SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

Offline or Online?: How Should Biology Be Taught in a Flexible Learning Modality in the Philippines

Aaron Jhoe M. Penuliar[1], Vemma Mae R. Guinto[2], Agnes D. Oclay[3], Paz Cheri Ann V. Soriano[4], Maricris M. Sison[5], Jun S. Camara, PhD[6], John Rommel T. Retuya[7], John V. Bernardo[8]

[1]Bachelor of Science in Secondary Education, Major in Science
[2]Faculty, Pangasinan State University, Bayambang Campus
[3]Faculty, College of Arts and Science, PHINMA University of Pangasinan
[4]Faculty, Natural Sciences Dept., College of Arts and Sciences
[5]Programe Coordinator, BS in Education Major in Science
[6]Faculty, Cellular and Molecular Biology, TESC Department
[4,5,6]Faculty, Pangasinan State University, LINGAYEN Campus
[7,8]Secretariat, Project CAN, Extension Services, PARESSU, Inc
Correspondence: penuliarajm20@gmail.com

Abstract

How should Biology be taught during a pandemic in Higher Education Institutions? This study explored on the instructional delivery preferences of pre-service science major students in a public higher education in the Philippines, and identified its correlates to gender, year level, and post-secondary strand type, using validated instruments. Salient findings showed that majority of the respondents prefer the instructional delivery of Cell and Molecular Biology course in a *partially-online/offline* mode throughout the semester, a scheme which they believe when implemented will enable 100% of them to pass the course. If partial scheme is not an option, more respondents prefer the instructional delivery of CeMBio as *offline*, but ironically, there are more of them who believe they have higher chances of passing the subject if it is delivered *online*. Among the variables studied for correlates, gender did not appear to influence the delivery preferences of the respondents. Further, a significant difference is reported in terms of year level and strand type, along selected chapter segments of the CeMBio course only, with year level appearing to influence preferences at the first few chapters of the course and strand type in the middle topics of the course. Gender, year level, and strand type did not significantly differ along the last few chapter topics of the CeMBio syllabus content. The delivery of CemBio in a partial-offline-online modality is recommended, not only because of the respondents' 100%-passing belief, but because this scheme will reduce instructional loads among the teachers, allowing flexibility in instruction, research, extension, and production activities of the faculty. Finally, should the option to decide which topics are offline or online, the researchers recommend that topics without significant differences reported, will be delivered offline while those with reported significance will be delivered online with the hope that the teacher could possibly address during instruction the cause of these differences.

Keywords: Biology, College Students, Preferences, PSU, Science Education, Teaching

SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

INTRODUCTION

The World Health Organization declared the outbreak brought about by COVID-19 as Public Health Emergency of International Concern (PHEIC) last January 30, 2020 (DOH DM No. 2020-0055). The Philippine's Commission on Higher Education issued a memorandum which took effect on September 2, 2020 adopting and promulgating guidelines on flexible learning, or FL, to be implemented by public and private Higher Education Institutions (CHED MO No. 04, s. 2020). CHED considered it an urgent need, based on the said memorandum, to explore other innovative learning modalities that will facilitate migration from traditional to flexible teaching and learning options. Further, it accepts the fact that learners are differently situated in terms of time, pace, and place, and these options should allow customization of delivery modes responsive to students' need for access to quality education, enabling the students the option to choose the delivery mode most convenient to them as early as the time of their enrolment.

How has this situation changed the education landscape after a year? Based on the Conference Report of UNESCO during its 'One year into COVID: Prioritizing education recovery to avoid a generational catastrophe' held online on March 29, 2021, there are three themes of foremost concern on policy agendas: reopening of schools and supporting teachers; mitigating drop out and learning losses; and accelerating the digital transformation. The said report revealed that the majority of governments (133 countries) provided a mix of online, television and radio solutions to ensure learning continuity, in order to provide a strong ground to build more resilient education systems and bridge the digital divide (Camara *et al.*, 2021 SSRN). In the case of Philippine's Department of Education, in accordance with the DepEd Order No. 12, s. 2020, the Department employs multiple learning delivery modalities (LDMs) to ensure the continued provision of learning opportunities to learners while protecting the health and safety of both personnel and learners. This can be done through blended learning, distance learning, and home-schooling (Nacar & Camara, 2021).

