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## Editorial

This is the Volume 17, Number 2 of OUSL Journal, the Journal of The Open University of Sri Lanka which is published biannually. The articles published in this volume include research based on the disciplines of Chemistry, Education, Plant Pathology, Nursing, English Language Teaching, and Teaching Literature.

Rhenium(I) tricarbonyl complexes containing pyridine and phosphine-based ligands have shown a wide variety of applications in supramolecular chemistry, catalysis, and in biology as fluorescence imaging agents. $[ReX(CO)_5]$ (X = Cl, Br) has been used to polymerize 4-vinyl-1-cyclohexene diepoxide photochemically and thermally without cocatalysts. Rhenium(I) carbonyl complexes of the type *fac*-[ReX(N^N)(CO)$_3$] can be tuned by using different types of ligands and also by varying the R group. The rhenium(I) complex *fac*-[ReCl(2,2´-bipyridine) (CO)$_3$] selectively catalyses deoxygenation of nitrous oxide ($N_2O$) to nitrogen in organic media in the presence of water. *fac*-Re(I) tricarbonyl bis-imine complexes $[Re(bisimine)L(CO)_3]^+$ have the ability to retain their fluorescence in biological systems, thus making them promising cell imaging agents. The objective of the study on *Synthesis of tricarbonyl Re(I) Complexes of N and P Donor Ligands* is to explore the chemistry of bulky bipyridine ligands such as 5,8-diphenyl-6,7-di(3-thienyl)-1,12-diaza-triphenylene **L¹**, 6,7-di(4-*tert*-butylphenyl)-5,8-diphenyl-1,12-diazatriphenylene **L²**, 3,4,5,6-tetraphenyl-2,2´-bipyridine **L³**, half-cyclised N-heterosuperbenzene **L⁴**, 4-bromophenyl terpyridine **L⁵**, 4-phenyl-3,6-di(2-pyridyl) pyridazine **L⁶** and P,N donor ligands *Z*-3-diphenylphosphino-(1R)-(+)-camphor dimethylhydrazone **L⁷** and diphosphine $Z,Z$-PPh$_2$CH$_2$C (Bu$^t$)=N-N=C(Bu$^t$)CH$_2$PPh$_2$ **L⁸** with rhenium(I) centers. During this study, synthetic routes to hexa-substituted benzene derivatives **L¹** and **L²**, *facial* tricarbonyl rhenium(I) complexes *fac*-[ReCl(CO)$_3$(N^N)] (where N^N = **L¹** - **L⁶**), *fac*-[ReCl(CO)$_3$(**L⁷**-P,N)], *fac*-[Re(CO)$_3$(**L⁸**-P,N,P)]Cl and *fac*-[Re(CO)$_3$(**L⁸**-P,N,P)]PF$_6$ were discussed.

Students' welfare services and educational stability in tertiary institutions are of serious global concern. The academic calendars of the institutions are designed to go smoothly without any interruption. The study on *Students' Welfare Services and Educational Stability in Public Universities in the Oyo State, Nigeria* identified the welfare services that are in existence in tertiary institutions in the Oyo State; examined the level of student's satisfaction with the available welfare services as well as the relationship between welfare services and students' educational stability in public universities in the Oyo State. A descriptive survey research design was used for the study. The population for the study comprised of all the final year undergraduates from the two public universities in the Oyo State. A questionnaire titled, Students' Welfare Services and Educational Stability Questionnaire (SWSESQ), was used to gather information for the study. Data collected were analysed, using both descriptive and inferential statistics. Research questions raised were answered using frequency counts, percentages, and mean, while Pearson product Moment Correlation (PPMC) was used to test the hypothesis formulated at a 0.05 level of significance. The results showed that there was a moderate level of welfare services and there was no significant relationship between the students' welfare services and educational stability in the public universities in the Oyo State. The study concluded that students' welfare cannot determine educational stability in public universities in the Oyo State.

A higher student dropout rate is a serious issue in any educational institution because it reflects the lower performance and less effectiveness of the educational programme. Further, it reflects certain administrative issues and certain issues relevant to the academic programmes which need corrective measures. Hence, any educational institute should analyse the student dropout rate of the institutes and programmes and should apply strategic management principles to make corrective actions. The study titled, *Evaluation of Student Dropout Rate in Alternative Higher Education Sector of Sri Lanka: A Case Study,* is mainly focused on the student dropout rate of the Sri Lanka Institute of Advanced

Technological Education (SLIATE) which is a leading government-funded alternative higher educational institute in Sri Lanka. The average dropout rate of the SLIATE was analysed using five years' data for the whole institute, for the individual programmes, and for individual regional centres governed under the SLIATE. Findings revealed that Civil and Electrical Engineering programmes have the lowest (< 27%) student dropout rate and the Quantity Surveying programme showed the second lowest (29%) student dropout rate. Agriculture, Food Technology, Business Administration, Business Finance, Mechanical Engineering, English and Accountancy programmes showed a <50% dropout rate. The average student dropout rate of SLIATE was 48%. Out of the 19 centres, the Colombo centre showed the lowest student dropout rate (35%) whereas Tangalle and Batticaloa centres showed the highest student dropout rate (65%). Further studies are required to identify the reasons for such dropouts to develop strategies to minimize them.

Postharvest diseases account for the loss of a large percentage of fresh produce in Sri Lanka. *Colletotrichum* sp. is one pathogen that attacks several fruit and vegetable commodities in the country. Banana anthracnose caused by *Colletotrichum musae* is one such commodity attacked by *Colletotrichum* sp. The standard practice for controlling this disease is by using synthetic fungicides, which are a hazard to the consumer as well as the environment. Use of essential oils is now becoming a viable and safe alternative. However, due to its volatile nature, the antifungal effect of essential oils can be easily lost. Introducing the essential oils in a bio-safe coating material can overcome this issue. In the study *Control of Anthracnose in Banana Cultivar Kolikuttu (Musa sp.) with Essential Oils and Bio-safe Fruit Coatings*, the popular local banana cultivar *Kolikuttu* was used. The leaf, matrics of *Aloe vera,* was coating material into which essential oil was introduced. Of the tested essential oils, basil oil at 1000 µLL$^{-1}$ was effective with 2% or 4% *Aloe vera* coating in significantly reducing postharvest anthracnose with no negative effects on quality parameters. Results indicated that basil oil when incorporated into *Aloe Vera*

act as a suitable bio-safe fruit coating against anthracnose in banana.

Intimate partner violence (IPV) is considered a public health problem affecting one third of females globally. They suffer short- and long-term health consequences of IPV that affect the health of their families and thereby the society at large. Nurses as frontline healthcare providers have a responsibility to address the problems affecting females who visit hospitals for treatment. Many previous researches have reported deficiencies of knowledge, attitudes and practices of nurses when caring for such females. The study on *Nurses' Knowledge, Attitudes, Practices and Associated Factors in Caring for Females subjected to Intimate Partner Violence in the Western Province of Sri Lanka,* assessed these concerns in a sample of nurses from the Western Province and found that a majority of them had favourable attitudes towards the care for IPV-affected females while there were deficiencies in their overall knowledge related to this practice. The study recommends the inclusion of IPV-related content in nursing curricula and the authorities to take action to conduct educational programs to enhance knowledge and practices of nurses on this important area of public health.

Conducting teaching-learning activities using the Zoom technology has become essential in the present Sri Lankan context due to the COVID-19 pandemic. The study on *Student Perceptions on the Use of Zoom Technology for French Language Teaching: with Special Reference to Students in a French Language Institute* examines Sri Lankan students' perceptions on the use of Zoom technology for French language learning by using Sri Lankan female students from the pre-intermediate level classes at the French Language Institute of Alliance Française de Kotte. The findings indicated that the majority of the students considered the use of Zoom in French language teaching as effective and efficient in terms of time and the current pandemic situation and they agreed that learning the French language via Zoom can help them in practicing language skills and acquiring new vocabularies. However, lack of collaboration, loss of identity, difficulty in meeting the expectations of the students, distance and technical issues are considered to be

the major challenges in using Zoom technology for French language teaching. The results implied the necessity to conduct blended classes rather than using only online technologies such as video conferencing applications. The study carried out is significant in developing strategies to teach French language effectively and further research can be conducted on other video conferencing applications to find out ways to manage the challenges that students face.

Multiple interpretive possibilities make teaching literature a challenging task, particularly in an ODL context, where teacher's absence could be a common occurrence. Perhaps, the pandemic err zoom-learning might have caused enormous issues for teachers of literature who would count on the physical presence of students to grapple with dissemination concerns caused by the textual complexities of their subject matter. This study titled, *How to Read "Silence" in a Literary Text without a Teacher: ODL Learners' Perceptions of Studying Literary Texts through the Online Mode,* investigated second-year undergraduates' perceptions on learning T.S. Eliot's epic poem *The Waste Land* -- a notably difficult text for learners -- via both online and in-person Day Schools. Using a qualitative research design and in-depth semi-structured interviews the study found that the students viewed the online component of the course as useful but supplementary in its function. The online learning could replace the teacher in a physical classroom and the students preferred the physical presence of a teacher when attempting to read, understand and interpret the literary text.

In the discipline of teaching, the provision of feedback is an important aspect. It provides students with reinforcement and shows how they should correct their mistakes. There are different accepted ways of providing  feedback to learners' written work, i.e., peer feedback, teacher feedback, oral feedback, written feedback and video feedback. However, such practices are mostly Eurocentric and there is a lack of similar research in Sri Lanka. Furthermore, there are no studies conducted on the provision of video feedback in Sri Lanka. The study on *Effect of Video Feedback*

*on Adult ESL Learners' Paragraph Writing Skills* uses an experimental design and studies whether the provision of video feedback for ESL learners' paragraph writing is effective than the provision of written feedback. The target population used for this study comprised of ESL undergraduates. The main aim of this study is to locate whether there is a noticeable difference in video feedback when compared to other modes of feedback. The secondary purpose of the study is to contribute to the gap of knowledge on the provision of feedback for written work in Sri Lanka.

We welcome your suggestions for further improvement of this Journal. We are looking forward to publishing your current research findings in our next issue.

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# Synthesis of Tricarbonyl Re(I) Complexes of N and P Donor Ligands

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## Abstract

Reaction of 1,10-phenanthroline-5,6-dione **V** with 1,3-diphenyl propan-2-one afforded the keto-alcohol **VI**. Treatment of **VI** with alkynes, di(3-thienyl) acetylene and di(4-*tert*-butylphenyl) acetylene yielded 5,8-diphenyl-6,7-di(3-thienyl)-1,12-diaza-triphenylene **L¹** and 6,7-di(4-*tert*-butylphenyl)-5,8-diphenyl-1,12-diazatriphenylene **L²**, respectively. [ReCl(CO)$_5$] reacted with N^N-donor ligands **L¹**-**L⁶** to produce *fac*-tricarbonylrhenium(I) complexes (**20**)-(**25**) in good yields as coloured solids. Treatment of [ReCl(CO)$_5$] with the bulky P^N ligand **L⁷** formed the neutral complex *fac*-[ReCl(CO)$_3$(**L⁷**)] (**26**) whilst with the azine diphosphine *Z,Z*-**L⁸** afforded the cationic complex *fac*-[Re(CO)$_3$(*E,Z*-**L⁸**)]Cl (**27a**), where **L⁸** is a tridentate ligand. The chloride anion of the complex (**27a**) was replaced by treating it with NH$_4$PF$_6$ into *fac*-[Re(CO)$_3$(*E,Z*-**L⁸**)]PF$_6$ (**27b**). Above complexes were characterized by a combination of elemental analysis, IR, Mass and NMR spectroscopy.

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**Keywords:** *Re(I) complexes, rhenium, bipyridine, phosphine, carbonyl ligands*

## Introduction

All carbon polyphenylenes (*e.g.*, hexaarylbenzene derivatives) are the building blocks for polyaromatic hydrocarbons (*e.g.*, hexabenzocoronenes or superbenzene derivatives **I**), which exhibit interesting physical and electrochemical properties (Wu et al., 2007). Cyclodehydrogenation of tetraaryldipyrimidyl benzene (Draper et al., 2002) and triaryltripyrimidyl benzene (Wijesinghe *et al.*, 2014) containing four or six nitrogen atoms at the periphery lead to the preparation of fully-cyclised N-heterosuperbenzenes **II-IV** (Draper et al., 2002; Wijesinghe et al., 2014). Ru(II) complexes of the N-heterosuperbenzene derivative **II** showed unique optical and electrochemical properties (Draper et al., 2004; Gregg et al., 2005, 2006). The incorporation of heteroatoms into the carbon frameworks provides a number of new opportunities to fine-tune the molecular properties as discussed in the review of Mullen and coworkers (Wang et al., 2019).



R = H or organic groups
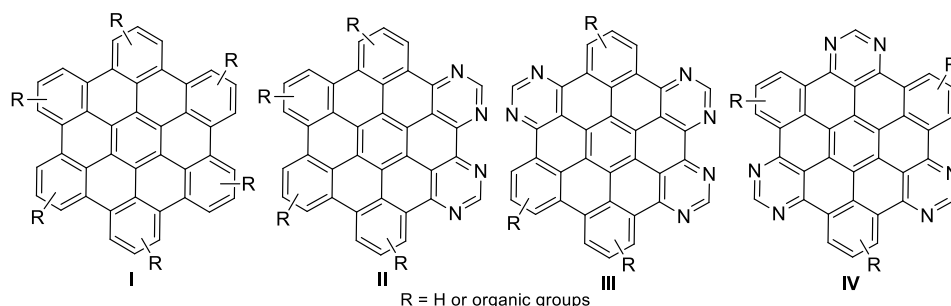
**Figure 1**. Molecular representation of superbenzenes and N-heterosuperbenzene derivatives

With the intention of finding more examples containing nitrogen and sulphur doped polycyclic aromatic hydrocarbons it was decided to synthesise polyphenylene derivatives such as 5,8-diphenyl-6,7-di(3-thienyl)-1,12-diaza-triphenylene **L¹**, 6,7-di(4-*tert*-butylphenyl)-5,8-diphenyl-1,12-diazatriphenylene **L²** and 3,4,5,6-tetraphenyl-2,2´-bipyridine **L³** (Figure 2). Rhenium(I) tricarbonyl complexes containing pyridine and phosphine-based ligands showed a wide variety of applications in supramolecular chemistry, catalysis, and in biology as fluorescence imaging agents (Amoroso et al., 2007; B.-Rodr´ıguez et al, 2009; Gupta & Sathiyendiran, 2018; Tan et al., 2021; C.-Lopez et al., 2021; Acosta et al., 2021).

