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களனிப் பல்கலைக்கழகம்
UNIVERSITY OF KELANIYA

RCSoTL

RCSoTL– 2023

Proceedings of Research Conference on Scholarship of Teaching and Learning

Evidence-based Practices in Higher Education

26th May 2023

Staff Development Center of the University of Kelaniya
collaboration with
W. M. Jayarathne Center for Management Research
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Research Conference on Scholarship of Teaching and Learning (RCSoTL)– 2023
"Evidence-based Practices in Higher Education"

Overview

Scholarship of teaching and learning (SoTL) involves the deliberate, inquisitive, systematic, and reflective use of research methods to develop and implement teaching practices that advance the learning experiences and outcomes of students. The improvement of teaching and learning in higher education is a continuous and dynamic process and has gained significant attention in the current global context owing its huge impact on the social, economic and cultural development. The development of evidenced-based teaching practices is a key in offering a meaningful undergraduate education and thereby, producing graduates who are competent in theoretical knowledge, practical aspects as well as critical skills required by industry such as communication skills, digital literacy, analytical thinking and teamwork skills. However, the area of SoTL is not much popular among the academics in the local context.

Main objectives of the conference are To: Popularize **Teaching as Research (TAR)** as a research area within the university community , Provide a platform for the UOK academics to showcase their innovative teaching, learning and assessment methodologies in an open, supportive and intellectually stimulating atmosphere and there by develop evidenced-based teaching practices, Form a leaning community who are interested in research on Teaching, Learning and Assessment and share their ideas/knowledge, discuss research in teaching, learning and assessment topics and learn from each other. Therefore, Research Conference on Scholarship of Teaching and Learning (RCSoTL) will showcase research on teaching, learning and assessment done by the scholars and conference will provide the opportunity for the academic members to learn more about research on teaching, learning and assessment and apply those to improve the quality of teaching, learning, and assessment in higher education in Sri Lanka.

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A Review of The Career Counselling Program Conducted by The Career Guidance Unit of The University of Kelaniya

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ABSTRACT

This study evaluates the effectiveness of career counselling sessions conducted at the University of Kelaniya in 2022. The Career Guidance Unit conducted 455 counselling sessions, with most sessions held in the humanities & social sciences faculties. The study collected data from students who participated in the sessions, with the career key psychometric test administrated digitally, and feedback obtained through a post-session google form evaluation. The results of the study indicate that most participants were able to identify their skills and interests through the career counselling sessions, with 99.6% of participants from the humanities and social science faculties and all 282 respondents finding appropriate career paths. Similarly, all 51 participants from the Science faculty who completed the career key psychometric test were able to identify their skills and interests, with 98% highly satisfied with the overall counselling session. In addition, all respondents from the Faculty of Computing & Technology reported that the career counselling session helped them to identify their skills, with 95% highly satisfied with the counselling session. The study concludes that the career counselling sessions at the University of Kelaniya were highly successful in assisting undergraduates in identifying their skills and exploring appropriate career paths. The findings of this study can inform career counselling practices in other universities and help to improve the effectiveness of career counselling services.

Keywords: ***Career counselling, Career Path, Psychometric Test, Career Key***

1.INTRODUCTION

The main function of the career guidance unit is producing highly employable graduates who would fit into the diverse sectors. University Grand Commission recommended ten focal areas for conducting career related programmes. According to the University Grant Commission Circular 934, Career Guidance Units at universities should focus on providing advice on careers for undergraduates (University Grant Commission).

Secondly National Education Commission recommended establishing and operating effective career guidance & counselling services in universities. Specially, they have

identified the gap between the industry and faculties of science humanities and social sciences. To reduce the gap, NEC recommended implementing productive career counselling services to prepare undergraduates for job market (National Education Commission, 2022).

Based on these two factors, Career Guidance Unit of the University of Kelaniya initiated the individual career counselling sessions starting in 2021. This study aims to review the effectiveness of career counselling sessions conducted by Career Guidance Unit in 2022. The CGU conducted an evidence-based study on this, and data was collected from the 455 students who participated in the career counselling sessions in 2022. Out of these, 282 participants were from the faculties of social sciences and humanities,155 respondents participated from faculty of Computing & Technology and 51 participants were from the faculty of science.

2. LITERATURE REVIEW

Several studies examined the effectiveness of combining psychometric test and individual career counselling sessions in facilitating career decision making. The finding from these studies shed light on the positive impact of this methodology on various aspects of the career exploration process.

In a study conducted by Smith and Jonson (2018), They examined the effectiveness of career counselling sessions that incorporated psychometric testing. The result indicated that individuals who underwent both psychometric testing and subsequent counselling sessions reported a high level of self-awareness compared to those who only received counselling without the use of psychometric tests. The inclusion of objective data from the test provided individuals with the clear understanding of their abilities and interests, resulting more focused and well-informed career choices (Smith & Johnson, 2018).

Similarly, Jones & Browns (2019) conducted a study to evaluate the impact of career counselling sessions that combined psychometric testing & individualized guidance. The findings revealed that individuals who participated in this combined approach experience enhanced clarity in their career goals. The psychometric tests provided valuable insights into their personality traits and interests, which when discussed during counselling sessions, helped individual narrow down their career options and make more confident decisions (Jones & Brown, 2019).

Furthermore, a study by Lee (2020) Explored the effectiveness of psychometric tests and individual career counselling in improving decision-making abilities. The result demonstrated that individual who underwent psychometric testing followed by counselling sessions displayed significantly improved decision-making skills compared to those who only received general career guidance. The personalized discussion during counselling sessions, based on the objective data obtain from the tests, empowered individuals to critically evaluate their options and career paths aligned with their aptitudes and interests. (Lee, 2020)

3. METHODOLOGY

3.1 Research Design

This study employed a quantitative research design and conducted as an evidence-based study. The data was collected from the students participated in the career counselling sessions 2022 via google form. In the study wanted to investigate the applicability of counselling method that utilizing CGU.

When client come to the CGU, the first step is the administration of the career key psychometric test design by Senior Professor Kirthi Premadasa and Career Consultant

Mr.Ajith Jayawaradane to identify their personality traits. The second step involves a follow-up session aimed at developing their career development plan.

3.2 Population, Sample and Data Collection

Sample based on convenience sample method and data were collected from the 455 students participated in the career counselling sessions in 2022 in the university. Out of these, 282 participants were from the faculties of social sciences and humanities,155 respondents participated from faculty of Computing & Technology and 51 participants were from the faculty of science. Data collected via feedbacks google form that was given after the each of every session.

3.3 Measure

This qualitative study used feedback questionnaire forms to collect data with the questionnaire design as a google form. The purpose of the questionnaire was to measure the productivity and effectiveness of the sessions. The questions were designed as open-ended and Likert scale questions. The data was collected by distributing the google form via WhatsApp after each session. Prior to this step, participants were provided with a google form to obtain consent for their participation in the session.

3.4 Analytic Strategy

The research paper focuses on analyzing feedback data collected through google forms from those who participated in career counselling sessions in 2022. The forms were design to gather participants opinion and experiences on career counselling sessions. This feedback data collected through Google Forms, contributing a comprehensive understanding of participants perspectives on the research topic.

4.RESULTS

This section provides a comprehensive analysis of the data collected, highlighting the key outcomes of our research. The finding from this study indicates that most participants from the faculties of Humanities and the Social Sciences were able to identify their skills, with staggering 99.6% (281) successfully recognized their aptitudes. Additionally, every single participant, constituting 100% of the sample, successfully identified their suitable career fields. Furthermore, a significant proportion of participants, specifically 96.1% (271 individuals), highly expressed satisfaction with the session, while a smaller percentage of 3.5% (10 individuals) reported being satisfied and only 0.4% (01 individual) indicated a general sense of acceptance. Finally, all participants 100% were obtain solutions for their career-related issues. The results highlight the effectiveness and success of the sessions in assisting participants with their skill identification, career choice, satisfaction-level and problem-solving needs.

The findings from the faculty of computing and technology indicate that all participants, comprising 100% (122 individuals), were able to successfully identify their skills. Among this participant, a significant proportion of 95% (116 individuals) expressed high satisfaction with the session, while a small percentage of 5% (6 Individuals) of participants were able to identify their skills. Among these participants, an overwhelming majority of 98% (50 individuals) expressed high satisfaction, with only 2% (1 individual) reporting satisfaction. These results underscore the success of the session in helping participants from both faculties their skills achieve high level satisfaction.

5. DISCUSSION AND IMPLICATION

Based on the findings of this study following recommendations are proposed:

1. Include career counselling sessions in the Academic Induction programme for first-year students:
   To ensure that students have early access to career guidance and support, it is recommended to incorporate career counselling sessions as a part of the academic induction programme for first-year students. By introducing students to the importance of career planning from the outset, they can make more informed decisions about their academic choices and gain a better understanding of the skills and competencies required in their chosen field.
2. Develop career plans from the first year onward:
   To foster a proactive approach to career development, it is crucial to encourage students to start creating their career plans from the first year of their academic journey. Institutions can facilitate this process by offering workshops resources and individualized guidance to help students identify their interests, strengths, and career goals. By initiating career planning early on, students can make informed choices about their courses, extracurricular activities and internships, ultimately increasing their chances of successful career outcomes.

6. LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

Despite the significant contribution of this research, it's important to recognize certain limitations and generalizability of our findings. The limitation of this research is the imbalance in sample size among faculties. Additionally adhering to ethics of counselling it is difficult to give counselling without clients' consent. It also effects to create gender imbalance in the study.

An avenue for future research could involve examining the long-term impact of individual career counselling sessions by conducting follow-up study with the same sample. While this study focused on evaluating the short-term effects, investigating the sustained effects over an extended period of time can provide valuable insights into the effectiveness and lasting benefits of career counselling interventions.

7. CONCLUSION

This study evaluates the effectiveness of career counselling sessions conducted at the University of Kelaniya in 2022. The Career Guidance Unit conducted 455 counselling sessions, with most sessions held in the humanities & social sciences faculties. The study collected data from students who participated in the sessions, with the career key psychometric test administrated digitally, and feedback obtained through a post-session google form evaluation. The results of the study indicate that most participants were able to identify their skills and interests through the career counselling sessions, with 99.6% of participants from the humanities and social science faculties and all 282 respondents finding appropriate career paths. Similarly, all 51 participants from the Science faculty who completed the career key psychometric test were able to identify their skills and interests, with 98% highly satisfied with the overall counselling session. In addition, all respondents from the Faculty of Computing & Technology reported that the career counselling session helped them to identify their skills, with 95% highly satisfied with the counselling session. The study concludes that the career counselling sessions at the University of Kelaniya were highly successful in assisting undergraduates in identifying their skills and exploring appropriate career paths. The findings of this study can inform career counselling practices in other universities and help to improve the effectiveness of career counselling services.
Based on the findings of this study following recommendations are proposed

1. Include career counselling sessions in the Academic Induction programme for first year students.
2. Develop career plans from the first year onward.

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Undergraduate Awareness of Cybercrimes on Digital Education: Study based on Faculty of Social Sciences, University of Kelaniya

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ABSTRACT

Hidden adjacent vulnerability to cybercrimes has correspondently advanced with the development of digital education. The increased utilization of Digital education tools due to the covid pandemic had opened new doorways to education and new methods of cybercrimes. The survey aimed to find University students' awareness regarding cybercrime's relation with digital education. A two-part questionnaire was distributed in Google form and 320 responses were collected from the students of the University of Kelaniya who were selected in random sampling. Both qualitative and quantitative data were collected and analyzed through MS Excel 2019 software. The findings suggest that students do have significant knowledge of cybercrimes, yet awareness of the complete attribution of cybercrimes is limited. Non-consensual Sexual content sharing has not been identified as a cybercrime by students; less awareness of phishing and spam among the students has also been identified. The P-value in Cyberbullying and increased Digital education is 0.0107, hence no significance in those two variables can be identified. As per the findings, students have mentioned that they would seek legal support if cybercrime happened was a positive factor. However, as per the findings it is recommended to increase awareness of technical sessions in identifying phishing sites, spam emails, and computer viruses should be conducted, and legal sessions in awareness of cybercrimes in all categories should be increased for the students.

Keywords: *Cybercrimes, Cybercrimes awareness, Legal support, University students*

1. INTRODUCTION

The sophisticated world is more advanced compared to the classical world with the evolution of the internet. Cyberspace is defined as virtual space, and it means the informational space modeled through a computer, in which various objects or symbol images of information exist. Therefore, it is a place where computer programs work, and data is processed. Cybercrimes are crimes of the physical world perpetrated in the medium of computers (Jain & Chaudhary, 2019). The act of Computer Crime Act No. 24 of 2007 defined cybercrime, and it encompasses the scope of computer-related crimes as well as hacking offenses (Computer Crime Act, 2007). Since the world's first computer-related crime in 1961, cybercrimes have

evolved to every formation and rapidly growing (Jain & Chaudhary, 2019).

The covid-19 pandemic has transformed classroom-centered education into digital education and it has continuously been developing since that. Digital education has been a developing concept for education, but the pandemic has accelerated the process and since then, almost every education institute had adopted digital education platforms for their teaching and delivering studies to the learners (Danmuchikwali & Suleiman, 2020). Digital education has both advantages and disadvantages; thus, it still lacks some areas that need to be developed (Minghat et al., 2021).

However, one should always keep an eye on the hidden adjacent threats that may relate to digital education. There are many threats integrated with digital education and one of the less concerning factors is cybercrimes (Danmuchikwali & Suleiman, 2020). As digital education opportunities grow in the country, opportunities for cybercriminals are also sprouting in the veil. Ignorance, illiteracy of the users, and their own benefits may cause the users of cyberspace to become victims of cybercrimes (Kumari, 2021). The country has implemented several laws and regulations to tackle cybercrimes, yet novel methods of cybercrimes are popping as mushrooms. Therefore, the users of the internet and cyberspace should be more vigilant during this digital era to protect themselves and not be any victims or perpetrators of cybercrimes. The study concentrated on the undergraduates from the Faculty of Social Sciences, University of Kelaniya's awareness of cybercrimes as a set of learners who are engaged in digital education.

2.OBJECTIVES OF STUDY

a) To identify the awareness of cybercrimes among Digitally educating undergraduates of the university.
b) Identifying obstacles may lead to becoming victims of crimes due to digital education.

3. LITERATURE REVIEW

Cyber Crime and Children in Digital Era is a paper by Madhu Kumari regarding the various aspects of Cybercrimes and their impact on digital education. The paper indicates the various types of cybercrimes as Cyberstalking, Cyberbullying, child pornography, cyberterrorism, Hacking, intellectual property claims, Phishing, Online gambling, Distribution of pirated software, cyber trespass, spam, Identity theft, and cyber extortion. The paper also identified factors like gender inequality, poverty, Digital illiteracy, family issues, and sexual orientation that can affect child sexual exploitation online. The paper indicated the awareness campaigns, programs manifested by the Indian government to reduce cybercrimes and laws enacted by the government as well as communal movements such as cyber peace clubs, and foundations (Kumari, 2021).

Talal Alharbi and Asifa Tassaddiq conducted research under Assessment of Cybersecurity Awareness among

Students of Majmaah University in 2021. 50 questions questionnaire has been distributed online to collect data in snowballing sampling method to cover most students of the university. A quantitative methodology has been used to analyze the data and they have found that the continuous awareness programs conducted by the university regarding cybersecurity had elevated the cybersecurity knowledge among the students and the study has suggested more proactive methods to deliver sufficient knowledge to students for better cybersecurity awareness. The study has a limitation like only the surveyed university student's knowledge was measured and selected student knowledge was only measured to derive a conclusion (Alharbi & Tassaddiq, 2021).

Cybercrime Awareness among Students at a Teacher Training College (IJCTT) is another study done by Moanes H. Tibi, Kholod Hadeje, and Bashier Watted in 2019. 73 students from the teacher education college had been given a questionnaire in the study and SPSS software has been used to analyze the data. Findings have suggested the students had unsatisfactory knowledge regarding cybercrimes even the computer science major students. Moreover, students' prior computer knowledge and cybercrime awareness do not have any correlation too. Therefore, the study suggested that having prior knowledge of computer literacy does not guarantee protecting oneself from cybercrimes. The study suggests improving the knowledge of teacher training students regarding cybercrimes to deliver more profound cybercrime knowledge to future generations (Tibi et al., 2019).

Understanding the concept of Cybercrimes in India vis-à-vis cyber laws of the USA done by Jyoti Jain, and Rashmi Chaudhary in 2019 is a study cross-referencing the US cyber laws and Indian cyber laws. The laws in both countries have been comparative studies in the paper to present and generate more viable cyber laws for fast-paced cybercrimes that are rapidly growing. The study has denoted several unresolved legal disputes in both countries that need to be filled and regulated soon as possible. The study also depicts how the rapidly growing cybercrimes are addressed by USA regulations, the illiteracy of the legal aspect of cybercrimes in the Indian community, and juridical systems besieged in cybercrimes (Jain & Chaudhary, 2019).

A Review on Cyber Crime: Some Educational Suggestions to Overcome by Manoj K. Saxena and Nitika Sharma is a paper published to analyze different aspects of cybercrimes. The paper mentioned that youth deliberately commit cybercrimes by pirating software and entertainment purposes. Moreover, the paper points out that most of the cybercriminals engaged in hacking are in their youth rather than elder people. Morality, financial status, and many other factors have been identified by the writer that motivates the youth to engage in cybercrimes. In conclusion, the study suggests enforcing educational programs

for youth, enforcing the law, and enacting new and effective punishments to mitigate cybercrimes (Saxena & Sharma, 2021).

Level of cybercrime awareness among Diploma students during the pandemic of Covid-19 is a study conducted by Venothiney Dewi Muniandy, Saralah Devi Mariamdaran Chethiyar, and Sameem 161 diploma students in the Quest international university was selected as the study sample and study aimed to study the difference of cybercrime awareness based on gender and race. A questionnaire was distributed and data were analyzed through SPSS software. Findings in the study show that there is no difference in cybercrime awareness among gender or race. The study has suggested extending future studies to university-level or college-level students to generate more knowledge (Muniandy et al., 2021).

The Sri Lanka Computer Emergency Readiness Team Also known as CERT is a national center for cyber security in Sri Lanka their annual report for 2020 indicates the reported cybercrime incidents in 2020 year and the programs and measurements CERT, acting under the Ministry of Technology of Sri Lanka, taken to mitigate the cybercrimes. The report graphs increased cybercrimes in social media, financial frauds, scams, phishing, ransomware, and phone hacking whereas a decrease in the abuse/hate/privacy violation. Cybercrimes in social media have dramatically increased from 2,662 to 15,895 which is a steep increase due to the Covid-19 curfew and the increased use of social media. The CERT program also conducted training and awareness programs on printed versions, and audio and video programs to make the public aware of cybercrimes (The National CERT of Sri Lanka, 2020).

4.METHODOLOGY

The study was conducted by the current undergraduates of the Faculty of Social Sciences from the University of Kelaniya. The population of the study was 3,195 and 320 students were taken as the sample of the study in random sampling (Gunarathna, 2023). Students were selected in random sampling to collect data distributed accordingly rather than stratified. Both quantitative and qualitative methodology was utilized. A questionnaire containing two sections was distributed in an online Google form version. For the accessibility of the questionnaire to every responder without vagueness, the questionnaire was prepared and distributed in the Sinhala language. The first part of the questionnaire was to collect demographical information of the responder and the later part contained twenty-five Likert scale questions, one multiple-answer question, one selection question, and four descriptive answer questions. MS Excel 2019 software has been used to analyze the data.

5.RESULTS AND FINDINGS

The questionnaire was completed by 320 responders. Among them, 76% of responses in the study were given by

female students and 24% of responses were from male students. (See Chart 1) 40% of the students equal to two out of every five students were browsing the internet for 5-12 hours a day. (See Chart 2) 24% of Students marked Strongly agree, and agree box was marked by 56% of the sample to the question "I do have an awareness of the cybercrimes". (See Chart 3) 36% of students marked neutral to the statement "University had conducted cybersecurity awareness programs correspondence to the digital education." (See Chart 4) 32% of students replied agree to the question "I have been cyberbullied" but the majority of 42% of students replied disagree. (See Chart 5) The question concerned about Identity theft has been depicted under "Somebody without my consent had appeared as me on the internet" (See Table 1), and the majority of 44% of the respondents disagreed whereas only 10% responded as agreed. 40% of students marked agree to the question "I have received non-consent sexual images/sexual messages through the internet" whereas 10% marked neutral. (See Chart 6) 38% of students from the study marked neutral to the question "I am aware of phishing and spam on the internet.", on the other hand, 28% marked agreed to the question. (See Chart 7) 34% of responses were given to the question "I open links in the emails I receive without checking" as disagree. 40% responses were in strongly disagreed with the question "Transactions were made online from my bank accounts without my consent." (See Table 2) 50% or half of the sample of the population marked strongly agree with the question "My internet usage has increased because of digital education." (See Chart 8) For the statement "Unknown phone calls were received to me after filling my contact numbers for the internet" were 34% disagree with the responses. 44% marked disagree for "Most of the internet-related issues arose after digital education." (See Table 3) To the question "Virus and harmful software affected my electronic devices" both 24% agree and 26% disagree responses. 34% of responses were marked as "I am aware of the cybercrime-related laws and regulations." (See Chart 9), and 40% of the responses were given as strongly agree to the statement "I would seek legal help if I encounter any cybercrime." 40% of the students responded that they had faced signal issues when digital education was conducted in the survey. (See Chart 10) 84% of the students preferred physical classroom education and only 16% preferred digital education. (See Table 4) 78% of students answered that they do not actively participate in digital education classes and 9% of the students who answered they prefer digital education answered saving time, money, transportation is the reason for them to choose digital education.

