

An Exploratory Study of a Conceptual Framework for Developing Micro-Credential Courses in Malaysian Higher Education Institutions

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Abstract: The rapid growth of technology and digitalization has led to a new model of learning known as micro-credential to reorient Higher Education Institutions and prepare graduates for work related skills in the 21st century. Even with much attention and support from the Malaysian Government, there is, however, still a lack of consensus for proper implementation of micro-credentials in Higher Education Institutions due to its infancy stage. Using grounded theory and qualitative content analysis, a conceptual framework was developed with three main themes emerging. These are; (1) learning principles, (2) e-learning theories and models and (3) assessment principles with reference to micro-credentials. The creation of this conceptual framework intends to help guide practitioners in the development of micro-credential courses in Higher Education Institutions in Malaysia. Key terms: Exploratory, micro-credential, conceptual framework, e-learning, learning principles, assessment principles

INTRODUCTION

Micro-credential (MC) is a form of online, on-demand certification earned through demonstrating skills, knowledge and competencies in a specific area at a time. Wheelahan & Moodie (2021) defined MC as “industry-

aligned short units of learning that are certified or credentialed, that counts towards a higher education qualification”. They are earned either through credit or non-credit courses in a form of short stackable courses, learn-by-doing processes or evidence submission to demonstrate the specific skills for undergraduates, graduates, non-traditional students and working professionals (Gallagher, 2019; Rossiter & Tynan, 2019; Fong, Janzow & Peck, 2016). In addition, MC differs from traditional degrees and certificates as it is completed in a short period of time while providing personalised learning context and flexibility (as it is normally delivered through online platforms) in achieving the learning outcomes (Hanafy, 2020, Hunt et al, 2020; Malaysian Qualifications Agency, 2019 & Crow & Pipkin, 2017). Upon completion, learners earn digital badges or digital certificates that contain meta-data which verifies mastery of these specific skills, knowledge and competencies.

Although there have been numerous contributions related to micro-credentials design, implementations and assessment (Lim et al, 2018; Jeantet, 2018; Song, 2018; Carey & Stefaniak, 2018; and Hall-Ellis, 2016), there is still no definite term of what constitutes a micro-credential in terms of period of study, principal characteristics or specific forms of assessment and award system (Kato et al, 2020; Chakroun & Keevy, 2018; Rossiter & Tynan, 2019). This is especially challenging for Malaysian Higher Education Institutions (HEIs) as they need to develop micro-credentials to ensure their graduates not only have 21st century skills once they graduate but also the competencies that meet the demands of the future workforce.

Currently, the only framework available for micro-credential development is the Common Microcredential Framework (CMF), which was based on the European Qualification Framework. CMF is used in over 400 HEI across Europe, for the purpose of standardizing portable digital certification through flexible learning. Due to the differences in the national qualification framework (MQA) and the European Qualifications Framework (EQF), CMF is not suitable for Malaysians HEIs. For instance, MQF guidelines on the qualification level for micro-credential awardance must be at APEL (C); whereas CMF has outlined that learners must be at level 6 or 7 in the EQF. APEL (Accreditation of Prior Experiential Learning) is a formal and informal learning evaluation process of a learner based on cumulative experiences; such as knowledge and skills to obtain credit transfer for course(s) in the programme enrolled. Currently it can be used for entry

requirements for Malaysia HEI programs such as certificate (level 3), Diploma (level 4), Bachelor's (level 6), and MAster's (level 7).

The purpose of this paper is to develop a micro-credential conceptual framework that would be the basis for designing and developing a Micro-Credential for Malaysian HEIs.