Thus, it is important to explore the chemistry of these bulky bipyridine ligands with rhenium(I) centres. In this publication, coordination modes of **L¹**-**L³**, half-cyclised N-heterosuperbenzene **L⁴**, 4-bromophenyl terpyridine **L⁵**, 4-phenyl-3,6-di(2-pyridyl) pyridazine **L⁶** with Re(I) centres are reported. **L¹**-**L⁴** can act as bidentate (N^N) ligands; **L⁵** has three N-donors and it can act as either a bidentate (N^N) or a tridentate (N^N^N) ligand; **L⁶** is an unsymmetrical ligand with four N-donors and it can show two different (N^N) bidentate modes.

This work was further extended to investigate the coordination modes of bulky P,N donor ligands *Z*-3-diphenylphosphino-(1R)-(+)-camphor dimethylhydrazone **L⁷** and diphosphine *Z,Z*-PPh₂CH₂C (Buᵗ)=N-N=C(Buᵗ)CH₂PPh₂ **L⁸**. The ligand **L⁷** has one P-donor and two N-donors and it can show two different (P^N) bidentate modes due to Z ↔ E isomerization around the C=N bond. The ligand **L⁸** has two N-donors and two P-donors; it can show (P^P) and (P^N) bidentate modes, and one (P^N^P) tridentate mode because the energy barrier to the rotation around a C=N bond is quite low.
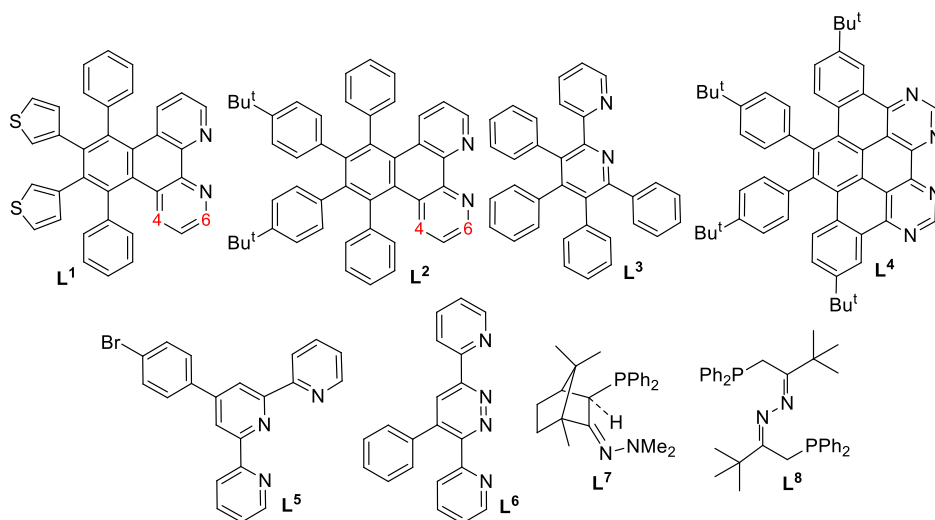


**Figure 2**. Molecular structures of N- and P-donor ligands depicting atom labelling used for the assignment of NMR data.

Precursors such as [ReX(CO)₅] (X = Cl, Br, OTf), [Re(CO)₃(OH₂)₃]⁺, [Re(CO)₃(NCMe)₃]⁺, [Re(CO)₃(dimethylsulphoxide)₃]⁺ & [Re(CO)₃Br₃]²⁻ have been used to prepare many different rhenium complexes including 2D and 3D metallacycles (Gupta & Sathiyendiran, 2018; Canadas *et al.*, 2019; Blanco-Rodr´ıguez et al., 2009; Coogan et al., 2009). [ReX(CO)₅] (X = Cl, Br) has been used to polymerize 4-vinyl-

1-cyclohexene diepoxide photochemically and thermally without cocatalysts (Abu-Abdoun, 2019).

Rhenium(I) carbonyl complexes of the type *fac*-[ReX(N^N)(CO)$_3$] (**1**) (Figure 3) containing bidentate nitrogen donors are easy to prepare (Canadas et al., 2019; Deeba et al., 2021). These complexes are quite stable at room temperature, and photophysical properties can be tuned by using different types of ligands and by varying the R group. The rhenium(I) complex *fac*-[ReCl(2,2´-bipyridine)(CO)$_3$] selectively catalyses deoxygenation of nitrous oxide (N$_2$O) to dinitrogen in organic media in the presence of water (Deeba et al., 2021).



R = organic group, X = Cl, Br,OTf, SR
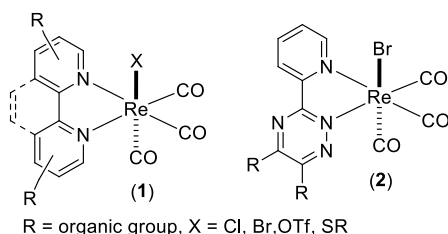
**Figure 3.** [ReX(N^N)(CO)$_3$] complexes with N^N donor ligands

Bipyridine-based mononuclear and binuclear Re(I) carbonyl complexes were successfully used in photocatalytic reduction of carbon dioxide to carbon monoxide (Bruckmeier et al., 2012). Rhenium(I) tricarbonyl complexes (**2**) containing the pyridyl triazine core have been synthesized using the precursors [Re(CO)$_5$Br] and [Re(CO)$_3$(H$_2$O)$_3$]OTf in an organic solvent mixture and water (Ranasinghe et al., 2016).

The reaction of the tridentate ligand (**3**) with [ReCl(CO)$_5$] formed the *fac*-tricarbonyl complex (**4**) (Coogan et al., 2009) with one uncoordinated pyridine ring, and the central ring has tautomerized to the 4-hydroxypyridine form (Figure 4). Similarly, with [ReCl(CO)$_5$] tridentate ligands 2,2´:6´,2´´-terpyridine and tris(2-pyridy1)amine produced *fac*-tricarbonyl complexes (**5**) and (**6**), respectively (Anderson et al., 1990).
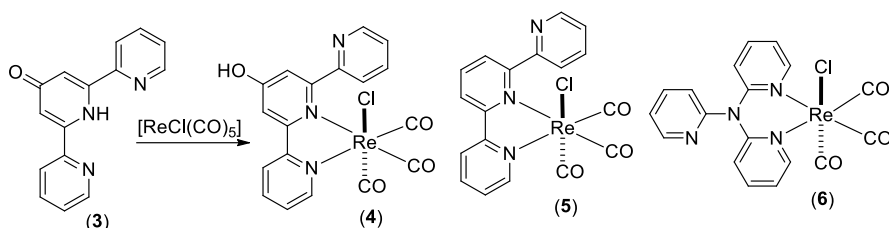
**Figure 4.** Structures of tricarbonyl Re(I) complexes with potential tridentate ligands

Various cationic complexes of the type *fac*-[Re(L)(N^N)(CO)$_3$]$^+$ (**7**) and (**8**) exhibited attractive photophysical properties with lifetimes up to microseconds (Fernaˊndez-Moreira et al., 2010) (Figure 5). These cationic complexes can be prepared by using the labile complex *fac*-[Re(NCMe)(N^N)(CO)$_3$]$^+$ or replacing the coordinating anion X from [ReX(N^N)(CO)$_3$], in the presence of the ligand L and a non-coordinating anion.



R, R' = organic group
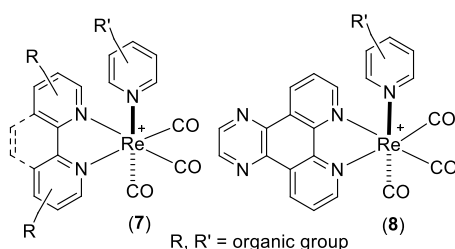
**Figure 5.** Cationic *fac*-complexes with bidentate (N^N) and monodentate (L) ligands

*fac*-Re(I) tricarbonyl bisimine complexes [Re(bisimine)L(CO)$_3$]$^+$ have the ability to retain their fluorescence in biological systems, thus, making them promising cell imaging agents (Amoroso et al., 2007). The cationic derivatives [Re(bipy)(CO)$_3$(L)]$^+$ have attracted the most attention in the imaging field, particularly those with axial pyridine ligands (Fernaˊndez-Moreira et al., 2010).

Methanol was added on to the bound-MeCN in the cationic complex *fac*-[Re(CO)$_3$(Me$_2$bipy)(NCMe)]BF$_4$ to form Re(I)(iminoether) complexes, *fac*-[Re(CO)$_3$(Me$_2$bipy){HN=C(Me)OMe}]BF$_4$ (**9**) (Perera et al., 2012). Similarly, amines (HNR'$_2$) were added on to MeCN to give amidine-complexes, *fac*-[Re(CO)$_3$(Me$_2$bipy){HN=C(Me)NR$^1$$_2$}]BF$_4$ (**10**) (Abhayawardhana et al., 2012). Perera and co-workers studied the photophysical properties and the capability of cationic Re(I)

complexes (**11**) containing tridentate ligands as anti-inflammatory drug leads (Darshani et al., 2020).



R, R' = organic group
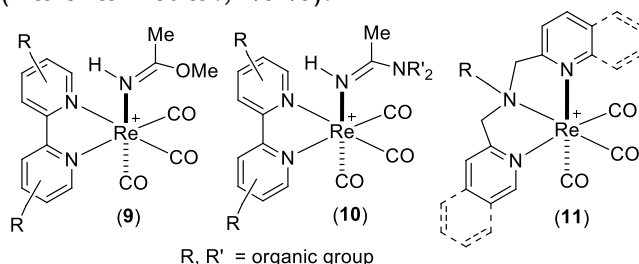
**Figure 6**: Cationic complexes: $fac$-[Re(CO)$_3$(N^N){HN=C(Me)OMe}]$^+$, $fac$-[Re(CO)$_3$(N^N){HN=C(Me)NR$^1_2$}]$^+$ and $fac$-[Re(CO)$_3$(N^N^N)]$^+$

Recently, the role of zero-field splitting (ZFS) and the geometric arrangement including π-stacking interactions present in complexes (**12**), (**13**), [Re(bpy)(CO)$_3$(4-phenyl-1-methyl-1H-1,2,3-triazole)]$^+$ and [Re(bpy)(CO)$_3$(4-phenyl-1-propyl-1,2,3-triazole)]$^+$ (bpy = 2,2´-bipyridine) were studied (C-Lopez et al., 2021).



R = CH$_2$CH$_2$CO$_2$Et
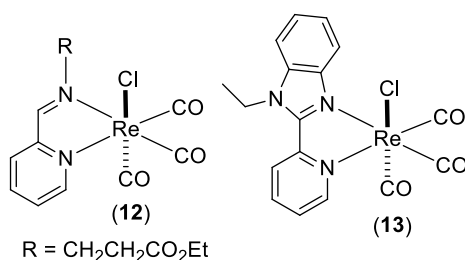
**Figure 7**. Molecular structures of $fac$-[ReCl(CO)$_3$(N^N)] complexes

The synthesis of rhenium(I) tricarbonyl phosphine bromides and hydrides of the type $fac$-[ReX(CO)$_3$(P^P)] (**14**)-(**16**) (Figure 8), where (X = Br or H), P^P = bis(diphenylphosphino)propane (dppp), 1,4-bis(diphenyl-phosphino)butane (dppb), and 1,10-bis(diphenyl phosphino)ferrocene (dppf) has been reported (Beckett et al., 2003; Kimari et al., 2005).
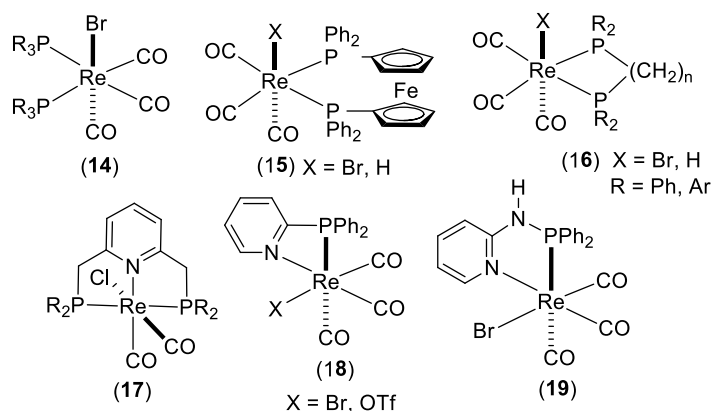
**Figure 8**. Molecular structures of tricarbonyl Re(I) complexescontaining N- and P-donor ligands

Vogt et.al. (2014) reported the synthesis of the pincer complex *mer,cis*-[Re(P^N^P)(CO)$_2$Cl] (**17**) (Figure 8). Interestingly, the dearomatized five-coordinate complex [Re(P^N^P)(CO)$_2$] underwent a reversible 1,3-addition of CO$_2$ to form *cis*-[Re(P^N^P-COO)(CO)$_2$] *via* Re-O and C-C bond formation (Vogt et al., 2014). *fac*-Re(I)tricarbonyl complexes (**18**)-(**19**) exhibited photoisomerization upon irradiation at 365 nm and they are found to be promising antibacterial agents (Acosta et al., 2021).

## Methodology

All experiments were carried out in an inert atmosphere (nitrogen or argon). Elemental analysis was carried out on a Carlo Erba 1006 automatic analyser. IR spectra were recorded on a Perkin-Elmer Spectrum One spectrometer fitted with a Universal-ATR sampling accessory. Mass spectral data were obtained using a micromass LCT electrospray mass spectrometer. MALDI-TOF mass spectra were recorded on a Waters Premier spectrometer using α-cyano-4-hydroxy cinnamic acid matrix. Accurate mass spectra were referenced against Leuicine Enkephalin. NMR spectra were recorded on a DPX 400 spectrometer operating at 400.13 MHz for ^{1}H, and 100.62 MHz for ^{13}C, and were standardized with respect to TMS. ^{31}P NMR spectra were recorded at 161 MHz and were standardized with respect to phosphoric acid.

[ReCl(CO)$_5$] was purchased from Aldrich and 1,10-phenanthroline-5,6-dione (Rosa et al., 1996), **L¹** (Perera et al., 2007), **L²** (Perera et al., 2011), **L³** (Ollangnier et al., 2008), **L⁴** (Gregg et al., 2005), **L⁵**

(Wang et al., 2005), **L⁶** (Varughese et al., 2009), **L⁷** (Perera et al., 1991) and **L⁸** (Perera et al., 1992) were prepared according to literature procedures.

