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A QUALITATIVE STUDY OF DIGITAL TEACHING RESOURCES INTEGRATION INTO UNIVERSITY BIOLOGY COURSES

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ABSTRACT

Faculty and students of science courses at the university level are in a nimble transition from the usual face-to-face pedagogy to the digital technology-based classes without the assumptive roadblocks or bias against or unfamiliarity with the digital world. The new normal teaching integrating digital technology have become burdensome to a few faculties with somewhat conservative attitude towards technology, and yet to some it has become a challenge and quickly pursued training to learn things quickly. Unfortunately, many of the technologies used, changed teaching and learning, to a certain degree, as a necessity of the times or convenience.

Faculty and BSc Biology students were purposively selected and interviewed using an inclusion criteria. The study did not delve into students' final course grade as effect but rather focused only on how the quality and character of teaching have been impacted by the integration of digital technology into Biology courses. Audio-recorded interviews on Zoom transcribed manually were thematically analyzed.First cycle coding was done using in vivo. Evaluation codes, were utilized during the second cycle coding using NVivo. Emerged codes from the evaluative perspective of the researchers and qualitative commentary provided a systematic collection of information of activities related to digital integration, characteristics and outcomes which provided judgment, improve effectiveness, and/or inform decisions about future development plans, programs, and policies. Codes were scored with corresponding magnitude. Positive/negative signs were further used to indicate whether a theme positively/negatively affected respondents, then tabulated and analyzed.

Digital technology integration was significantly correlated with faculty and students' attributes such as age, computer gaming experience. Biology courses need the essential alignment like the TPACK framework and advanced didactics. Digital technologies integration has been plainly limited the effects of teaching as conventional education models need to embrace changes brought about by the pandemic in the post-industrial decline.

Keywords*: Digital Technology, Impact, Integration, Distance, Online Teaching, Digital Didactics.*

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1. INTRODUCTION

The newly installed and acquired digital resources, such as MOOCs, Labster, gamified and simulated videos, whiteboard on MS, interactive and non-interactive videos including manipulatives, DIYs and internet platforms, e.g. DNA2App became the staple of the learning community. Technology can be both challenging and demanding, as it is very aggressive in its activity, in itself a contrivance. If in Philosophy technology is poesis, an activity which a person brings something into being that did not once exist, then in education technology simply means setting common standards and protocols for formatting and/or handling data so that information can then be shared (McNamara, Valdeverde & Beleno, 2018). Traditional teaching of Biology courses are designed with a lab component and is co-requisite for that course. To possibly achieve the competencies, for example in Genetics, students will need to use Escherichia coli to explore basic concepts in prokaryotic genetics such independent assortment, mutagenesis, inheritance, genotyping and even Bioinformatics. A blended learning program of both (1) hands- on and (2) computer simulation experiments must cover all those mentioned concepts and techniques, however blended learning programs are only effective when students are allowed in the labs to engage in some bench work. As it is, with extended community quarantine protocol, without the benefit of a lab, often faculties rely heavily on the said digital resources, as mentioned, simulated experiments. As a result education has changed dramatically with the distinctive rise of e-learning whereby teaching is undertaken remotely using digital platforms. To test and to endeavor ourselves using constructivist approaches (Garbett, 2011), if we have been successful in achieving our targeted goals and objectives after only a year of painstakingly integrating available digital resources we encouraged all our faculty teaching Biology to explore beyond and to assess authentic students' learning. The intent is to describe the issues of concerning the faculty as well as students. Although the 'themes' that emerged can be the product of interpretivism (Gibson, 2006), that is we impose meanings on the world that we inhabit, that we engage in cultural practices that are defined by shared interpretations; we do not operate as isolated beings but do share with other groups of people from within and outside the academe certain interpretations. The researchers have borrowed the empirically validated and widely used social cognitive theory (Bandura, 1989) as the study explores deeper into the connections between (a) technology readiness, (b) learning that is self-directed, and (c) faculty and students motivation. What are the significant impact on learner attitudes and learning behavior in traditional educational environments (Fairchild, Jeanne-Horst, Finney, & Barron, 2005).

2. METHODOLOGY

To appraise the impact the of digital technology integration in this study the researchers believe that in-depth interviews will generate the products "we were trying to find" from the specific interaction between the 'interviewee' and the 'interviewer.' For producing data this is an appropriate method, one that will give account of 'what the respondents say and how they say it. A participant informed

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consent form was presented and were signed by each participant before the interview.

Interviewees were assigned a particular numerical code for identification purposes and to conceal the identity of the interviewees. A semi-structured interview schedule was created and pilot-tested. The interview schedule covered the questions regarding integration of digital technologies into Biology courses. The interview schedule have a five (5) core points clustered into: (a) changes in university operations, (b) approaches in instruction, (c) culture and social influences, (d) the use of digital resources specifically, Labster, whiteboard in MS Teams, and YouTube videos. The full interviews via zoom were audio recorded and were manually transcribed upon completion.

The the coded responses of the respondents were tabulated. The analysis was based on the scores of the magnitude coding. Magnitude codes (Saldana, 2016) are numbers in lieu of descriptive words which indicate intensity or frequency as well as such continua as weight or importance.