RELATED WORKS

A learning theory is meant to explain and help us understand how learners learn. Four most popular learning theories are behaviorism, cognitivism, social constructivism and multiple intelligence. Behaviorism focuses on how learners behave and how they respond to certain stimuli, then when repeated, can be assessed, quantified and controlled for each learner. Watson, following Pavlov's work, coined the term behaviorism and argued that the learning process involves stimulus and responses as compared to mind and consciousness. Skinner introduced the term operant conditioning that emphasized positive and negative reinforcement (helps learners learn new behaviours), which had significant influence on computer assisted instruction (CAI). Reliance on encouragement and repetition was a common element in early CAI programs as it promotes positive learning activities.

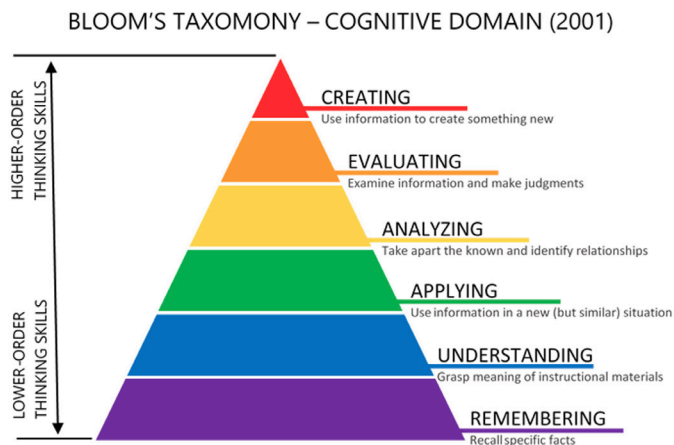


Figure 1: Bloom's Taxonomy (Blooms & Krathwohl, 1956; Krathwohl, 2002)

Cognitivism believes that the mind (such as motivation and imagination) has an important role in the learning process and focuses on the interaction between the occurrences of environmental stimuli and learners' responses. Proponents of cognitivism argued that the creative mental process, levels of cognitive levels and the acquisition of knowledge is not observable in the physical world. Bloom's taxonomy (1956) as shown in Fig. 1, emerged as a tool for curriculum development for charting skills related to the development of intellectual and higher order thinking skills. In addition, Gagné's 9 Events of Instructions, a cognitivists instructional design, outlines the objectives and strategies for the design of instructional material. [See Fig. 2]

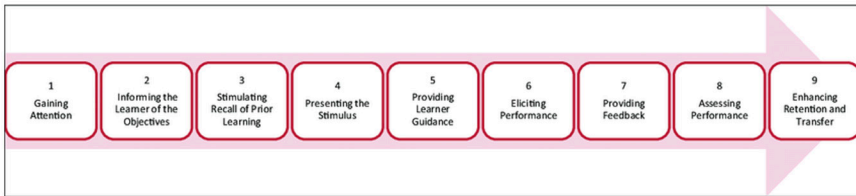


Figure 2 : Gagné's 9 Events of Instructions (Gagné, 1985)

Constructivism describes teaching and learning as a complex interactive social phenomenon between the instructor and the learner. In the constructivism approach, learning takes place when learners are in the “zone of proximal development”, in which the learner constructs with more knowledgeable peers the knowledge necessary to solve the problem (Vygotsky). Additionally, constructivists believe that learners learn by doing, collaborating and reflecting with their peers (Dewey), which is very much evident in the present day classroom context. Furthermore, adults, seeking to enhance their professional knowledge or learn out of curiosity, learn through social context and experiences, either from traditional programs, continuing education programs, competency-based learning or professional development in HEIs (Knowles, 1998).



Figure 3: Gardner's Theory of Multiple Intelligences, (Gardner, 1999)

The Multiple intelligence theory proposes that intelligence consists of multiple entities used by learners in different situations and proportions to understand and learn about the world. The eight basic intelligences outlined are; linguistic, logical/mathematical, spatial, musical, bodily kinesthetic, interpersonal, intrapersonal, naturalistic, and existential as shown in Fig. 3 (Gardner, 1999). This theory sparked the design of multiple learning modalities which allow learners to engage in learning in ways they prefer, according to their ability. According to the multiple intelligence theory, learning is an evolutionary process (where learners move from one place, subject etc to another) - this sparked a framework for multimodal instructional design that relies on a variety of pedagogical techniques, delivery approaches and multimedia elements (Willingham, 2008).

