks, as well as telecommunications. Without these technologies, processes, and capabilities, remote work, activities, and communications will not be enabled, nor will communication and processing of data and information be empowered and enabled effectively and efficiently. Obviously, skills must be developed in these areas, hence, students must be taught.

ICT Networking Skills and Equipment Quagmire

Over and above the general information and communication technology (ICT) skills gap (Mikroyannidis et al., 2018, p. 1),, there are skills gap in the areas of networking and telecommunication, especially ICT networking which is the focus of this paper (Adesemowo, Mhlaba, et al., 2017; Mikroyannidis et al., 2018).

Compounding the scarcity of skills, is the challenge of inadequate physical equipment to go round for students training (Mikroyannidis et al., 2018). In the era of COVID-19, not only are there equipment inadequacy, there are accessibility constraint due to social and physical distancing protocol occasioned by COVID-19 pandemic (Crawford et al., 2020, p. 3). Gaming, virtual reality, augmented reality, animation, simulation, virtual and remote labs are some of the approaches that are being used as stop-gaps (de la Torre et al., 2015, p. 934; Lai & Bower, 2019, p. 32). Remote labs allow for 'controlled' access to