Selective coding (Saldana, 2016) was utilized during the underlying coding to cover and to represent any remaining codes and classifications defined up to this point in grounded hypothesis analysis. Then using the NVIVO (QRS International, 2021) software program, these codes were tagged, depending on the categories and themes and relevant texts on hand. The goal is to let the data 'speak' while the researchers tried to avoid contaminating the codes between which they seek associations or correlations to be able to extract from the data.The codes were cross-checked regularly to see whether the respective tag and data matched. Categories that emerged from the broader themes were applied to the codes. Magnitude coding of the data was then used which was more focused around the core category purposely looking for the links of the themes generated in the evaluation of the shift or integration of digital technologies into Biology courses.

Summary table No. 1
What is Working

What is working	*Res* 1	*Res* 2	*Res* 3	*Res* 4	*Res* 5	*Res* 6	*Res* 7
Attributes (computer games, digital engagement, including age, background, integrity, etc.)	+	+	+	+	+	-	+
Adaptability	+	+	-	+	+	-	+
University assistance	+	+	+	+	+	+	+
Convenience	+	+	-	+	+	-	+
Online preference	+	+	-	-	-	-	-
Totals:	**5**	**5**	**-1**	**4**	**4**	**-3**	**4**

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3. FINDING AND DISCUSSION

Positive data pattern (what is working in integration)

The researchers found four important attributes (summary table no.1) that is working well in the integration of digital technologies into courses in Biology. Of the 7 respondents only 1 did not have the right attributes for example, having had a computer gaming experience when they were still young, or during senior high school. Age did not figure out, but 1 respondent mentioned she was “not really into technology” although she have had the chance to use computers during her high school years “Im not really happy, Im not really into technology, (L48R6).” The university innovated a ‘Made for Learners’ scheme of offline/online, synchronous/asynchronous platform where the basic required electronic gadget is the mobile phone. Unfortunately, despite their digital capabilities of respondents, only 2 of the respondents had preference to online mode of learning/teaching. Only five out of 7 respondents thought digital technologies made learning/teaching very advantageous, in spite of the entirety of the respondents recognized the help with coordinating innovation given by the college.

Negative data pattern (what is not working in integration)

In a question on “how these newly integrated digital technologies affecting your work/studies”, respondent 1 mentioned, on (L100R1) “it suits me, because I am a shyperson, (L109R1) “ I am quite happy about it in this sense I get to improve as well like what I said ago about having a 21st century skill..., (L112-115R1) but its very challenging.” Respondent are more patient and careful now than before when communicating through digital media even in private messages. A ‘lost in translation’ game seems to have become so common even in learning and teaching in the digital platform.

There are a lot of constraints and boundaries, connectivity issue were referenced a fewtimes for all intents and purposes by almost every one of the respondents. “Lack of internet capability...(L119R6), the only barrier would be to connect to the internet and the materials...(L180R7), the internet connectivity is a barrier...(L48R5), internet connectivity and grasping of the totality of the topic... (L156-157R4), internet signal in our place is very intermittent...”(L145-148R3). Required specs, for example of videos, digital programs, programs online are not met by some of the students who happens to have outdated laptops. Appropriately, a recreated action or investigation particularly like simulated videos in Science isn't equivalent to in real experimentation on the research laboratory.“ Laboratory based courses in Biology is such a challenge...(L64R2), its difficult without an actual lab, simulations are not very satisfactory...(L154-155R3), not as engaging as an actual lab”...(L50-51R5).

However, one respondent said simulated videos can become effective only when it is paired with active discussions...”simulations given that is paired with topic discussions will help us understand”...(L143-147R4). Plagiarism was likewise referenced by one respondent, still some assume that students will, in general pass around, using the same technology, the appropriate responses, replicating, and cheating.

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Summary table No. 2

What is not working

What is not working:	Res 1	Res 2	Res 3	Res 4	Res 5	Res 6	Res 7
Love and hate relationship	+	+	-	-	+	-	+
Lost in translation	+	+	+	+	+	-	+
Barriers and limitations	-	-	-	-	-	-	-
Plagiarism	-	-	-	-	-	-	+
Connectivity	-	-	-	-	-	-	-
Specs	-			-	-	-	
Doing it (hands-on) is the same as different from) simulation	+	+	-	-	-	-	-
Digital technology preference	+	+	-	+	-	-	-
Totals:	**0**	**0**	**-6**	**-4**	**-4**	**-8**	**-2**

Digital technologies used

Videos have now become an every now and again utilized strategy for educating, furnishing understudies with intelligent substance that makes learning more amusing. Labster which provides students with a virtual version of the lab practical to use beforehand, teaching students the techniques, skills, processes, protocols and underlying principles of various science disciplines, “is the closest thing to an actual lab...(L34-35R2), best experience ever...(L36R2), Unfortunately for certain respondents, they couldn't utilize Labster as some of them have obsolete PCs which does not match with the required technical specs of Labster. “For Labster yes I was so excited at first with Labster I believe that it could be a good supplement for students because particularly because we don’t have these equipment but the problem with Labster is I can’t even load the entire file when my connectivity is much stronger”... (L153-156R1).Furthermore, “Yes I would say in genetics there is a lot of computations and I find it a bit difficult to have to show this solution problem solving using whiteboard compared to if I had a whiteboard marker and a actual whiteboard where in I can actually do”...(L301-303R1). Whiteboard in MS Teams utilized in problem solving in Genetics end up being exceptionally valuable and simple to utilize, however not for all.