Teaching has never been the same since then. In the case of Pangasinan State University – a public state university in Pangasinan, Philippines, Flexible Learning Modality has been implemented (Camara, Tabisola, Sison & Dalisay, 2021), and technological preparedness has been determined by the administration in order to provide a functional quality instruction. However, something has to be done outside the 'technology' requirements. We need to put the learners at the center of the situation.

In the case of college science teaching, both the lectures and 'laboratory' courses are done online, or at least, are communicated online. While both the teacher and learner could manage with this set-up, prolonged exposure will result to loss of years of progress, truly no screen can replace a teacher (UNESCO, March 29, 2021). Successful learning in the field of natural sciences is closely related to the methods used by teachers (Veselinovska, Gudeva and Djokic, 2011), which depend on the characteristics and content of the course and the actual situation. The K to 12 Implementation in 2013 has changed the direction and approach in education (Camara, 2020) which marks its implementation a crucial checkpoint for any researcher to begin with in strategizing innovations in the teaching-learning process.

The current situation brought by the COVID-19 pandemic – including the demands of new normal in education, E4.0, and other drivers that (Morales *et* al, 2021) may change the landscape of education – poses HEIs to reflect on the technology integration practices and capacities of their teachers, which is found convenient (Knibel, 2001) it does not require the need to attend training centers and universities classes face-to-face. If Higher Education Institutions in the Philippines would find this mode of online learning sustainable, then it should prepare its courses for online transfer (Toquero, 2021), and align its competencies that students should learn from any subject in an online modality.

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

If HEIs would opt to push through the flexible modality, there has to be a checkpoint between how the teachers want to teach digital learners, and how the learners want to be taught lessons in a digital scheme. As Muthuprasad, Aiswarya, Aditya and Jha (2021) observed, the schools and colleges in India are shut for an indefinite period, both educational institutions and students are experimenting with ways to complete their prescribed syllabi in the stipulated time frame in line with the academic calendar and noted that while these measures have certainly caused a degree of inconvenience, these have also prompted new examples of educational innovation., including preferences in learning using learning styles (Efe, Maskan, Selahattin, & Hevedanli, 2011). In terms of instructional delivery preferences, this study is anchored on the concept Warner *et al's* (1998) of readiness for online learning. They described readiness for online learning mainly in terms of three aspects:(1) the preference of students for the way of delivery opposed to face-to-face classroom instruction; (2) student's confidence in the utilising the electronic communication for learning which includes competence and trust in the use of the Internet and computer-based communication; and (3) capability to engage in autonomous learning.

OBJECTIVES OF THE STUDY

Generally, this study aims to measure the level of instructional delivery preferences of undergraduate students in a cell and molecular biology course in a public higher education institution in the Philippines, and identify the influence the gender, year level and post-secondary track exert on these preferences. Specifically, this study will:

1. identify profile of the respondents in terms of gender, age, curriculum year, post-secondary track, enrolment status in Cell and Molecular Biology Course, and instructional delivery preference, and genetics grade perception;
2. measure the level of instructional delivery preference of the respondents to selected Cell and Molecular Biology Course topics for synchronous and asynchronous instruction; and
3. to determine if there is a significant difference between the instructional delivery preferences of the respondents and their gender, year level and post-secondary strand type.

METHODOLOGY

Sample Population

The respondents of the data were the undergraduate students of one State University located in Pangasinan, Philippines. The sample consisted of sixty-four (64) students segmented through year level as 1st year (39.1%), 2nd year (40.6%), and 3rd year (18.8%). For purposes of analysis, the 1.6% (1 of 64) participation of an irregular student was excluded in the presentation but not in the analysis as this is an extreme value that will automatically reject statistical computation. During the time of data-collection, 59.4% of the respondents were yet to enrol in a Cellular and Molecular Biology (CeMBio) class in the succeeding year.

