Phygital Learning Concept: From Big to Smart Data

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Abstract **- 'Phygital' or physical plus digital, is a combination of a physical circumstances or tangible objects and digital or online technology-driven experience. This paper introduces a challenge on potential phygital learning environments that may induce superior learning experiences for students as compared to experienced realized through either physical or digital experiences. 'Phygital learning' is a novel design concept to induce a new dimension of learning experiences while students interact with the physical context simultaneously as the digital information similarly enhances levels of competence. The authors also illustrate a conceptual idea of phygital learning which transforms theory to practice. Finally, the paper argues that the new concept of phygital can elevate learning outcomes in alignment with 21st Century technology by adding a form of smart data as opposed to big data into the mix to address a broader array of learning styles.**

Keywords **- Big Data, Blended Learning, E-Learning, Digital, Perception, Phygital, Physical, Smart Data**

I. INTRODUCTION

Phygital learning is a concept of a smart learning ecosystem which balances digital contents or online technology-driven experience together with physical or live-contexts. Phygital learning relies on advanced technologies to increase meaningful and effective interaction among students, instructor, data and environment. The potential of phygital learning will contribute a positive effect at all levels from global to the individual since digital contents should influence people to be more involved in physical contexts and not be isolated in the realm of virtual reality. Phygital learning is a disruptive innovation since its concept leverages and does not replace the potential of eLearning or blended learning [1]. An imperative in 21st century accelerates to the digitisation of everything's arrival [2] at the same time as an era of big data which is not big insights enough [3]. The phenomenal of open educational resources, massive online open courseware or MOOC and eLearning courses have established an enormous online knowledge base but what people want are the answers or accurate information rendering specific to the learning objectives [3-5]. To provide a clear understanding of a novel concept, this article describes how a phygital learning concept applies to the psychomotor domain subjects that require motor skills and tasks such as playing musical instruments, being an athlete requires a standard of instruction planning for activity-based learning that begins from less complex perception to the higher end outcomes

[6, 7].

II. LITERATURE REVIEW

A. Learning Domain

Learning is developmental process that enhances the brain's growth and changes after the individual moves through series of cognitive checkpoints such as process, connection, cataloguing, and practice [8]. Learning domains include three main categories: cognitive, affective, and psychomotor [8]. Each domain represents a progress of learning from basic to deeper levels of learning [8]. The concept of "Phygital Learning" is to enhance all three learning domains especially the psychomotor domain which requires a mind/body connection [6]. Digital media normally presents only visual and audio components and is not totally adequate to address all learning domains. Nevertheless, music education for example, has an increased capacity to induce holistic development and improve the psychomotor, affective, and cognitive domains of students [7, 9, 10]. A review of the results of the psychomotor domain for music education proven by Kibler Barker and Miles's (1970) the taxonomy enables effective classification of music objectives [7, 10]. The psychomotor domain according to the taxonomy developed by Kibler et al (1970) consists of four levels: Gross Body Movements, Finely Coordinated Movements, Non-Verbal Communication Sets, and Speech Behaviours [9]. The activity-based on live- physical contexts for music education such as playing musical instruments, singing or other similar activities which aim to create student psychomotor skills might be considered to follow these four steps for holistic development of students.

B. Phygital Concept

The convergence of physical and digital channels is an extra dimension of interaction and engagement recommended in business. This is considered as an issue of stimulus as just one side of the digital or physical dimensions of stimuli might not simulate sufficient spontaneity within a learning environment. The combination needed to provide a deeper meaningful experience to business customers [11-14]. The fundamental concept of phygital at a minimal level is comprised of content, context and consistency [14]. Technology and applications on mobile devices such as quick response (QR), augmented reality (AR), geofencing, iBeacon and Google Glass will blur the boundary between physical and digital and create a new ecosystem [11, 12, 15].

C. Related Research Studies

Phygital was coined as a term in the retail industry while the fact its concept suits many fields-particularly education. Phygital projects of Homeplus in the Republic of Korea made a significant change by expanding 76 per cent of their online shoppers and 130 percent of online sales [16]. Phygital concepts appeal to the deeper senses rather than only digital perception since people can touch, smell and taste the product physically while perceiving an interesting well design digital media [13].

A phygital urban game, namely 'Active Parks' uses interactive xylophone and involved more than 150 participants across different ages, was found to be an enjoyable way to encourage sedentary individuals to be active in the playful environment [17]. The experience of phygital spaces was presented to the person involved who is interacting with their mind and body, virtuosity in the context of audience interactive interfaces in the New Interfaces for Musical Expression [18]. The research results from the phygital public space approach in Volpiano, Italy demonstrated higher benefits than expected because participants became actively involved in each stage with openness and transparency while the phygital process was flexible and spent less than the proposed budget [19]. UK academic research found a gap between the offered learning technologies and the selected technology according to disruptive innovation theory [20]. The same research demonstrated that students preferred the simple and convenient technologies to support their learning even though there was a high demand from educational resources to "bring your own devices" (BYOD), was very practical [20].

In conclusion, phygital learning can be described as a concept of smart learning ecosystems. This form of education balances the power of digital with physical spaces systematically with an emphasis on the subjects that are linked to skills within the psychomotor domain. This skill area requires practice with actual objects such as music, sport, and cuisine. Phygital learning is not a standalone mechanism but integrates many elements that work seamlessly as an ecosystem. It is a method that embodies many functions and technologies working together to form a smart learning system.

III. RESEARCH METHODOLOGY

The prototype of phygital learning has been drafted and illustrated to present a clear vision of this new concept. The phygital learning can be equipped with state-of-art technologies that bridge the physical environment with digital media for educational purposes.