### *11b-Hydroxy-1,3-diphenyl-1,11b-dihydro-7,8-diaza-cyclopenta[l]phenanthren-2-one (VI)*

1,10-Phenanthroline-5,6-dione (**V**) (Scheme 1) (1.32 g, 6.28 mmol), 1,3-diphenylpropan-2-one (2.0 g, 9.5 mmol) and potassium hydroxide (65 mg) were stirred at room temperature in dry methanol (12 mL) for 2h under nitrogen. The resulting solid was filtered and washed with little cold methanol. This solid was dissolved in dichloromethane (20 mL), filtered through celite and solvent was removed under reduced pressure. The residue (**VI**) was crystallised from methanol as a white crystalline solid. Yield (2.2 g, 87%). Found: C, 76.76; H, 4.71; N, 6.46; calcd. (%) for $C_{27}H_{18}N_2O_2 \cdot 1.25CH_3OH$: C, 76.69; H, 5.24; N, 6.33. IR (neat) cm$^{-1}$: 3666 (O-H), 3223 (O-H), 1706 (C=O), 1575, 1415, 1342, 1090, 763, 740, 717 and 699. ESI-MS (m/z): found: 403.1459, calcd. 403.1447 for $C_{27}H_{19}N_2O_2$, $[M+1]^+$. $^1H$ NMR (400 MHz, CDCl$_3$, $\delta$ in ppm): 8.74 (dd, 2H, $^3J(HH)$ 4.5 Hz, $^4J(HH)$ 1.5 Hz, H$^6$), 8.71 (dd, 2H, $^3J(HH)$ 4.5 Hz, $^4J(HH)$ 1.5 Hz, H$^{6'}$), 8.03 (dd, 2H, $^3J(HH)$ 8.0 Hz, $^4J(HH)$ 1.5 Hz, H$^4$), 7.60 (dd, 2H, $^3J(HH)$ 8.0 Hz, $^4J(HH)$ 1.5 Hz, H$^{4'}$), 7.6-7.4 (m, 8H, H$_{Ph}$), 7.36-7.33 (m, 3H, H$_{Ph}$ and H$^5$), 7.13 (dd, 2H, $^3J(HH)$ 4.5, 8.5 Hz, H$^{5'}$), 4.49 (s, 1H, C*H*Ph) and 3.19 (br, s, 1H, OH). $^{13}C$ NMR (100 MHz, CDCl$_3$, $\delta$ in ppm): 202.3 (C=O), 158.3, 152.1 (C$^{6'}$), 150.4 (C$^6$), 149.8, 149.7, 139.8, 136.1 (C$^{4'}$), 136.0, 134.4, 133.5 (C$^4$), 131.5 (C$_{Ph}$), 129.4, 128.7, 128.6 (C$_{Ph}$), 128.5 (C$_{Ph}$), 127.8 (C$_{Ph}$), 124.8, 124.2 (C$^5$), 123.2 (C$^{5'}$), 74.3 (C=) and 60.5 (*C*HPh).

### *5,8-diphenyl-6,7-di(3-thienyl)-1,12-diazatriphenylene (L¹)*

Di(3-thienyl) acetylene (350 mg, 1.83 mmol), 11b-hydroxy-1,3-diphenyl-1,11b-dihydro-7,8-diaza-cyclopenta[l]phenanthren-2-one (**VI**) (600 mg, 1.49 mmol) and benzophenone (2.5 g) were heated at 330 °C under argon for 75 min. The product was purified by column chromatography on silica using 5%MeOH in dichloromethane as the eluent, to yield a pale-yellow solid (470 mg, 58%). Found: C, 76.42; H, 3.99; N, 4.84; calcd. (%) for $C_{36}H_{22}N_2S_2 \cdot 0.25CH_2Cl_2$: C, 76.72; H, 3.99; N, 4.93. IR (neat) cm$^{-1}$: 1566, 1426, 1276, 1260, 764, 744, 718 and 703. ESI-MS (m/z): found: 547.1301, calcd. 547.1303 for $C_{36}H_{23}N_2S_2$, $[M+1]^+$. $^1H$-NMR (400 MHz, CDCl$_3$, $\delta$ in ppm): 8.93 (d, 2H, $^3J(HH)$ 4.5 Hz, H$^6$), 7.83 (d, 2H, $^3J(HH)$ 8.5, Hz, H$^4$), 7.25-7.20 (m, 6H, H$_{Ph}$), 7.10 (d, 4H, $^3J(HH)$ 7.5 Hz, H$_{Ph}$), 7.06 (dd, 2H, $^3J(HH)$ 4.5, 8.5 Hz, H$^5$), 6.95 (dd, 2H, $^3J(HH)$ 5.0, Hz, $^4J(HH)$ 3.0 Hz, H$_{Th}$), 6.49 (d, 2H, $^4J(HH)$ 3.0 Hz,

$H_{Th}$) and 6.43 (d, 2H, $^3J$(HH) 5.0 Hz, $H_{Th}$). $^{13}$C-NMR (100 MHz, CDCl$_3$, δ in ppm): 148.8 (C$^6$), 137.2 (C$^4$), 131.2 (C$_{Ph}$), 129.9 (C$_{Th}$), 128.7 (C$_{Ph}$), 127.1 (C$_{Ph}$), 124.3 (C$_{Th}$), 123.5 (C$_{Th}$) and 121.6 (C$^5$).

### 6,7-di(4-butylphenyl)-5,8-diphenyl-1,12-diazatriphenylene (L²)

Di(4-*tert*-butylphenyl) acetylene (210 mg, 0.723 mmol), (**VI**) (300 mg, 0.745 mmol) and benzophenone (1.2 g) were heated at 300 °C under argon for 1 h. Column chromatography on silica using 5% methanol in dichloromethane afforded **L²** as an off-white solid (255 mg, 55%). MA ESI-MS (m/z): found: 647.3431, calcd. 647.3426 for C$_{48}$H$_{43}$N$_2$, [M+1]$^+$. $^1$H-NMR (400 MHz, CDCl$_3$, δ in ppm): 8.91 (dd, 2H, $^3J$(HH) 4.5 Hz, $^4J$(HH) 1.5 Hz, H$^6$), 7.83 (dd, 1H, $^3J$(HH) 8.5 Hz, $^4J$(HH) 1.5 Hz, H$^4$), 7.11-7.17 (m, 6H, H$_{Ph}$), 7.07 (m, 4H, H$_{Ph}$), 7.04 (dd, 2H, $^3J$(HH) 4.5, 8.5 Hz, H$^5$), 6.88 (d, 2H, $^3J$(HH) 8.5 Hz, H$_{Ar}$), 6.57 (m, 2H, $^3J$(HH) 8.5 Hz, H$_{Ar}$) and 1.17 (s, 18H, CMe$_3$). $^{13}$C-NMR (100 MHz, CDCl$_3$, δ in ppm): 148.5 (C$^6$), 147.7, 146.8, 141.5, 137.5, 136.4, 136.2 (C$^4$), 131.4 (C$_{Ph}$), 130.4 (C$_{Ar}$), 128.8, 127.8, 127.4 (C$_{Ph}$), 126.2, 125.4 (C$_{Ph}$), 122.9 (C$_{Ar}$), 120.7 (C$^5$), 33.7 (*C*Me$_3$) and 30.8 (C*Me*$_3$).

### fac-[ReCl(CO)₃(L¹)] (20)

A suspension containing [ReCl(CO)$_5$] (10 mg, 0.027 mmol) and 5,8-diphenyl-6,7-di(3-thienyl)-1,12-diazatriphenylene **L¹** (15 mg, 0.027 mmol) in degassed benzene (2.5 mL) was heated under reflux for 3 h to give a yellow solution. It was allowed to cool and then concentrated to a low volume and triturated with hexane to yield (**20**) as a yellow solid (21 mg, 89%). Found: C, 55.05; H, 2.65; N 3.30, calcd. (%) for C$_{39}$H$_{22}$ClN$_2$O$_3$S$_2$Re$^.$: C, 54.95; H, 2.60; N 3.29. ESI-MS (THF, m/z): found: 852.0358, calcd. 852.0318 for C$_{39}$H$_{22}$N$_2$O$_3$S$_2$ClRe, [M]$^+$. IR (neat, cm$^{-1}$): 2926, 2017, 1912, 1878, 1575, 1438, 1377, 1019, 773, 699 and 680. $^1$H NMR (400 MHz, CDCl$_3$, δ): 9.11 (d, 2H, $^3J$(HH) 5.1 Hz, H$_{Py}$), 8.01 (d, 2H, $^3J$(HH) 8.0 Hz, H$_{Py}$), 7.39 (s, C$_6$H$_6$), 7.34-7.29 (m, 6H, H$_{Ph}$), 7.22 (dd, 2H, $^3J$(HH) 5.1, 8.0 Hz, H$_{Py}$), 7.13 (d, 4H, $^3J$(HH) 7.3 Hz, H$_{Ph}$), 6.96 (m, 2H, H$_{Th}$), 6.52 (d, 2H, $^4J$(HH) 1.5 Hz, H$_{Th}$) and 6.43 (d, 2H, $^3J$(HH) 4.3 Hz, H$_{Th}$). $^{13}$C NMR (100 MHz, CDCl$_3$, δ): 197.2, 190.0, 151.4, 148.1, 140.9, 139.7, 139.6, 138.6, 138.4, 130.9, 130.7, 129.5, 129.3, 129.1, 128.3, 127.9, 127.8, 124.7, 123.9 and 123.6.

### fac-[ReCl(CO)₃(L²)] (21)

A suspension containing [ReCl(CO)$_5$] (8.4 mg, 0.023 mmol) and 6,7-di(4-*tert*-butylphenyl)-5,8-diphenyl-1,12-diazatriphenylene **L²** (15 mg, 0.023 mmol) in degassed benzene (2.5 mL) was heated under reflux for 3 h to give a yellowish brown solution. It was allowed to cool, then concentrated to a low volume, and hexane was added to

yield (**21**) as a yellow solid (20 mg, 91%). Analytical sample was crystallised from dichloromethane/methanol. Found: C, 62.35; H, 4.05; N 2.60, calcd. (%) for $C_{51}H_{42}ClN_2O_3Re \cdot 0.5CH_2Cl_2$: C, 62.16; H, 4.36; N 2.82. ESI-MS (THF, m/z): found: 952.2477, calcd. 952.2442 for $C_{51}H_{42}N_2O_3ClRe$, $[M]^+$. IR (neat, cm$^{-1}$): 2962, 2017, 1910, 1898, 1866, 1600, 1437, 1024, 808, 699 and 678. $^1$H NMR (400 MHz, CDCl$_3$, δ): 9.10 (d, 2H, $^3J(HH)$ 5.0 Hz, H$_{Py}$), 8.01 (d, 2H, $^3J(HH)$ 9.0 Hz, H$_{Py}$), 7.39 (s, C$_6$H$_6$), 7.25-7.16 (m, 8H, H$_{Py}$ & H$_{Ph}$), 7.10 (d, 4H, $^3J(HH)$ 7.0 Hz, H$_{Ph}$), 6.89 (d, 4H, $^3J(HH)$ 8.5 Hz, H$_{Ar}$), 6.57 (m, 4H, H$_{Ar}$) and 1.17 (s, 18H, CMe$_3$).

## *fac*-[ReCl(CO)$_3$(L$^3$)] (22)

A suspension containing [ReCl(CO)$_5$] (16 mg, 0.044 mmol) and 3,4,5,6-tetraphenyl-2,2´-bipyridine **L$^3$** (22 mg, 0.047 mmol) in degassed benzene (6 mL) was heated under reflux for 3 h to result a yellow solution. It was allowed to cool and then concentrated to yield (**22**) as a yellow solid (33 mg, 97%). Found: C, 59.80; H, 3.35; N 3.30, calcd. (%) for $C_{37}H_{24}ClN_2O_3Re \cdot 0.5C_6H_6$: C, 59.66; H, 3.38; N 3.48. ESI-MS (THF, m/z): found: 789.0924, calcd. 789.0931 for $C_{37}H_{24}N_2O_3ReClNa$, $[M+Na]^+$. IR (neat, cm$^{-1}$): 3031, 2015, 1908, 1872, 1602, 1551, 1478, 1448, 768, 698 and 682. $^1$H NMR (400 MHz, CDCl$_3$, δ): 9.06 (d, 1H, $^3J(HH)$ 5.0 Hz, H$_{Py}$), 7.60 (d, 2H, $^3J(HH)$ 7.5 Hz, H$_{Py}$), 7.52-7.40 (m, 3H, H$_{Py}$ & H$_{Ph}$), 7.39 (s, C$_6$H$_6$), 7.25-7.16 (m, 8H, H$_{Py}$ & H$_{Ph}$), 6.75 (d, 1H, $^3J(HH)$ 8.0 Hz, H$_{Ar}$), 6.69 (d, 2H, $^3J(HH)$ 8.0 Hz, H$_{Ar}$) and 6.65 (d, 1H, $^3J(HH)$ 6.5 Hz, H$_{Ph}$). $^{13}$C NMR (100 MHz, CDCl$_3$, δ): 197.3 (CO), 196.8 (CO), 191.5 (CO), 161.7, 159.0, 154.6, 152.9, 152.7, 140.5, 138.3, 137.2, 136.9, 136.4, 135.7, 131.7, 131.2, 130.8, 130.5, 130.2, 130.0, 129.9, 129.6, 129.3, 129.1, 129.0, 128.3, 128.2, 127.9, 127.6, 127.3, 127.2, 126.7, 127.1, 127.0, 126.6 and 124.8.

## *fac*-[ReCl(CO)$_3$(L$^4$)] (23)

A suspension containing [ReCl(CO)$_5$] (3 mg, 0.0083 mmol) and **L$^4$** (4.5 mg, 0.0059 mmol) in chloroform (2 mL) was heated under reflux for 6 h to give a cherry red solution. It was concentrated to a low volume and triturated with methanol to yield (**23**) as a dark brown solid (5 mg, 79%). Maldi (THF, m/z): found: 1027.3564, calcd. 1027.3597 for $C_{54}H_{52}N_4O_3Re$, $[M-Cl]^+$. IR (neat, cm$^{-1}$): 2962, 2018, 1921, 1885, 1609, 1556, 1535, 1464, 1397, 1362, 1259, 1024 and 835. $^1$H NMR (600 MHz, CDCl$_3$): δ 10.28 (s, 2H, H$^1$), 9.65 (d, 2H, $^4J(HH)$ 2.3 Hz, H$^2$), 7.88 (d, 2H, $^3J(HH)$ 9.0 Hz, H$^4$), 7.50 (dd, 2H, $^3J(HH)$ 9.0 Hz, $^4J(HH)$ 2.3 Hz, H$^3$), 7.33 (m, 4H, H$^6$), 7.07 (d, 4H, H$^5$), 1.51 (s, 18H, CMe$_3$) and 1.38 (s, 18H, CMe$_3$). $^{13}$C NMR (161 MHz, CDCl$_3$, δ): 196.2 (CO *trans* to N), 187.5 (CO *trans* to Cl), 156.6, 155.3, 151.9, 151.2, 150.5, 144.9, 138.9, 132.9, 130.4,

130.3, 129.5, 129.3, 128.4, 125.1, 124.9, 123.0, 120.0, 118.6, 35.0 (*C*Me$_3$), 34.5 (*C*Me$_3$), 31.2 (C*Me$_3$*) and 31.0 (C*Me$_3$*).