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Summary table No. 3

A. Digital technologies used.

Digital Technologies Used	Labster	YouTube	Simulated videos	Whiteboard
Easy to use	+	+	+	-
Required specs	-	+	+	+
Mobile compatibility	-	+	+	+
Totals:	**-1**	**3**	**3**	**1**

Table B a derived sequel of table A another ordered valuation of the individual respondents proceeds on digital technologies used. Three of the seven respondents have scored 4, which have posted a major impact on the accomplishment of the integration and the other three respondents also posted a slight impact and other related effects. Only one of the respondents scored 0, which means there is no effect and integration isn't working in any way.

Summary table No.4

B. Digital technologies used

Digital technologies Used	*Res 1*	*Res 2*	*Res 3*	*Res 4*	*Res 5*	*Res 6*	*Res 7*
Labster	-	-	+	+	+	-	+
YouTube	+	+	+	+	+	+	+
Simulated videos	+	+	+	+	+	+	+
Whiteboard	+	+	-	+	+	-	+
Totals:	**2**	**2**	**2**	**4**	**4**	**0**	**4**

Interpretation of their significance

Significance evaluates whether an outcome is probable because of possibility or to some factor of interest unlike the significance of certain empirical findings which is assessed by means of a null hyphothesis (de Groot,n.d.). So what is a positive impact as to the shift or integration of digital technology into Biology courses. To Denzin (1989) every technique suggests an alternate line of activity towards the real world and consequently each will uncover diverse aspect of it, like a kaleidoscope, contingent upon the point at which it is being held, it will uncover various shades and designs of objects to the viewer. The aim of the researchers is not to produce a consistent version of the subject of the study, as that subject is always socially constructed but to offset the particular weaknesses of each approach and challenged the biases that come from only one perspective (Green, & Thorogood, 2005). All interpretation is unfinished, provisional, and incomplete, it is this conceptualization in the study when it was started about when putting all the elements of associating, ordering, and making meanings that makes the data and codes and themes generated not just mere descriptions but thereby interpreting them.

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4. CONCLUSION

Digital technology integration in Biology courses was significantly correlated with faculty and students attributes such as age, computer gaming experience at a very younger age, accessibility and ease of use and the innovative scheme of the university to name a few. They do have a shorter attention span so they have difficulties concentrating on a particular assignment for a longer periods of time. Age was important in a sense, these are younger respondents both faculty and students who were introduced to the concept of computing at a very early stage in their academic development. Members of this generation born between 1995 and 2010 are true digital natives, they are the ones who have been exposed to the internet, and have witnessed the digital revolution, and who have never experienced a world without the Internet. Comparing them to the Millenial generation, they are more cautious, pragmatic but because the more apparent precarious conditions they were growing upwith, they are less confident and reluctant to take over leadership posts. This hypercognitive generation is very comfortable with collecting and cross-referencing many sources of information and with integrating virtual and offline experiences (Francis & Hoefel, 2021).

However, the study finds many factors as well why integration may not work. The respondents referenced (1) technical specs prerequisite against their old outdated PCs, (2) internet connectivity was mentioned as the greatest barrier, and (3) simulations as hands-on activity as an alternative to a lab experiment was less satisfying. There were lots of meaningful activities in the videos or simulated videos but none is just about asfulfilling as going to the lab to dissect a frog or see the change/adjustment in color dueto the presence of sugar in Benedict's test. Labster was the closest thing to a lab experiment yet most students have ostracize or have thrown away the practice even it was proven to be very convenient to use. There seems to be a great difference between the traditional face-to-face model and using digital technology platform models, as well as a change in didactics and pedagogy. The uptake on simulations in the integration has been slow, perhaps because faculty and students are unaware of its benefits and partly so because it needs to target specific laboratory needs. Notwithstanding the remote faculty teaching in work-at-home scheme or lack of in-person interaction between the faculty and students, the effort to use innovative teaching/learning method as well as continuing with the basic tenets of pedagogy is important. Students who are serious about learning actually long for the eye to eye instructing, the traditional face-to-face teaching despite the convenience brought about by the digital technology integration, and regardless of the comfort achieved theadvanced innovations combination. Personal contact is always important in education to some. Individual contact is consistently significant in education, and putting together this contact is much more hard for an online course. However, there might bevarious approaches to keep in touch with student learners. The findings point out that digital technology integration needs the necessary alignment of the courses, a framework like the TPACK and digital didactics. Computerized instructional methods (digital pedagogies) allude to educating learning approaches in which new innovations change the manner in which we instruct. In this study some felt it changed their learning while others opposed and did not even take part in the full integration.

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