Instrumentation, Collection and Data Analysis

The main instrument used in the study is a 5-point Likert scale survey-questionnaire on selected profile variables of the respondents as well as a list of CeMBio topics *(n=43)* for an undergraduate course in the Philippine context. The instrument was administered digitally via email, FB messenger, and MS Teams from April to May, 2021, and was closed on May 12, 2021. Data were collected via google sheets. The data were pre-coded, tabulated, and converted into a readable file for SPSS v20 analysis. Data were subjected to simple descriptive statistics.

SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

Identification of Topics Instrumentation

The researcher surveyed the Table of Contents and Sample Chapters of at least three (3) Filipino-authored textbooks on Genetics available during the time of study (February 2021) considering topics which were overlapping and/or emphasized which is similar with the initial methodology of Camara (2018) in developing a Research Curriculum Competency Checklists for Special Science students. It was the researcher's that overlapping topics and those with emphasis by textbook authors are indispensable contents of a list of genetics topics. Further, course syllabi proposed for use in the subject in the study locale were consulted as well.

RESULTS

Profile of the Respondents *(n=64)*

Table 1: Frequency and Percentage of Respondent Profile Variables (n=64)

		f	%
Gender	Male	18	28.1
	Female	46	71.9
Age	18-19	6	9.4
	20-21	28	43.8
	22 above	30	46.9
Curriculum Year	1st	25	39.1
	2nd	26	40.6
	3rd	12	18.8
	Irregular	1	1.6
STEM Graduate	Yes	17	26.6
	No	47	73.4
Course Taken	Yes	14	21.9
	No	50	78.1
Course Enrolled	Yes	26	40.6
	No	38	59.4
Gadgets Used	Laptop	5	7.8
	iPad	1	1.6
	Mobile Phone	58	90.6
Delivery Mode	Fully Offline	17	26.6
	Partially Offline/Partially Online	45	70.4
	Fully Online	2	3.1
ONLINE Pass	Yes	56	87.5
	No	8	12.5
OFFLINE Pass	Yes	25	39.1
	No	39	60.9
PARTIAL Pass	Yes	64	100
	No	0	0
	Total	64	100.00

Table 1 shows that 71.9% of the respondents are female while 28.1% are male. In terms of age, most of them are 22 years old and above (46.9%) while some are either 20 or 21 years old (43.8%). Majority of the respondents are in their 2nd year (40.6%) followed by 1st year students (39.1%). A little less than three-fourths of the respondents are non-STEM graduates (73.4%) while 26.6% are STEM graduates. Also, results showed that most of the respondents have not yet taken Cellular and Molecular Biology (78.1%). In terms of subject enrollment, less than half of the respondents are currently enrolled (40.6%) upon data collection while the majority were not (59.4%). In terms of gadgets used in online learning, almost all of the students use mobile phones (90.6%) while some use laptops (7.8%).

SOUTHEAST ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

Further, when asked about preferred delivery mode of learning for Cellular and Molecular Biology, majority of the respondents chose partially offline/partially online (70.4%), while few chose fully offline (26.6%) and fully online (3.1%). Furthermore, in terms of passing the subject based on the delivery modes, less than 50% of the respondents thought a fully offline delivery mode will help them pass the course (39.1%). In contrast, more than 75% of them believed that having a fully offline or a partially offline/partially online mode will allow them to earn a passing grade. It is important to note, however, that all (100%) of the respondents perceived that in a combined online and offline environment will result in a passing grade. Partially Offline/Partially Online obtained the highest number of respondents who believe they will pass the subject among the stated delivery modes of learning (100%).