### [ReCl(CO)$_3$(L$^5$)] (24)

A suspension containing [ReCl(CO)$_5$] (15 mg, 0.041 mmol) and 4-bromophenyl-terpyridine **L$^5$** (17 mg, 0.043 mmol) in chloroform (5 mL) was heated under reflux for 4 h to give a yellowish brown solution. It was allowed to cool and then concentrated to a low volume to yield (**24**) as a yellow solid (28 mg, 96%). Found: C, 37.20; H, 1.70; N 5.10, calcd. (%) for C$_{24}$H$_{14}$BrClN$_3$O$_3$Re·1.0CHCl$_3$: C, 36.92; H, 1.86; N 5.17. IR (neat, cm$^{-1}$): 2983, 2016, 1912, 1873, 1708, 1613, 1482, 1386, 1080, 1008, 829, 788 and 745. ESI-MS (DCM, m/z): found: 657.9783, calcd. 657.9776 for C$_{24}$H$_{14}$BrN$_3$O$_3$Re, [M-Cl]$^+$. $^1$H NMR (400 MHz, CDCl$_3$, δ): 9.15 (d, 1H, $^3$J(HH) 5.5 Hz, H$^6$), 8.87 (d, 1H, $^3$J(HH) 4.5 Hz, H$^6$), 8.40-8.36 (m, 3H, H$^3$, H$^7$ and H$^{7'}$), 8.11 (t, 1H, $^3$J(HH) 8.5 Hz, H$^4$ or H$^{4'}$), 7.97 (m, 2H, $^3$J(HH) 8.5 Hz, H$^4$ or H$^{4'}$), 7.92 (d, 1H, $^4$J(HH) 1.5 Hz, H$^{3'}$), 7.73 (d, 2H, $^3$J(HH) 8.5 Hz, H$_{Ar}$), 7.65 (d, 2H, $^3$J(HH) 8.5 Hz, H$_{Ar}$) and 7.56 (m, 2H, H$^5$ and H$^{5'}$).

### [ReCl(CO)$_3$(L$^6$)] (25)

A suspension containing [ReCl(CO)$_5$] (34 mg, 0.091 mmol) and 4-phenyl-3,6-di(2-pyridyl)-pyridazine **L$^6$** (30 mg, 0.096 mmol) in de-gassed benzene (4 mL) was heated under reflux for 2 h to give a red solution. The solvent was removed and the residue was crystalized from dichloromethane/methanol to yield (**25**) as an orange solid (49 mg, 88%). Found: C, 44.55; H, 2.20; N 8.65, calcd. (%) for C$_{23}$H$_{14}$ClN$_4$O$_3$Re·0.25CH$_2$Cl$_2$: C, 43.82; H, 2.29; N 8.80. IR (neat, cm$^{-1}$): 2010, 1907, 1880, 1862, 1603, 1561, 1478, 1443, 1396, 1229, 1152, 994, 798, 757 and 699. MS (m/z–MALDI-TOF, CH$_2$Cl$_2$): found: 581.0614; calcd. 581.0624 for C$_{23}$H$_{14}$N$_4$O$_3$Re, [M-Cl]$^+$. $^1$H NMR (400 MHz, CDCl$_3$, δ): 9.16 (d, 1H, $^3$J(HH) 5.2 Hz, H$_{Py}$), 8.83 (d, 1H, $^3$J(HH) 7.9 Hz, H$_{Py}$), 8.75 (s, 1H, H$_{Pyr}$), 8.74 (d, 1H, H$_{Py}$, overlaps with the singlet), 8.01 (dt, 1H, $^3$J(HH) 7.8 Hz, $^4$J(HH) 1.4 Hz, H$_{Py}$), 7.73-7.45 (m, 8H, H$_{Ph}$ & H$_{Py}$) and 7.34 (d, 1H, $^3$J(HH) 8.3 Hz, H$_{Py}$). $^{13}$C NMR (100 MHz, CDCl$_3$, δ): 198.2 (CO), 196.6 (CO), 189.3 (CO), 158.2, 156.8, 154.4, 153.7, 150.7, 149.7, 144.8, 137.7, 137.6, 135.8, 130.5, 130.0, 128.2, 128.0, 127.1, 126.2 and 123.0.

### [ReCl(CO)$_3$(L$^7$)] (26)

A suspension containing [ReCl(CO)$_5$] (16 mg, 0.044 mmol) and **L$^7$** (18 mg, 0.047 mmol) in degassed benzene (3 mL) was heated at 65 °C for 3.5 h to give a colourless solution. It was concentrated to a low volume and hexane was added to yield (**26**) as a white solid (21 mg, 70%). Found: C, 47.05; H, 5.00, N, 4.25. calcd. (%) for

$C_{27}H_{31}N_2O_3ClPRe$: C, 47.40; H, 4.57, N, 4.09. IR (neat, cm$^{-1}$): 2022 (CO), 1925 (CO), 1880 (CO), 1642, 1478, 1435, 1090, 745, 693 and 679. MS (*m/z*–MALDI-TOF, $CH_2Cl_2$): found: 621.1682; calcd. 621.1680 for $C_{26}H_{31}N_2O_2PRe$, [M-CO-Cl]$^+$. $^1$H NMR (400 MHz, CDCl$_3$, δ): 7.71-7.61 (m, 2H), 7.52-7.36 (m, 8H), 3.68 (s, 3H, NMe), 2.76 (d, 1H, $^2$J(PH) 12.6 Hz), 2.64 (m, 1H), 2.57 (s, 3H, NMe), 2.15 (m, 1H), 1.84 (m, 1H), 1.64 (m, 1H), 1.47 (m, 1H), 1.01 (s, 3H, Me), 0.74 (s, 3H, Me) and -0.18 (s, 3H, Me). $^{13}$C NMR (100 MHz, CDCl$_3$): 193.4 (d, $^2$J(PC) 5.8 Hz), 191.6 (d, J(PC) 74.3 Hz, CO *trans* to P), 191.0 (d, J(PC) 7.8 Hz), 179.4 (C=N), 137.2 (d, J(PC) 10.8 Hz), 132.7, 131.5 (d, J(PC) 46.0 Hz), 130.4, 130.1 (d, J(PC) 43.0 Hz), 128.6 (d, J(PC) 9.8 Hz), 128.4, 128.3 (d, J(PC) 6.0 Hz), 66.9, 55.7, 50.7, 47.9 (d, J(PC) 47.9 Hz), 46.6, 37.0 (d, J(PC) 11.7 Hz), 33.2, 30.2 (d, J(PC) 5.9 Hz), 22.2, 19.0 and 11.2. ]$^+$. $^{31}$P NMR (161 MHz, CDCl$_3$): 45.9 (s).

### *fac*-[Re(CO)$_3$(E,Z-L$^8$)]Cl (27a)

A suspension containing [ReCl(CO)$_5$] (14 mg, 0.0376 mmol) and azine diphosphine **L$^8$** (23 mg, 0.04 mmol) in degassed benzene (3 mL) was heated under reflux for 6 h to give a white precipitate. The reaction mixture was concentrated to a low volume, and hexane was added to yield (**27a**) as a white solid (29 mg, 88%). Found: C, 55.85; H, 5.20, N, 3.35. calcd. (%) for $C_{39}H_{42}N_2O_3ClP_2Re\cdot0.5C_6H_6$: C, 55.47; H, 4.99, N, 3.08. IR (neat, cm$^{-1}$): 2966, 2028, 1960, 1915, 1618, 1478, 1382, 1198, 1098, 1080, 833, 739 and 693. MS (*m/z*–MALDI-TOF, $CH_2Cl_2$): found: 835.2223; calcd. 835.2228 for $C_{39}H_{42}N_2O_3P_2Re$, [M-Cl]$^+$. $^1$H NMR (400 MHz, CDCl$_3$): 7.91-7.76 (m, 2H), 7.76-7.56 (m, 5H), 7.51-7.35 (m, 5H), 7.21-7.08 (m, 3H), 7.08-6.97 (m, 3H), 6.72-6.59 (m, 2H), 4.70 (dd, 1H, $^3$J(HH) = 18.6 Hz, $^2$J(PH) 11.5 Hz, CH$_2$), 4.40 (t, 1H, $^3$J(HH) = $^2$J(PH) 13.1 Hz, CH$_2$), 3.57 (dd, 1H, $^3$J(HH) = 18.6 Hz, J(PH) 2.5 Hz, CH$_2$), 3.16 (t, 1H, $^3$J(HH) = $^2$J(PH) 13.1 Hz, CH$_2$), 1.59 (s, 9H, CMe$_3$) and 1.05 (s, 9H, CMe$_3$). $^{31}$P NMR (161 MHz, CDCl$_3$): 31.9 (d) and 19.3 (d), $^2$J(PP) = 24 Hz.

### *fac*-[Re(CO)$_3$(E,Z-L$^8$)]PF$_6$ (27b)

A solution of NH$_4$PF$_6$ (14 mg, 0.086 mmol) in methanol (0.5 mL) was added to a solution of (**27a**) (26 mg, 0.029 mmol) in methanol (0.5 mL). After 15 min, the solution was concentrated to a low volume to yield (**27b**) as a white solid (23 mg, 79%). Found: C, 47.65; H, 4.05, N, 2.55. calcd. (%) for $C_{39}H_{42}N_2O_3F_6P_3Re$: C, 47.80; H, 4.32, N, 2.86. IR (neat, cm$^{-1}$): 2041 (CO), 1960 (CO), 1914 (CO), 1642, 1578, 1478, 1436, 1097, 832, 740 and 697. MS (*m/z*–MALDI-TOF, $CH_2Cl_2$): found: 835.2211; calcd. 835.2228 for

$C_{39}H_{42}N_2O_3P_2Re$, $[M- PF_6]^+$. $^1H$ NMR (400 MHz, CDCl$_3$): 7.96-7.56 (m, 7H), 7.49-7.38 (m, 3H), 7.27-7.12 (m, 3H), 7.11-6.69 (m, 5H), 6.61-6.49 (m, 2H), 4.58 (dd, 1H, $^3J(HH)$ = 18.6 Hz, $^2J(PH)$ 11.5 Hz, CH$_2$), 4.02 (t, 1H, $^3J(HH)$ = $^2J(PH)$ 13.1 Hz, CH$_2$), 3.52 (ddd, 1H, $^3J(HH)$ = 18.6 Hz, J(PH) 2.5, 4.5 Hz, CH$_2$), 2.81 (t, 1H, $^3J(HH)$ = $^2J(PH)$ 13.1 Hz, CH$_2$), 1.54 (s, 9H, CMe$_3$) and 0.98 (s, 9H, CMe$_3$). $^{31}P$ NMR (161 MHz, CDCl$_3$): 30.5 (d) and 19.5 (d), $^2J(PP)$ = 24 Hz.

## Results and Discussion

### Synthesis of ligands

Oxidation of 1,10-phenanthroline (phen) with bromine and conc. sulphuric acid yielded 1,10-phenanthroline-5,6-dione **V** as a yellow solid (Scheme 1). Base-catalysed condensation of 1,10-phenanthroline-5,6-dione **V** with 1,3-diphenylpropan-2-one afforded the keto-alcohol **VI** as a white solid in 89% yield. Characterising data for compound (**VI**) and other compounds are given under methodology and all new compounds were characterized by a combination of elemental analysis, IR, Mass and NMR spectroscopy.
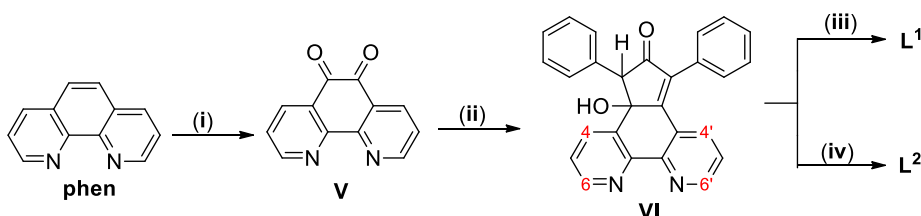


**Scheme 1**. (i) Br$_2$/conc. H$_2$SO$_4$; (ii) 1,3-diphenylpropan-2-one; (iii) di(3-thienyl) acetylene; (iv) di(4-*tert*-butylphenyl) acetylene

The IR spectrum of **VI** showed IR bands at 3666 and 3223 cm$^{-1}$ for the OH group and a band at 1706 cm$^{-1}$ for the carbonyl group. The proton resonances for the CHPh and OH appeared at 4.49 ppm (singlet) and 3.19 ppm (broad singlet), respectively. Diels-Alder cycloaddition reaction in benzophenone melts under argon between (**VI**) and di(3-thienyl) acetylene and di(4-*tert*-butylphenyl) acetylene afforded ligands **L$^1$** and **L$^2$** (Figure 2), respectively, in moderate yields. Characterizing data of **L$^1$** and **L$^2$** are in good agreement with the proposed structures. The $^1H$-NMR spectrum of **L$^1$** showed resonances at 6.95 (dd, $^3J(HH)$ 5.0, $^4J(HH)$ 3.0 Hz), 6.49 (d, $^4J(HH)$ 3.0 Hz) and 6.43 (d, $^3J(HH)$ 5.0 Hz) for thienyl protons. The $^1H$-NMR spectrum of **L$^2$** showed peaks at 6.88 (d, $^3J(HH)$ 8.5 Hz) and 6.57

(d, $^3$J(HH) 8.5 Hz) ppm for the aryl protons; and a singlet at 1,17 ppm for the *tertiary*-butyl groups.