6.DISCUSSION AND RECOMMENDATION

The majority of the responders to the study were female students from the Faculty of Social Sciences. The findings suggest that 56% of the sample has an awareness of cybercrimes, which depicts

a positive aspect regarding the awareness of cybercrimes. The Department of Mass-communication in the Faculty of Social Sciences has commenced a progressive movement that was cybercrime, right to know to act awareness programs that were broadcasted on [1]UniK radio made some awareness in the students, but faculty-wise cybersecurity awareness and cybercrime awareness sessions need to be conducted correspondence to the digital education, since students may prone to be victims of cybercrimes due to the ignorance. More than half of the students are aware of cybercrimes. The majority of the technical side of cybercrime-related questions were marked as aware of the phishing and spam emails, do not disclose sensitive data to the public websites but a specific finding can be emphasized in the statement whether they have received any non-consent sexual images from somebody. 32% and 8% of the sample agreed and strongly agreed with the statement that depicts student awareness of cybercrime is still vague. Non-consent sexual images sent and received can be considered a crime with reference to the Obscene Publications Act and Penal Code (Amendment) Act No 22 of 1995 (Obscene Publications Act, 1995). However, it is students do not have clarity regarding that and they did not consider non-consent sexual images as cybercrime. The awareness of cybercrime students marked as known has a knowledge gap and it seems that students believe cybercrime as only hacking, phishing, spam, and other computer-related crimes rather than other cybercrimes such as online drug trafficking, pornography, child pornography, online homicides, etc. The P-value in the correlation of Cyberbullying and increased digital education is 0.0107, hence no significance in those two variables can be identified and the hypothesis of increased digital education has an adverse effect on cyberbullying. The positive notion of students seeking legal support and reporting cybercrimes can be emphasized, but as per the finding of student ignorance of the cybercrimes apart from hacking will not be reported or supported through legal aspects. Qualitative findings include that widespread network coverage is still growing in the country and thus, students have to face several issues in digital education. They had to travel somewhere else to connect to the internet, which raised their vulnerability to becoming a victim of both physical and cybercrimes. Even though the University has conducted broadcastings of cybercrimes, faculty-wise cybersecurity awareness sessions were needed. As the definition of cybercrimes is physical crimes conducted in computer medium, students should make well aware of the legal and jurisdiction portion along with the

[1] Radio station administrated under the Department of Mass Communication of Faculty of Social Sciences, University of Kelaniya which was commenced on 13/02/2022 (de Pasqual, 2018).

cybersecurity and how to stay safe online and protect themselves from cybercrimes. Limitations of the study can be illustrated as that the study was only concentrated on a specific faculty in selected universities of Sri Lanka and therefore, further studies can be conducted to cover up other subsets in different universities.

- Conducting faculty-wise awareness programs of both cybersecurity and cybercrimes.
- Broadcasting more awareness programs regarding cybersecurity and cybercrimes on UniK Radio.
- Empowering more efficiently and embarking laws the cybercrimes.
- Empowering signal strength in the networks island-wide to have stable connectivity.

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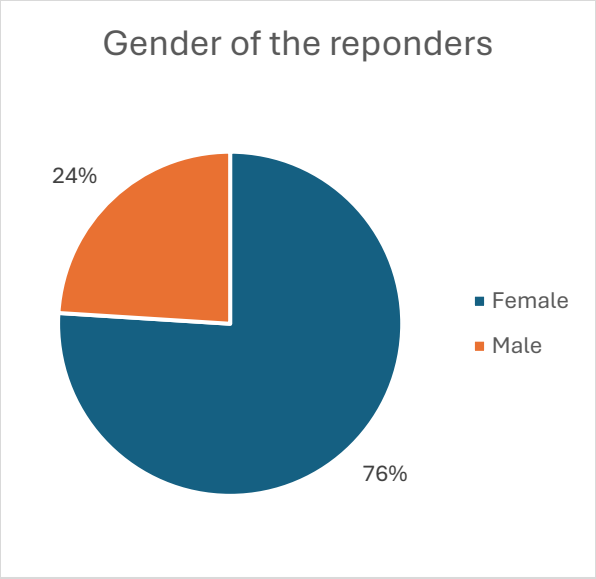
APPENDICES

APPENDIX A: FIGURES

Chart 1



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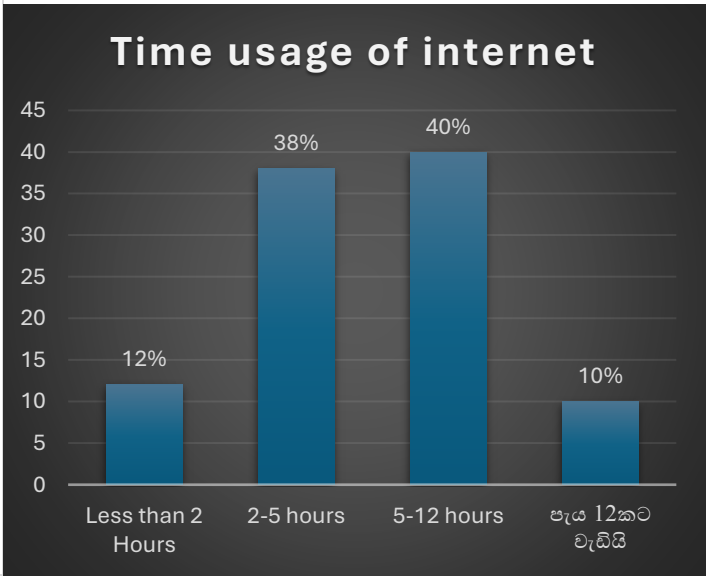

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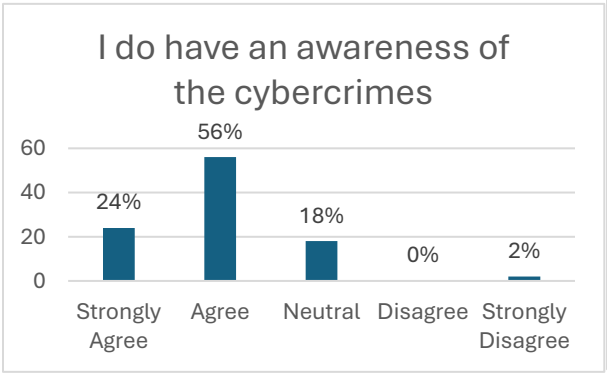

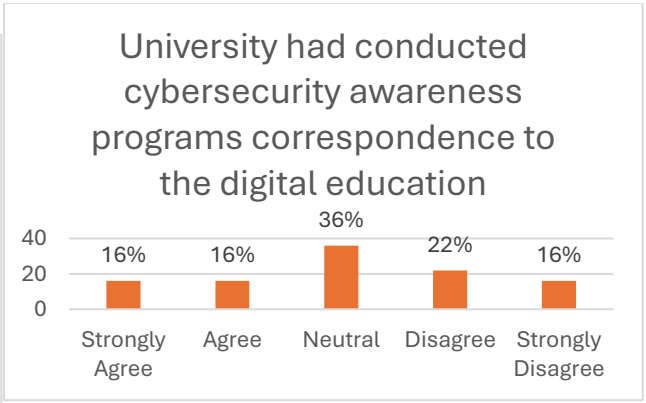

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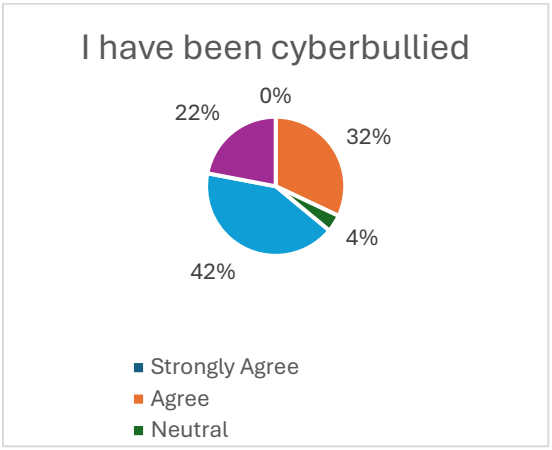

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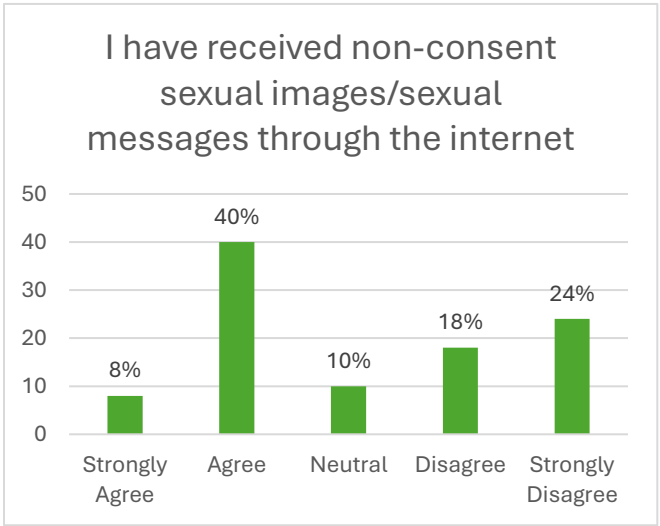

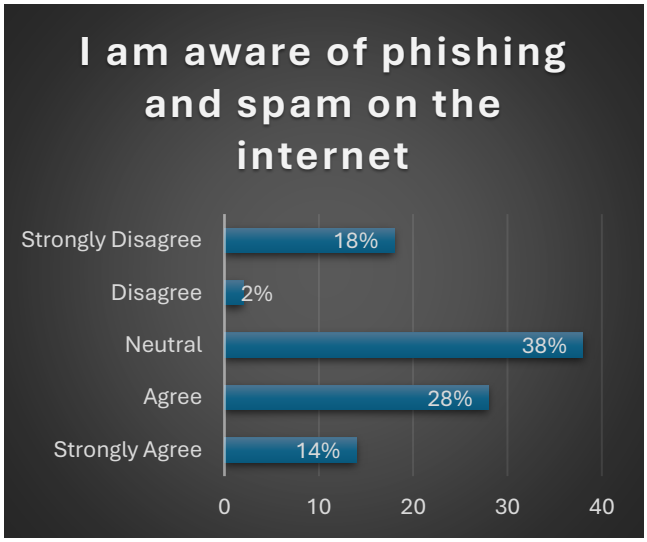

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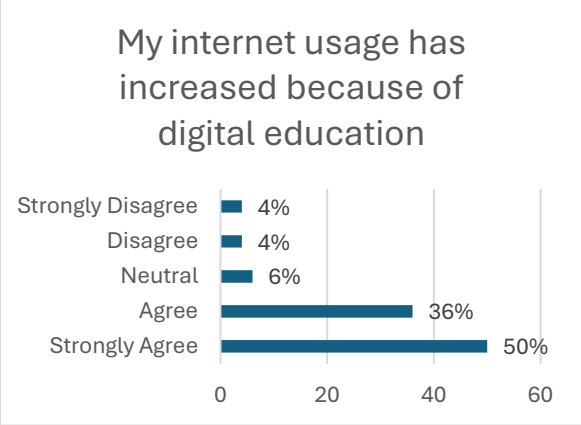


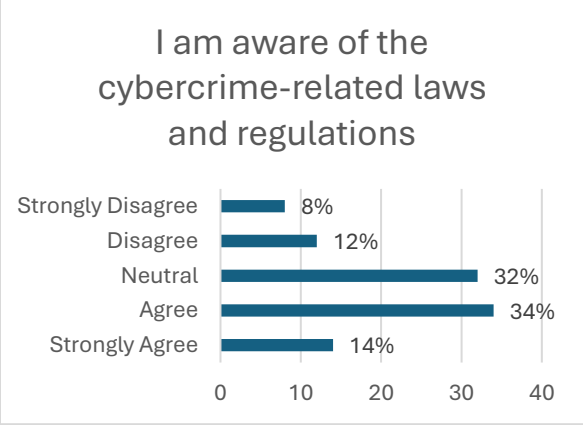
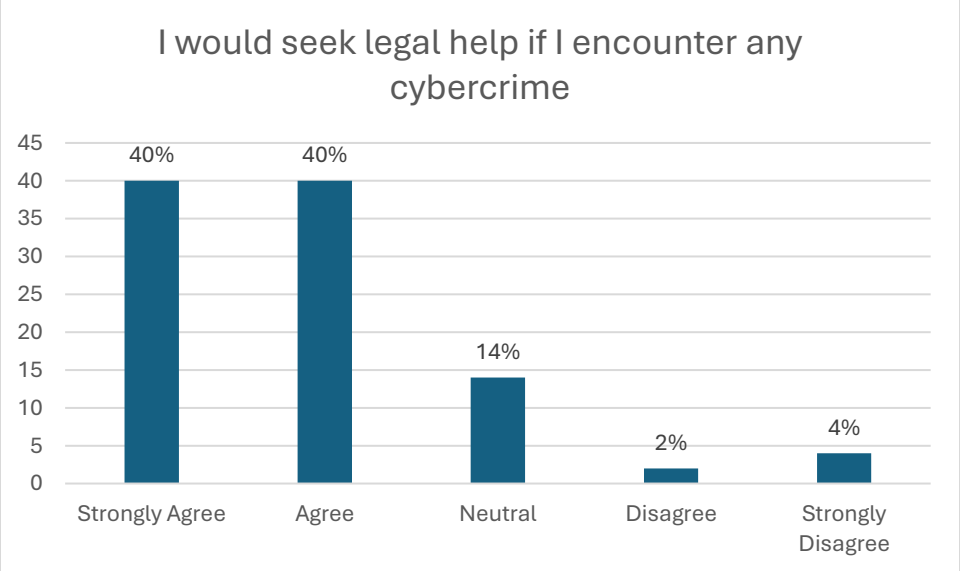


Chart 10



APPENDIX B: TABLES

Table 1

Somebody without my consent had appeared as me on the internet	
Strongly Agree	0%
Agree	10%
Neutral	14%
Disagree	44%
Strongly Disagree	32%

Table 2

Transactions were made online from my bank accounts without my consent	
Strongly Agree	4%
Agree	6%
Neutral	16%
Disagree	34%
Strongly Disagree	40%

Table 3

Most of the internet-related issues arose after digital education	
Strongly Agree	6%
Agree	10%
Neutral	16%
Disagree	44%
Strongly Disagree	24%

Table 4

Preferred education method	
Digital education	84%
Physical Classroom education	16%

Conflict of Interest: The authors declare that she has no conflict of interest.

Acknowledgement: The author wishes to express gratitude toward the University of Kelaniya for the support and undergraduates of the Faculty of Social Sciences, University of Kelaniya for the support given by completing the questionnaire.

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University-Industry Collaborations in Designing a First-ever Internship Program for Forensic Accounting Undergraduates of the University of Kelaniya

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ABSTRACT

This study examines the university-industry collaborations in the development of the first-ever forensic accounting internship program for the Bachelor of Business Management (Honours) in Auditing and Forensic Accounting Degree program of the University of Kelaniya. The Internship in Auditing and Forensic Accounting is an essential component of the degree program. The internship is a learning and development program through which individuals first develop competence to perform a role of a forensic accountant. Forensic Accountants shall require sufficient practical experience to enable aspiring forensic accountants to demonstrate that they have gained the (a) technical competence, (b) professional skills, and (c) professional values, ethics, and attitudes necessary for performing a role of a forensic accountant. Having aspiring forensic accountants complete sufficient practical experience to perform a role of a forensic accountant, the public interest is protected, and the credibility of the profession is enhanced. Thus, interactions with the industry enable the development of internship programs that fit the industry's requirements and needs as explored in this study.

Keywords: Forensic accounting, Internship, Undergraduate internship

1. Introduction

The university-industry collaborations to introduce job market-oriented degree programs and produce career-ready graduates are strong recommendations to state universities by the World Bank (Larsen, et al., 2016). Since 1980, a number of higher education funding projects were awarded to Sri Lanka through the International Development Association of the World Bank as a means to uplift the economy of Sri Lanka by improving the quality and relevance of the education system in the country (World Bank, 2009; Little & Hettige, 2013). As a recipient of such external funding over four decades for education sector improvements in Sri Lanka, higher education's 'quality' parameters entail graduates being 'best fitting the job market' country (World Bank, 2009; Little & Hettige, 2013). The role of the job market, particularly of the jobs providers and their interactions in the design and

development of undergraduate degree programs is not well addressed in the literature, particularly new degree programs introduced for emerging global professions.

This paper aims to explore the case of a state university that interacts with industry professionals in designing its first-ever forensic internship program for undergraduates of its new degree program; Bachelor of Business Management (Honours) in Auditing and Forensic Accounting Degree. Forensic accounting is an emerging global profession and universities and colleges in developed countries have started offering forensic education through offering forensic courses or degree programs to produce the required graduates for this emerging job market (Zeytinog lu & Anadolu, 2020 ; Seda & Kramer 2008). In Sri Lanka, the Department of Accountancy, Faculty of Commerce and Management Studies, University of Kelaniya introduced the first-ever forensic accounting degree program in Sri Lanka; Bachelor of Business Management (Honours) in Auditing and Forensic Accounting Degree in 2020.

2. Methodology

This study is conducted as a case study selecting the Bachelor of Business Management (Honours) in Auditing and Forensic Accounting Degree program introduced by the Department of Accountancy, Faculty of Commerce and Management Studies, University of Kelaniya. The selection of this case is justified due to its uniqueness in exploring a degree program that has witnessed its first batch of students commencing internship training in the year 2023, coinciding with the emergence of the forensic accounting profession in Sri Lanka.

The primary objective of this paper is to analyze the views and feedback of key industry partners in the forensic accounting and auditing profession who have engaged with the Department of Accountancy over the past two years, starting from 2022. Their engagement primarily revolved around designing the forensic internship program for graduates of this degree program. All interactions with these industry partners were conducted online, and meticulous records of these interactions were kept. These records were then transcribed into Microsoft Word format to facilitate data analysis.

The data obtained from these interactions were analyzed using the thematic analysis method, which involved identifying broader themes and subsequently breaking them down into specific units of analysis. The results of this analysis are presented in the following section, offering insights into the key findings and outcomes derived from the engagement with the industry partners.

By examining the perspectives and feedback of these industry partners, this study aims to provide a comprehensive understanding of the challenges, opportunities, and potential improvements in the forensic accounting internship program. The insights gained from this research can contribute to the enhancement of the program's curriculum, structure, and overall effectiveness in preparing graduates for the evolving demands of the forensic accounting profession in Sri Lanka.

3. Analysis and Discussion

The first batch of forensic undergraduates commenced internship training in the current year 2023. The study finds that the internship period span over one and a half years and of which one year's experience is evaluated for Six credits in the curriculum. Data analysis reveals four key areas of concern by the industry professionals: career opportunities, technical and professional skills, duration of the internship period, and availability of internship placement opportunities in the industry. The table below depicts the cross-matching of industry experts' views with the internship program (draft) prepared by the department and gaps identified to improve the internship program to better fit the industry requirements. Whilst the findings are in line with prior local studies Muansinghe & Bandara (2009); Munasinghe & Weligamage, (2006) in terms of basic subject knowledge, competencies and skills components, this study reveals several extra competence requirements which are unique to the forensic accounting profession itself and needs to process them by graduates.

Table 1: Industry experts' views on forensic internship program features

Theme	Industry insights	Improvements/ Changes to the internship program
Career Opportunities	Career opportunities are available in audit and non-audit sectors both.	Students/academics' awareness of international job opportunities, new employment fields beyond traditional accounting and auditing Non-audit sector employment opportunities are also to be incorporated for internship placements
	Career Opportunities are available locally as well as internationally	
	Career opportunities revealed- in the fields of compliance, risk management, financial crime investigations, and internal audit divisions	
Technical/ professional skills expectations for forensic accounting graduate	The skill which is covered under the draft internship guide is reasonable and suggested to revisit the emphasis of those training areas in terms of time frame. Three main skills are required, General Accounting Knowledge, Practical Knowledge about legal proceedings,	An internship period of two years minimum is suggested Suggested specific knowledge areas and skills to be included in the

	Investigation, and Analytical knowledge and preferred for Digital forensic skills - To handle and understand the digital forensic results or data and as a must knowledge about business digital environment and about the tools of forensic investigation.	curriculum and internship program Arrangements for industry support for mentoring students in improving soft skills
	Suggested to incorporate the following specific skills Interviewing skills and record keeping/documenting skills as essential specific skills for investigators	
	It is good to have knowledge about criminal law and behavioral and managerial accounting experience categories to be included in the internship guide	
	Soft Skills are essential for any graduates It is proposed to appoint a mentor from the organization that interns working to get those soft skills	
Internship training Opportunities	Provide an opportunity to interns to work anywhere, they can get the forensic exposure	To identify organizations offering internship placements To identify specific training areas for forensic internship training
	They can go to the compliance and internal audit divisions of non-audit firms	
	Students need to work full-time during the internship period Two years is considerably okay which intern gets a considerable level of training	
Internship duration	We need three years plus for positioning a student as a forensic accountant because some investigations need more than six months and with the investigation knowledge, they need special skill sets regarding general accounting.	An internship period of two years minimum is suggested

Source: compiled by authors

4. Conclusion

Being the first state university seeking forensic-specific internship opportunities for its forensic undergraduates, this study was conducted to reveal the features of forensic internship programs and potential internship opportunities proposed by the industry experts. The findings of the study will be immensely useful for educators in designing a career-ready internship program for the Forensic accounting degree program. This study was limited only to the analysis of industry experts' views on internship program development and future studies can be conducted to cover the success of degree programs in terms of meeting the demands of the forensic accounting profession in Sri Lanka

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Effective Student Engagement for Undergraduate Assessment Evaluation using Competitive Based Assessments: A Case Study on Sri Lankan Science Undergraduates

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ABSTRACT

Engaging students in classroom discussions is a conventional barrier for lecturers in Sri Lankan universities as students have practised passive learning over the years. Although some undergraduates wish to come out of their shells, they are not confident enough to either ask or answer questions in front of lecturers and their peers. In this research, we provide a platform for classroom discussion known as competitive based assessments (CBA). Encouraging students to provide constructive evaluations for peers' assessments, CBA empowers students to both provide and manage constructive feedback. Through the evaluator's role, students perceive learning outcomes to assess the quality of assessments and learn from peers' assessments. CBA encourages collaboration between lecturers and students to generate knowledge. We trailed CBAs for the second and fourth year students at the Department of Industrial Management, Faculty of Science, University of Kelaniya. The majority of the participants provided consistent evaluations showcasing their impressive active listening and critical thinking skills. Therefore, CBA helps students to develop both analytical and soft skills under a healthy competition platform. We analyzed participants' perspectives on CBA as an assessment, evaluator, and evaluatee. The participants were confident about students' competence in evaluating peers' assessments. They have enjoyed this teaching-learning experience without considering it a tedious assessment. Many participants admit they received their deserved score and providing constructive feedback will not make divisions and disputes among friends. In summary, both lecturers and students are in favour of implementing CBA to encourage student's engagement in the teaching-learning processes.