Instructional Delivery Preferences of the Respondents in Cellular and Molecular Biology

Table 2: Instructional Delivery Mean Preferences and Correlates of Respondents' Profile and Cellular and Molecular Biology Topics

No	**Topics in Cellular and Molecular Biology**	**M**	**sd**	**Meaning**	*GE*	*YL*	*ST*
1	History of Cell Biology	3.03	0.94	Flexible		+	
2	Importance of Biology	3.07	0.96	Flexible		+	
3	Techniques to Study Cell Biology	2.65	1.01	Flexible		+	
4	The Cell Theory vs the Organismal Theory	2.47	0.96	Highly Online			
5	Prokaryotic vs Eukaryotic Cells	3.00	1.05	Flexible		+	
6	Diploid vs Haploid Cells	2.55	1.05	Highly Online			+
7	The Cell Membrane Model	2.77	1.08	Flexible			+
8	Structure of Organelles	2.63	1.03	Flexible		+	
9	Function of Organelles	2.61	1.11	Flexible		+	
10	Cellular Transport	2.28	0.97	Highly Online			
11	Mitosis	2.53	1.05	Highly Online			+
12	Meiosis	2.56	1.08	Highly Online			+
13	Photosynthesis (Molecular Approach)	2.50	1.09	Highly Online			
14	Cellular Respiration (Molecular Approach)	2.35	0.96	Highly Online			
15	Cell Communication	2.32	0.99	Highly Online		+	+
16	Introduction to Molecules	2.84	1.01	Flexible			+
17	The Nucleic Acid Structure	2.42	1.00	Highly Online			+

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

18	Functions of Nucleic Acids	2.53	0.97	Highly Online			+
19	The DNA Molecule	2.56	1.07	Highly Online			+
20	Types of DNA	2.59	1.09	Highly Online			
21	Genes	2.55	1.11	Highly Online			+
22	The RNA Molecule	2.52	1.04	Highly Online			+
23	DNA Replication	2.39	0.97	Highly Online			+
24	Protein Structure	2.44	0.94	Highly Online			+
25	Protein Synthesis Processes	2.28	0.98	Highly Online			+
26	Laboratory Methods in Molecular Genetics	2.03	0.93	Highly Online			
27	Processing Biological Materials for Laboratory Purposes	2.03	0.93	Highly Online			
28	Methods of Nucleic Acid Isolation	1.98	0.88	Highly Online			
29	Principles of plasmid DNA isolation	2.03	0.91	Highly Online			
30	Principle of RNA Isolation	2.03	0.92	Highly Online			
31	Gel Electrophoresis	2.00	0.93	Highly Online			
32	Restriction Endonucleases	1.96	0.89	Highly Online			
33	DNA-DNA Hybridization	2.00	0.87	Highly Online			
34	Restriction Fragment Length Polymorphism	1.98	0.92	Highly Online			
35	Method of DNA Fingerprinting	2.00	0.96	Highly Online			
36	Polymerase Chain Reaction	2.05	0.97	Highly Online			
37	Modifications of PCR Method	1.95	0.88	Highly Online			
38	Utilization of PCR Method	1.95	0.86	Highly Online			
39	Fluorescent in situ hybridization (FISH)	1.89	0.85	Highly Online			
40	DNA sequencing	2.02	0.92	Highly Online			+
41	Biochips	2.03	0.85	Highly Online			
42	Intro to Molecular Genetics of Viruses	2.13	0.89	Highly Online			+
43	The Covid-19 and Molecular Biology	2.02	0.89	Highly Online			
	Weighted Mean	***2.33***	***0.97***	***'Highly Online'***			

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

The respondents (n=64) were asked to rate the level of their instructional preference of Cellular and Molecular Biology topics as either online, offline (highly or very highly), or 'Flexible.' When they select this 'Flexible' option, they consider the topic to be delivered either in an offline or online mode, whichever is applicable at the moment of the teacher's instruction. Based on Table 2, it appears that 18.60% (8 of 43) of the topics are considered 'Flexible' by the respondents, and these topics are found in the first chapter of Cellular and Molecular Biology and introductory topics. This is understandable because introductory topics of any undergraduate course contain the basics which do not have to be complex. Further, Table 2 reveals that 81.40% (35 of 43) of the topics are considered to be delivered 'Highly Online'. These topics are found after the first chapter until the last chapter with the topic 'Fluorescent in situ hybridization (FISH)' (*M=1.89; sd=0.85*) receiving the lowest mean which, in the scale of interpretation, is the topic considered to be most 'highly online'. The standard deviation of 0.85 shows that the answers of the students in any curriculum level are similar or less spread out. In summary, however, the whole Cellular and Molecular Biology topical list (n=43) is preferred to be 'Highly Online' (*M=2.33; sd=0.97*). This result is understandable because a course in applied sciences including Cellular and Molecular Biology is non-self-explanatory and guidance from the teacher is necessary.