## Synthesis of rhenium(I) complexes containing N-donor ligands

Reaction of [ReCl(CO)$_5$] with several N-donor ligands was studied; as expected, bidentate ligands **L¹**-**L⁴** afforded *fac*-chlorotricarbonyl rhenium(I) complexes, *fac*-[ReCl(CO)$_3$(N^N)] **(20)**-**(23)** (Figure 9) in good yields as coloured solids. For example, mass spectral data of **(20)** indicated (m/z, 852.0358 for C$_{39}$H$_{22}$ClN$_2$O$_3$S$_2$Re) the presence of M$^+$ ion. The $^1$H-NMR spectrum showed resonances at 6.96 (m), 6.52 (d, $^4$J(HH) 1.5 Hz) and 6.43 (d, $^3$J(HH) 4.3 Hz) for thienyl protons. In the $^{13}$C NMR spectrum of **(20)**, the carbon resonances for the three carbonyl ligands appeared at 197.2 and 190.0 ppm with the intensity ratio of (2:1), which were assigned to carbonyl ligands *trans* to nitrogen and chlorine, respectively. These values and assignments are in good agreement with the values reported in the literature (Canadas *et al*, 2019). The IR spectrum showed three strong IR bands at 2017, 1912 and 1878 cm$^{-1}$ for carbonyl ligands. The complexes **(22)**-**(23)** (Figure 9) were characterized in a similar manner and their IR and NMR data suggest them to have the molecular formula *fac*-[ReCl(CO)$_3$(N^N)], where N^N = **L²**-**L⁴**.
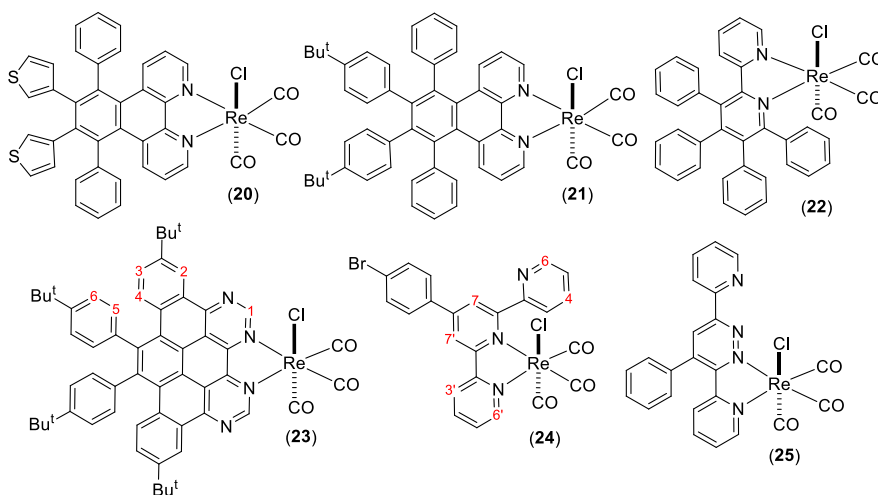


**Figure 9**. Molecular structures of **(20)**-**(25)** and atom labelling used for the assignment of NMR data

4-Bromophenyl terpyridine **L⁵** has three N-donors; it can be a bidentate (N^N) or tridentate (N^N^N) ligand depending on the

geometrical and electronic requirements of the metal centre, and the reaction conditions used. Reaction of [ReCl(CO)$_5$] with **L$^5$** in refluxing chloroform resulted in the formation of *fac*-[ReCl(CO)$_3$(**L$^5$**-N^N)] (**24**) (Figure 9) as a yellow solid in 96% yield where terpy ligand **L$^5$** is a bidentate ligand as shown by its $^1$H-NMR data for the H$^6$ of the coordinated and uncoordinated pyridyl groups: 9.15 (d, 1H, $^3$J(HH) 5.5 Hz, coordinated-H$^6$) and 8.87 (d, 1H, $^3$J(HH) 4.5 Hz, uncoordinated-H$^6$).

4-Phenyl-3,6-di(2-pyridyl)-pyridazine **L$^6$** is an unsymmetrical ligand with four N-donors and it has two different (N^N) bidentate sites for coordination to a metal centre. Treatment of [ReCl(CO)$_5$] with **L$^6$** in boiling benzene afforded *fac*-[ReCl(CO)$_3$(**L$^6$**-N,N)] (**25**) (Figure 9 & 10) as an orange solid in 88% yield. Accurate mass peak at m/z, 581.0601 corresponds to the [M-Cl]$^+$ ion. Strong IR bands observed at 2010, 1907 and 1880 cm$^{-1}$ for carbonyls are in agreement with the *fac*-Re(CO)$_3$ arrangement. The X-ray crystal structure of (**25**) (Figure 10) was determined to find out the exact coordination site of the pyridazine ligand **L$^6$**, and it confirmed that the Re(I) centre is coordinated to the (N^N) bidentate site next to the phenyl group.
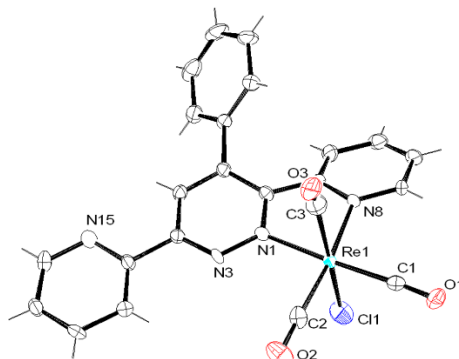


**Figure 10**. X-ray crystal structure of the complex (**25**)

## Synthesis of Re(I) complexes containing P,N ligands

Coordination modes of two P,N ligands were studied. The camphor ligand **L$^7$** has one P-donor and two N-donors and it has shown two different (P^N) coordination modes (Perera *et al.*, 1991). Treatment of **L$^7$** with [ReCl(CO)$_5$] formed *fac*-[ReCl(CO)$_3$(**L$^7$**)] (**26**) (Figure 11) as indicated by its $^1$H NMR spectral data: the presence of two singlets at 2.76 and 3.68 ppm for the two sets of methyl protons of the NMe$_2$ group clearly suggests the coordination of nitrogen of the NMe$_2$ group to the rhenium centre. The phosphorus-31 resonance of (**26**) is a singlet at 45.9 ppm.
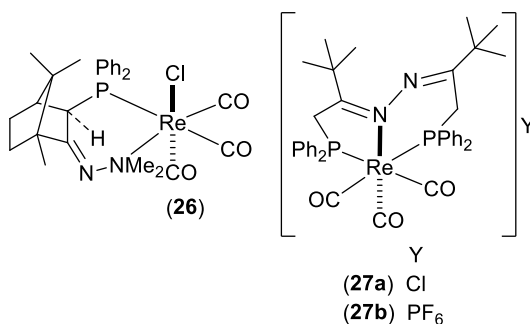
**Figure 11**. Molecular structures of (**26**) and (**27**) with P,N-donors

The ligand **L⁸** has two N-donors and two P-donors and it has shown the (P^P) coordination mode forming a 9-membered chelate ring and the tridentate (P^N^P) coordination mode forming 5- and 6-membered chelate rings (Perera et al., 1992). Reaction of [ReCl(CO)$_5$] with **L⁸** in boiling benzene precipitated the chloride salt *fac*-[Re(CO)$_3$(**L⁸**-P,N,P)]Cl (**27a**) (Figure 11) as a white solid in 88% yield. It was converted to the PF$_6$ salt *fac*-[Re(CO)$_3$(**L⁸**-P,N,P)]PF$_6$ (**27b**) by treating a methanolic solution of (**27a**) with NH$_4$PF$_6$ in methanol. The phosphorus-31 resonances of the two tricarbonyl rhenium(I) complexes (**27**) appeared as two doublets with a $^2$J(PP) of 24 Hz confirming the *facial*-arrangement of the ligand **L⁸**.

## Conclusions

1,10-Phenanthroline was converted into two hexa-substituted benzene derivatives **L¹** and **L²**. Treatment of [ReCl(CO)$_5$] with N,N-donor ligands **L¹ - L⁶** produced *facial* tricarbonyl rhenium(I) complexes *fac*-[ReCl(CO)$_3$(N^N)] (**20**)-(**25**) in good yields as coloured solids. Treatment of the P,N-donor ligand **L⁷** with [ReCl(CO)$_5$] formed *fac*-[ReCl(CO)$_3$(**L⁷**-P,N)] (**26**). The salts *fac*-[Re(CO)$_3$(**L⁸**-P,N,P)]Cl (**27a**) and *fac*-[Re(CO)$_3$(**L⁸**-P,N,P)]PF$_6$ (**27b**) were obtained by treating [ReCl(CO)$_5$] with the P^N^P-donor ligand **L⁸**.

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# Students' Welfare Services and Educational Stability in Public Universities in the Oyo State, Nigeria

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## Abstract

The study identified the welfare services that are in existence in tertiary institutions in the Oyo State; examined the level of student's satisfaction with the available welfare services as well as the relationship between welfare services and students' educational stability in public universities in the Oyo State. A descriptive survey research design was used for the study. The population for the study comprised of all the final year undergraduates from the two public universities in the Oyo State. A questionnaire titled Students' Welfare Services and Educational Stability Questionnaire (SWSESQ) was used to gather information for the study. Data collected were analysed, using both descriptive and inferential statistics. Research questions raised were answered using frequency counts, percentages, and mean, while

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Pearson product Moment Correlation (PPMC) was used to test the hypothesis formulated at a 0.05 level of significance. The results showed that there was a moderate level of welfare services and there was no significant relationship between the students' welfare services and educational stability in the public universities in the Oyo State. The study concluded that students' welfare cannot determine educational stability in public universities in the Oyo State.

**Keywords:** Welfare Services, Educational Stability, Satisfaction, Personnel Management

## Introduction

The yearnings for stability in the university educational system are becoming a growing concern and increasing at alarming rates in the Nigerian educational system. University students require stable educational programmes and activities to succeed academically, build positive social interaction and connections, successfully transit to the global community to function effectively as tools for transformations; and become productive, self-fulfilled and self-actualized. It is however observed that many university institutions are confronted with challenges, and anxieties in their educational system stirred by the instability that truncates the academic activities and processes, and their calendar year, such that all efforts to thrive academically are jeopardized and hindered.

In the same vein, Bala & Ishaya (2014), viewed and conceptualized that many universities suffer instability due to all manners of malfunctions in the system; they further reiterated that this made the entire system to suffer setbacks which decays the system and causes decays to be forgotten too easily. They go on to reiterate that these concerns affect the university institutions to the level of underdevelopment within the academic system. Thus, the quest for stability in educational systems becomes a concern that needs to be addressed.

Inspiring the learners in the university system is hinged on those

practices, processes and procedures while the purpose of such inspiration rests primarily on motivation and maintaining learners' physical, social, intellectual, emotional, and all-around well-being and development. This can be demonstrated by suggesting that the best any higher institution of learning could offer was to make a conducive environment available, where effective learning through understanding and wholesome development of learners can be achieved. It should be taken into consideration the provision of such services that tends to improve, motivate, and enhance students' well-being.

Alani, Okunola & Subair (2010), lend credence to this with their opinion that apart from the emphasis on academic work, universities should also offer welfare services (e.g. good hostel facilities). This should be challenging and learner friendly to maintain one's individuality, physical and mental health and to form a relationship with others. This will offer an opportunity for students to grow and help them to become more effective individuals both at personal and societal levels. This implies that aside from the academic climates that are correlated with learning through the 'four walls' of the University; there exist other processes, procedures and services that have been observed tending to enhance student readiness to learners.

Alani, et. al. (2010), reported that welfare services are key motivating factors to human success in life, as well as essential ingredients upon which the pillars of university education are founded. They further claimed that welfare provision within the school setting can be divided into support services and the personnel development programme, which are designed to help students to devise effective coping strategies for perceptibly high academic pressure in their courses and careers. "Students support services describe the myriad service area on a university campus whose service is providing academic and support services to the student in such areas which include career service housing student health, counselling services, student's activities and leadership development, disability support services, international students' services, among others" (Walker, 2008). They are

predominantly delivered by the Student Affairs Division. The foundation effect of welfare service is to enhance human life, motivate students to learn and aid the wholesome development of learners and individuals' entire lives.

Nations invest in university education because society expects it will contribute to national development. University education is the apex and the centre of the educational system. It is the highest level for human capital development. The entire intellectual and professional life of any country depends on sound education for highly erudite scholars who are trained and developed in the university. The investment in university education has been justified on the ground that its degrees benefit society by adding to the skills and values of the population and in general to the public good. Nations are aware of the opportunities which university education provides for social mobility, self-improvement, and economic empowerment. They depend increasingly on knowledge, ideas, and skills which are produced in the universities. All over the world, investment in university education is a critical component of national development efforts.

According to Haastrup & Adedokun (2009), nations invest in university education because society expects it to contribute to national development in three principal ways.

Firstly, society expects universities to produce highly skilled personnel in Technology, Engineering, Management, and other professions. Secondly, universities have the responsibility of producing their corps of academic personnel which is the intellectual resources pool that will through scientific research generate new knowledge and innovation to solve developmental problems, and finally, universities produce teachers, administrators, and managers for other levels of human resources development institutions. Hence, there is no gainsaying in the fact that the role of the university is critical to human capital development, research and technological innovation of any country or society.

The goals of tertiary education in Nigeria in the National Policy on

Education according to the Federal Republic of Nigeria (FRN, 2013), shall be to contribute to national development through high-level relevant manpower training; provide accessible and affordable quality learning opportunities in formal and informal education in response to the needs and interest of all Nigerians; provide high-quality career counselling and lifelong learning programme that prepares students with the knowledge and skills for self-reliance and the world of work; reduce skill shortages through the production of skilled manpower relevant to the needs of the labour market; promote and encourage scholarship, entrepreneurship and community service; forge and cement national unity, and promote national and international understanding and interaction.

Universities in Nigeria are established essentially to advance knowledge, wisdom and understanding through teaching, research and for the rendering of services to the community. University education began in Nigeria with the Elliot Commission of 1943 which moved the establishment of University College Ibadan (UCI) in 1948. There and then it was an affiliate of the University of London. When Nigeria attained independence in 1960, the need to train skilled manpower to take over from Colonial expatriates heightened (Haastrup & Adedokun, 2009).

According to Osagie (2001), at the time of independence, Nigeria was faced with the problems of having to provide the manpower to operate her governmental machinery, economy, diplomatic and other services; as a result, it became glaring the dire need for the massive development of education sector as the solution to manpower shortage problems and the provision of higher-level manpower needs. This necessitated the appointment of a nine-man commission composed of three (3) members each from Nigeria, Britain, and America, led by Sir Eric Ashby, to study the needs of Nigeria with regards to middle and higher-level manpower needs of the country for the next 20 years.