Keywords: Competitive based assessments, discussion-based learning, peer- evaluation,

1.Introduction

Traditionally, Sri Lankan University students seldom actively engage during teaching-learning Thus lectures have become passive teaching sessions where lecturers deliver the content and students act as just information receivers. Students' engagements are more or less confined to taking notes as students' focus is on formal education rather than non-formal and informal education. Not only students, lecturers also concentrate on formal education. According to a Cambridge research report (Johnson, 2022), non-formal and informal learning are challenging but powerful educational concepts. The great philosopher Plato emphasized the need for dialogues in education, and his literature writing styles are in dialogue format, indicating the importance of discussions during learning (Warmington & Rose, 1984). However, some literature indicates that Plato's techniques cannot be called mere teaching but it is discussions and dialogues (Gaarder). Further, John Dewey's four principal of education indicates that learning is improved when engaging, and discussion is the main way of engagement (Sprouts|YouTube, 2021). Many novel education techniques such as the Triple E: Engagement, Enhancement, Extension, framework (Kolb, 2017) and the PhET simulation tool (Olurinola, n.d.) have emphasized the significance of engagement in learning. Although students are reluctant to actively engage in classroom discussions, we can empower them by facilitating to initiate peer discussion platforms. It is also evident that the lecturers and students have distinguished them in this teaching-learning aspect but integrating both contributions enhances the objectives of education. This helps universities to build a learning culture in which students and lecturers amalgamate to generate knowledge (Sarathchandra).

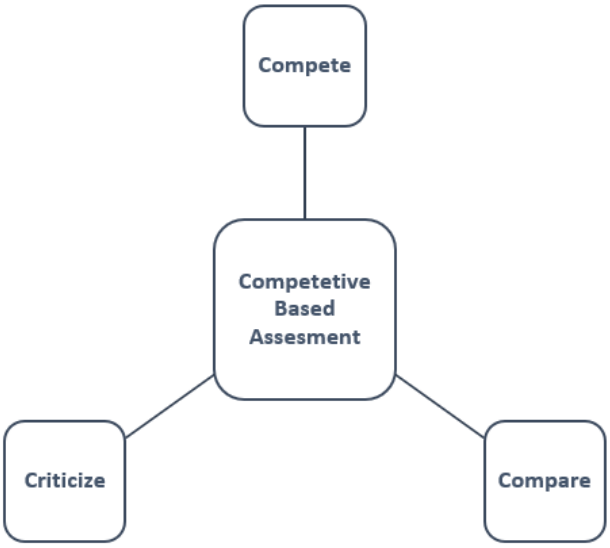
Rather than lecturers solely evaluating students' group or individual assessments such as presentations, reports, poster presentations, and product demonstrations, we can incorporate students (assessment takers) as evaluators. This opportunity motivates students to actively listen and learn from their peers' assessments. Playing an evaluator role helps students to perceive their performance status. Assessing and discerning the peers' assessments' quality creates competition between candidates. Therefore, the lecturers should correctly design the assessment to navigate this competition. When healthy and ethical competition is in place, students tend to perform better in their academics (Cantador, 2010). We identified important parameters for an educational competition such as defining explicit objectives (aligned to learning outcomes) and awarding with symbolic benefits such as rewarding marks. We performed our experiment within a short duration to enhance students' active engagement.

Culturally, Sri Lankan students are not willing to provide or acknowledge constructive feedback as they are of the view that criticisms will create divisions and disputes among peers. However, constructive

criticism help students identify their weaknesses and appreciation encourages and helps them to identify their strengths. Hence, constructive feedback helps students to become stronger and improve their analytical and soft skills. In the ancient Sri Lankan culture, appreciation was utilized to dignify weak authorities. However, the university education should build strong personalities who can manage both appreciation and criticism which is an essential soft skill for academic, personal and career development. Competitive based assessments (CBA) stimulate students to practice, acknowledge and learn from constructive feedback (Carlton & Fong, 2016).

Selection is an important soft skill that students need to perform throughout their life: in academics, careers as well as in their personal life. Incorporating constructive feedback, CBA leads students to compare their peers' assessment performance. During the CBA evaluation process, the students are supposed to provide distinct ranks for peers' assessments with justifications. As a result of comparison with constructive criticism, CBA set up a positive competition among students. Therefore, CBA addresses students' academic, career, and personal development through a combination of three main skills: compete, criticize, and compare, see **Figure 1**.

Figure 1
Core Skills in Competitive Based Assessments



Eric Mazur encourages a shift from simple teaching to helping students learn (Lambert, 2012). The main objective of this research is to promote using a CBA platform to help students to learn by establishing effective engagement where students and lecturers

work collaboratively in the teaching and learning process. CBA builds three core skills, say 3Cs: Compete, Compare, and Criticize, which entice students to self-evaluate and ask questions from peers' to make rational evaluations (and decisions). , students are inclined to inquire intelligently which is considered the main method in accelerated learning concepts (Abepala, 2018) and gravitate towards managing constructive feedback (acknowledging both appreciation and criticism). When CBA is implemented for group assessments, the students improve soft skills such as leadership, making collective decisions and teamwork.

Implementing Competitive based assessments

CBA suits for group/individual assessments such as project presentations, reports, poster presentations, and product demonstrations. To facilitate discerning peers' assessment quality, the assessments should be designed to showcase knowledge and understanding. We assigned CBAs for final-year students with a data warehousing project and second-year students with a statistical analysis project after delivering them induction sessions on CBA. Students were allowed to choose groups, identify a research problem/application, and select a dataset to perform the assessment.

Each group plays an evaluator role by assessing peers' assessments and becomes an evaluatee for the other groups. Therefore, we incorporated students in preparing rubrics for project presentations (Jönsson & Panadero, 2016). This led students fully cognizant of the assessment objectives not only to evaluate peers' assessments but also to enhance their project presentation. Once a group presented their project, the evaluators can question and provide constructive feedback to identify the project's quality to make rational decisions on ranking. We allocated a few marks to encourage students to ask questions as it promotes peer discussion. Once all groups are done with presentations, we disclosed both the student groups' and lecturer's evaluations which contain ranks and constructive feedback, see **Table 1**.

Each group were supposed to justify their peer evaluation rankings for the participants. We examined each group's constructive evaluation by raising the following example questions:

1. Why do you think Group … deserves rank 1?
2. Why did Group … get the lowest rank?
3. Can you explain why Group … was ranked higher/lower than Group …?
4. What each group could have done better to achieve a better rank?

When an evaluator provides an unjust rank for another group (a few examples are highlighted in **Table 1 a)** and **Table 1 b)**), they are supposed to provide valid justifications. Then, the evaluatee could respond by accepting or counterarguing. After discussing rankings, justifications, and responses, we asked each group's opinion on their earned rank. Then, each group commented on their received feedback

(including whether they accepted/denied it) while maintaining a constructive conversation. After that, the lecturer provided their rankings and feedback to each group and finalized marks for each group presentation, see **Table 1**. Finally, we collected CBA participants' feedback via an anonymous survey (Asanka & Mahanama) for further

Group/ Evaluator	Ranks received by groups from evaluators						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1		6	4	**5**	1	2	3
2	5		2	3	1	4	6
3	6	5		2	1	3	4
4	4	6	2		1	3	5
5	5	6	2	1		3	4
6	5	6	2	1	4		3
7	5	6	1	3	2	4	
Lecturer	6	7	1	3	2	4	5
AREO	5.0	5.8	1.8	2.0	1.2	3.4	3.8

Group/ Evaluator	Ranks received by groups from evaluators							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1		3	4	7	2	5	1	6
2	4		2	7	1	3	6	5
3	4	1		7	2	3	6	5
4	4	2	7		1	6	3	5
5	7	2	1	6		5	3	4
6	5	2	1	4	3		7	6
7	6	3	1	7	5	4		2
8	6	1	3	7	2	4	5	
Lecturer	6	2	1	7	5	8	3	4
AREO	5.3	2.0	1.9	6.5	2.3	4.3	4.7	5.0

in general. Considering evaluators' (students' and lecturers') rankings, we improvement.

Analysis of Competitive based assessment results

.

Table 1

Finalized CBA Rankings using Average Rank Excluding Outliers (AREO)

a) Fourth Year Students' CBA Rankings *b) Second Year Students' CBA Rankings*

Each groups' distinct ranks awarded for peer groups are recorded in rows of **Table 1 a)** and **Table 1 b)**. The set of ranks received from peer groups (available in columns) seems to be similar except for few exceptions which are highlighted in **Table 1**. As the chief evaluator, the lecturer is supposed to analyze the set of peer rankings awarded for each group. Since there were around eight groups, the rankings are acceptable when the difference between distinct ranks received by an evaluatee is between one and three (minor differences). Otherwise, the rankings are considered to be not consistent with other group rankings. The fourth year CBA rankings were highly consistent although the second year CBA rankings had significant variations but the minor and major ranks are not substantial, see **Table 2**. To avoid the impact of outlying ranks, we calculate the average rank excluding outliers (AREO) and finalized the ranks, see **Table 2**.

Table 2

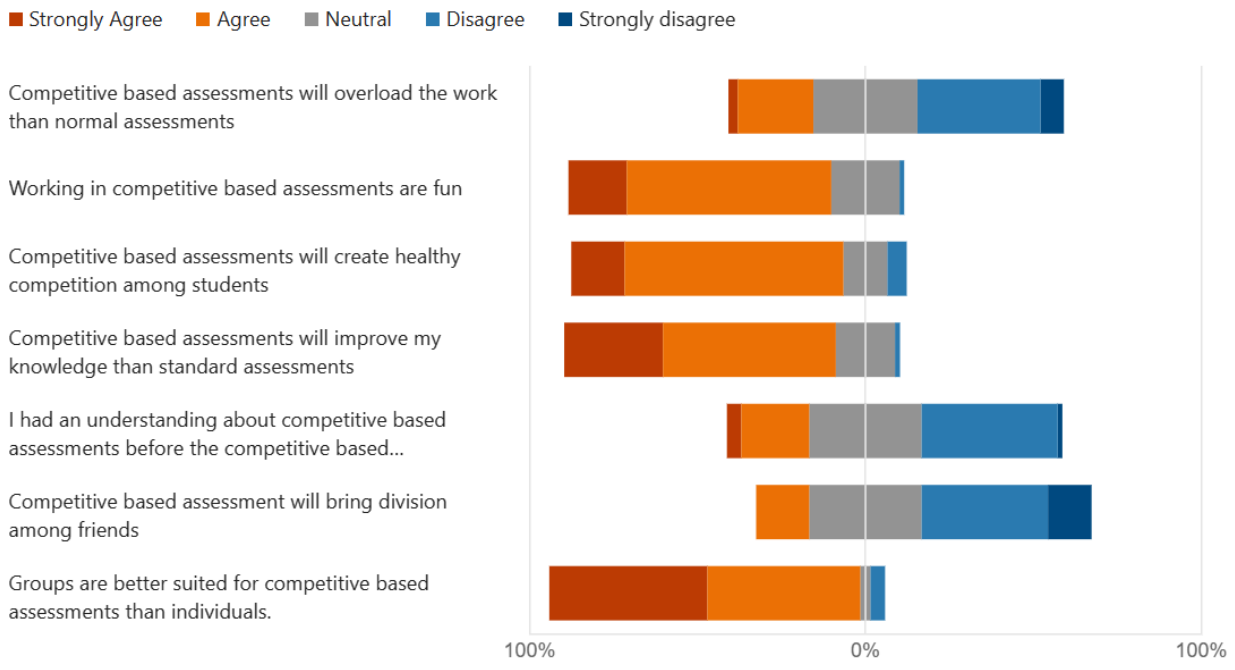
Comparison of Evaluation Processes in the Fourth Year and Second Year CBAs

Ranking Parameters	Fourth year CBA	Second year CBA
Total number of peer ranks	42	59
The number of outlying ranks	4	9
Percentage of outlying ranks	9.5%	15.3%
Number of ranks which contains minor differences between students' and lecturer's ranking	1	2
Number of ranks which contains major differences between students' and lecturer's ranking	0	2

We collected CBA participants' feedback at the end of the assessments through an anonymous survey. Among the 71 respondents, where 45 are fourth year students and 26 are second year students, 83% are in favour of CBAs with overall satisfaction of 4.23 out of 5 (where 5 is the best and 1 is the worst). We analyzed students' perspectives on CBA as an assessment, an evaluator, and an evaluatee. The results are summarized in **Figures 2-4**.

Figure 2

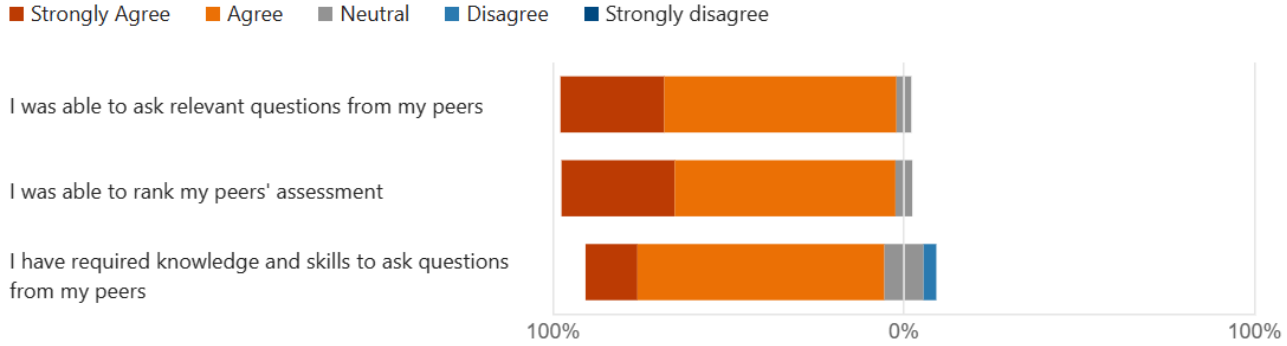
Participants' Perspectives on CBA: Knowledge, Workload, Competitivity, Teamwork, Enjoyability



Although students used to complain about the high workload in assessments, the participants do not think CBA overload them compared to standard assessments. Importantly, more than 80% of students have agreed that CBA has improved their knowledge and they enjoyed this new assessment type. Majority of the participants perceived CBA create healthy competition which is a salient objective of this research. However, only 16% of the participants were afraid whether CBA will bring divisions among friends.

Figure 3

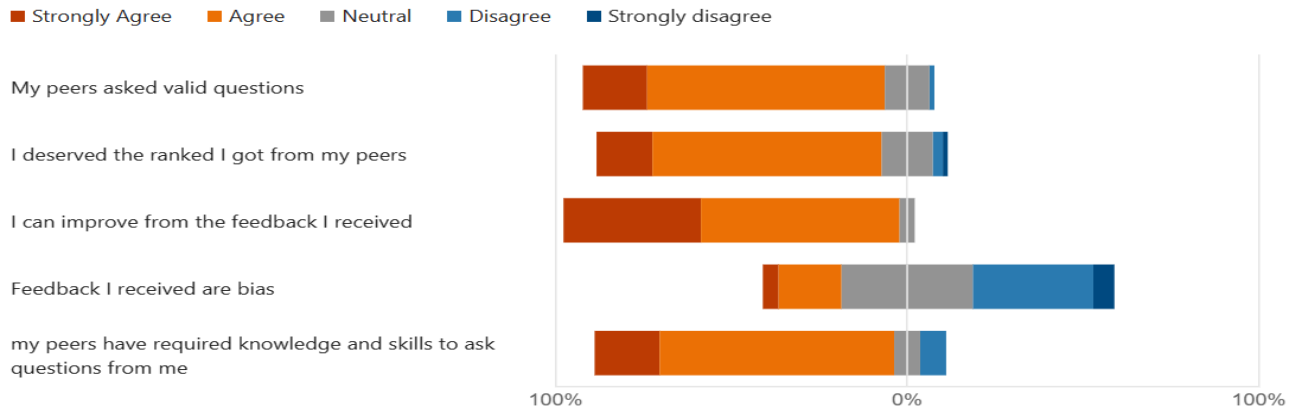
Perspectives on CBA as an Evaluator: Inquiring Intelligently and Rational Decision Making



Since each group plays both evaluator and evaluate roles in CBA, we examined the two distinct views separately in **Figure 3** and **Figure 4**. Participants were confident about their competence to evaluate peers' assessments by asking intelligent questions towards making rational decisions on ranking, see **Figure 3**. We noticed students' active listening and critical thinking skills which hardly showcased in other presentations.

Figure 4

Perspectives on CBA as an Evaluatee: Evaluators' Competency and Managing Constructive Evaluations



We validated the evaluators' competencies (see **Figure 4**) which were investigated under the questions provided in **Figure 4**. The evaluatees acknowledge the peers' constructive feedback and believe they are helpful for further improvement. Although more than 80% of participants admit they received their deserved rank, some participants assume the feedback is biased towards some groups due to non-academic reasons.

We received valuable comments and suggestions on conducting CBA and some of the comments are as follows:

- "This is good to practice in the Sri Lankan education system. We know it is really hard to evaluate our friends in front of them. But it teaches us to accept our weaknesses and being open-minded and criticize others and accept others criticizing us. This method will help to have good attitudes among the students rather than being biased as this is a healthy criticizing."
- "Very happy to share my views because it helps me make soft skills rather than target on doing the project so this evaluation is very good for me, the assignment was a very friendly manner, and no stress and I got lots of experience Thanks for the competitive based assignment"
- "Although I wasn't too keen at first, having a competitive based assessment motivated me and my team to perform better. Also, it was surprising how most of the groups thought alike when assessing. Although I understand its importance, it did feel a bit awkward since students were compelled to ask questions for the sake of marks."
- "This concept is really good and fun. Learned a lot about how to apply what we learned practically and was a good opportunity to learn concepts from one another. But some students rank according to their biases."
- "This will make a new change compared to traditional methods. This makes it more fun and learn. It is better than having common presentations. Also, it's not boring. Really interesting."
- "I think this is a new experience for all and an opportunity to understand the competitive based feedback methods like the 360-degree method. It will be helpful in our future careers also. But I think sometimes feedback may be biased and this may lead to division among friends."

The participants seemed to have enjoyed their first CBA which lead them to learn from peers by providing and managing constructive feedback. CBA provides an ample platform to develop critical thinking and soft skills rather than earning marks for the module. In summary, students seem to be in favour of CBA, apart from a few complaints about the biases in some group rankings caused by less professionalism.

Conclusion

Prior to carrying out this research, CBAs were executed for more than four years as a trial for fourth year students at the Department of Industrial Management, Faculty of Science, University of Kelaniya, Sri Lanka. We aimed to encourage students in providing and managing constructive evaluations through CBA which helps to improve their subject knowledge as well as to sharpen their soft skills. CBA empowers students to develop constructive feedback to make rational decisions on peer assessment evaluations through three core skills: compete, compare and criticize. Since students play as evaluators in CBA, lecturers and students can improve the teaching-learning objectives cohesively.

According to the CBA participants' feedback, students enjoyed the assessment without taking it as a burden. However, some second-year students had a couple of concerns about some students' being biased, and we addressed that issue by finalizing group ranks excluding outlying ranks. The fourth year students seemed to be more proficient evaluators as they have already exposed to work culture through internships. CBAs should be extended to postgraduate courses to further research.

CBA fits better for group projects rather than individual projects. Further, the analysis should be carried out to explore the significance of considering other parameters such as gender, type of university (state/non-state), professional experience (industry/internship), and degree program (Diploma /Undergraduate/Postgraduate). We are conducting another CBA for a postgraduate module that will be a continuous CBA in which the students have the opportunity to utilize their peers' feedback. This will allow them to deliver more quality projects at the end of the module. CBA could be expanded to different disciplines of studies after altering the process accordingly.