Gender, Year Level, and Strand Type Influence on Flexible CeMBio Instruction

Table 2 did not register any significant difference in terms of gender which means that gender does not influence the instructional preferences of the students in CeMBio instruction. This supports the findings of Lacap (2015) that there is no significant difference between the scientific attitudes of science major students of PSU Bayambang grouped according to gender. Further, seven topics registered a significant difference in terms of year level, and most of these topics are those in the first chapters of CeMBio, which implies that those in the higher years would opt to have these topics offline while the younger years prefer these to be online. Sixteen topics registered a significant difference in terms of strand type, and these topics are mostly found at the middle part of the syllabus, which implies that those who graduated from the STEM strand would prefer these topics to be offline but those who are non-STEM graduates would prefer these topics to be delivered online. Interestingly, though, the topics of CeMBio towards the end of the course did not register any significant difference between any of the three variables considered (gender, year level, and strand) and the topics. Closer look at these topics with no significant differences showed weighted means that are interpreted as 'Highly Online' and the values are close with all the others.

CONCLUSIONS AND RECOMMENDATIONS

The study showed the preference of the respondents to receive instruction for Cell and Molecular Biology online, in fact, 'highly online' across all year levels. Gender did not appear to influence the preferences of the respondents, while year level seems to influence the preferences of the respondents in the first few chapters of the course. There is also statistical evidence that in the next few chapters (i.e. largely at the middle of the course topics), those who graduated from the STEM strand significantly different in their preference compared with those of non-STEM graduates. Further, gender, year level and strand type are not influencing the preferences of the respondents during the last few chapters of the course.

While the number of students who believe could pass the course when it is delivered fully online (87.5%) is higher than the number of students who could pass it when it is delivered offline (39.15), 100% of the respondents believe that they could pass the course when it is delivered partially online-and-offline, which was the preferred delivery mode by majority of them (70.4%). Hence, the use of partial offline-online along the course (i.e. segments) is recommended.

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

Conflict of Interest

The author declares no conflict of interest.

Funding Agency

This article is a component study of the researcher's Project CAN (Curriculum Assessment in the New Normal) in cooperation with the Philippine Association of Research Practitioners, Educators, and Statistical Software Users (PARESSU), Inc and the College of Education, Pangasinan State University, Lingayen Campus.

Limitations

The respondents of this study included students taking up an education degree (100%) who specialized in the area of the Sciences. Findings could be best generalized with undergraduate students of similar discipline.

REFERENCES

Camara, J. S., Tabisola, CTT, Sison, JS, & Dalisay, CM (2021). Online Learning, COVID-19 and Higher Education Institutions: A Case of a Philippine University. ISBN 978-1636483528, Published 2021-09-17. Republic of Moldova

Camara, J. S. (2020). Philippine Biology Education for a Curricular Innovation towards Industrial Revolution 4.0: A Mixed Method. *Asian Journal of Multidisciplinary Studies*, *3*(1). Retrieved from https://www.researchgate.net/publication/340308812_Philippine_Biology_Education_for_a_Curricular_Innovation_towards_Industrial_Revolution_40_A_Mixed_Method

Commission on Higher Education, CHED Memorandum Order No. 04, s. 2020. Guidelines on the Implementation of Flexible Learning. Sept. 2, 2020. Retrieved from https://ched.gov.ph/wp-content/uploads/CMO-No.-4-s.-2020-Guidelines-on-the-Implementation-of-Flexible-Learning.pdf

Department of Education, Department Order No. 12, s. 2020. Adoption of the Basic Education Learning Continuity Plan for the School Year 2020-2021 in light of the COVID-19m Public Health Emergency. Retrieved from https://authdocs.deped.gov.ph/deped-order/do_s2020_012-adoption-of-the-be-lcp-sy-2020-2021/