The findings and the recommendations of the commission made possible to a great extent the establishment of more universities in

the country in addition to the one already in existence as an affiliate to the University of London. So, in 1962, University College, Ibadan (UCI) was made a full-fledged university with the establishment of more others, which made the number of Nigeria universities rise from one in 1948 to five in 1962. These are called first-generation Universities: *i.e.* University of Ibadan, Ibadan, 1948; the University of Nigeria Nsukka, 1960; the University of Ile, (Now Obafemi Awolowo University, Ile-Ife, 1962; Ahmadu Bello University, Zaria, 1962 and University of Lagos, Lagos, 1962. These Universities were planned to take care of the lapses created in the early years of the first university. They were established as full autonomous Nigerian universities aimed at raising the required manpower to take their respective places in the country (Amaele, Akanbi & Salawu. 2006).

Following the independence, university education in Nigeria began to grow at a very rapid rate. As noticed by Subair (2008), despite the proliferation of universities in Nigeria, yet the enrolment rate outweighs the pattern designed by the NUC, and this appears to be so due to growth in school-age population and the preference for university rather than Polytechnic or College of education by secondary school leavers. However, this upsurge of increase rate in universities seems to have been explained by Adedeji (2003) and Durosaro (2004), who posited that the growth of the Nigerian Universities system was enhanced by the rapid increase in oil revenue between 1973 and 1980.

Similarly, Ogunyemi (2013), observed this to have been the resultant effects of a decree promulgated by the government in 1993 which provides guidelines for the

interested private investors in tertiary education. Despite that this went into a coma, and it was later resuscitated in 2001. Now, the Nigerian universities have reached the numerical strength of 155, with the breakdown as follows: 46 Federal, 40 State and 69 Private; nationwide as approved by the NUC (Idoko, 2016).

Personnel management functions relate to the activities that are concerned with the effective use of human resources through the

management of people, their activities,

programmes and services to achieve the predetermined objectives and goals. Ejiogu (1997) stated that in the school setting there exist a personnel development programme and the practice of the administration shows that a set of elements which relates to administrative tasks such as planning, communicating, commanding, coordinating and decision-making also exists.

According to Alabi (2002), personnel management can be viewed as obtaining, organizing, and motivating the human resources required by the organization. It is concerned with helping the enterprise or institution to meet its legal obligations and its social responsibilities towards its employees with regards to the conditions of work and quality of life provided for them in developing climate and management styles.

This will promote the effective effort, co-operation, and trust between all the people working in it to achieve its objectives. It encourages making the best use of the skills and capabilities of all those employed in the organization to attain the potentials of individuals employees, and organizational goals and objectives. It can also be viewed as a task area in management dealing with human resources to be supplied and managed.

Hence, it can be deduced that students' personnel management will involve obtaining, organizing, and motivating learners by the institution of learning, and develop a learning climate and management styles. It will promote effective effort and cooperation of the learners and helping the institution of learning to meet their legal obligation and social responsibilities towards the learners with regards to the conditions of learning and quality of services provided. Students' personnel management, therefore, consists of designing and implementation of policies and practices that can assist in promoting efficient learning and all-round development of students. So, to anyone charged with students' personnel management functions, the understanding of students' personal individuality and or typology becomes a must as

this will help a long way in determining what its effects would be on the administration. The essence of this is to create a healthy corporate body in the school so that both objectives, as well as the students' personnel needs, are satisfactorily realized. This study covered the public universities in Oyo State. These include Federal and State, (Convectional and Specialized, Residential and Non-residential), universities, which are the University of Ibadan (UI) and Ladoke Akintola University of Technology (LAUTECH), Ogbomoso.

## Statement of the Problem

It was observed that many university campuses nowadays are confronted with students' unrest, students' demonstrations, students' militancy, and other anti-social activities. This in turn does not only constitute a menace to the academic community but also jeopardizes the stable educational opportunities for the students; in terms of attendance at class, punctuality at lectures, and academic year-calendar among others. This situation most often results in total interruption and sometimes gets the students disconnected from the university system, perhaps it is an indication that students are not satisfied with the welfare services provided, yet there has been no sufficient causative evidence identified. In contrast, previous studies have also indicated factors mitigating the students' educational stability on Campus (Ekundayo & Ajayi, 2009; Alani et al., 2010). Considering this, there is the need therefore to carry out an empirical investigation to establish the correlation between students' welfare services and educational stability in the public universities, hence this study.

# Literature Review

Alani et al. (2010) conceptualized that welfare services are key motivating factors to human success in life and are also found to be essential ingredients upon which the pillars of university education arc founded. They further claimed that apart from the emphasis on academic work, universities should be adorned with welfare services such as good hostel accommodation that are learners' friendly and challenging, this enhances and motivates

one's individuality, physical and mental health; and forming a relationship with others to offer the opportunity to grow and to help students to become more effective individuals both at personal and at societal levels. They reiterated that one of the support services and the personal development programme in which the school setting is designed to help the student device effective coping strategies for what can be very high pressure, course and career are welfare services. Similarly, Fafunwa (1971) claimed that both the Elliot commission in 1945 and the Asby commission in 1960 overtly emphasized the need for the welfare service on the Campus.

Subair (2008), claimed that student welfare service is one of the wide range of services put in place by the school authority, to ensure sound learning of students on the campus. He further identified accommodation, counselling, career information, and support from a tutor, course information, student unionism, bursary award/scholarship, and transportation as the basic welfare services that would serve the entire students' populace in any higher institution of learning. Individual learners can be helped to satisfy their own needs and utilize their potential and at the same time contribute to the aims of an enterprise. This can be simply demonstrated by suggesting that the essential goal of any institution of learning is to create a conducive learning environment where the effective and wholesome development of learners can be achieved. Alina (2013), again emphasized that the role of students' services is influenced by how the policies are elaborated, by the content of curriculum and services, and by the degree of knowledge regarding the development of the students and how the environment outlines their behaviour.

Similarly, Maduewesi (2005), identified the learners as the most precious resources for moulding, so those who take care of the students should be experienced with initiative and persuasive skills to carry them along. Studies have equally found that the welfare service is the basis of all that is involved in education, the foundation effect to enhance and motivate students to learn; and to aid wholesome development of learners and individuals' entire lives. Opadokun (2004) found that accommodation is the pivot

around which all the activities of the student in an institution revolve.

Also, Ajayi (2014), claimed that financial aid is a crucial component for achieving students' goals in colleges of education and is responsible for the crisis in the universities. Onyike (2013) reported that the lack of adequate essential facilities on campuses causes students crisis which leads to unstable educational programmes in higher institutions of learning in Nigeria and that one must not forget that hierarchy of needs (water, electricity, accommodation) must be met to attain a state of congruence because these are necessary for the survival of students on campus; and especially for the promotion of positive behaviour within the social environment.

Subsequently, Oyebade (2001), observed that students' complaints in the past arose from problems ranging from inadequate welfare services to other unfavourable factors bordering on their concerns or issues affecting the generality of the masses, no wonder it is common then to see students frustrated, downcast and dejected especially when they are seen as not satisfied or not getting a clear picture of what constitutes reasons for poor welfare services. This corroborates with Maslow (1954), who thought that human needs are in the form of hierarchy and are never satisfied. As a set of needs is satisfied it ceases to be a motivator, and as lower-level needs are met higher-level needs emerge. Nevertheless, studies have also revealed that welfare services are essential ingredients upon which the pillars of university education are founded (Alani et al., 2010). In this regard, students' welfare services should be provided to the maximum level that will serve the students adequately in the public universities.

In a separate study, Ayodele (2003) found that the learning environment should be enriched to stimulate students' wholesome development, and the more a child is comfortable, the more he/she wants to learn. All these are indications that welfare service is the basis of all that is involved in education, and that it should be considered relevant to aid the wholesome development of the student on the campus.

Bala & lshaya (2014), who viewed and conceptualized that many universities suffer instability due to all manner of malfunctions in the system; they further reiterated that this made the entire system to suffer a setback and almost forgotten; that the menace affects the university institutions to the level of underdevelopment within the academic system.

Similarly, Ekundayo & Ajayi (2009), claimed that the constant closure of the universities, and disruptions of the academic calendar that constitute instability in the educational system among others, have been the resultant effects of the students' militancy in Nigerian universities. They further posited that where such things occur there is no guarantee that academic programmes would run normally without being truncated. Subsequently, Fitz (2001) opined that stability is more important to the students in school because these are critical learning periods. He further emphasized that without stability students involved will continue to have academic problems; so he postulated that to achieve educational or academic stability students should be made to remain in the school system they are currently attending. Stability is worth ensuring for consistency in programmes and the credibility of the institution so that students can sustainably accomplish and actualize goals on campus.

**Objectives of the Study**
(a) identify students' welfare services available in the public universities in the Oyo state;
(b) examine the levels of students' satisfaction with the available welfare services in the public universities in the state;
(c) examine the educational stability in public universities in the state; and
(d) determine the relationship between welfare services and students' educational stability in public universities in the state.

**Research Questions**
(1) Do the students' welfare services exist in the public universities in Oyo State?

(2) What is the level of students' satisfaction with the existing welfare services in the public university in Oyo State?

(3) Are the educational systems stable in the public universities in Oyo state?

**Research Hypothesis**

**HO1:** There is no significant relationship between the students' welfare services and educational stability in the public universities in Oyo state.

## Methodology

The research design adopted for this study was a descriptive survey. The population for this study comprised all the final year undergraduates of (2015/2016) academic sessions in the public Universities in Oyo State. There are 21 faculties in public universities in Oyo State. The rationale for selecting final-year students was that it is believed that this set of students has interacted with various welfare services for more than two years to have developed an independent mind. On a faculty basis, it consists of Agricultural Science 2,038, Arts 400, Pharmacy and Basic Medical Science 526, Clinical and Dentistry 201, Education 442, Law 159, Public Health and Veterinary 109, Science 2,039, Environmental Science 491, Social Science 404, Engineering and Technology 1,033, Management Science 517, totals: UI = 3208, and LAUTECH = 5151 respectively; and the Grand Total = 8,359. The sample for this study was 500 students, (*ie.* 250 respondents each) selected from the two public universities in Oyo State (University of Ibadan (UI) Ibadan, and Ladoke Akintola University of Technology (LAUTECH), Ogbomoso using the Purposive Sampling Procedure. In each of the universities (5), five faculties or colleges with the more student population were purposively sampled while an accidental sampling procedure was used to select a total of 50 respondents from each faculty and or college.

The faculties and a college are as follows: From UI: Faculty of Agricultural Science, Faculty of Arts, Faculty of Education, Faculty of Science, and the Faculty of Social Sciences were selected.

Similarly, from LAUTECH, the Faculty of Agricultural Science, Faculty of Science, Faculty of Engineering and Technology, Faculty of Management Science, and the College of Medicine were selected. The rationale was to ensure that the sampled faculties/ college provided the required number of respondents. Fifty (50) final-year students were selected from each faculty using the Accidental Sampling Procedure. In all, a total of five hundred (500) final year students were sampled for this study. The instrument used to collect data in this study was a questionnaire titled: Students' Welfare Services and Educational Stability Questionnaire (SWSESQ). It was divided into two sections. Section (A) was used to elicit information on the characteristics of the institutions such as Year of Establishment, City or Town of Location, Proprietorship, Curriculum focus and Residential status. Section (B) was used to elicit information on: Students' Welfare Services Assessment Students' Level-of-Satisfaction-with-the-Welfare-Services; and the Assessment of Students' Stability, which was rated on 4 points Likert Scale: Strongly Agreed (SA), Agreed (A), Disagreed (D), Strongly Disagreed (SA).

The instrument was validated by the researcher by giving copies to the experts in the Department of Educational Management, as well as Test and Measurement experts and the research supervisor. Their comments, corrections and suggestions were built upon to ensure face, content and construct validity. The reliability of the research instrument was ensured through the test-retest method. A pilot study was conducted in the Ondo State. The instrument was administered to (50) students of Adekuunle Ajasin University, Akungba-Akoko and the Federal University of Technology Akure: twice within two weeks. The reason is that it is believed these groups shared similar characteristics with the population of the study. The responses collected were correlated using Pearson Product Moment Correlation. A co-efficient of 0.842 was obtained which was considered high enough for reliability.

The researcher personally administered the questionnaires with the help of research assistants who were workers in the sampled universities, having been given an orientation by the researcher

and were employed to work together with the researcher. A total of 500 copies of the research instrument were distributed, and a hundred per cent of returns were retrieved being that the researcher took pain to be patient and collected on the sport after it had been completed by the respondents. Data collected from the respondents were analysed, using both descriptive and inferential statistics. Research questions raised were answered using Frequency Count, Percentages, Mean and Standard Deviation while the hypothesis formulated was tested using Pearson Product Moment correlation (PPMC) at a 0.05 level of significance.

# Results

**Question 1:** Do the students' welfare services exist in the public universities in Oyo State?

**Table 1.**
*Assessment of Students' Welfare Services in the University System*

| Items_(%) | | Disagree (%) |
|---|---|---|
| There is easily accessible hostel accommodation | 294(58%) | 206(42%) |
| The hostels and halls of residence are managed with the supply of sufficient amenities and facilities | 274(55%) | 226(45%) |
| There are capable security personnel, fully equipped with modern devices and 24 hours security surveillance on the university campus | 351(70%) | 149(30%) |
| There is a health centre with necessary medical equipment with sufficient medical personnel who gives enough medical attention /emergency health care almost | 73(20%) | 402(80%) |

| | | |
|---|---|---|
| immediately to students | | |
| All students are eligible to go to the health center to visit physicians usually free of charge | 426(85%) | 74(15%) |
| There are wards for students with serious cases with drugs and other facilities needed | 79(16%) | 421(84%) |
| There are easily accessible and online banking services on campus | 334(67%) | 166(33%) |
| There are 24 hours functional internet services, adequate and effective services at subsidized charges | 323(66%) | 177(34%) |
| There is work-study opportunity with other financial aids available in the university for the interested students | 324(65%) | 176(35%) |
| The financial aids opportunity available to students are strictly merit based | 293(59%) | 207(41%) |
| **Average** | **344(68%)** | **156(32%)** |

Table 1 presents the opinion of the respondents on the assessment of welfare services available in the public universities in the Oyo state. The Table indicated that 294 (58%) of the respondents claimed that there are easily accessible hostel accommodations with reading rooms, a regular supply of water and electricity provided in their university. Similarly, it also indicates that 274 (55%) agreed that the halls are owned and managed with sufficient amenities and facilities such as toilets, bathrooms, and laundry in their university. The Table further shows that 351 (70%) of the respondents agreed that there are capable security personnel, fully equipped with modem devices with 24-hour security surveillance on their university campus. It further shows that 402 (80%) agreed that there are health centres with necessary medical equipment, and sufficient medical personnel, who give enough medical attention and emergency health care almost immediately to the students. Furthermore, 426 (85%) agreed that all the students are eligible to attend the health centre and visit the physicians and nurses free of charge.