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Designing a Cyber Security Awareness Program for Young School Leavers in Sri Lanka Using Scenario-Based Learning

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ABSTRACT

This study explores the necessity of cybersecurity awareness initiatives among young school leavers, considering their future roles as employees. Uninformed and untrained students are susceptible targets for cybercriminals. To address this issue, scenario-based learning, a student-centered methodology, is proposed. It involves presenting students with complex, real-world challenges to enhance their understanding of cybersecurity concepts and principles. Scenario-based learning offers a risk-free environment for students to experiment, learn from their failures, and improve their knowledge without facing adverse consequences. The research conducted at the American College of Higher Education compared the effectiveness of two teaching approaches for cybersecurity awareness. The study employed a pretest-posttest comparative method with an experimental control group. The experimental group participated in a cybersecurity awareness program utilizing scenario-based learning strategies, while the control group experienced a teacher-centered approach. The scenario-based group watched a video-based scenario and answered related questions. The results revealed that students in the scenario-based learning group exhibited significantly higher levels of cybersecurity awareness compared to those in the traditional learning group. Implementing scenario-based learning in cybersecurity awareness programs would be beneficial for future employers as well as higher education institutions. As future work It is essential to expand the curriculum to address a comprehensive set of competencies and continuously enhance the course content based on student feedback. Additionally, the use of an artificial intelligence-based system that offers effective learning paths should be explored as a potential direction for future research and development.

Keywords: Cybersecurity Awareness; Scenario-Based Learning; Digital learning; Higher education, School Leavers

1.INTRODUCTION

The Internet presents numerous advantages, but it also introduces certain concerns. Young students, due to their limited experience, may not fully comprehend the benefits and drawbacks of using the Internet and other digital technologies. However, a significant amount of their personal information is now being digitally recorded, which can pose future risks to their privacy and safety. Unfortunately, the dangers and risks associated with online activities may only become apparent to them when it is too late (Quayyum, 2929). Therefore, it is essential for students to have a solid understanding of various cybersecurity threats, not only to benefit future employers but also for their own protection. Cybersecurity focuses on safeguarding computer systems and networks from unauthorized access, theft, damage, and disruption, covering aspects such as confidentiality, integrity, availability, accountability, and nonrepudiation (Schatz, 2017; Stallings, 2015). The human element remains the weakest link in cybersecurity, as online criminals constantly expand their range of cybercrimes (SANS Intitute, 2021). It is crucial to prepare young students to effectively address information security challenges in order to prevent potential security breaches.

The field of cybersecurity education is being influenced by the growing demand for higher education institutions to equip their students with essential skills, knowledge, and capabilities required by future employees. In order to address cybersecurity threats in their day-to-day tasks, higher education institutions are compelled to adopt modern teaching strategies. However, there exists a significant gap between what students are being taught and what is expected of them in real-world scenarios. This gap often hinders the ability of higher education institutions to provide practical, work-based learning experiences, primarily due to the lack of industry relationships and necessary resources (Ghosh, 2021).This study is unique in that it targets young school leavers, while most cybersecurity awareness programs focus on employees in various establishments. Few studies in the literature have evaluated the impact of scenario-based learning on young learners' cybersecurity awareness.

1.3 Research Problem

- Can scenario-based learning be used as a methodology for raising cyber security awareness among the young school leavers in Sri Lanka?

1.4 Aims

- Design a cybersecurity awareness program using scenario-based learning.
- Demonstrate that scenario-based learning is an effective tool for increasing cyber security awareness among young school graduates.

1.5 Objectives

This research has multi-fold objectives aimed at enhancing cybersecurity education. Firstly, it aims to develop an interactive video series presenting various scenarios that address significant cybersecurity issues. Through these scenarios, participants will be educated about key cybersecurity concepts and best practices while raising awareness. To foster

active engagement and knowledge retention, a gamified scoring system will be implemented, rewarding participants with points for correctly answering questions related to each scenario.

Additionally, the research seeks to evaluate the effectiveness of the awareness program through a comprehensive questionnaire. This well-structured questionnaire covers all aspects covered in the course, providing a thorough assessment of participants' knowledge and understanding. By analyzing the survey data, valuable insights will be gained to determine whether scenario-based learning proves more effective in enhancing student learning compared to traditional lessons. This analysis will inform the refinement and improvement of cybersecurity education strategies, ensuring a more impactful and engaging learning experience for participants

2. LITERATURE REVIEW

Information and communication technologies have significantly impacted education, challenging traditional teaching methods (Jakee, 2011). Previously, teachers were regarded as the central figure in the teaching process and the primary source of information. However, the contemporary classroom is witnessing the integration of various innovative technologies. Notably, interactive smart boards have outperformed conventional whiteboards, enabling spontaneous engagement with diverse materials. Furthermore, online platforms like Zoom, Google Meet, and WhatsApp are increasingly utilized for lesson delivery. To enhance the learning experience, learning management systems (LMS) are employed for effective distribution, management, and collaboration of learning materials, assignments, notifications among students. Although the use of these most recent technologies in the classroom is expanding, traditional modes of delivery will always have a place there. Undoubtedly, certain subject matter will always call for some type of "lecture-style" instruction, in which students attend lectures where teachers demonstrate a procedure or direct the learning process (Baetena, 2013).

Chickering(1987) suggested that pupils need to engage in other activities besides listening, such as reading, writing, talking, or problem-solving. Students must perform higher-order thinking activities like analysis, synthesis, and assessment in order to effectively participate. In this context, it is suggested that instructional activities that involve students in doing things while also considering what they are doing are strategies for encouraging active learning. Jakee**Invalid source specified.** claims that active learning is a much more effective process than a process where a teacher spoon-feeds students..

Recent literature (Hursen, 2017; Cone et al., 2006) highlights the growing interest in modern teaching strategies such as project-based learning, problem-based learning, inquiry-based learning, scenario-based learning, and reflective learning. Numerous studies have investigated the effectiveness of instructional strategies and self-competence, emphasizing the importance of student responsibility in the learning process and the role of teachers as guides.

Scenario-based learning (SBL) is an effective teaching approach that bridges theory and practice, providing a realistic reflection of the professional work environment (Errington, 2010). SBL enhances graduate employability by allowing students to analyze experiences and apply their learning to real-world

situations (Errington, 2010). In Sri Lanka, there is a need for improved cybersecurity awareness and education among undergraduates (Nagahawatta et al., 2018). Despite efforts to enhance cybersecurity knowledge, students still fall victim to cybercrime due to the absence of comprehensive cybersecurity education (Ahlan et al., 2020).

3. METHODOLOGY

3.1 Research Design

The pretest-posttest comparative method with an experimental-control group, which is one of the quantitative research methods, has been used in the research. A pretest was conducted to determine whether the student groups to whom the application was applied were equal, and a posttest was conducted to demonstrate the effectiveness of the methods. The experimental group participated in a cybersecurity awareness program using scenario-based learning strategies, while the control group participated in a cybersecurity awareness program using a teacher-centered method

3.2 Population, Sample and Data Collection

This study was carried out with 39 students doing various academic courses in the American College of Higher Education. According to Fraenkel and et al. (2006) there is no set rule that dictates the size of the experimental study group. Thus, it is considered that there are enough students in both the scenario-based groups and the conventional learning groups. The traditional learning group (control group) has 19 students, whereas the scenario-based learning group (experimental group) has 20 students, the majority of whom are undergraduates following American degree programs and students doing various certificate and diploma courses.

Only the final digit of each student's index number is used to divide the class into two groups. The scenario-based learning group is comprised of students whose index numbers end in an odd number, while the traditional learning group is composed of students whose school numbers end in an even number. After the groups were separated, each group is given a pre-test (an accomplishment test) as an online questionnaire to see whether or not they are comparable in terms of achievement.

3.3 Analytic Strategy

A questionnaire was developed to evaluate cybersecurity issues in Sri Lanka and globally. It covered topics like online privacy, securing devices, safe practices, ransomware, cryptocurrency mining, password security, confidential information protection, Wi-Fi safety, and security awareness. A pretest ensured equal student groups and identified areas to focus on for the cybersecurity awareness program

The experimental group engaged in a two-hour scenario-based cybersecurity awareness program, while the control group received traditional teaching using PowerPoint presentations. The program included an overview of cybersecurity principles and scenario-based games to enhance retention. Video-based scenarios depicted online challenges within a student's daily life. After each scenario, students answered questions to assess their knowledge and earn points.

Figure 1 illustrates the process of creating scenario-based learning videos using the online app SimpleShow**Invalid source specified.**. The app uses artificial intelligence to automatically generate visual animations based on scripts created in a word processor.

The visuals can then be further customized to suit each scenario, and authors can add their own narration to make it more student-friendly.

Figure 1

Animation created with the simple show online animation creator

To enhance the students' understanding of each scenario, subtitles were added using another online tool called Kapwing**Invalid source specified.**, which automatically generates subtitles using artificial intelligence. H5P, an open-source JavaScript platform, was used to create interactive cybersecurity videos. It simplifies content production and sharing while introducing potential online challenges to students. Available at h5p.org, H5P offers various question formats, including drag-and-drop and multiple-choice

The post test was conducted with the attendees of stage 3, approximately two weeks after the awareness program, to assess the impact of the intervention. These survey questions were delivered to the students as an online survey.

In this study, the questionnaire responses were analyzed by the author in order to obtain the mean of the two approaches. The average or mean value of the responses from participants in each approach was calculated as part of the analysis process. The individual responses were summed up and divided by the number of participants in each approach, resulting in the determination of the average value. This average value represents the mean of the respective approach and provides insights into the participants' perspectives on the cybersecurity awareness program.

The study used IBM SPSS Statistics version 26 (IBM SPSS Statistics, 2022) to analyze quantitative data using percentage, mean, standard deviation, and independent samples t-test procedures. Standard deviation was used to measure data dispersion around the mean, and the independent samples t-test was used to compare the means between the two

groups. A significance level of 0.05 was used for analysis. Levene's test (Levene Test for Equality of Variances, 2012) was used to check for equal variances between the experimental and control groups.

The assumptions for the analysis included random samples, independent observations, normal distribution of the population in each group, and equal population variances. As the variances for the two groups are equal, we calculated the pooled standard deviation. This resulted in a combined estimate of the overall standard deviation**Invalid source specified.**. The pooled variance formula is written as formula (1).

$$s_p^2 = \frac{((n_1 - 1)s_1^2 + ((n_2 - 1)s_2^2)}{n_1 + n_2 - 2} \quad (1)$$

The test statistic is calculated as formula (2).

$$t = \frac{(\overline{x_1} - \overline{x_2})}{s_p\sqrt{1/n_1 + 1/n_2}} \quad (2)$$

Where:

n_1=Group one sample size

$n2$=Group two sample size

$x1$=Group one mean

$x2$=Group two mean

$s1$= Group one standard deviation

$s2$= Group two standard deviation

4.RESULTS

4.1 Pre-Test

The box plots in Figure 2 provide an overview of the pre-workshop cybersecurity awareness data, indicating that both groups have similar distributions without any outliers.

Figure 2

Box plots of the marks for the pretest for the scenario-based learning group and the traditional learning group

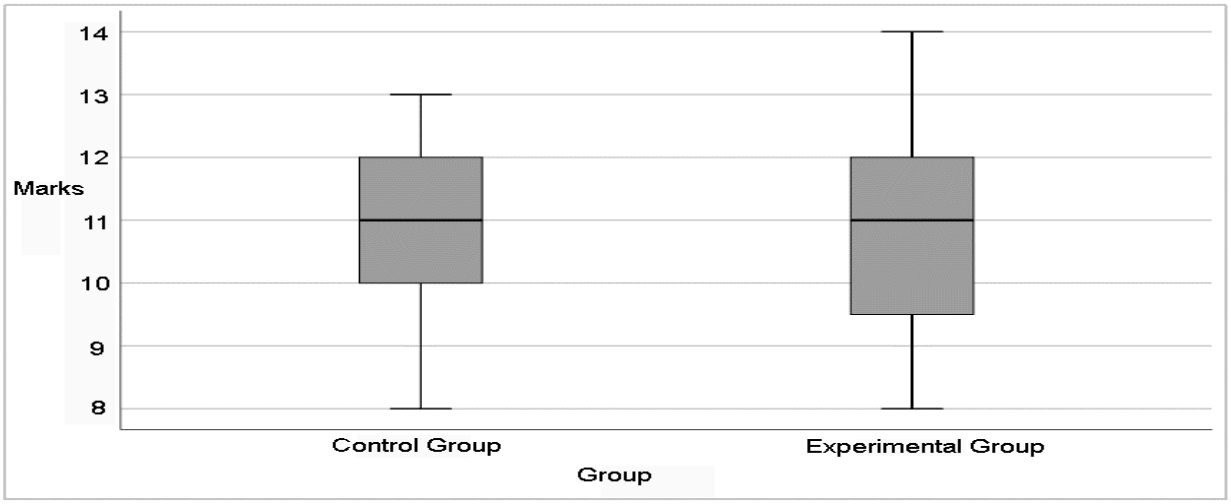

Table 1 summarizes the experimental and control groups with mean values of 10.95 and 10.24, respectively, indicating similar cybersecurity awareness levels. This suggests that prior to any intervention, the two groups had comparable levels of cybersecurity awareness. The mean values represent students' "information security mark" obtained through a gamified points system.

Table 1

Pre-test score distributions of scenario-based learning group and traditional learning

Group	Sample Size	Mean	Std. Deviation	Std. Error Mean
Experimental	20	10.9500	1.76143	0.39387
Control	19	10.8421	1.42451	0.32681

An independent samples t-test was conducted to compare the marks for the experimental group and the control group. Table 2 shows the p-value for the Levene test is greater than 0.05, hence the variances are not significantly different from the experimental group to the control group. Hence equal variance is assumed between experimental and control groups.

Table 2

Levene's test for equality of variances

F	Sig.
0.517	0.477

H_0: There is no significant difference in cybersecurity awareness level between the experimental and control groups during the pretest period.

H_1: There is a significant difference in cybersecurity awareness level between the experimental and control groups during the pretest period.

The results of the t-test for equality of means are presented in Table 3. There was no significant difference(t(df)=-.210, p=0.835) in the scores with the mean scores for experimental (M = 10.95 SD = 1.76) and control (M = 10.84 SD = 1.42). The magnitude of the difference in the means (means difference =.107, 95% CI: .93483 to 1.15062) was very small. As a result, H_0 is maintained. Since there was no statistically significant difference between the control and experimental groups, it may be concluded that both groups are equal, and the sample was chosen independently.

As can be seen in the Table 3, there was no significant difference in the pre-test scores of the scenario-based learning group and the traditional learning group (t =.210, p>0.05). The findings have revealed that both groups have an equal amount of cyber security awareness

Table 3

t-test for equality of means

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
0.210	37	0.835	0.10789	0.51462	-0.93483	1.15062

4.2 Post Test

The box plots in Figure 3 provide an overview of the post-workshop cybersecurity awareness data. They illustrate that the experimental group exhibited a median post-test score of approximately 16.4 points, whereas the control group had a median score of approximately 14 points. The distribution of the experimental group was positively skewed, suggesting a higher average of marks. These findings suggest that scenario-based learning is more effective in increasing cybersecurity awareness by 12% compared to traditional learning methods.

Figure 3

Post-test score distributions of scenario-based learning group and traditional learning

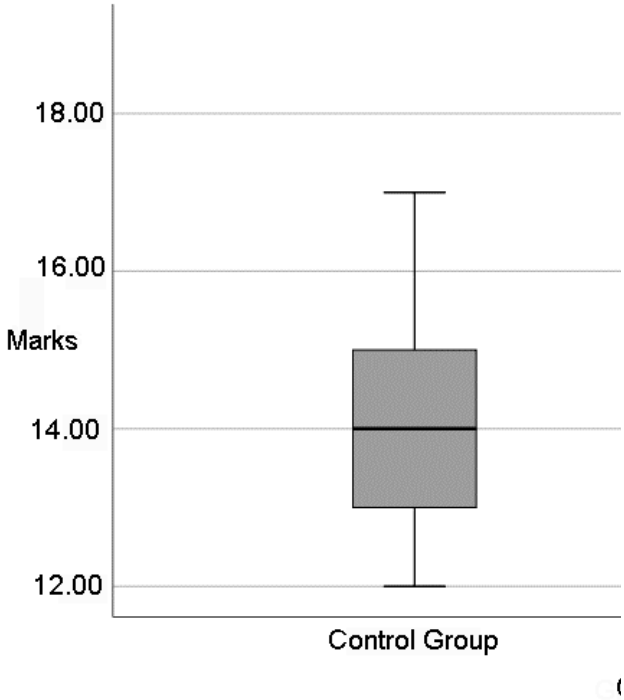

Table 4 indicates that the experimental group achieved a mean score of 16.40, while the control group had a score of 14.15, demonstrating a significant difference in mean scores between the two groups. This suggests that scenario-based learning is more effective in enhancing cybersecurity awareness among young school-leavers compared to traditional learning methods.

Table 4

Post-test score distributions of scenario-based learning group and traditional learning

Group	Sample Size	Mean	Std. Deviation	Std. Error Mean
Experimental	20	16.4000	1.81804	0.40653
Control	19	14.1579	1.38497	0.31773

Table 5 shows the p-value for the Levene test is greater than 0.05, hence the variances are not significantly different from the experimental group to the control group. Hence equal variance assumed between experimental and control groups.

Table 5

Levene's test for equality of variances

F	Sig.
0.697	0.409

H_0: There is no significant difference in cybersecurity awareness level between experimental and control groups

H_1: There is a significant difference in cybersecurity awareness level between experimental and control groups

Table 6

t-test for equality of means

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
4.315	37	0.0001	2.24211	0.51958	1.18933	3.29488

An independent samples t-test was conducted to compare the Marks for experimental group and the control group. There was a significant difference(t(df)=-37, p =0.0001) in the scores with the mean scores for experimental (M = 16.40 SD = 1.81) and Control (M = 14.15 SD = 1.38). The magnitude of the difference in the means (means difference = 2.24, 95% CI: 1.19 to 3.29) was significant. H1 was supported.

4.3 **Analysis of Variance of Gain Scores**

An analysis of variance (ANOVA) was conducted to examine the impact of the scenario-based approach on students' performance by comparing the changes in test scores between the experimental group and the control group. The results of the ANOVA, presented in Table 8, provide insights into whether the mean score differences between the two groups from the pre-test to the post-test were statistically significant

Table 7

The analysis of variance of the mean score difference

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Experimental Group	9.63	38.00	0.00	5.45	0.57
Control Group	7.27	36.00	0.00	3.32	0.46

Table 8

Comparison of the mean difference between experimental and control groups

Group	Pre-Test Score	Post-Test Score	Mean Difference
Experimental	10.95	16.40	5.45
Control	10.84	14.16	3.32

The study of the change in scores yielded the finding that both the experimental and control groups' scores had improved from the pre-test to the post-test. However, the students in the scenario-based learning method group saw a considerable improvement in their evaluation scores compared to the students in the traditional approach group (Mean difference of 5.45 versus mean difference of 3.32). This further shows that scenario-based learning is more effective than traditional learning.

5. DISCUSSION AND IMPLICATION

The experimental group demonstrated a 12% higher post-test score compared to the control group, confirming the effectiveness of scenario-based learning (Figure 8). This difference was statistically significant, indicating the superior improvement in evaluation scores for the scenario-based learning group Scenario-based learning offers a risk-free environment where students can learn from real-life examples without negative consequences. By using videos and gamification, students can practice and study,

understanding their mistakes and making improvements. This approach promotes accountability and allows students to evaluate their progress.

5.1 Theoretical Implications

The theoretical implication of this study is that scenario-based learning can be a valuable instructional approach in the field of cybersecurity. By presenting complex, real-world challenges to students, this methodology promotes active learning, critical thinking, and problem-solving skills. It goes beyond the mere delivery of information and engages students in practical application, leading to a deeper understanding and retention of cybersecurity concepts. This study adds to the growing body of research supporting the effectiveness of scenario-based learning in enhancing cybersecurity awareness among learners.

5.2 Practical Implications

The practical implication of this study is that educational institutions and organizations should consider implementing scenario-based learning approaches in cybersecurity awareness programs. By providing students with realistic scenarios and opportunities to apply their knowledge, organizations can enhance their employees' cybersecurity awareness and readiness to respond to potential threats. This can ultimately contribute to a more secure digital environment and mitigate the risks associated with cyber threats.

Overall, the findings highlight the potential of scenario-based learning as an effective and engaging approach to improve cybersecurity awareness. Further research can explore the long-term impact of this methodology and investigate its applicability in different educational and organizational settings.

6. LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

The study on scenario-based learning for cybersecurity awareness provides valuable insights, but there are limitations to consider. The findings may not be generalizable due to the specific educational institution and small sample size. Self-reported data introduces biases and long-term retention of knowledge should be assessed. Individual characteristics and external factors were not explored, which could influence learning outcomes. Replication with larger and diverse samples, long-term assessments, integration of emerging technologies, continuous improvement of course content, and collaboration between academia and industry are recommended for future research. These efforts will enhance the understanding and effectiveness of scenario-based learning in cybersecurity awareness, leading to improved educational interventions in the field.

7. CONCLUSION

This study demonstrates the effectiveness of scenario-based learning in enhancing cybersecurity awareness among students. It provides real-world challenges and learning opportunities that significantly improve students' cybersecurity awareness compared to traditional methods. However, limitations include the specific setting, sample size, reliance on self-reported data, and focus on immediate post-test scores. Further research is needed to replicate the findings, consider long-term retention, individual differences, and external factors. Practical implications suggest integrating scenario-based learning in cybersecurity programs, improving content and collaboration, and leveraging emerging technologies. Overall, scenario-

based learning shows promise for proactive cybersecurity education.