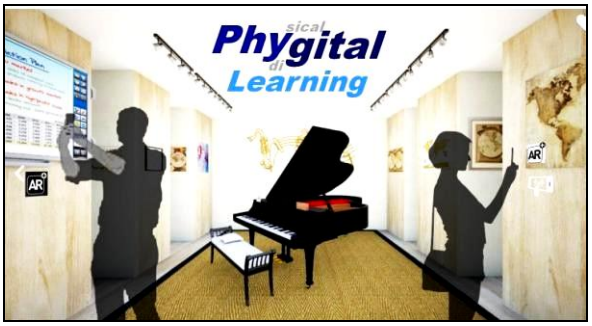

Fig. 1 A Prototype of Phygital Learning

The two important balances are a real instrument representing the physical aspect such as music instruments or sporting equipment and a smart application or system which represents the digital components such as interactive video or mobile application that students will learn from both features.

Phygital learning can occur at any place indoors or outdoors where Wi-Fi is available for an Internet signal. A traditional classroom can be renovated to be a phygital learning environment by adding an AR marker on a physical object such as a poster or a board (Fig. 1). The approach of phygital learning can be described into an 8Cs process (Fig. 2): 1) Connection, 2) Captivation, 3) Contexts, 4) Contents, 5) Communication, 6) Collaboration, 7) Consistency, and 8) Competency. Each step will be driven by instructors together with students while they are physically presented at the specific environment with the full functionality of technology that supports each stage in the smart learning ecosystem. Details of each step are to follow.

Fig. 2 8Cs Processes of Phygital Learning

1. Connection to the advanced technology when students arrive to a classroom, BYOD needs to be fully implemented since each student will use their own device. iBeacon or similar technology will be triggered and accessible on their devices. The physical learning materials such as a board, poster or book will be embedded with AR technology which assists students to access to digital learning material seamlessly, no need to type URL.

2. Captivation by a 'badge' or digital tokens that will appear as an award icon on student's profile after students accomplish learning tasks such as either are integrated into the phygital classroom, answer questions on the interactive video or completion of a

learning skill. This will motivate students to be active at higher levels.

3. Contexts represent real environments or tangible objects in learning contexts. These instruments such as any musical instruments in the music class, a music note, piece of sporting equipment or kitchen tools and other related objects depending on the subject are all viable tools to stimulate learning.

4. Contents include well-designed digital media which is prepared specifically to meet learning objectives in a micro-learning environment. A game, an interactive video or mobile applications should be created or selected to make the phygital learning meaningful. The "smart" digital contents need to be straight forward to complement the learning objectives, through the use of concise, simple and interactive resources.

5. Communication enables students to interact with both the context of the learning and the content which complements the skill and knowledge development. The two-way communication requires an accurate advice and feedback from instructors to students who are willing to make a shift to improve their skill and reach a level of competency in a new learning environment.

6. Collaboration encourages students to be active, share and shape the learning process, not just be passive recipients. A smart learning ecosystem will not be created in a competitive environment but will establish a team work atmosphere to foster learning and the formulation of new knowledge and skills that can be invaluable when instructors and students collaborate with deeper interest.

7. Consistency requires discipline and is crucial improving psychomotor skills. It is recommended for students to perform regularly in a phygital learning environment. The digital learning media needs to be designed to boost students' skills on occasions when they are practicing alone or communicating distantly with an instructor.

8. Competency is an expected outcome from a comprehensive and all embracing process underpinned by phygital learning. Students should accomplish a deeper knowledge and better skills according to the learning objective which aims to induce heighten skills and cognitive development within the psychomotor domain.

The 8Cs processes of phygital learning represent a pathway of progress that leads to higher learning levels and results in deeper competency of students.

IV. DISSCUSSION

Phygital learning concepts are still in the implementation stage and are viewed as a work in progress by those who accept any relevant or useful advanced technology and/or ideas that support deeper and superior psychomotor learning. The various unique subjects and skills which each dimension of phygitial attributes its uniqueness will influence and create an improved bridge to learning in a practical dimension. Many crucial factors for example such as strategy, structure, systems, style, and staff of the institution must be considered at the preparation stage of any phygital projects. The purpose, concept and 8Cs processes which are still open to modification are recommended to be experimented with using a scientific research method. Instructional design of phygital learning needs to result in a new way to support the balance of the physical and digital aspects linked to learning in harmony to achieve the desired learning outcomes. Classroom management will differ from the orthodox approach and this leap forward requires new knowledge levels of advanced technology that should to be the basis of training for instructors and students beforehand. Learning facilities and infrastructure related to technology will play an important role to position phygital learning successfully within pedagogical environments.

V. CONCLUSION

The concept of phygital learning can be applied to serve many aspects of education, such as public relations for mass communication however, this article is limited to the specific subject of education. Phygital learning was designed to improve quality and effectiveness of education particularly within the psychomotor domain which requires extensive practice to establish a tangible and developed skill. Phygital learning concepts also emphasize the learning process as a residual benefit which can be described as the 8Cs processes and interaction among instructors, students, technologies and instruments. The format of the smart learning ecosystem in 21st century cannot be fulfilled based upon a single education component but requires bridging the highlight of physical and digital strategies together has endless possibilities in terms of stimulating learning. This paper offers a contribution to this emerging field and provides a foundation to consider as an alternative approach to solve problems where particular subjects may use limited in digital content which may be ineffective from learning and teaching perspective. The processes and results of research in phygital learning will be boosted and made accessible to educators in the near future given its dynamic growth which involves advanced technology and can empower and rejuvenate education in multiple ways.

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(Arranged in the order of citation in the same fashion as the case of Footnotes.)

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