In the same vein, 421 (84%) agreed that there are wards for the students' admission in serious cases with drugs available and dispensed to the students. Furthermore, 334 (67%) agreed that there are easily accessible internet and banking services on the campus. More so, 323 (66%) agreed that there are functional internet services with adequate and effective banking services at less and subsidized charges. The Table further indicates that 324 (65%) agreed that there is work-study with other financial aids available in their university for interested and capable students. Finally, 293 (59%) agreed that the financial aid opportunity available to the students is strictly merit-based. On average, 344 (68%) agreed that there exist welfare services in the public universities in Oyo state. This implies that there are welfare services in existence in the public universities in Oyo State.

**Question 2:** What is the level of students' satisfaction with the existing welfare services in public universities in Oyo State?

**Table 2.**

*Level of Students' Satisfaction with the Existing Welfare Services*

| Items_ | Moderate | Low | |
| --- | --- | --- | --- |
| Students are accommodated based on the required number in each room. | 94(19%) | 193(39%) | 213(43%) |
| The halls of residence are meant for all students with comfortable beds and bedding. | 40(8%) | 153(31%) | 307(61%) |
| The health center provides laboratory, X-ray, pharmacy and physical therapy services with tests free of charge | 57(11%) | 153(31%) | 206(41%) |
| Health operates for 24 hours including weekends with at least one resident Doctor with other on-call in case of emergency | 134(27%) | 280(56%) | 86(17%) |
| Information or education is provided in case of epidemic and pandemic | 121(28%) | 157(37%) | 151(35%) |
| There are sophisticated security devices at strategic places with enough orientation on security alertness for students on campus | 92(18%) | 230(46%) | 178(13%) |
| The institution is completely fenced with lockable gates, | 112(22%) | 323(65%) | 65(13%) |

| | | | |
|---|---|---|---|
| with the students themselves security conscious | | | |
| Drainage for erosion each time it rains, with the garbage disposal that always constitute problem there by resulting in filthy environment | 92(18%) | 274(55%) | 134(27%) |
| Internet /banking services networks are made available, effective, satisfactory and less cost on the campus than in the town | 73(15%) | 223(45%) | 204(41%) |
| The university management is just and fair in administering financial and scheme | 172(34%) | 163(33%) | 165(33%) |
| **Average** | **98(20%)** | **140(48%)** | **162(32%)** |

Table 2 shows the opinion of the respondents on the level of welfare services in existence in the public universities in Oyo state. The Table shows that 94 (19%) of the respondents claimed that there exists a high level of students' accommodation based on the required number in each room, while 193 (39%) claimed that the level is moderate; and 213 (43%) claimed that the level of the existence is low. 40 (8%) claimed that the student welfare services are at a high level in the hall of residence meant for students with comfortable beds and beddings, while 153 (31%) claimed that it is moderate; and 307 (61%) claimed that it is low.

It further indicates that 57 (11%) claimed that there exists a high level in health centre provision of laboratory, X-ray, Pharmacy, Physical therapy services with test free of charge, while 237 (47%) claimed that it is moderate, and 206 (41%) claimed that it is low. More so, the Table indicates that 134 (27%) claimed that there

exists a high level in health centre operation for 24 hours including Weekends with at least one resident Doctor and other on call in case of emergency at night while 280 (56%) claimed that the level is, moderate; and 86 (17%) claimed that it is low.

Furthermore, it indicated that 109 (22%) claimed to support that a high level of information or education is provided in case of an epidemic, while 325 (65%) claimed that the level is moderate', and 66 (13%) claimed that it is low. Again, it indicates that 92 (18%) claimed that the level of sophisticated security devices at strategic places with enough orientation on security alertness for the students is high, while 230 (46%) claimed that it is moderate; and 178 (36%) claimed to support the opinion that it is low. More so, it shows that 112 (22%) claimed to support that there exists a high level in completely fenced with lockable gates, and the students themselves security conscious in the institution, while 323 (65%) claimed that the level is moderate; and 65 (13%) claimed only to support the opinion that its level is low.

The Table further indicates that 92 (8%) claimed that there exists a high level of drainage for erosion each time it rains with the garbage disposal always constitutes problems thereby resulting in a filthy environment, while 274 (55%) claimed to support the opinion that its level is moderate; and 134 (27%) claimed to support that the level is low. Similarly, it shows that 73 (15%) claimed that there exists a high level of effective, satisfactory and less cost internet banking services available, on the campus than in the town, while 223 (45%) claimed that the level is moderate; to support that 204 (41%) claimed to support the opinion that the level is low.

Finally, 172 (34%) claimed that the level at which the university management is just and fair in administering the financial scheme is high. While 163 (33%) claimed that it is moderate; and 165 (33%) claimed to support that the level is low. On average, 98 (20%) emerged to support the claim that the level of welfare services in existence in the university is high, while 240 (48%) emerged to claim that it is moderate; and 162 (32%) emerged to claim that the level is low. This implies that the level of welfare services in

existence in the university has only been moderate.

**Question 3:** Are the educational systems in the public universities in Oyo State stable?

**Table 3.**

*Assessment of Students' Stability in the University System*

| Items | Agree (%) | Disagree (%) |
|---|---|---|
| The academic year calendar programmes are always taken off and end up normally as scheduled by the university | 169(34%) | 331(66%) |
| There has never been any interruption in the academic calendar of the university as a result of welfare services fail to provide by the university authority | 51(10%) | 449(90%) |
| The time frame for the lectures with other educational programmes has never been cut short by any emergency in the university | 61(12%) | 439(88%) |
| The academic activities of the university usually run smoothly as expected | 93(19%) | 407(81%) |
| The student's activities such as assignments, tutorials, seminars and projects are regularly held | 298(60%) | 202(40%) |

| | | |
|---|---|---|
| The students' social activities on campus have their scheduled time fully and here allowed without interruption | 298(60%) | 202(40%) |
| The schedule of the university academic year calendar is always pleasing to the students | 270(54%) | 230(46%) |
| The co-curricular activities of the students on campus are rarely interfered with by any policy of the university | 318(64%) | 182(34%) |
| The students' union programmes with other activities are given their own columns in the university calendar. | 280(56%) | 220(42%) |
| Students extra-curricular together with other social activities never scramble with punctuality, attendance at lectures or other educational /learning activities | 246(49%) | 254(51%) |
| **Average** | **208(42%)** | **292(58%)** |

Table 3 presents the opinion of the respondents on the educational stability in the public universities in Oyo state. The Table indicates that 169 (34%) of the respondents claimed that academic year calendar and programmes always take off and end up normally as scheduled by the university. However, the results also show that

449 (90%) disagreed that there has never been any interruption in the academic year calendar of their universities. Similarly, it shows that 439 (88%) disagreed that the time frame for the lectures with other educational programmes has never been cut short by an emergency in their universities. Also, 407 (81%) disagreed that the academic activities of their universities usually run smoothly as expected.

Furthermore, it shows that 290 (58%) agreed that the student's activities such as lectures are held continually. It henceforth shows that 298 (60%) agreed to support that the students' social activities have their scheduled time fully are allowed without interruption. In the same vein, t shows that 270 (54%) agreed to have agreed that, they are pleased with the schedule of the university academic year calendar. More so, it shows that 318 (64%) agreed that the co-curricular activities of the students on campus are rarely interfered with by any university policies. Also, the results indicated that 280 (56%) agreed that the students' union programme with other activities is given their column in the university calendar.

Nevertheless, Table 3 shows that 254 (55%) disagreed that students' extracurricular activities together with other social activities never scramble with such activities as punctuality, attendance and other educational/ learning activities. On average, 208 (42%) agreed that the students' educational system has been stable. This implies that the educational system in the public universities in Oyo state has hitherto not been stable.

**Hypothesis Testing**

**HO1:** There is no significant relationship between the students' welfare services and the students' educational stability in the public university in Oyo State.

**Table 4.**

*Analysis of Significant Relationship between Students' Welfare Services and    Educational Stability*

| Variables_N | Mean | SD | r-cal | r-tab | |
|---|---|---|---|---|---|
| | | | | sig | |
| Student welfare services | 500 | 2.560 | 0.761 | 0.112 | 0.195 |
| Educational stability | | 2.378 | 0.729 | | |

Table 4 shows the result of Pearson Product Moment Correlation (PPMC) on the test of the relationship between students' welfare services and educational stability; the co-efficient (r) = 0.112, at 0.05 level of significance. The r-calculated (0.112) is lower than the r-table value (0.195) hence, the null hypothesis is accepted. This shows that there exists no significant relationship between students' welfare services and the educational stability in the public university in Oyo State. It implies that there is no significant relationship between the student's welfare services and educational stability in the universities.

## Discussion

The results of this study indicate that welfare services that exist in public universities are considered imperative for the all-round in the Oyo state. This corroborates with Fafunwa (1971), who claimed that both the Elliot commission in 1945 and the Asby commission in 1960 overtly emphasized the need for welfare service on the campuses. Also, the findings agreed with Alani et al. (2010), who found that welfare services are key motivating factors to human success in life and are essential ingredients upon which the pillars of university education are founded. This also aligned with Ayodele (2003), who found that the learning environment should be enriched to stimulate students' wholesome development, and the

more a child is comfortable, the more he/she wants to learn.

This study also showed that the levels of the existence of welfare services have been moderate. It implies that it has been neither high nor low. However, considering the proportion of respondents on such services as accommodation and on the management and administration of financial aid scheme, it implies that most of the respondents are not pleased with the services offered. It should be noted that these services constitute the necessities upon which human life is hinged. This supports the findings of Opadokun (2004), who reported that accommodation is the pivot around which all the activities of the student in an institution revolve. But it negates the report of Onyike (2013), who found that lack of adequate essential facilities on campuses causes students' crisis, which leads to unstable educational programmes in higher institutions of learning in Nigeria. Oyebade (2001), also found that students' complaints in the past arose from problems ranging from inadequate welfare services to other unfavourable factors bordering on their concerns or issues affecting the generality of the masses. Thus, one should not be surprised to find students frustrated, downcast and dejected especially when they are seemingly not satisfied with welfare services provided for them and do not have a clear picture of what constitutes reasons for poor welfare services.

This study further indicates that educational systems in the public universities in the Oyo state have hitherto not been stable. This implies that students have not been enjoying stable educational opportunities. Studies have traced the effects of this to such occurrences as students' militancy, students' crisis, and the incessant strikes action by which have been disrupting and paralyzing the ASUU in Nigeria universities' academic calendars and students' academic pursuit (Ekundayo & Ajayi, 2009; Onyike, 2013; Ajayi, 2014). This also corroborates the opinion of Bala & lshaya (2014), who viewed and conceptualized that many universities suffer instability due to all manner of malfunctions in the system; they further reiterated that this made the entire system to suffer setbacks which decays the system and causes such

decays to be forgotten too easily. They go on to reiterate that these concerns affect the university institutions to the level of underdevelopment within the academic system.

In the same vein, this study indicates no significant relationship between students' welfare services and students' educational stability in the public universities in the Oyo State. This implies that there exists no significant relationship between students' welfare services and educational stability in public universities. However, critical views have indicated that attainment of the laudable universities' educational goals borders significantly on the quality and quantity of the welfare services. This finding corroborates with the opinion of Alani et al. (2010); Subair, (2008); Maduewesi, (2005), with emphasis that educational services play a supportive role in the realization of educational objectives. Specifically, they claimed that for educational objectives to be attained there is always the need for certain services like library counselling and school health care delivery system to be provided by the school authority. They further reiterated that support services and personal development programmes which the school setting are designed to help the students devise effective coping strategies for what can be very high-pressure, courses and careers are welfare services.

## Conclusions

The study concludes that there exist welfare services in the public universities in the Oyo State, the students claim that the levels of the existence of welfare services are moderate, yet there is no significant relationship between welfare services and educational stability in the universities.

## Recommendations

Based on the findings and conclusion of this study, the following recommendations were made:

The Management of the universities should make efforts to add

more to the welfare services available for the students on the campus. Students should be motivated through consolation on issues of unsatisfactory welfare services. The management should turn their 'listening ears' to the students whenever they register their displeasure on the poor condition of the existing welfare services and expedite action to rectify and improve upon those conditions.

All hands should be 'on deck' to put in place good quality, standard and regular welfare services which can promote positive behaviour among students within the university system. Subsequently, the creation of efficient student services that are focused on necessities such as accommodation, and financial aid schemes, among others is needed to provide the required support for academic activity and stimulate personal, social, cultural and cognitive development.

The effectiveness and most lasting impression of any university are that which is made by a stable and consistent system. So that the educational system can be made stable, university management should try and manage to reduce and or eliminate all factors that constitute menace (such as temporary closure of the institution, boycott of lectures, disruption of school administration and truncation in academic programmes) to the educational system of the university. The educational policy also needs to be improved and educational practices should help young people to enter, stay and finish their studies.

Welfare services are required and imperatives for all that are involved in education and for the all- round development of the students. For being significant and essential ingredient upon which the pillars of university education are founded, welfare services should be adequately provided in good quality in the universities to promote the overall well-being of students, to help for maximum concentration and that will encourage students to shun violence, crisis and give room for a crisis-free and peaceful existence in the university system which promotes continuity.

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# Evaluation of Student Dropout Rate in Alternative Higher Education Sector of Sri Lanka: A Case Study

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## Abstract

The main objectives of this study were to assess the average student dropout rate of the Sri Lanka Institute of Advanced Technological Education (SLIATE) and its regional centers by analyzing five years of data on student intake and convocation relevant to 14 Higher National Diploma (HND) programmes in 19 centers.

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Student recruitment and convocation data were collected and the total population of the students were considered in calculating the dropout rate. Data were analyzed using SPSS statistical software. One sample t-test, ANOVA and descriptive statistics were used for the analysis. The mean population dropout rate was compared with the sample dropout rate of each HND programme. The significance of the sample pass rate and the dropout rate was compared with the population pass rate and dropout rate to identify the significance level at p= 0.05 level.

Findings revealed that Civil and Electrical Engineering programmes have the lowest (< 27%) student dropout rate and the Quantity Surveying programme showed the second lowest (29%) student dropout rate. Agriculture, Food Technology, Business Administration, Business Finance, Mechanical Engineering, English and Accountancy programmes showed a <50% dropout rate. The average student dropout rate of SLIATE was 48%. Out of 19 centers, the Colombo center showed the lowest student dropout rate (35%) whereas Tangalle and Batticaloa centers showed the highest student dropout rate (65%). It is recommended to identify the reasons for student dropout to develop strategies to minimize student dropout.