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A Study on Identifying the Impact of Digital Education on Practical Subjects: With Reference to the Archaeology Subject in Sri Lanka

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ABSTRACT

Information technology plays a major role in every sector nowadays. People use new technologies to connect with others easily as well as to make their lives easier. This wide usage of technology and changing lifestyles to digital platforms became more popular during the Covid -19 pandemic situation that affected the whole world recently. During this period, the classroom-based education system has changed and studies using digital tools and technologies have become popular in the university system. Hence, this research attempts to identify the undergraduate's likeness to a practical subject through Digital Education during the pandemic, redefining their traditional role in various approaches. In this study, the problem statement 'How is it possible to study a practical subject like Archaeology through digital platforms' is selected and the research objective is to mainly identify the student's willingness to digital education for a practical-based discipline like Archaeology during a pandemic period. As the research methodology, comments from twenty-five undergraduate and postgraduate students from local universities who experienced studying archaeology through digital methods during the pandemic period were obtained under quantitative data using a questionnaire. Research papers and case studies were used in addition to this as secondary sources. Data analysis revealed that students faced various difficulties in studying archaeology through digital education methodologies during the pandemic. The main problems were identified as having to study practical course units such as field and laboratory methods without the practical sessions, phone signal problems, and limitations in library access. This study identified that most students were not impressed with digital methods, although the practical parts were covered to some extent by recorded lectures and other video footage. Also, it revealed that although digital education is economically beneficial and positively affects in pursuit of knowledge, it has negative effects on studying practical based subjects like archaeology.

Keywords - Archaeology, Digital education, Impact, Practical subjects

1. INTRODUCTION

Information technology is a study-based system that is specially used in the telecommunication sector as well as devices to store data, retrieve, and send information. Transmitting telegraph messages and the

radio are important applications of the technology (Wikramanayake, 2005). Information technology plays a major role in every sector nowadays. People use new technologies to connect with others easily as well as to make their lives easier. Plenty of software are used in the present era to improve human communication and day-to-day lifestyles. People can keep the news from around the world at their fingertips.

Among all the sectors education can be identified as a sector that is significantly affected by the development of technology. Digital education stands out among these. Digital education is the innovative use of digital tools and technologies during the teaching and learning process and is often referred to as Technology Enhanced Learning (TEL) or e-learning. Exploring the use of digital technologies allows educators to design engaging learning opportunities in the courses they teach, and these can take the form of blended or fully online courses and programs **Invalid source specified.**. Also, digital innovation has demonstrated powers to complement, enrich and transform education, and has the potential to speed up progress towards Sustainable Development Goal 4 (SDG 4); quality education for education, and transform modes of provision of universal access to learning **Invalid source specified.**.

The Sri Lankan education system was operated based on religious centers such as temples and churches in ancient times. Students used 'welipila' to practice writing, and they used talipots as papers and, a stylus as a pen. During the colonial period books and pens were introduced to the people. With time, nowadays most people are interested in using digital devices and digital education methodologies for educational purposes. Even libraries are digitalized. People are getting used to e-libraries and e-books. During the Covid 19 pandemic, the e-classroom system was introduced in some of the leading schools in Sri Lanka. As well the state universities also introduced digital education for their education systems. Even though these digital education platforms are popular in Europe countries, it is a new experience for third-world countries which are used to traditional classroom-based education systems like Sri Lanka. Since the usage of digital education in the state education system is a new experience for Sri Lankans, we can observe that they are getting used to it nowadays.

This wide usage of technology and changing lifestyles to digital platforms became more popular during the Covid 19 pandemic situation that affected the whole world recently. During this period, the traditional classroom-based education system has changed and digital education using digital tools and technologies has become popular in the university system as well as schools. It took some time for the Sri Lankans to get used to digital education. But now, even though the pandemic situation normalized, Sri Lanka still uses virtual platforms for education. It is because, online learning offers many benefits for students, including the chance to study flexibly and from a location that suits them. Digital education causes advantages as well as disadvantages. Identifying these possibilities as well as the things to be improved while conducting the degree programs of the subjects with a

practical base like archaeology is expected through this research.

During the Covid -19 pandemic period schools and universities conducted their learning processes via digital platforms. The main and most popular platform was Zoom cloud meetings. Also, Google Meet, MS Teams, and WhatsApp were used for educational purposes. In Sri Lanka, the state universities were kept completely closed during the Covid-19 pandemic period and all the lectures were conducted through digital platforms.

Archaeology is the main subject area considered in this research. Archaeology is the study of human activities through the recovery and analysis of material culture, and the archaeological records consist of artifacts, architecture, bio-facts and eco-facts, sites, and cultural landscapes (Renfrew, Bahn, 1991). This subject is influenced by subjects like anthropology, history, geography, zoology, ethnology, etc. and it was built as an interdisciplinary discipline with a practical base. Archaeology is identified as a practical based subject as exploration, excavation, and conservation hold major roles in this discipline. From the undergraduate level, the archaeology degree program contains field studies, and field visits to cover the above-mentioned subject areas and many other sub-units. Also, an internship period is not included in the archaeology degree program. All the training programs are included in the course units themselves. Due to this reason, it is necessary to well manage the degree programs along with the practical sessions when it's conducted through digital education methods.

2. RESEARCH PROBLEM

Hence, this research attempts to identify the impact of learning a practical subject like archaeology through digital education during the Covid-19 pandemic, redefining their traditional role in various approaches. In this study, the problem statement 'How is it possible to study a practical subject like Archaeology through digital platforms' is selected.

3. OBJECTIVE

The objective of this research is to mainly identify the student's willingness to digital education for a practical-based discipline like Archaeology during a pandemic period. Also, we aimed to collect ideas from the students who studied via virtual platforms about the effectiveness of digital education. And as a result, we aimed to present the advantages and disadvantages of using digital education for practical subjects like archaeology.

4. METHODOLOGY

Digital education is somewhat new to archaeology in Sri Lanka. In Covid 19 pandemic period, it was able to observe that foreign universities used many advanced technologies and digital educational methodologies to conduct archaeology degree programs along with practical training. As the objective of this study is to 'identify the student's willingness of digital education for a practical-based discipline like Archaeology during a pandemic period', we used a questionnaire to identify the student's willingnesses and the improvement of learning and teaching methodologies using digital education in Sri Lanka.

The questionnaire was used for quantitative data collection as the main method. Under this, the ideas of twenty-five students who had to study from home as a result of the closure of universities during the Covid-19 epidemic period were obtained. To collect data, we used a Google form and asked students to fill it up. The questionnaire was in the Sinhala language to make it more clear for the participants. We have got twenty-five responses for the Google form. Since the research is focused on studying a practical subject like archaeology through digital education methods, undergraduate students and post-graduate students from various state universities were asked to participate in the questionnaire. The questionnaire was more focused on addressing questions like, were there any problematic situations in studying the subject under digital education methods rather than studying archaeology in the classroom? how successfully could the practical subject parts be completed? which educational method is more economically favorable? were all subject areas covered as usual?

In addition to analyzing the information obtained through the questionnaire, referring secondary data was also used as a research methodology. Under that, various research papers, case studies, etc. were used to conduct the research.

5. RESULTS AND DISCUSSION

For this research, a sample of twenty-five students from the state universities of Sri Lanka, where archaeology is taught as a subject, has been used. 96% of them were identified as undergraduate and postgraduate students who had studied archaeology via digital education during the Covid-19 pandemic period (Figure 1).

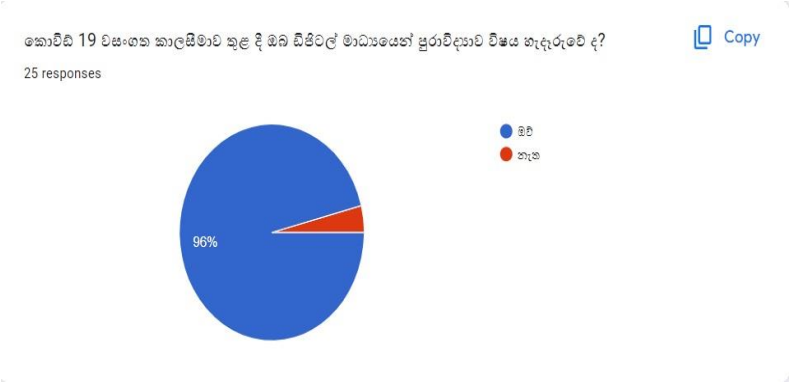

Figure 1

In this study, it was possible to identify some of the main problems faced by the students in studying archeology which is a practical subject through digital education. Those problems can be listed as follows.

1. Problems in not being able to engage in practical activities
2. Problems with phone signals
3. Barriers to joining field training
4. Limitations in using the library facilities
5. Technical problems
6. Difficulties in learning the subject matters and engaging with the lecturers

Problems in engaging in practical activities and not being able to gain awareness about how to handle the types of equipment in the field activities and work in the field can be mentioned as long-term problems affecting the students because of learning a practical subject like archaeology through digital methods. Archeology is a difficult subject to learn without practical knowledge. Also, they have not been able to complete practical subjects like laboratory training, archaeological photography, Planning and drawing, maritime archaeology, conservation, and epigraphy.

56% of the students who contributed to the research have not been able to experience practical activities throughout the period of the Covid-19 pandemic and 44% of students had the opportunity to experience practical activities alongside the archaeology curriculum through various videotapes and other methods, through the recordings of the practical activities that have been recorded and presented by the teachers, and by making field trips to a small extent.

According to the students, 32% of them were able to complete practical sessions to a certain extent through videotapes and various other methods. 24% experienced those activities through the practical sessions recorded and shared by the lecturers and 12% of them were able to participate in some field training for practical course units (Figure 2).

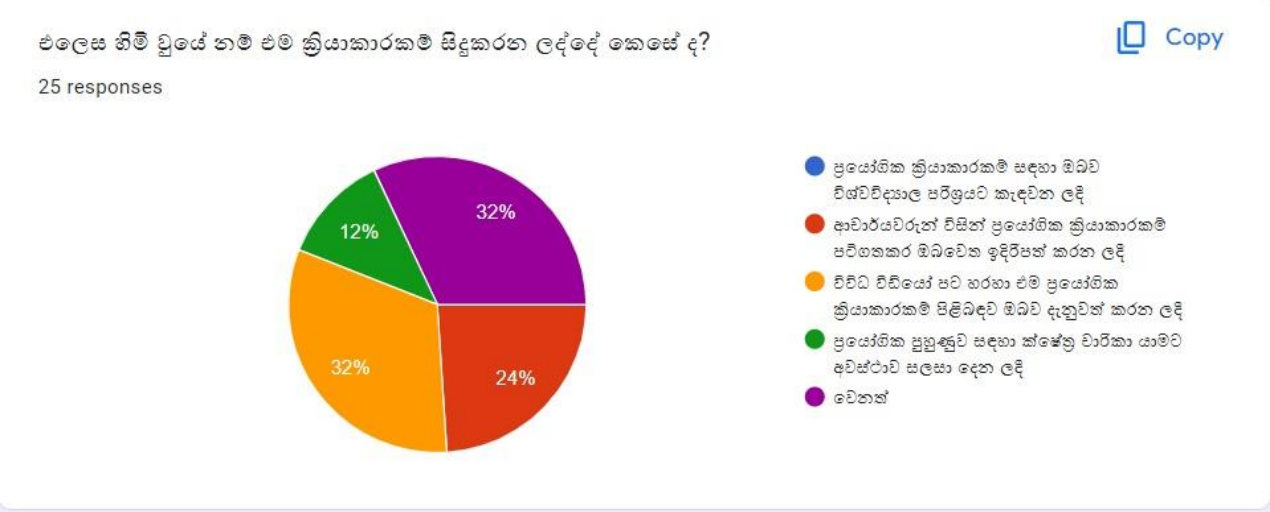

Figure 2

It can be mentioned that 40% of the students directly stated that studying archaeology through digital education was a failure and it was completely rejected by them. As well as

most of them (60%) stated it was a good step taken due to the lack of alternatives in the existing Covid-19 pandemic situation. But they also mentioned that teaching archeology by relying on digital education alone was a failure. It was possible to recognize that there is no opposition among the students involved in the research on the use of digital education methods by further improving the facilities like providing practical training where necessary.

Of the students who participated in the questionnaire 76% of the students responded negatively regarding the coverage of course units through digital education. Subject areas like field and laboratory methods, archaeological photography, maritime archaeology, archaeological conservation, ancient technology, etc., have not been covered and it has affected the students directly as these subjects include practical sessions.

Finally, the fact that was identified through this research was that 92% of the students involved in this study, i.e., the majority, prefer the traditional education methods conducted in the classroom with fieldwork (Figure 3). The reasons identified for not taking up digital education, despite being economically viable, were;

1. Difficulty in understanding practical subject matters without practical training
2. Problems of not managing teaching activities systematically along with the practical sessions

The students repeatedly mentioned that a subject connected with practical knowledge like archaeology will be less effective in teaching using digital education methods without proper management.

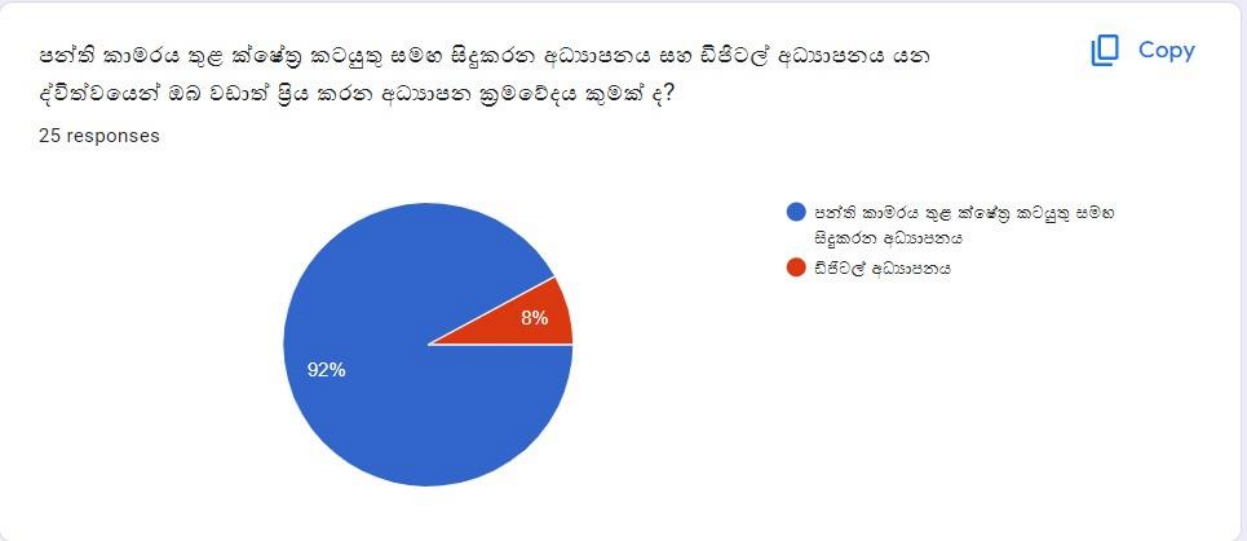

Figure 3

In referring to all these facts, it could be identified that studying a practical subject like archaeology under digital education methods with the Covid-19 epidemic situation, the students have mostly faced various difficulties. The main problems were

identified as having to study the course units that should be done alone with the practical activities without doing the practical part, phone signal problems for students in remote areas, obstacles, restrictions on library access, etc. It was also identified in the study that many students are not impressed with digital education methods. It was revealed through this research that although digital education is economically good in some cases and has positive effects on knowledge exploration, it has negative effects on the study of subjects that cannot be done without practical training such as archeology.

6. SUMMARY AND CONCLUSION

There are both advantages and disadvantages in digital education. It is also the same for studying practical subjects like archaeology through digital education. According to the information collected and analyzed in this research, theoretical lessons regarding the archaeology degree programs can be conducted through virtual platforms, and it was easy for the students than having traditional classroom-based lectures physically in a situation like Covid 19 pandemic. But the data we have got for practical subjects under archaeology is vice versa. Most of the students prefer field training for the practical sessions and the field training and the practical sessions are a must for the degree program as well. Also, many students are not impressed with digital education methods. Even though the practical sessions can be held using digital platforms it can't be identified as a more effective solution compared to the physical field training.

As the world is being digitalized with the rapid development of digital technologies digital education is also becoming more popular worldwide. Even though Sri Lanka is introduced as a third-world country it is necessary to step forward when the world is becoming progressive. As digital education is a new experience for Sri Lankans it will take some time to make progress in digital education methodologies. It is essential to find more up-to-date answers to the problematic situations that arise in digital education to make the journey to achieve positive results through digital education more effective. Also, currently, teachers as well as students must develop their awareness about digital education and turn it into a more effective education system. What is important here is good management of the teaching methodology of practical streams like archaeology in digital education.

Through this research titled 'A study on identifying the impact of digital education on practical subjects like Archaeology in Sri Lanka' it can be concluded that subjects with a practical base like archaeology cannot be taught completely through digital education. If so, the course units need to be well managed to have an effective result. As well most of the students are not completely satisfied with learning archaeology through digital education. Although digital education was identified as the best solution to continue education in universities during the Covid – 19 pandemic situation it has both advantages and disadvantages as well. To make a positive impact of digital education on subjects like archaeology, course units must be well managed along with the practical sessions

and field training to not make any failure in degree programs.

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A review on online teaching-learning process of Sri Lankan undergraduates during the pandemic: the challenges and opportunities for learner autonomy

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ABSTRACT

Thirteen documents published on the online teaching-learning process of Sri Lankan undergraduates during the Covid-19 pandemic had been reviewed to explore whether the researchers have strived to establish learner autonomy among them. At present, the Sri Lankan teaching-learning process has been endowed with technological sophistication to a considerable level but still, the attitude of the learner and the teacher towards self-regulated learning or emergency remote teaching has not been positive enough. Since online teaching and learning have become inseparable elements in the current education process, most academic institutions and learners prefer to resort to their programs online. But, teaching and learning an undergraduate study program online needs many skills for the teachers and the students alike. Apart from that, the learning environment, curriculum, conducting assessments and examinations, and evaluating the answers should align to achieve the expected outcomes of online learning. The articles written based on the impact of Covid-19 on higher education have discussed more challenges but fewer opportunities for establishing learner autonomy. It has been notably inconclusive in many articles about learner autonomy. The review revealed that the educational authorities should take necessary steps to train the academic staff, revise the existing curriculum and introduce new assessment methods to improve learner autonomy among Sri Lankan undergraduates.

Keywords: Covid-19-Pandemic, online teaching-learning, learner autonomy, review paper, Sri Lankan undergraduates

1. INTRODUCTION

Educational institutes throughout the world had been shifting or planning to shift from traditional teacher-centered learning (TCL) to student-centered learning (SCL) (Kashefian-Naeeini and Kouhpeyma, 2020). Over the past few years, Sri Lankan private and public sector tertiary educational institutes have also been trying to promote SCL (Navaz, 2014). Since the time the

educational system had got established in the local social structure, the teaching-learning process has been dominated by the teacher (Moscolo, 2009). It has been noted that most of the teachers do not have a comprehensive understanding of the nature and the advantages of the SCL (Kashefian-Naeeini and Kouhpeyma, 2020), and the students, on the other hand, prefer to depend largely on the teacher (ibid.). Therefore, some researchers have found that both are equally important in the educational context (Emaliana, 2017).

The SCL has been defined by different scholars and the common understanding is that the learner is responsible for what he is learning. What s/he should learn, how s/he should learn, and why s/he should learn are to be decided by the learner (Hannafin, 2012). It never means that in SCL, the teacher is absent or passive, the teacher has to act as a facilitator when and where necessary. The selection of resources, goal-setting, and goal-getting are at the discretion of the learner. During this process, the learner is allowed to evaluate his strengths and weaknesses and to take remedial measures to learn what he likes most by enjoying the process rather than suffering through the forced learning that s/he dislikes.

The TCL has not been in high esteem in academic and scholarly circles due to its many drawbacks (Nurjannah et al, 2017). The teacher dominates the class and designs the instructional material and the learner has less freedom and scope for creativity. So, modern-day educationists propose and practitioners prefer to practice SCL. In this context, the outcome is learner autonomy (LA). Heloc (1981), the pioneering scholar in promoting the concept, mentioned that LA is '*the ability to take charge of one's own learning*' (p.1). Little (1991) mentions the three main advantages of LA. Learners who participate in the decision-making process have the advantage of short-term and long-term achievements in learning. Second is that the responsibility the learners take makes them stronger in the learning process. Finally, the learner can utilize this autonomy in his entire life span even when he is out of the learning process.

The sudden shift to emergency remote teaching (ERT) due to the impact of the Covid-19 pandemic on education posed many challenges to all the stakeholders related to education (Mohmmed et al, 2020). The institutes have been closed, the learners were deprived of access to libraries, and zero co-presence with peers. In such an environment of learning, the learner has to cope with all the challenges in the teaching-learning process. But in the Sri Lankan context both the teacher and learner have been accustomed to an environment where all parties are present physically. The absence of peer and collaborative learning had many direct and indirect impacts on moderate and weaker learners.

Objectives

The review was conducted to achieve the following main objective through its associated specific objectives. The main objective of the article was '*to evaluate whether online learning and teaching*

fostered LA among Sri Lankan undergraduates during the pandemic'. The specific objectives that facilitated the main objective could be mentioned as follows.