Department of Health, Department Memorandum No. 2020-0055. Interim Guidelines on 2019 Novel Coronavirus Acute Respiratory Disease (2019-nCOV ARD) Response in Schools and Higher Education Institutions. Retrieved from https://doh.gov.ph/sites/default/files/health-update/DC2020-0042-Reiteration-of-DM2020-0055-Interim-Guidelines-on-2019-nCoV-ARD-Response-in-Schools-Higher-Education-Institutions.pdf

Efe, R., Gonen, S., Maskan, A. K., & Hevedanli, M. (2011). Science student teachers preferences for ways of learning: Differences and similarities. *Educational Research and Reviews*, *6*(2), 201-207. Retrieved https://www.researchgate.net/publication/228374634_Science_student_teachers'_preferences_for_ways_of_learning_Differences_and_similarities

Knibel, E. (2001). The Use and Effect of Distance Education in Healthcare: What Do We Know? Bethesda, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project. Operations Research Issue Paper, 2(2). Retrieved from https://www.semanticscholar.org/paper/The-Use-and-Effect-of-Distance-Education-in-%3A-WhatKnebel/cda9b3bd188a9541aed3e670ec8ba6a6f1516df7#citing-papers

Lacap, M. P. (2015). The scientific attitudes of students major in science in the new teacher education curriculum. *Asia pacific journal of multidisciplinary research*, *3*(5), 7-15. Retrieved http://oaji.net/articles/2016/1543-1464848419.pdf

Muthuprasad, T., Aiswarya, S., Aditya, K. S., & Jha, G. K. (2021). Students' perception and preference for online education in India during COVID-19 pandemic. *Social Sciences & Humanities Open*, *3*(1), 100101. Retrieved https://www.sciencedirect.com/science/article/pii/S2590291120300905

Morales, M. P. E., Avilla, R. A., Butron, B. R., Ayuste, T. O. D., Masangcay, D. B., & Laureano, R. A. (2021). Technology Integration Traditions, Transitions and Best Practices in Philippine Higher STEAM Education. Philippine Journal of Science, 150(5), 1265-1278. Retrieved from

Volume 6, Issue 1, 2021
P-ISSN: 2672-2984
E-ISSN: 2672-2992
www.sajst.org

https://philjournalsci.dost.gov.ph/images/pdf/pjs_pdf/vol150no5/technology_integration_traditions_transitions_and_best_practices_.pdf

Nacar, CJB & Camara, JS (2021). Lived Experiences of Teachers in Implementing Modular Distance Learning in the Philippine Setting. *Isogoge – Journal of Humanities and Social Science, 1(4), 29-53*. Retrieved at https://www.telosjournals.com.br/ojs/index.php/isa/article/view/43/37

Tabisola, C. T. F., Camara, D., Jun, S., & Sison, J. (2021). Technological Preparedness and Flexible Learning of Pangasinan State University Amidst the COVID-19 Pandemic. *Available at SSRN 3899887*. Retrieved https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/pt/ppcovidwho-290438

Toquero, C. M. (2020). Challenges and opportunities for higher education amid the COVID-19 pandemic: The Philippine context. Pedagogical Research, 5(4). Retrieved from https://www.pedagogicalresearch.com/article/challenges-and-opportunities-for-higher-education-amid-the-covid-19-pandemic-the-philippine-context-7947

UNESCO. Report of UNESCO Online Conference. 'One year into COVID: Prioritizing education recovery to avoid generational catastrophe'. March 29, 2021. Report of UNESCO online conference. Retrieved from https://apa.sdg4education2030.org/sites/apa.sdg4education2030.org/files/2021-05/376984eng.pdf

Veselinovska, S. S., Gudeva, L. K., & Djokic, M. (2011). Applying appropriates methods for teaching cell biology. Procedia-Social and Behavioral Sciences, 15, 2837-2842. Retrieved from https://www.sciencedirect.com/science/article/pii/S1877042811007452

Warner, D., Christie, G., & Choy, S. (1998). Readiness of VET clients for flexible delivery including on-line learning. *Brisbane: Australian National Training Authority*. Retrieved https://www.voced.edu.au/content/ngv:35337