2.1 Learning Approaches in an Online Environment

This section presents several theories in terms of its appropriateness for designing and developing a framework for micro-credential in Malaysia's HEIs. As most micro-credentials are available through an online learning platform, the responsibility for learning shifts primarily from the instructor to the learners.

Connectivism is a learning model that suggests learners should combine knowledge, thoughts, theories and general information in a useful manner and acknowledge that technology and information flow have a major part in the learning process. Due to the constant connectedness, it gives learners opportunities to make choices about their own learning, and at the same time promotes collaboration, discussions and showcases learning artefacts through various online activities. Connectivism believes that learning happens through social media, online networks, blogs, or information databases. Siemens (2004) describes connectivism as the “integration of principles explored by chaos, network, complexity and self-organization theories”. He argued that due to the volatile nature of information explosion, what must be learned is determined by others and that learners need to unlearn what they’ve learned in the past and learn how to learn and evaluate new information online.

In addition, in an online environment, students are accountable for their own learning and how they learn it (Swan, Garrison & Richardson, 2009). Effective online learning for higher order skills are dependent on community’s development (Swan et al, 2009). Based on a constructivist approach to learning in higher education, (Garrison, 2007), where community produces knowledge, a Community of Inquiry Model describes how “meaningful learning takes place for a group of individual learners through educational experience that occurs at the intersection of social, cognitive and teaching presence. Social presence is the “ability to identify and communicate with the community and develop interpersonal relationships”. Cognitive presence is defined as the “extent to which learners construct and confirm meaning through sustained reflection and discourse in a critical Community of Inquiry”. Teaching presence is defined as the “design, facilitation and direction of cognitive and social presence for the purpose of realizing the relevant learning outcome (Garrison, 2009; Garrison, Anderson & Archer, 1999). The integration of any technology into online courses varies from choosing the appropriate applications, to the use of digital spaces for supplementing course content. Elements of the Community of Inquiry model helps learners and explains how technology can be applied in an online environment.

2.2 Learning approaches to Micro-Credential

Micro-learning emerged as a result of micro-credentials, which delivers topics that are difficult in bite-size training modules, or small units and uses short-term-focus activities used to acquire knowledge, skills and abilities which happen on a daily basis (Jomah et al, 2016; Hug, 2005). This type of learning is suitable for an online learning environment as they are targeted, self-paced, concise, highly modular, flexible and on-demand, which is needed in view of medial, societal and constant environmental change (Job & Ogalo, 2012). Complexities of learning are broken down and students get immediate feedback after each unit (Bell & Mladenovic, 2008; I'Anson et al., 2003; Paintal, 1980). Micro-learning experience proved successful and showed a high acceptance rate when integrated into the learners' daily routine as compared to e-learning experience (Jomah et al, 2016; Gassler, Hug & Glahn, 2010).

Competency-based learning is defined as a system of instructions, assessments and reporting of student learning and achievements in demonstrating the target skills and abilities. Competency-based learning is a widely used approach in micro-credentials and micro-learning to help learners improve their skills, and knowledge; mastering these skills is the general goal. Current employers are looking for graduates who possess competencies that are relevant to the hiring position, thus forcing HEIs to shift their courses to meet the employers demand (Lim et al, 2018, Baughman, Brumm, Mickelson, 2012; Voorhees, 2001). However, there were some concerns outlined in employing competency-based learning in micro-credentials for HEIs. Voorhes (2001), argued that with bundling and unbundling micro-learning units, there needs to be a common understanding of what competency is being assessed and the performance standards.