- to ascertain the nature of online learning and teaching that had taken place during the pandemic
- to assess the challenges and opportunities encountered by the learners and teachers during the pandemic
- to evaluate whether there had been a space for learner autonomy to be developed among the Sri Lankan undergraduates

2. METHODOLOGY

2.1 Research Design

In this review paper, the main objective was to understand how the transition from TCL to SCL during the pandemic had created a positive environment for LA. Even though there is no specific definition of what is a review paper (Balon, 2022), the attempt was to assess the nature and the scope of the published material concerning the outcomes of Sri Lankan undergraduates' learning through online mode. The topic had been in academic circles for a long time and it was expected to generate a sound discussion on the LA because the present context demands a higher degree of autonomy from the learner. A critical analysis of the findings of the articles was aimed at the opportunities and challenges the learners and the teachers encountered.

2.2 Population, Sample and Data Collection

In compiling this review paper thirteen articles written by Sri Lankan authors and two ADB Policy Briefs published from 2020 to 2022 had been considered other than the textbooks and journal articles that provided the definitions and information needed for key terms used in the article.

2.3 Analytic Strategy

All the articles had been carefully read before classifying the titles according to the year and the author(s). Then, those were classified according to the discipline, and the online or ERT had been mentioned. The challenges of the teachers and the learners mentioned had been documented while the opportunities had been recorded similarly. It was assessed whether the article's opinion on LA was developed or vice versa.

3. RESULTS

After reviewing the selected articles the following elements have been found out with the title.

Table 1 – Summary of the titles of the articles

Title	No. of articles
Impact/minimizing the impact of Covid-19 on the higher education sector in Sri Lanka	4

Adapting to online learning in the higher education sector in Sri Lanka	1
Student perception/satisfaction with online learning during Covid-19	3
Factors influencing online learning during the Pandemic	1
Knowledge, attitudes, and practices of SL undergraduates during the Covid-19 pandemic	1
Psychosocial, economic, and environmental impact of Covid-19	1
Perception of university academics	1
Challenges, opportunities, and experiences of University Students	1
Total	13

Source: Compiled by the authors

Based on the above titles, it was understood that the authors were interested in various aspects of the impact of Covid-19 on the higher education sector in Sri Lanka. All of them have studied the impact of Covid-19 on online teaching and learning whereas the priority had been given to the learner. There had been only one article that has been written from the perspective of the teacher. Challenges and opportunities have been discussed in general in many articles but there had not been any article that directly discusses the propagation of LA. The crucial factor in online learning is that there is less interaction between the learner and the teacher compared to traditional, on-site learning. Therefore, instilling the skills to generate LA is a must.

Table 2 – Summary of the institute, discipline, sample, and the method used

Article no.	Institute	Discipline	Sample	Method
1	One state university	Not specifically mentioned	120 students from all faculties	Quantitative
2	Undergraduates from various countries including Sri Lanka	Not specifically mentioned	2000 from 13 different countries majority from Sri Lanka	Online questionnaire – quantitative
3	Public and private university undergraduates in Sri Lanka	Not specifically mentioned	900 undergraduates	Survey – quantitative [but the title mentions a case study]

4	Three state-owned universities	Humanities and Social Sciences	1376 undergraduates	Survey – structured questionnaire quantitative
5	One state university	Representing all faculties	14 undergraduates	Qualitative semi-structured interviews
6	One state university	Management	30 undergraduates	Qualitative semi-structured survey questionnaire [thematic analysis]
7	Both public and private sector Universities / educational institutes	Management	359 undergraduates	Quantitative Structured questionnaire
8	One state university	Dental Science undergraduates	246 undergraduates	Quantitative Structured questionnaire
9	All the universities	A general analysis	Not mentioned	Qualitative - a literature review
10	Six state universities	Engineering students	367 undergraduates	Quantitative Structured questionnaire
11	Not specifically mentioned	Not specifically mentioned	39 research papers and reports	Qualitative Review article
12	Lecturers of State Universities	Not specifically mentioned	337 lecturers from different state universities	Quantitative Structured questionnaire

13	Three state Universities in Sri Lanka	Different fields of study	657 undergraduates	Quantitative Structured questionnaire

Source: Compiled by the authors

4. DISCUSSION AND IMPLICATION

Irrespective of the aspect that has been discussed, all the authors believe that the online teaching-learning process will be a must in the future. Even though the pandemic is over, online teaching and learning can be continued because of its advantages. The articles summarize the common challenges the learners face under different categories such as technical, economic, personal [psychological, cognitive], educational, instructional (Haththotuwa & Rupasinghe, 2021), and even environmental (Menike, 2022). Other than the common features, the prominent factors were the inability to get adjusted to the new learning style (Madhuwanthi et al, 2021; Sriyalatha & Kumarasinghe, 2021), the unsuitability of the curriculum (Arachchige et al, 2021; Sriyalatha & Kumarasinghe, 2021), and the testing or evaluating patterns (Hettiarachchi et al, 2021; Rameez et al, 2020). The challenges for the teachers were the common factors that any article mention, but the critical ones are the inability to develop new instructional materials and delivery styles (Khashunika et al, 2021), designing new tests and evaluation methods (Madhuwanthi et al, 2021), and providing feedback after marking (Hettiarachchi et al, 2021). The decisive one was the lecturer's inability to counter the fraudulent activities the learners engage in submitting their answers (Wijewardene, 2021).

Even though online teaching and learning have generated more challenges than opportunities, there are many opportunities for the learners and the teachers to exploit. Both teachers and learners can save time, enjoy flexibility, work at their own pace, learn the latest developments in global technology, use the stored material for later references, familiar with new testing and evaluation methods, improve different types of hard and soft skills, and the connectivity to the global knowledge base (Khashunika et al, 2021; Rathnayaka et al, 2022). Both the teachers and the learners can use the opportunity to enhance their innovativeness. Educational administrators also have the challenges to provide the necessary human resources and the infrastructure facilities to promote online learning and teaching (Wijekoon et al, 2021). Respondents have suggested skills enhancement programs (Rameez et al, 2020) while the authorities have been accused of poor institutional contribution (Arachchige et al, 2021).

The majority of the authors of the concerned articles had been expressing their concerns over the learners' preferences for hybrid

mode, blended learning (Illangarathna et al, 2022; Rameez et al, 2020, Rathnayaka et al, 2022). Though many aspects have been the subject of discussion, two notable elements are worth a detailed discussion. The first is making a comprehensive policy framework for online teaching and learning. Many universities may have taken steps through quality assurance units, but it has not been the topic of any of the articles. There should be a common policy framework for all the public and private sector higher educational institutes to follow to avoid unnecessary inequalities. The second is the propagation of LA. Though this has been mentioned indirectly, no article has taken any initiative to discuss the importance of LA in this context. Every learner should be made an autonomous learner for him or her to achieve the best outcomes for his or her efforts.

5. LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

When going through the articles selected for review, it was identified that most of the Sri Lankan state universities have not been represented. The authors presume that both private and public universities should be studied with equal merit. The diversity of the subject fields also has not been represented well. There are differences in online teaching and learning because some disciplines demand more than other disciplines in teaching, assessment, and supervision, especially the subjects with a practical component in laboratories or fieldwork. The samples do not represent the population of the Sri Lankan public and private sector undergraduate cohort and there are some issues regarding the selection of the methods. Researchers have opted for quantitative mostly whereas qualitative analysis could provide better insights into the challenges and opportunities of the concerned population.

6. CONCLUSION

In concluding the review, the authors would like to answer each specific objective formulated at the beginning of this study. According to the articles, all the educational institutions in the country including schools, vocational training centers, state universities, and private educational institutes have taken the necessary steps to introduce online learning to facilitate the learning of their students. They have introduced technical facilities to provide connectivity to strengthen the uninterrupted teaching-learning process. The teachers have been given training at the initial stage to start and there had been regular training and development to empower the teaching-learning processes. Despite the irregularities faced at the beginning, by now the majority of the Sri Lankan educational institutes are equipped with the required human and physical resources. The students and the teachers are conversant enough to run their study programs without disturbances.

The challenges the teachers and the learners have faced were innumerable because the majority of Sri Lankans belong to lower-income families (Hayashi et al, 2020 & Hayashi et al, 2022). Affordability has been

the prime question whereas adaptability to the new system too was challenging (Arachchige et al, 2021; Haththotuwa & Rupasinghe, 2021; Illangarathna et al, 2021; Madhuwanthi et al, 2021; Rameez et al, 2020). Even though the digital literacy of the population, at least among the academic community, is not at a higher level (Hayashi et al, 2020), the learners, teachers, and institutions have been managing the tasks at a satisfactory level.

There is a question of whether the Sri Lankan academic community and the general public have grabbed the opportunities gifted by the pandemic to enhance their academic endeavors, and the authors have mentioned that the situation is satisfactory but not up to the expected standards (Rathnayaka et al, 2022). The suggestions given in many conclusions highlight the importance of proper exploitation of the opportunities granted by the pandemic. As a Third World country with low digital literacy and a high digital divide (ibid.), this has been a remarkable opportunity to get its technical and technological shortcomings solved (Illangarathna et al, 2022). All the stakeholders have to launch an all-inclusive, comprehensive program to bridge the knowledge and capacity gaps in the educational structure.

The main objective of reviewing the articles published on online teaching and learning during the pandemic was to find out whether there has been any space to create and establish LA among Sri Lankan undergraduates. As learning has been mainly supported by technology in the current century, the role of the teacher is fading. So the learner has to take more responsibility for his learning whereas traditional spoon feeding is out of context. Even though the use of social media had been on the rise, there has not been a significant study to see among these articles during the concerned period that discusses the promotion of LA.

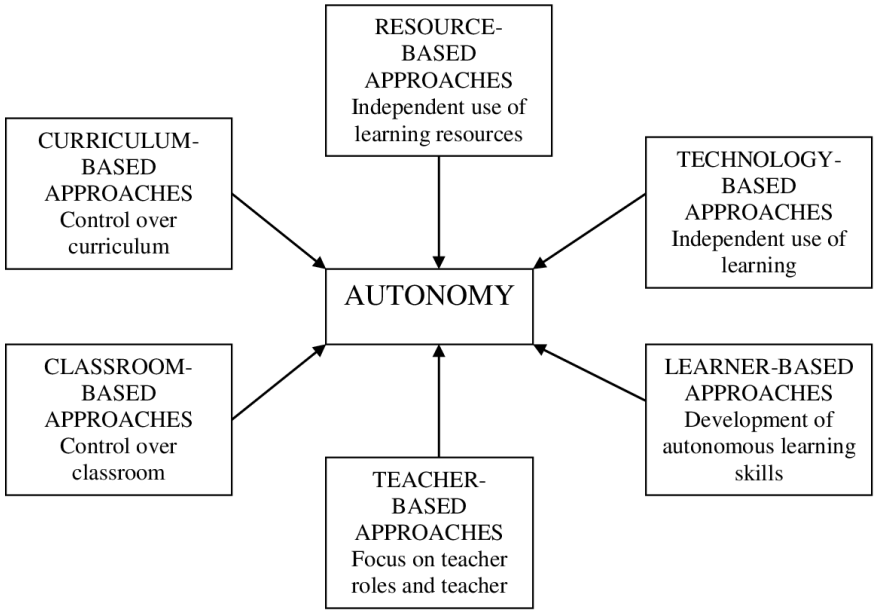
As all the parties related to teaching and learning agree, an autonomous learner is extremely an asset even to the teacher, peers, and the discipline. When autonomous learners are there the teacher's burden in the process is less. In a heterogeneous class, the weaker and the moderate students' learning can be facilitated by him. He will bring new ideas to the class and new problem-solving methods, critical thinking, and a higher level of innovativeness. While the teacher's role is also supported, the autonomous learner will provide a challenge to the teacher to be better equipped to deliver the session with knowledge and skills. But none of the articles selected have been developing any discussion on LA in its content.

Recommendations

It has been noted that LA has been a common topic among the Sri Lankan academic community, especially, those who are in the fields of Linguistics, Education, Teaching English as a Second Language [TESL], and the lecturers in the Department of English Language Teaching [DELT]. But the academic community members who represent other disciplines seem to have less knowledge of LA. Therefore, it is recommended that all the members of the

academic community from school level onwards should be given thorough training on LA. For example, the different approaches proposed by Benson (2001) cited in Kashefian-Naeeini and Kouhpeyma (2020) to foster LA can be utilized.

Figure 1 - Autonomy in language learning and related areas of practice



Source: Benson, P. (2001, p.112)

Even though this has been proposed in the context of language learning, the same could be introduced to other disciplines as well. The six different approaches cover all the areas that we have in the teaching-learning process. Therefore, the teacher can facilitate his delivery of the knowledge by understanding the limitations of the context and the strengths and weaknesses of the learner community. The integration of all the approaches would inevitably provide a better environment for the learner to survive first, perform next, and finally, sustain all his skills and capacities to succeed in his learning environment and beyond.

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Utilizing Metaverse as an Advanced Pedagogical tool to Enhance Student's Experiential Learning

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ABSTRACT

Rapid technological advancements have enabled diverse alternative technical solutions to effectively facilitate digital education. This research study aimed to explore the potential of utilizing the Metaverse as an advanced pedagogical tool to enhance students' experiential learning in an immersive way. Traditional teaching methods, focused on theoretical concepts, have been limited in accessibility and failed to cater to individual learning styles. In contrast, the Metaverse offers an immersive and interactive learning experience that can increase student engagement and provide access to various resources, allowing students to apply their knowledge in simulated real-world scenarios. By offering a personalized learning experience tailored to each student's learning style, the Metaverse has the potential to revolutionize education in the 21st century.

The concept of the Metaverse was first introduced in Neal Stephenson's sci-fi novel, Snow Crash, published in 1992. In the novel, characters transformed into symbols and interacted within a three-layered virtual world called the Metaverse. This virtual reality, which exists beyond reality, encompasses a collection of developing virtual and augmented reality technologies, offering a more vivid experience compared to the current internet. To assess the readiness of learners, teachers, and stakeholders to integrate the Metaverse into the education system, and to develop a model for creating a simulated education platform, this study employed a mixed research approach. Quantitative and qualitative methods were used, including a list of questions given to selected students to determine the impact of the Metaverse on their learning, participant observations, focus group interviews, and thematic analysis of the qualitative data. The study's findings revealed a significant enhancement in learning after interacting with the Metaverse, resulting in an average increase of 72.83% in grades. These results provide strong evidence that incorporating the Metaverse into virtual education platforms has the potential to revolutionize education and improve student performance. In conclusion, this research study aimed to shed light on how the Metaverse can be utilized to enhance students' experiential learning in an immersive manner and assess the education system's readiness to integrate it into the learning environment. The findings of this study have the potential to revolutionize education in the 21st century by leveraging the capabilities of the Metaverse.

Keywords: Metaverse, Experiential Learning, Digital Education, Pedagogical tool

1.INTRODUCTION

The aim of this research study was to explore the use of the Metaverse as a means of enhancing student experiential learning. Experiential learning is a dynamic process that involves students learning by doing and reflecting on their experiences. This can include a range of activities, such as hands-on laboratory experiments, internships, practicums, field exercises, study abroad, undergraduate research, and studio performances (Takyar, 2022b). Well-planned, supervised, and assessed experiential learning programs can stimulate academic inquiry, promote interdisciplinary learning, civic engagement, career development, cultural awareness, leadership, and other professional and intellectual skills.

Experiential learning is characterized by four key elements,

1.Reflection, critical analysis, and synthesis;

2.Opportunities for students to take initiative, make decisions, and be accountable for their results;

3.Intellectual, creative, emotional, social, or physical engagement;

4.A designed learning experience that allows learning from natural consequences, mistakes, and successes.

Kolb's learning cycle (Takyar, 2022b) illustrates the experiential learning process, which involves the integration of three elements: knowledge, activity, and reflection. The knowledge element involves the concepts, facts, and information acquired through formal learning and experience, while the activity element involves the application of knowledge to a real-world setting. Finally, reflection involves the analysis and synthesis of knowledge and activity to create new knowledge. In traditional education, classrooms are often teacher-cantered, where the teacher is the source of authority, downloads information to students, and assesses their regurgitation of the information on a test (Ruhl,2020).

However, the National Education Association has identified four essential 21st-century skills that children should learn: critical thinking, creativity, communication, and collaboration (Chiruguru & Chiruguru, 2020). These skills will be in demand and rewarded in the 21st century. This experimental study utilized the Metaverse to allow students to learn classroom characteristics by choice, where a range of activities were available to students designed to meet their diverse learning styles. Students engaged in hands-on experiences, and collaboration involved communication, teamwork, critical thinking, and problem-solving. The author of a published article and TED speech, Joe Ruhl, emphasized that the brain is wired for the five Cs, which are critical thinking, creativity, communication, collaboration, and choice (Takyar, 2022b) Authentic learning can happen when students are allowed to engage in these five Cs.

In this research, the author suggests that a classroom setup based on the five Cs requires a shift from a teacher-cantered classroom to a student-cantered one. As Albert Einstein said, "education is not the learning of facts, but the training of the mind to think" (Takyar, 2022b) Thus, it requires teachers to remove themselves from the front and centre and become more of a facilitator, providing

opportunities to teach, coach, mentor, nurture, and inspire. The study was well-organized, with a consistent discipline to achieve the learning outcomes. Effective use of Metaverse, an immersive virtual technology, allowed for the stifling of creativity, motivating students to get inspired and involving themselves in the classroom in student choice, collaboration, communication, critical thinking, and creativity.

The study used the Metaverse as a pedagogical tool to create a new educational environment space for students to learn, collaborate, and experience a higher degree of freedom to create and share, providing new experiences and high immersion through virtualization (Ruhl, 2020) The Metaverse is a three-layered virtual environment that combines the real world with virtual space and reality, venturing into virtual space (Bass, R. 2012)The Metaverse elements are attractive in making interaction with exercises. All in all, one's genuine self relates to assets in the Metaverse. Moreover, the expression "metaverse" alludes to "a universe wherein virtual and genuine universes interface and co-advance, and where social, monetary, and social exercises are done to create esteem (Bass, R. 2012)." The Metaverse can likewise allude to a world wherein day-to- day existence and financial exercises are done in an assembled way; furthermore, the Metaverse can allude to a world where day-to-day existence and monetary exercises are taken care of in a bound together way.

2. LITERATURE REVIEW

Overview of the prior studies conducted similarly providing an emphasis on selected dimensions of investigating the various ways in which Education will embrace the metaverse and explore the seven layers of the metaverse to achieve experiential learning in Education, which are dependent variables of this study. discusses the concept of Metaverse in Education, its definition, framework, features, and potential applications. The Metaverse is not just a new entity for VR or AR, but a collection of emerging technologies such as 5G, AI, VR, AR, and digital twins Internet of Things. The article proposes a seven-layer model to describe the value chain of the Metaverse market from the experiences people seek out to the enabling technologies that make it possible. The Metaverse in Education can be regarded as an educational environment enhanced by metaverse-related technologies that fuse with the virtual and real educational environment elements. It enables learners to use wearable devices to enter the educational setting without being limited by time and location. The framework of the Metaverse in Education includes essential components such as hardware, software, and content, and methodologies such as user interaction, implementation, and application. The review also describes the potential use cases of the metaverse in education, including social experiences, immersive commerce, digital assets, and decentralized learning.

Challenges in Metaverse in Higher Education

In his article, the associate professor of philosophy and director, applied ethics

centre, UMass Boston, discusses the challenges of using the metaverse as an advanced pedagogical tool to enhance student experiential learning. The Metaverse is a series of emerging virtual and augmented reality technologies that offer a more immersive experience than the current internet. The article highlights five challenges that need urgent attention, namely academic freedom, focus, communication, a sense of community, and digital divides. Academic freedom is essential in the academy to express scholarly perspectives without fear of repression or punishment. In the Metaverse, it is crucial to solve the problem of giving social media companies veto power over the topics that students and faculty can discuss. Attention to what is going on in class is necessary for successful learning, and designers must ensure that the metaverse does not exacerbate the obstacles to classroom focus. Effective communication is critical to the success of virtual learning environments, particularly in discussion-heavy courses like humanities. The sense of community is also an essential aspect of university life, and designers must pay attention to the materials to reproduce the feeling of community in the metaverse.

Lastly, governments and educators must consider whether the metaverse will make universities more accessible or create a new digital divide between the elites and those who cannot afford traditional schooling. Despite these challenges, if the metaverse takes off and these issues are solved, it may offer colleges a new way to exist.

The objective of this study is to enhance student experiential learning by leveraging the metaverse as an advanced pedagogical tool, increasing student engagement and participation and to leverage the immersive and interactive nature of the metaverse as an advanced pedagogical tool to facilitate student experiential learning, resulting in improved understanding of complex concepts.

3. METHODOLOGY

3.1 Research Design

This study implements a mixed-method research design to explore the association between qualitative and quantitative forms of data. The research design encompasses both qualitative and quantitative approaches, allowing for a comprehensive examination of the impact of utilizing the Metaverse to enhance student experiential learning.

To begin the exploration, one-to-one interviews were conducted as a primary method of data collection. These interviews aimed to gather in-depth insights and perspectives from participants. Additionally, quantitative methods such as structured observations and questionnaires were utilized to assess the impact of the Metaverse on student experiential learning. Summative assessments were employed to evaluate student performance.

3.2 Population, Sample and Data Collection

The population for this study consists of educational institutions involved in digital education. Multiple sources were used to collect data, including secondary data sources obtained through a literature review. Primary data was collected through face-to-face interviews and questionnaires. The sample selection involved carefully choosing

participants who had direct experience with the Metaverse and were willing to share their insights.

The data collection procedure involved conducting one-to-one interviews to gather qualitative data. Questionnaires and structured observations were used for quantitative data collection. The researcher ensured that the privacy and confidentiality of participants were maintained throughout the data collection process.

3.3 Measure

The study utilized various measures to assess the impact of the Metaverse on student experiential learning. These measures included qualitative data obtained from interviews, as well as quantitative data collected through questionnaires and structured observations. Summative assessments were employed to evaluate student performance.

3.4 Analytic Strategy

Thematic analysis was employed as the primary method of data analysis, given the qualitative-dominated approach of this study. This involved identifying and analyzing patterns, themes, and key findings within the qualitative data. Additionally, statistical analysis was performed to validate the data and enhance the study's reliability. The researcher manually reviewed the data using Microsoft Excel to correct any errors before exporting it to SPSS for statistical analysis.

3.5 Ethics and Human Subjects Issues

To ensure ethical considerations, the researcher implemented measures to protect the data and maintain participant confidentiality. Raw data was securely stored in a fire-proofed, locked drawer, and all processed information was password-protected on the computer, external disks, and flash drives. Data sharing with any unauthorized individuals was strictly prohibited. Participants were fully informed about the study and voluntarily agreed to participate without any harm or coercion.

4.RESULTS

The aim of this study was to explore the potential of utilizing the Metaverse as an advanced pedagogical tool to enhance student experiential learning. A mixed-method research design was employed, incorporating both qualitative and quantitative approaches to test and validate the data.

In the first stage of data collection, qualitative interviews were conducted with students, teachers/facilitators, and experts to determine the potential of using the Metaverse in virtual education platforms. A purposive sampling technique was utilized, resulting in a sample of 60 participants from the first year of the University of Kelaniya's Faculty of Computing Technology. The independent variable, the use of the Metaverse, was manipulated to measure its effect on the dependent variable, the students.

The second stage of the study involved an in-depth evaluation to identify the necessary approaches and modifications for incorporating the Metaverse into virtual learning platforms. This was accomplished through interview techniques and participant observations. An in-depth interview was conducted with John Kelly, an expert in using the Metaverse in the classroom and the director of Colegio Ikigai bilingual school in

Mexico City. Participant observations and focus group interviews were also utilized to analyze behavior and gather insights in a natural setting.

Thematic analysis and statistical analysis with a coding system were employed to analyze the data gathered from interviews and participant observations.The findings of the study revealed that while the use of the Metaverse in virtual education platforms had gained significant interest and provided effective results in developed countries such as the United Kingdom, Australia, and the USA, it was still a novel model in Sri Lanka. The qualitative data collected in the first stage of data collection supported the potential of using the Metaverse as an advanced pedagogical tool to enhance student experiential learning.

Table 1: Descriptive statsistics: Average enhancement

		Statistics	
	Before interacting with metaverse		After using metaverse in the learning platform
N	Valid	60	60
	Missing	0	0
Mean		33.83	72.83

The above analysis shows that there is an average increase of 72.83% in the grading. Thus, representing the significant

The study included a sample of 60 students who had previously obtained low marks, and a test was administered to analyze the impact of using the Metaverse in the virtual learning platform on their grades. As illustrated in the table 1 and 2 the results showed an average increase of 72.83% in grades, indicating a significant improvement in performance after interacting with the Metaverse. Moreover, 40 students (60%) achieved marks of 80 or above after using the Metaverse. The study concluded that integrating the Metaverse in the learning context has a significant positive impact on student engagement and learning outcomes, particularly for students who struggle with learning engagement and obtaining low marks.

The statistical analysis of the evaluation comparison of the sixty students who got low marks previously.
improvement of the grades after using metaverse in the learning platform.

Table 2: Marks obtained before and after interacting with the metaverse in the virtual learning platform

Before interacting with metaverse		Valid Percent	Cumulative Percent	After using metaverse in the learning platform		Valid Percent	Cumulative Percent
Valid	10	3.3	3.3	Valid	40	1.7	1.7
	20	15.0	18.3		50	18.3	20.0
	30	21.7	40.0		60	13.3	33.3
	40	60.0	100.0		70	13.3	46.7

				80	36.7	83.3		
				90	3.3	86.7		
				100	13.3	100.0		
	Total	100.0			Total	100.0		

The study found out that using metaverse in the virtual learning platforms had a significant positive impact in terms of the effective student engagement leading to effectively achieve the learning outcomes. Thus, had a significant improvement of the marks obtained. This study found an interesting finding that is integrating metaverse in the learning context has a significant positive impact on the students who had issues with learning engagement and had obtained lowest marks.

5. DISCUSSION AND IMPLICATION

5.1 Theoretical Implications

The findings of this study provide evidence that the use of the Metaverse in virtual education platforms has the potential to enhance student experiential learning. The qualitative data collected indicated that the Metaverse could be utilized to develop students' interest in subject matters and discover new knowledge from their perspective. The incorporation of the Metaverse in virtual learning platforms encourages critical thinking, problem-solving, and knowledge sharing among students. These theoretical implications highlight the importance of leveraging advanced pedagogical tools to create immersive and interactive learning experiences that cater to individual learning styles.

Several studies have indicated the need for continued investigation in this area. For example, Dwivedi et al. (2022) found that incorporating immersive virtual reality technology, including the Metaverse, into higher education positively impacts student learning outcomes. Zhang et al. (2022) conducted a study exploring the effectiveness of using the Metaverse in language learning and found that it enhances students' language proficiency and promotes collaborative learning. However, there is still a need for further research to fully understand the long-term effects of using the Metaverse in different educational settings and address ethical concerns related to privacy and data security.

5.2 Practical Implications

The practical implications of this study underscore the potential benefits of integrating the Metaverse into virtual learning platforms. By leveraging the immersive and interactive nature of the Metaverse, educators can foster student engagement, improve learning outcomes.

6. LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

The Metaverse has infinite potential as a new social communication space. The Metaverse is predicted to change our daily life and economy beyond games and entertainment. Some of its limitations may be weaker social connections and the possibility of privacy impingement.

Future tasks for educational use of the Metaverse include the following:

1. Teachers should carefully analyze how students understand the Metaverse.
2. Teachers should design classes for students to solve problems or perform projects cooperatively and creatively.
3. Educational metaverse platforms that prevent misuse of student data should be developed.

7. CONCLUSION

In conclusion, utilizing the metaverse as an advanced pedagogical tool can enhance student experiential learning by providing a fully customizable and interactive classroom setting with virtual worlds, avatars, and games. This approach enables effective student engagement and collaborative learning, which are essential 21st-century skills. The development of infrastructure is crucial for the successful implementation of metaverse in virtual learning platforms.

The study also highlights that virtual training and immersion in games can significantly increase engagement in learning activities and lead to the achievement of intended learning outcomes.

The use of metaverse in the virtual learning context holds great potential for enhancing remote growth opportunities for 21st-Century Education, which is essential in the rapidly evolving digital age.

Based on the findings of this study, there are several recommendations for future studies related to the integration of metaverse in virtual learning platforms to enhance student experiential learning.

Firstly, future studies should focus on incorporating different subject areas to provide a more generalized context for the findings. This would enable a more comprehensive understanding of the impact of using metaverse in different educational settings and subject areas.

Secondly, there is a need for further evaluation of the use of games and other simulation techniques to provide students with hands-on experience in their learning. This can enhance student engagement and promote active learning.

Thirdly, future research should focus on identifying the most effective pedagogical strategies for utilizing metaverse in virtual learning platforms. This can help in the development of guidelines and best practices for educators to follow when integrating metaverse in their teaching.

Lastly, there is a need for long-term studies to evaluate the sustainability and long-term impact of utilizing metaverse in virtual learning platforms. This can provide insights into the effectiveness of metaverse in improving student learning outcomes and can inform decisions related to the adoption of metaverse in educational settings.

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Insights of Student-Centered Learning and Teacher Satisfaction: Lessons Learned with First-year Undergraduate Students.

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ABSTRACT

As presented in various research studies, transferring from teacher-centered learning to student-centered learning creates significant benefits for the student's achievements as well as teacher satisfaction. This paper presents insights from the application of a student-centered learning approach with first-year undergraduate students of the University of Kelaniya. Since they are new to the university environment and have no prior experience in this environment, it was easier to introduce this new approach to the first-year students. This paper explains many initiatives as how the new arrangements were introduced to the traditional classrooms, practical instructional materials, simple learning resources, in advance preparation of the teacher for the lesson, prior exercises before the class, and involvement of ICT tools in the teaching-learning process, which made the learning exercise interesting to the students. The lessons learned from classroom management, lesson planning, lesson delivery and instruction support were discussed. And the students' engagements in terms of knowledge transferring from high learning profiles to low learning profiles, knowledge sharing with each other, knowledge retention, lasting experiences and learning as an enjoyment were indicated as results. Teacher satisfaction is high in this transformation, and it is regarded as the most precious gift they earned in this profession. Further challenges faced were discussed with some operational suggestions.

Keywords: Classroom management, Student-Centered learning, teacher-centered learning, teacher satisfaction, traditional teaching

1. INTRODUCTION

With the purpose of improving the relevance and quality of higher education in Sri Lanka, many changes have been introduced to the curricula, teaching and learning process, assessments, classroom management and staff development initiatives. Different grants were provided by the world bank and other funding agencies in this regard. This essay presents some classroom innovations and student-centered learning (SCL) strategies that were introduced to "the year one students of the B.B.Mgt. Accountancy (Special) degree program". As we introduced the SCL approach with the newly introduced curriculum, which was designed with more concentration on SCL approach, we are expected to change the teaching methodology.

Many studies highlighted that teacher-centered learning (TCL) is the main mode adopted in current courses in universities(Blumberg, 2012; Froyd & Simpson, n.d.; Sadeghi et al., 2014) and however, it is accepted that the traditional teaching mode cannot fully stimulate the learning initiatives and enthusiasm of students and is also not conducive to cultivating their innovative thinking ability(Brown, 2011). It was found that the complete adaptation of TCL inhibits achieving the teaching goal (Kaput, 2018). The classrooms at the university level are extremely instructor-centered, and this situation works against students becoming successful as mature learners. Many instructors understand this situation and try to change their teaching method towards a more student-centered direction. Year one students are coming just finishing their school education, and they are more familiar with TCL styles. When they start their university education, unless the system does not introduce changes to the teaching-learning process, the intended learning outcomes may not be achieved. Finally, the outcomes expected by the country through the universities are not met since the economy needs more reflective, corporative, risk-taking, flexible and self-directed graduate profiles. The traditional teacher-centered learning styles make the students passive recipients of knowledge, which seem today to be more idealistic. The concerns of educators today are much different because the industry requirements are more diverse. The potential effects of instructional systems today must emphasize active learning, higher-order thinking and responsibility to learning where the knowledge is co-constructed by the mutual engagement of the teacher and the student(Garrett, 2008). Constantinou et al.(2020) identified that SCL affects not only academic learning but also other social skills, such as active participation in group activities, professionalism, respecting others' views, tolerating others', mutual trust etc. Therefore, SCL requires a holistic view of the learning and development of students (Constantinou, 2020).

The objective of this paper is to share the experience obtained by application of SCL strategies with the year one student of the B.B.Mgt Accountancy (Special) degree program. We worked as a group and conducted SCL sessions for the first-year students. The average number of sessions we had using SCL techniques was six. There are four aspects of SCL strategies discussed in this short essay. At the same time, how the students perceive the new transformation and teacher satisfaction towards SCL is also presented. Classroom management, lesson planning, lesson delivery and assessments are the four main areas of experience explicitly given in this essay.

2. IMPLEMENTATION OF SCL PRACTICES

2.1.Classroom Management

Classroom management is a multi-faceted concept that ranges from the organisation of the physical environment, the establishment of rules and routines, the development of effective relationships and the prevention and responding the misbehaviors of students(Brown, 2011). The existing classroom was prepared as a traditional lecture theatre where the teacher plays a dominant role in front of the class, reserving more space for the teacher. The whiteboard and the multimedia

projector connected to a laptop are the main instruments used in the classroom. The students are silent listeners, and they talk only when the teacher poses a question.

According to my experience, we arranged the classroom in a way that suits the SCL approach and allowed the students to sit in circles instead of typical rows of desks and have significant flexibility in their schedules. The sessions were taken by a group of teachers. The group consists of at least three teachers. The establishment of a positive and supportive classroom creates a safe and welcoming space for all students and each student feels like they belong in the classroom and that their voice is heard. The teacher is a facilitator creating a culture of mutual trust, respect, and collaboration. Students are informed about the ground rules and norms of the classroom basically which results in encouraging positive peer relationships, accepting diversity, equality and flexibility in learning. We model positive behaviours setting an example to the students with respectful communication. The classroom is full of dynamic learning activities, covered by intermittent explanations by the students or sometimes by the teacher. The misbehaviours are quickly addressed by respecting individual values, so the students are directed to self-discipline. At the same time, we identify the poor learners and connect them with good or proficient learners. In this environment, the teacher walks around the classroom helping the students. Interactions occur very often and close contacts with the students encourage the students to get involved in the classroom activities.

2.2.Lesson Planning

Lesson planning is focused mainly on encouraging students to active learning, promoting collaborative engagements, and supporting the students to achieve intended learning outcomes (ILOs) beginning with lower-order skills to higher-order skills. Therefore, I prepare the lessons with extra effort to align the learning activities to specified ILOs. The lessons are well-defined, practical activities with clear instructions. There is a clear flow in the arrangement of activities. The learning activities facilitate collaborative learning incorporating more group work which encourages the student to learn from and support each other. The activities are more structured with all formats and standards. Basically, we always begin an activity with example.

There are many different types of activities which we used in SCL sessions.

I. Q&A sessions on a specific lesson.

The full lesson is divided into logical sections and the student groups are given different sections of the lesson to build questions and answers as much as possible. Then groups are paired to do a Q&A session.

II. Problem-based learning

The students are given a broad problem relevant to the lesson. The group of students can discuss, explore through web links, refer to books and even talk to outsiders to find out the solution. Relevant justifications are needed to provide with the answer.

III. Debate

The students are given a challenging topic in advance and two groups challenge each other with relevant facts.

IV. Role plays and Demonstrations

Students try out an experience created by the teacher in a stimulated situation.

V. Creating posters
Students are given instructions to study a topic and prepare a poster. This can be done with the use of web-based tools like padlet.

VI. Creating media
Students are instructed to create a video on an issue. This may be a cartoon or a video presentation.

VII. Lesson summary presentations
This is a group activity to make a presentation on the last week's lesson. This can be used at the start of the class to remind or recap the last week's session.

2.3.Lesson Delivery

At this stage, we play a very reflexive role. At the beginning of the class, we clarify the learning outcomes so that participants understand the purpose and direction of a lesson. Then share information and model of the activities that are expected to practice. Giving feedback and receiving feedback is the main task at this stage. This creates the students an opportunity to understand blurred areas and resolve confusion. The main tools are visuals, including mind mapping, flowcharts, videos, cartoons and sometimes posters. We utilize peer learning activities as well. Most of the time the groups teach to the peers and other groups are moderators. We as teachers are passive guides to the students. In the case of tough theories to teach we use stimulations or guided demonstrations with a narrated scenario. We experimented with several new teaching strategies and approaches to meet the needs of the students. A few the examples are given below.

The lesson is about leadership styles.

We gave the book chapter early via the LMS. The students were requested to read the chapter before the class. As the exercise, the students were asked to prepare a script for a mini-acting that shows the different characteristics of each leadership style. Finally, four types of leadership styles were displayed in front of the class.

The lesson is about ten managerial roles.

Before the class, the students were asked to prepare a hypothetical official diary of a manager for about one month including what may have been done each day as a manager. Then students presented their diary entries to the class about what they had done as a manager for one month. Then we pick different roles of managers in their presentation to explain the ten roles of managers.

The lesson is about how to identify intrinsic rewards and extrinsic rewards in HRM.

The students as groups were asked to prepare a crossword puzzle. The statements for down represented intrinsic rewards and the statements for cross represented the extrinsic rewards. Each group exchanged the puzzle with another group and solved it followed by a discussion.

There are some norms we used in doing these exercises. Timing is paramount important at this stage. We had a very good time plan to finish each activity on time. Otherwise, we are unable to reach the daily target and achieve the ILOs. Therefore, each step of the activity must be given a specific time, and the teacher should regulate the group activities on time.

Students are allowed to talk to each other and to move from one group to another leisurely. At the same time, the use of mobile phones, laptops and the internet are not banned. We

expected the students to be knowledge explorers with these activities. The students with their peers, use technology to access information and take responsibility for their education. We focus on cooperation among each other, not competition. In a healthy learning environment, the students work together to support and help each other. This type of environment fosters a sense of community and belongingness(Brown, 2011).

At the end of the class, it is important to provide a summary of the day's lesson by the teacher as a recap of the lesson and show them how the ILOs are achieved.

2.4.Assessments

The formative assessments often take place in the classroom. In the classroom, assessments provide good feedback for the students. We use assessment feedback for teaching as it describes knowledge contents more. In our classrooms, teacher-guided peer assessments are very common using a simple assessment rubric. As the students do not like to use complicated assessment rubrics, it should be more simple. In the case of peer assessments, a high level of transparency must be maintained to minimize the students' quarries. We used to prepare the assessment guides at the stage of developing learning activities. The ILOs play a major role in developing assessments. The assessment ensures that the learner achieves the ILOs effectively (Bohaty et al., 2016). The results of the assessments can be released just after finishing the exercise or otherwise. But due care must be paid in this instance to minimize the biases so that the students trust the fairness of assessments (Garrett, 2008).

2.5.Teacher Satisfaction with Student-Centered Learning

Teachers are always open to students' feedback. Therefore, in our classrooms, we are flexible and adaptable and help the students to grow beyond the classroom. Teachers always depend on the achievement of the ILOs on time and the level of student engagement.(Weimer, n.d.). Student-centred classrooms include students in planning, implementation, and assessments. (Froyd & Simpson, n.d.) Involving the students in these decisions will place more work on them, which can be a good thing. We try to be comfortable with changing the leadership style from directive to consultative from "Do as I say" to "Do on yours". I usually say, "Let's co-develop and implement a plan of action". According to my experience, this process makes me more comfortable in the classroom. It is a completely pleasing environment and gives me more memories of my professional life. Moreover, this allows me to get to know my students better and build stronger relationships. The relationship we build with the students is long-lasting. When students feel comfortable with their teacher, they're more likely to take risks and ask questions(Kaput, 2018). For better information, we used a teacher satisfaction survey questionnaire developed by Center for Teaching Quality (CTQ) which measures teachers' satisfaction scientifically. We measured teacher satisfaction with some modifications to the survey questionnaire. Every day just after the session we measured the level of teacher satisfaction, and we found the satisfaction score as 89% which is a great indicator for inspiring teachers' morale.

3. CONCLUSION

We discussed the benefits of student-centered learning and its implementation with first-year undergraduate students at the University of Kelaniya. The initiatives such as classroom management, lesson planning, lesson delivery, and the use of ICT tools in the teaching-learning process were explained. Implementation of SCL showed that student engagement and knowledge retention were improved, and teacher satisfaction was high. Further, we discussed the norms and practices used in a student-centered learning environment, including the importance of timing, the use of technology, and assessments using simple rubrics. In the SCL process, teachers are flexible and get the students involved in planning, implementation, and assessments. Building relationships with students is important for a comfortable learning environment.

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Development of an Active Learning Instructional Strategy to Teach Laboratory Safety for Technology Stream Undergraduates

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ABSTRACT

Laboratory safety is an essential part of laboratory instruction in academic settings as well as in industry. The integrated system that has been created over the last 15 years to educate students on the abilities required to operate safely with chemicals in the laboratory has been substantially improved by modifications and additions. Over the years, Laboratory safety has been taught in various ways, including direct instruction, student-centered cooperative methods, seminar courses, trivia games, skits, scavenger hunts, and word-search puzzles. This study focuses on developing an innovative instructional strategy to teach the topic, "Laboratory Safety". Here in, we have conducted an extensive literature review on prevailing instruction methods used to teach "Laboratory safety" in STEM fields. According to the literature, it has been indicated that current lab safety training methods are not effective in enhancing the interest of 21st-century learners. Hence, the current study proposes to use images of "*students' comic characters*" in a chemistry lab as a modern effective learning strategy for teaching safety in a laboratory. The results of our study show that employing a comic story as a teaching tool makes safety training more effective and less stressful than other teaching methods. This method of instruction is also more interesting. Further, a problem-solving session on real-world issues related to MSDS is also proposed here to improve students' critical thinking ability, communication skills, and teamwork.

Keywords: Laboratory Safety, Interactive, Methodology, Learning and undergraduates

1. INTRODUCTION

The university environment in Sri Lanka offers opportunities for academic study in Technology, Science, and Engineering safety as well as hands-on experience in working in labs and conducting independent research safely. This is crucial for undergraduates in Science, Technology, Engineering, and Mathematics (STEM) fields as laboratory safety is an essential skill expected by the industry upon their graduation.

Although lab safety is a mandatory lesson to teach for STEM students, a handful of papers have been published regarding the effective and active protocols of safety and health for chemistry curricula, and as per our knowledge, none have been reported in the Sri Lankan context. Hence, this study will focus on an interactive learning strategy that would enhance undergraduate students' interest in chemistry safety and would ensure that students secured substantial practice learning to recognize, demonstrate, and assess safe laboratory practices. The main objective of the current study is to create an interactive teaching methodology for students to learn laboratory safety. This approach should be more appealing than conventional teaching methods and shouldn't be lethargic for students.