In order to ensure key stakeholders benefit from the development and implementation of the micro-credentials, The Malaysian Qualification Agency (2019) outlined six principles for HEIs to adhere to; (1) outcome-based, (2) personalised, (3) on-demand & industry driven, (4) secure and shareable, (5) transparency and (6) naming convention. In the context of "on-demand & industry driven", the micro-credential

must be context-based. In line with the constructivist view of learning, context-based learning is described as a type of active learning, where learners are expected to have autonomy over their own learning, where authentic situations (context) are provided as a starting point for learning the content matter (concepts) (Gilbert & Treagust, 2009; Gilbert, 2006; Parchmann et al 2006). Gilbert (2006), outlined the nature of context used in context-based learning as;

a setting within which mental encounters with focal events are situated; a behavioural environment of the encounters, the way that the task(s), related to the focal event, have been addressed, is used to frame the talk that then takes place; the use of specific language, as the talk associated with the focal event that takes place; a relationship to extra-situational background knowledge

Personalised learning is one component for an effective micro-credential ecosystem (Malaysian Qualification Agency, 2019; Berry, Airhart and Byrd, 2016). Personalised learning is learner-centered, where it provides learners agency over their own learning, achieving their own learning goals by deciding how, when and where they learn (Harkema & Schout, 2008; Jones & English, 2004). Learner-centered is an educational approach that aims to customize student's learning while using various strategies to engage and develop their target skills and competencies, and at the same time make learners take responsibility for their own learnings. Through this approach, learners' motivation increases since they have some control over their learning, and their retention also increases since they become more aware of what and why they are learning (Weimer, 2011), which is the main core business for micro-credential - a tailored learning to learner's career goals and responsibilities.

2.3 Assessments in an Online Environment

Assessment is crucial to education and all learning activities. Biggs and Tang (2007) mentioned that assessment tasks and teaching-learning activities must be aligned to "ensure students achieve the intended learning outcomes and develop cognitive abilities at a range of levels".

The two types of assessments are; summative and formative, in which summative assessments are high-stakes activities that have more impact on the students' grades as compared to formative assessments, where low-stakes activities are used to gauge students progress to what extent a student is learning a concept, skill, or knowledge set, towards the completion of the course outcomes. To ensure that students develop all of the intended learning outcomes and for students to demonstrate their learning, instructors can use a range of assessment types. The aim of assessment is to provide feedback on the learners' progress and help them identify their readiness for the next level. Online assessment provides the flexibility for allowing learners to take them at their convenience, and this is ideal as micro-credentials are offered in an online platform.

According to Robles and Braathen (2002), online assessment is a system for evaluating students' achievements, as there are various components to measure; such as online peer-to-peer interactions, learner-to-instructor interactions, participation, and learning outcomes. As mentioned in the guideline by Malaysian Qualifications Agency (2020), micro-credential providers are to ensure skills, knowledge, attitudes and competencies gained are reported and measured through appropriate and suitable assessments methods for formative, diagnostic and summative purposes. Outcome-based assessment is defined as a collection of evidence on learners' achievements or progress based on outcomes and competencies, and are obtained through various alternative assessment methods such as portfolios, observations, projects and self-assessments (Malaysian Qualification Agency, 2019; Brindly, 2001, Brown and Hudson, 1998). Transparency in reporting, alignment of teaching and curriculum goals and sensitivity to learners' needs are some advantages of outcome-based assessments.

In terms of assessment methods, Gayton and McEwan (2007) interviewed online instructors and found projects, portfolios, self-assessments, peer evaluations, time tests and quizzes and asynchronous discussions to be effective in an online environment. Other popular assessment methods for online courses are online discussions, written assignments, quizzes and tests, and instructors need to use a variety of assessment methods to accurately and thoroughly assess the learners

(Swan, 2001; Arend, 2007; Robles & Braathen, 2002).