2. LITERATURE REVIEW

By incorporating interactive learning strategies into laboratory safety courses, educators can create an engaging and immersive learning experience that enables students to develop a solid understanding of safety protocols, critical thinking skills, effective communication, and the ability to handle safety challenges in real-world laboratory environments

Several accidents have taken place in laboratories and industry due to lack of knowledge on laboratory safety, such as Angji's death (Kemsley, 2009), the death of Michele Dufault at Yale University (Van Noorden, 2011), the explosion causing significant injuries to Preston Brown at Texas Tech (Ménard & Trant, 2020), a gas leak at the national university of Singapore (Schmidt, 2018), the mishandling of a drum of radioactive material (Cournoyer et al., 2016) and a sucrose-acid explosion at an unnamed university (Phifer, 2014). Therefore, it is mandatory to empower students with relevant knowledge to avoid/minimize these tragic accidents in laboratories. The science of safety and laboratory risk assessment must therefore be covered in STEM undergraduate curricula and educators must acknowledge and integrate safety as an institutional value from the freshmen level. (Fivizzani, 2016), (Augspurger &, Amanda, n.d.)

Safety lessons are typically offered to students with a brief explanation about why they are in place and what hazards they aim to address to respect the safety concerns that arise in undergraduate laboratories. There have been numerous requests for safety training to be more effectively incorporated into the undergraduate curriculum. Over the course of nearly 25 years, educators have employed a variety of techniques to teach laboratory safety to university students. The most commonly used approach to teaching laboratory safety is through a lecture followed by a safety information sheet (manual), which are considered as "teacher-centered activities" with a minimum engagement of the students. Despite years of implementation, these efforts were not enough to convey the needed level of safety awareness. Then certain universities have introduced training in laboratory safety. For example, Jchas et al. have reported a new approach, where students have to follow a

short course and a quick test on the content before enrolling in their first chemistry class. The student must pass a safety test with a passing grade (80%) to move on to the next laboratory course in the curriculum; otherwise, they must retake the safety course (Crockett, 2011).

In another study, Reniers et.al has reported that certain intervention sessions on laboratory safety resulted in improvements in (self-reported) safety knowledge, safety perception, and safety attitude, but critically, no equivalent improvement in safety behavior (Reniers et al., 2014). Similarly, to this, numerous studies have looked into program-wide safety programs that used a range of tactics. Numerous published studies cited handouts, didactics, the construction of safety databases, self-study programs, laboratory exams and quizzes, the usage of safety contracts, and the development of safety-focused courses at various institutions as common components of these programs (Bradley, 2011; Burchett et al., 2017; Crockett, 2011; Fivizzani, 2016; Kennedy & Palmer, 2011; Ritch & Rank, 2001). However, this conventional method occasionally resulted in subpar lab procedures and safety attitudes among students. The long list of lab safety guidelines and brief lab safety notes bored the students (Alaimo et al., 2010). Other researchers have examined the application of more focused techniques for boosting safety, such as safety planning documents (Kapin, 1999), black lights to demonstrate issues of lab cleanliness, scavenger hunts as a training strategy, student safety teams (Alaimo et al., 2010), and personalized safety videos (Matson et al., 2007). Others have made comparisons between online and in-person safety training programs. Apart from that visual aids superheroes, and crime-fighting icons of comic book mythology such as Sherlock Homes may be used as a medium to facilitate and promote lab-related safety education through the richness of colorful and entertaining imagery to help sustain interest and perhaps even make learning lab safety fun (Di Raddo, 2006).

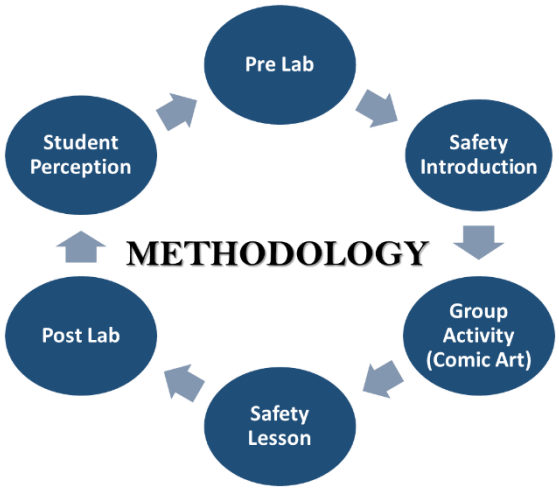
As a known factor that lab safety is a mandatory lesson, students find lab safety to be boring. Several articles have been written about enhancing students' engagement and successful safety and health protocols for the chemistry curriculum. As a result, this study will concentrate on an interactive learning technique that uses a *comic story* to increase undergraduate students' interest in chemical safety and make sure they get enough of knowledge evaluating safe laboratory practices.

3. METHODOLOGY

3.1 Research Design

Φιγυρε 1

Λεσσον Πλαν



The proposed teaching strategy covered several safety education topics that are crucial for the students. They were given a validated pre-lab questionnaire to complete before the lesson to evaluate their level of familiarity and the pre- knowledge on lab safety for the first 10 minutes. Next, the lesson began interacting with students on a topic of interest. Without clarifying what lab safety is, the lecturer led a discussion about road safety for the first 15 minutes. Discussed some recent news concerning car accidents and traffic collisions will assist instructors to engage with students. The instructor then led a discussion on the factors that contribute to accidents and how to avoid them. While this was going on, the instructor can combine the lesson on safety in the chemistry lab with a discussion about it. By employing this strategy, we can encourage students to discuss lab safety as a familiar topic to them. With a brief introduction to safety, a video regarding a lab accident was presented. This was aimed to emphasize the significance of safety in chemistry labs. In the following 20 minutes, the instructor facilitated a discussion utilizing the developed comedic stories about lab mishaps (Figure 1). Students in the class have the appearance and names of superhero characters. The instructor simultaneously taught students the bad and good habits in a laboratory and Personal Protective Equipment (PPE) described in the examples during the conversation. It would be an interactive technique to get the interaction of students to the lesson and help them remember safety strategies for a long time.Then the instructor led a discussion about lab accidents. The following 15 minutes were dedicated to the discussion of general safety regulations, hazard versus risk,

flammable materials, laboratory safety (chemical, personal,

Φιγυρε 3

Χομιχ στοοψ

physical, and group safety), laboratory-specific signage for flammables, and laboratory, and personal protective equipment. Next, 30 minutes were spent discussing the handling of chemicals and glassware, first aid and labeling of chemicals, and accidents.

Next 15 minutes, briefly discussed with the students the following information that is found on the Material Safety Data Sheet (MSDS) and its importance. (a) The date of preparation. (b) The formula and molecular weight. (c) The proper first aid to follow for contact by ingestion, skin contact, eye contact, and inhalation. (d) Firefighting. (e) Storage requirements. (f) Physical properties. (g) Terminology. (h) Government regulations. Providing an authentic assessment to enhance the problem-solving skills of students when they work in the industry using the MSDS, will be designed to focus on the current objective to "Develop learning strategies to examine safety knowledge and identify, prevent, take action against potentially hazardous events and behaviors that could harm people, property, environment, and global commitments into their job as field professionals." Finally, the same validated pre-lab questionnaire was given to students to measure their knowledge after the intervention. Then we provide a survey to explore the perception of the

students regarding the novel learning strategies we used.

3.2 Population, Sample and Data Collection

This study was conducted as a part of the Chemistry for Technology Laboratory course module in the 1st year Bachelor of Engineering Technology (BET) curriculum at the Faculty of Computing and Technology, University of Kelaniya. And 79 students were involved in this research.

3.3 Analytic Strategy

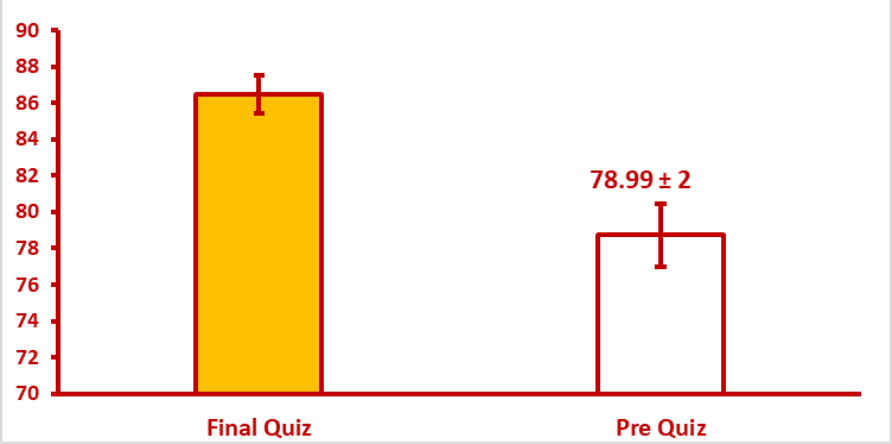
Both, in-class quizzes were given to measure the impact of comic art on students' learning. A qualitative survey was used to assess students' perception of comic books as an effective instructional strategy. The survey was performed through Google form.

4. RESULTS

Pre- and post- lab quizzes were administered through LMS. The quiz consists of 10 questions. The results of both quizes were averaged to compare the grades of the students to measure the knowledge level. Means of the final quiz and the pre quiz are presented in Figure 2.

Φιγυρε 4

Κνοωλεδγε χομπαρισον οφ πρε θυιζ ανδ φιναλ θυιζ



Grades of the pre and post quiz were statistically compared to investigate whether there is any significant difference in the performance of students after the intervention. SPSS statistical software was used for the comparison.

Ταβλε 9

Ρεσυλτσ οφ τηε θυιζ γραδινγσ

	Post- quiz	Pre quiz
Mean ± SD	86 ± 9	79 ± 16
Lowest	50	20
Median	90	80

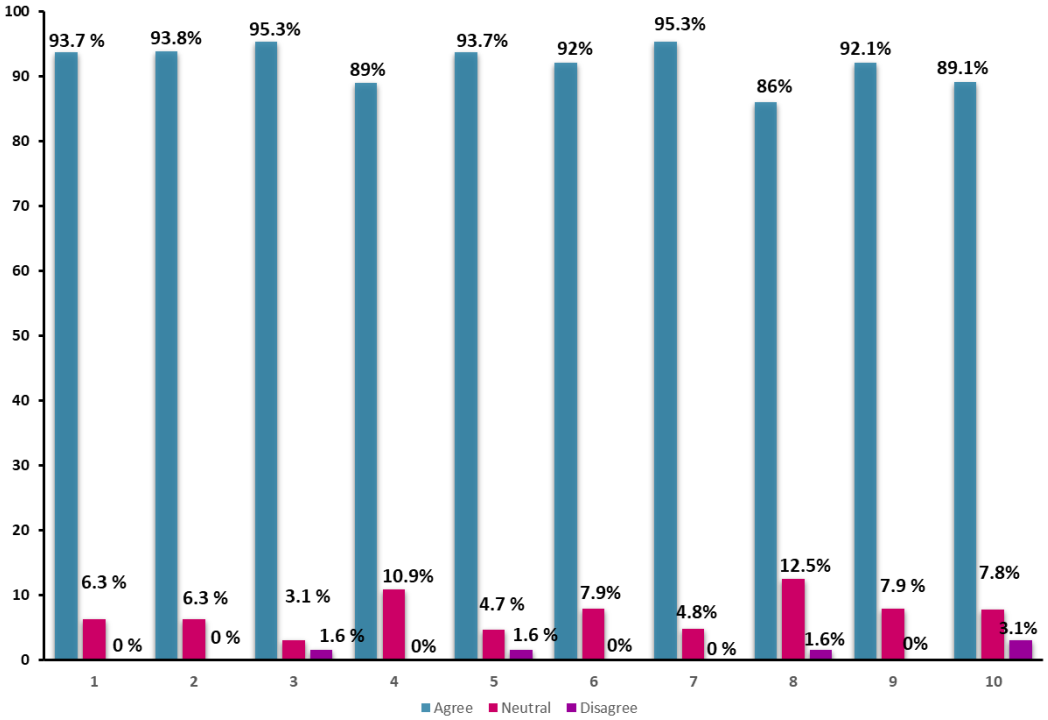
Ταβλε 10

Στυδεντσ Περχεπτιον Θυεστιονναιρε

No.	Question	Agree %	Neutral %	Disagree %
How do Comics stories influence the student learning process?				
1.	Incorporating Comics story has deepened my interest in the safety subject matter of this course	94	6	0
2.	Comics stories encouraged me to learn	94	6	0
3.	Comics story is less stressful than traditional in-class delivery	95	3	2
4.	Comics story is more effective than traditional in-class delivery	89	11	0
5.	Comics story is more enjoyable than traditional classroom	94	5	2
How do the Comics stories help to improve critical thinking skills, collaboration skills, and student performance?				
6.	Comics stories in my course improved my interaction with the teacher	92	8	0
7.	Comics stories in my course improved my interaction	95	5	0

Φιγυρε 5

Στυδεντσ Περχεπτιον



	with my classmates			
8.	Comics stories provide more time for questions, discussions	86	13	2
9.	Using Comics stories	92	8	0
	allowed me to explore the interest of my own			
10.	Comics stories Model activities are interactive	89	8	3

5. DISCUSSION

Figure 1, interprets the impact of comic art on students' learning. The lowest grade of the post quiz is 50 and pre quiz is 20. According to statistical testing, a significant difference was found between the average pre-quiz scores and the post- quiz. No significant difference was observed with regard to the median of the post and pre quizzes. Moreover, the findings of the current study have reported high student satisfaction on the

comic learning strategy. 94% students had named comic story has deepened their interest in the safety subject matter of this course. More than 89% of students agreed with that this learning methodology encourage to learn, less stressful and effective than conventional in class delivery. And 0% of students disagree with that a comic story is more effective than traditional method. 95% of students named comic story has improved their interaction with classmates. Our findings don't show more than 4% of disagreement for all the questions.

6. LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

Current study was limited to Engineering Technology first-year students of 2021/22 academic year at the Faculty of Computing and technology, University of Kelaniya. This intervention will be carried out with few more batches to obtain a better conclusion in the future.

7. CONCLUSION

According to the findings of our study, using a comic story as a teaching tool makes safety lessons more efficient and less stressful than other teaching techniques. Additionally, this teaching approach is more engaging. Based on our research, we recommend using the comic narrative learning technique to enrich educational lessons in other subject areas as well.

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Study of Students Perception on Blended Learning for Physics for Technology Laboratory

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ABSTRACT

Transformation of traditional face to face classroom lectures and laboratory sections to online sessions were a challenge. Especially in the laboratory classes students do need to gain the experience of instrument handling and experimental organisations to improve their kinaesthetic skills. This study has been carried out to evaluate the students perception on blended learning methodology for the first year first semester physics for technology laboratory. The student body never experienced the university environment as they are freshly graduated from high school. Therefore, they did not have prior experience to compare the blended learning model to traditional face to face university teaching style. The lectures were physically present in the university physics laboratory with the laboratory equipment for that day's experiment and the students were connected to class through the Zoom via LEARN online platform which enables students to attend the class without paying any charges for the internet. The concept, theory and safety measures were explained as a pre lab lecture at the beginning of the class. The laboratory handouts were already shared to the students via the learning management system (LMS). By referring to the lab handout the experimental setup was constructed while students were watching. Students were encouraged to ask questions to clarify the doubts in the experimental set up. During the demonstrations the safety measures were emphasised. Thereafter data analysis and calculation methods were discussed. The video recording for that day was uploaded to the LMS. At the end of the semester the pandemic situation got alleviated hence the students were brought back to the physical laboratory to conduct the experiments. As they have learned the experiment online and have access to the video recordings, it was easy to deliver the content and perform the experiment for that day. Eighty-two students from the Engineering Technology subject stream participated in the laboratory class. Positive and negative impacts of Blended Learning Model to the first-year physics laboratory class. Sixty nine percent of the students responded agree or strongly agree for , how the blended learning model assisted for their learning process. 21% of students were neutral and only 9.5% of students either agreed or disagreed. 68% students, overall average 3.8, responded either strongly agreed or agreed to how the Blended Learning Model helped their physics lab to improve the critical thinking skills, collaboration skills, and student performance. Again 68% of the students stated they have a positive impact from the model to their lab performance whereas 8% stated they have negative feelings about the model. By analysing the above data from the study there is a strong preference for the blended learning model among the first-year students for the physics laboratory. Some of the students comment's state that this model really helps them to get an idea about the lab activity before they attend the physical laboratory sessions.

Keywords: Blended learning, critical thinking, colloborative skills, performance, undergraduates

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Formulating Effective Teaching and Learning Strategy for Qualitative Academic Disciplines: Special Reference to the Academic Discipline of International Studies

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ABSTRACT

Qualitative academic disciplines have become integral to modern education systems, as they offer a unique perspective on understanding complex social phenomena and human cultures. The quantitative teaching and learning methodologies have shown areas for improvement in understanding the qualitative content. The quantitative mechanisms continuously discouraged students from understanding qualitative academic disciplines such as international studies. This research paper proposes a new four-stage teaching and learning strategy for the qualitative academic discipline of international studies, intending to enhance student learning outcomes and promote critical thinking, analysis, interpretation, and skill development. The study is based on primary data collected through semi-structured interviews, participatory discussions, and observations with students in international studies. The data is analyzed using qualitative grounded theory analysis to develop an effective teaching and learning strategy. The proposed strategy includes guiding, researching, presenting, and lecturing stages and is designed to address the challenges and issues of existing teaching and learning strategies in international studies. The developed framework has been validated through reviews and feedback from students in the Department of International Studies at the University of Kelaniya. The findings indicate that the proposed strategy has significantly improved student engagement, knowledge acquisition, and skill development, and students were delighted with the new learning mechanism. The research paper provides insights and recommendations for implementing the proposed teaching and learning strategy in other academic disciplines.

Keywords: *Qualitative academic disciplines, international studies, teaching and learning strategy, four stages strategy, new framework*

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Best Practice Teacher's Questioning Strategies for Effective Use of Questions as A Teaching Tool

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ABSTRACT

The success and smoothness of education cannot be separated from a classroom management. In managing the classroom, a teacher usually places a physical environment, a psycho-social environment, manages and monitors classroom activities. Classroom response systems can be powerful tools for teaching. Their efficacy depends strongly on the quality of the questions. Asking questions is natural and intuitive. Teachers ask questions from the start of the lesson until the end. Asking questions forms part of any lesson because it invites the student to think. Questions have long been used as a teaching tool by teachers and preceptors to assess students' knowledge, promote comprehension, and stimulate critical thinking. Research study is planning to its significance in affecting students' performance and achievement. Proper questioning techniques are important in the teaching and learning process. Proper questioning techniques will make it easier for teachers to get feedback from students whether or not they understand the subject. The aim of this study is to discuss the efficacy of questioning techniques of the teachers in the classroom. The study is going to conduct in three years of Students in special degree in library and information science, and a sample of 50 students will purposively select and interview through semi-structured interviews. A qualitative method is select to analyse the data; where the primary data is support by secondary information and previous scholarly arguments. This review summarizes the taxonomy of questions, provides strategies for formulating effective questions, and explores practical considerations to enhance student engagement and promote critical thinking. This concept will be applied in the classroom and in experiential learning environments.

Keywords: classroom questioning, student learning, Effective questioning skills, Learning and role, teaching tool, critical thinking

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Impact of Different Teaching and Learning Methodologies on Subject Performance Improvement

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ABSTRACT

The objective of this study is to identify the impact of the use of different teaching and learning strategies on the students' performance improvement in a selected subject. Sixty-seven students were included in the study as a single case study and secondary data were collected. Two different teaching methodologies were selected, such as lecture-based instruction and self-directed individual learning. Methods of instruction and marks obtained for questions given for each method are considered measurement variables. Mean comparison of the results obtained for each method, and descriptive and correlation tools used to measure the significant correlation among the selected variables. Findings revealed that the student scored more on questions asked from the lecture-based instruction and gained low scores for the self-directed individual learning-based questions. Results from the correlation analysis proved that there is a significant impact on the teaching method used and their exam scores. The study concluded that lecture-based instruction has an impact on the improvement of students' results and the application of self-directed individual learning methodologies not given more advantage to increase their results. Hence, careful attention should be directed toward the tools used in delivering the lectures, and more attention should focus on monitoring the self-learning activities given to the students. The findings of this study can be used to educate teachers to identify the importance of the use of direct teaching methodologies to enhance student performance and select the best mode of methodology

Keywords: Teaching methodologies, lecture-based instruction, individual learning, subject performance

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Learning Management System as A Decision Support Mechanism for The School Education System in Sri Lanka

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ABSTRACT

The education system in Sri Lanka is based on classroom-based teaching, and it does not use networked learning methods. Hence, there is a need for improving the efficiency and effectiveness of teaching and learning in the Sri Lankan school system. Developed countries have already transitioned to networked learning. The objective of the present study was to devise an internet-based Learning Management System (LMS), which would provide an easier and more attractive way of teaching for the Sri Lankan education system. Data were collected through in-depth interviews, participatory observation, content analysis of Learning Management Systems, and review of previous research. The results demonstrated the need for integrating the web and mobile apps for teaching. Images, videos and 3D images provide a more attractive way of teaching than the current textbook-based teaching process. Augmented reality, virtual reality, and video games can be used for such web- and mobile-app-based teaching and learning. This would be more attractive and enable students to understand lessons. Necessary guidance could be provided to teachers through such an LMS, while policy-planning institutions such as the National Institute of Education and the Ministry of Education can supervise the teaching and learning process. Supervising student activities through the LMS would enable identifying the degree to which students have understood the lessons and thereby assess the teachers. Such observations will be useful for teachers and school administration to identify weaknesses in the teaching process and remedy them. Overall, the LMS would enable easier decision-making regarding the education process.

Keywords: Learning management system, digital education, E-learning, school education, decision support system