Once learners have fulfilled the criteria required to pass the assessment, credentials or certifications will be awarded- however due to the nature of digital credentials, there are challenges such as security, authentication, integration and management. Blockchain based education systems might address these challenges as it provides a way of verifying the credentials of a learner based on the global network of employees, employers, micro-credential issuers and learners who have personal access to their portfolio of diverse range of skills, knowledge and competencies (Bhaskar, Tiwari & Joshi, 2020). A study conducted by Turkanovi et al (2018), used blockchain technology to create a global decentralized platform for managing, assigning and presenting digital credentials for learners and issuing bodies; such as HEIs, employers or organisations. Blockchain technology is a tool to manage electronic data that supports transparency and accountability. It is also a way to keep digital assets unalterable and transparent through the use of decentralization and cryptographic hashing. The process of the development and deployment of any digital services such as awarding micro-credentials are modernised, secured and made effective through the use of blockchain technology (Turkanovi et al, 2018). Various research has proven the great potential when adopting blockchain technology in the education sector – however, barriers such as scalability, cost and security still need attention (Alammary et al., 2019; Turkanovi et al., 2018).

METHODS

The conceptual framework is based on reviewing related literature and published guidelines and standards discussing the design, development and implementation of micro-credentials. The learning approaches, guidelines and standards were consolidated to develop a conceptual framework for designing and developing a Micro-Credential for Malaysian HEIs.

RESULTS

Based on the literature, a conceptual framework for designing micro-credential is developed. The following diagram (Fig. 4) shows the tentative model of the conceptual framework in the development of a micro-credential.

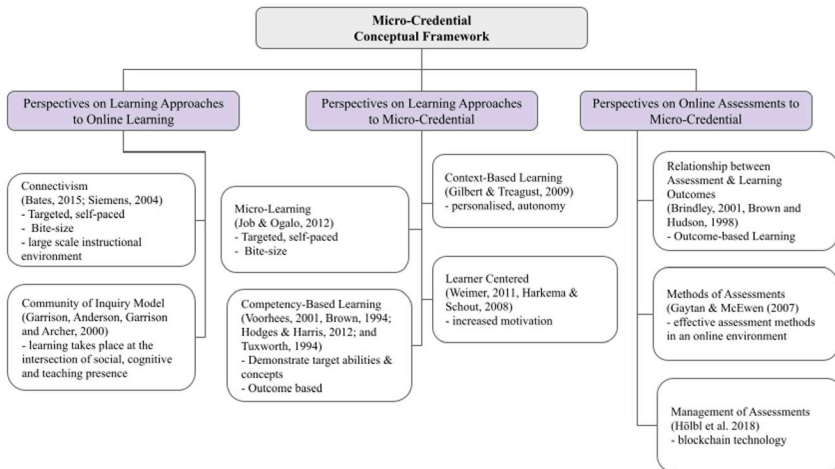


Figure 4: The Micro-Credential Conceptual Framework

In this initial consideration for the micro-credential conceptual framework, two important theories were considered on the perspectives for learning approaches to online learning; Connectivism (Bates, 2015; Siemens, 2004) and Community of Inquiry Model (Garrison, Anderson, Garrison & Archer, 2000). In addition, four theories were also considered on the perspective for learning approaches to micro-credentials; Micro-learning (Job & Ogalo, 2012), Competency-based Learning ((Voorhees, 2001, Brown, 1994; Hodges & Harris, 2012; and Tuxworth, 1994), Context-based Learning (Gilbert & Treagust, 2009) and Learner-Centered (Weimer, 2011, Harkema & Schout, 2008). Lastly, three aspects were considered on the perspectives for online assessments to micro-credentials; relationship between assessment and learning outcomes, assessment methods and assessment management.

CONCLUSION

The Micro-Credential Conceptual Framework was developed and will serve as a foundation and guideline for the next phase of the study which will be in the form of framework instantiation for developing a micro-credential. The conceptual framework includes literature review, and relevant theories on learning approaches to online learning and micro-credentials, as well as online assessment considerations with reference to micro-credentials. The outcome of the conceptual framework will be applied and validated in future studies.

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