**Keywords:** *Student dropout rate, Student pass rate, Performance level*

## Introduction

In Sri Lanka, State Universities provide higher educational opportunities free of charge for Advanced Level qualified students. However, due to limited capacities in state universities, some of the qualified students will not get the opportunities for a government university education. Hence, such students may select their higher educational journey through private universities, foreign universities, and other alternatives higher educational or vocational education pathways. Even though, students registered for higher educational programmes, student dropout is a common scenario in many educational institutes. However, a considerable dropout rate affects the performance of the institute.

Dropout occurs when students enrolled at an educational institution and give up their studies without completing their qualifications (Bonneau, 2015). This has been identified in many higher educational institutes and it will directly affect the effectiveness and efficiency of the institutes. Further, it affects the academic performance of the institute. There may be many reasons for student dropout such as financial issues of the students, non-availability of job opportunities for the programmes, outdated syllabuses, less physical and human resource availability, ragging incidences, poor administration, and so on.

Any institute has a strategic plan to move forward and analyzing the internal and external environment of the institute help in many ways to develop or revise the strategic plan. Therefore, strategies should be developed or revised by analyzing the internal and external environment of the organization. SWOT analysis, PESTAL analysis and Porter's five force analysis are key tools for analyzing the internal and external environment and developing strategies for an organization.

This study was mainly focused on the identification of the average dropout rate of the Sri Lanka Institute of Advanced Technological Education (SLIATE) and identifying the student dropout rate institute-wise and programme-wise. It is a kind of internal environmental analysis.

Sri Lanka Institute of Advanced Technological Education (SLIATE) is a statutory body operating under the purview of the Ministry of Education and is one of the leading alternative higher educational institutions in Sri Lanka. SLIATE has been focusing on the development of Advanced Technological Education at the post-secondary level. At present, it manages and supervises 19 regional institutes in Ampara, Anuradhapura, Badulla, Batticaloa, Colombo, Dehiwala, Galle, Gampaha, Jaffna, Kandy, Kegalle, Kurunegala, Mannar, Nawalapitiya, Rathnapura, Sammanthurai, Tangalle, Trincomalee and Vavuniya (Annual Report, 2018). The institute offers Higher National Diploma (HND) programmes for Advanced-level qualified students especially concerned with

students who have not been able to enter state universities due to the unavailability of enough spaces. There are 16 HND programmes offered by SLIATE, they are: Accountancy, Business administration, Business Finance, Project Management, English, Management, Tourism & Hospitality Management, Building Service Engineering, Quantity Surveying, Engineering Civil, Electrical Engineering, Mechanical Engineering, Information Technology, Food Technology, Agriculture and Consumer Science and Product Technology.

As a higher educational institute and a government-funded institute, SLIATE needs to identify the dropout rate of each regional institute governed by SLIATE. Further, the dropout rate relevant to each educational programmes needs to be identified in order to identify the issues of the programmes and to identify strategies to minimize the student dropout rate and to achieve the targets of the institute and the country.

When comparing the student enrollment and student pass-out rate yearly, it is evident that there is a considerable gap between student enrolment and the pass-out rate of SLIATE (Annual Report, 2018). Even though, students for all programmmes registered in an academic year, they will pass out in different years based on the programmes durations. Hence, dropouts should be analyzed separately for different programmes.

As the regional centers of the SLIATE are located in different locations, it is needed to assess the student dropout rate to take corrective measures to overcome the dropouts of the students, region-wise. As an initial step, this study was focused to identify the student dropout rate of each programme and in each institute governed by the SLIATE. The results of the study are expected to be used in developing the strategic management plan for the SLIATE.

**Significance of the Study**

Education is the spirit of a country which leads to social and economic development. Low quality of education will lead to wasting of public money, reduction of competency of the young generation and become unfavorable for the development of a

country. There are many internal and external factors that may directly or indirectly influence the performance of the institute. Student dropout also enormously affects the performance of an educational institute as the investment for such programmes may not achieve the target objectives of the institute. Therefore, analyzing the student dropout rate of an institute along with reasons for such dropouts is important to enhance the performance of the educational institute. Furthermore, it is very much important to take corrective actions for student dropouts to direct the institute to achieve its vision and to achieve the sustainable development of the country by adjusting its mission.

## Research Objectives

The primary objective of this study was to determine the dropout rate of SLIATE with a view of identifying the dropout rate institute-wise and programme-wise.

**Specific Objectives were;**

1. To determine the average student dropout rate of SLIATE.
2. To identify the student dropout rate programme-wise and institute-wise which are governed under SLIATE.

**Research Problem**

What is the gap between student intake and student pass-out relevant to each HND programme and relevant to each regional institute of SLIATE?

**Table 1.**

*Student intake and student pass-out information*

| Year | Intake | Diploma awarded |
|------|--------|-----------------|
| 2019 | 9,845  | 3,664 |
| 2018 | 11,474 | 3,454 |
| 2017 | 13,436 | 3,299 |
| 2016 | 8,008  | 3,088 |
| 2015 | 6,942  | 2,077 |

SLIATE governs 19 regional institutes and offers 16 HND programmes. In each academic year, average student recruitment exceeds 6,000. However, only around 3,500 students qualify for the convocation each year. Hence, there is a huge gap between student intake and student pass rate. Due to the different durations of the educational programmes, it is not possible to directly identify the student pass rate and the dropout rate for each HND programme and for each institute. Hence, investigation of the student average dropout rate for each HND programme and each institute is important to identify the performance level of the individual institute and HND programmes and to identify demand for each HND programme regional-wise.

## Review of Literature

### Education in Sri Lanka

Sri Lanka provides free education to all children from age of five to sixteen. In addition, students can continue the free education privilege up to the undergraduate level. This has paved the way for a higher literacy rate in Sri Lanka. This free education policy was introduced in Sri Lanka by the late Dr C. W. W. Kannangara, the Minister of Education in 1945 (Alawattegama, 2020). This free education concept plays a major role in the development of the country by enabling students of low-income families to continue their studies up to graduation and help to minimize poverty.

According to the Central Bank of Sri Lanka Annual Report 2019, the government expenditure on education as per cent of GDP is 1.9. A limited number of students who pass the Advanced Level (A/L) examination become selected for university entrance. In 2019, 62.9% of students e became eligible for higher education. Out of that figure, 19.1% of students were selected for state universities (Central Bank Annual Report, 2019). This reveals that a limited number of students gain opportunities for university education. In addition to the universities, there are other higher educational institutes that provide higher education under the purview of the Ministry of Education in Sri Lanka. The alternative higher education sector provides opportunities for students who

were not selected for state universities but are eligible to follow higher educational programmes. SLIATE is a government-funded higher education institute which provides alternative higher education opportunities for such students. Whatever the education provided by an institute, the success of the academic activities plays a key role in the final output.

The academic success of any higher educational institute is a key factor which reflects the quality of the education provided by that institute. Sri Lanka mainly provides free education at the primary and secondary levels. Government schools and institutes provide free education to students. There are privately owned educational institutes which provide education for a fee. The Constitution of Sri Lanka defines education as a fundamental right. The government institutes which provide free education offer a service to the community and the objectives are not profit oriented. Hence, concern about business principles is less. Private-owned educational institutes are business oriented and they apply business principles to make them profitable for sustainability. However, strategic planning, implementation and evaluation are important areas to be considered for government or privately owned institutes to achieve the desired long-term goals of the organization. There are many methods to evaluate the academic success of an educational institute. The dropout rate is only one such method that could use to evaluate academic success.

**Methods of Evaluating Academic Performance**

Many studies have been conducted by researchers to identify factors that affect student performance and institutional performance. A study by Abu et al. (2019), to identify factors affecting students' performance in higher education and to identify the most suitable predictive data mining techniques showed that students' previous grades and class performance, e-Learning activity, demographics, and social information are the major categories of factors affecting performance. The most common data mining techniques used to predict and classify students' factors

were decision trees, Naïve Bayes classifiers, and artificial neural networks. Data mining is an information-analysis technique that involves the automated discovery of patterns and relationships in a data warehouse.

Alyahyan & Duştegor (2020) have used the education data mining technique for the early prediction of students' performance. They have considered prior-academic achievement, student demographics, e-learning activity, psychological attributes, and environments. This study focused on student academic activities at different levels. However, it has not focused on the overall academic performance of the institute. The data mining method was further used by Superby et al. (2006) to determine the factors influencing the achievement the first-year university students. They evaluated the personal history of the student, the implication of student behaviour, and perceptions of the student using a decision tree, random forests, neural networks and linear discriminant analysis.

However, the present study is more focused on the actual situation in the past five years than on future predictions and attempts to identify the gaps that could be improved for future development as per the goals of the organization.

A study by Li & Carroll (2019) examined the higher education academic performance of equity groups in the Australian higher education sector. They used actual dropouts and marks to assess the performance. The influence of student satisfaction on academic outcomes was also examined. Results revealed that students from equity groups tend to have poor academic marks and are more likely to consider the option of a dropout with health and financial reasons as important determinants. This approach could be used to assess the performance of higher education institutes, especially in developing countries.

A study was conducted by Al-haimi et al. (2018) to inspect current problems and factors that affect the performance of the higher education intuitions sector of Yemen which cause them not to be listed among World Class Universities. The findings of this study

showed that lack of national vision of government, leadership, financial support, research and development funding, autonomy, governance, academic staff development, the ratio of student enrollments and quality of academic programs as some of the major issues that the Yemen higher education institutions currently experience. The research problem of this study is directly relevant to the present study and the study also uses a qualitative approach. Hence, the results will depend on the opinion of experts, sample size and sampling method. The lack of a quantitative approach to identify the lapses in a measurable way which could be used in future development is a weakness in this research.

A study conducted by Sriyalatha (2013), to identify factors contributing to students' academic performance at the University of Sri Jayewardenepura, Sri Lanka found that mothers' education levels made a significant contribution to the student's academic performance.  Further, the English knowledge of the students became the second important factor which influenced students' academic performance.  Students with higher levels of attendance for lectures showed a positive effect on their academic performance. Further, higher socio-economic status exhibited a positive significant impact on students' performance. Sriyalatha (2013) only focused on a few external and internal factors to assess student performance. The present study focuses on the dropout rate and reasons for student dropout as a performance criterion of the institute.

Xenos et al. (2002) investigate the dropout in university-level education relevant to distance learning education at the Hellenic Open University. Results showed that dropouts are correlated to the use of technological means. They found that a correlation exists between dropouts and students' age, but not with gender. It also revealed that female students' commitment to a programme was stronger and the dropout rate was lower compared to male students. This study was focused on the dropout rate of students in distance learning education whereas the present study focused

on the dropout of students in in-class teaching and learning programmes. Factors affecting both modes of education are not the same. Hence, the same criteria cannot be used to evaluate the dropout rate of students in the higher education sector.

Ranjan et al. (2015) have developed a multi-criteria decision-making framework for performance evaluation and ranking of 16 engineering departments in an Indian university. It dealt with the inter-relationships between the selection criteria with the aid of the decision-making trial and evaluation laboratory (DEMATEL) method and built a relationship structure. The entropy method was used to determine the relative criteria weights and a compromise ranking method was applied to prioritize and rank departments. They have focused on analytical results, faculty/student ratio, infrastructural development, student results and international research publications in evaluating the performance of selected departments. Vakkuri & Meklin (2003) presented a conceptual model to demonstrate the relationship between the cultural features of a knowledge-intensive organizational context, the uncertainties in the objectives of performance measurement systems and the behavioural consequences of performance measurement in higher education. They have not discussed the method used to identify the performance of educational institutes. It emphasizes that cultural factors make an impact on performance evaluation.

Frenken et al. (2017) analyzed the factors underlying university research performances such as a number of highly cited publications, international co-publications, and university-industry co-publications. Results showed that research performance differences among universities mainly stem from size, disciplinary orientation and country location. Simon et al. (2015) investigated the relationship between research performance and the teaching quality of academic staff. They used a large cross-disciplinary sample of academics within a research-oriented university for the study and found that research productivity is not related to teaching quality, but research quality is positively related to teaching quality. However, the present study does not focus on

research publications as it is not a compulsory component at the diploma level.

The present study primarily focuses on the output of the institute compared to the input and the factors that affect the performance of output. The results of this study are important to develop the strategic movement needed to compete with rival institutes and to get the maximum benefit from government investment for free education.

## Methodology

### Theory and conceptual framework

The theory adopted in this study was Strategic Management. It is the art and science of formulating, implementing and evaluating, cross-functional decisions that enable an organization to achieve its objectives (David, 2011). Strategy formulation, implementation and evaluation are important aspects of strategic management. Any organization should have a strategic plan and after implementation, it is needed to evaluate the performance. This study is an evaluation of an educational institute with reference to its input and output. If there is any gap between input and output, strategies should be revised by analyzing the internal and external environment of the organization.

### Research Design

The research design used for the study was a quantitative research design with a descriptive case study approach.

This study was conducted at SLIATE which is the main alternative higher educational Institute governed under the higher education section of the Ministry of Education. The objectives of the study were to determine the average student dropout rate of the SLIATE and to identify the student dropout rate programme-wise and institute-wise. All 19 regional centers governed under SLIATE were selected for the study. Out of 16 HND programmes, 14 HND

programmes were selected which have produced diploma holders for at least five years. The study consisted of quantitative data analysis by collecting secondary data.

Selected HND programmes for the study were: Accountancy, Business administration, Business finance, English, Management, Tourism & Hospitality Management, Building Service Engineering, Quantity Surveying, Engineering Civil, Electrical, Mechanical, Information Technology, Food Technology and Agriculture. Selected regional centres for the study were: Ampara, Anuradhapura, Badulla, Batticaloa, Colombo, Dehiwala, Galle, Gampaha, Jaffna, Kandy, Kegalle, Kurunegala, Mannar, Nawalapitiya, Rathnapura, Sammanthurai, Tangalle, Trincomalee, Vavuniya

## Data collection

*Student pass rate and dropout rate:*
To determine the average student pass rate and a dropout rate of each Higher National Diploma (HND) programme, secondary data was collected from the academic affair branch of SLIATE. Student recruitment data for the past five years and convocation data for the last five years were collected relevant to 19 regional institutes and for selected HND programmes. The duration of each 14 programme was identified. The total population of the students who registered and participate in the convocation from 2015 to 2019 was considered in data collection and analysis.

## Data Analysis

One sample t-test, ANOVA and descriptive statistics were used for the analysis. The total student population of the SLIATE was used and students of each HND programme were considered as the sample. The mean population dropout rate was compared with the sample dropout rate of each HND programme. The significance of the dropout rates was compared with the population dropout rate to identify the significance level at p= 0.05 level. The significance of the mean dropout rate of HND programmes was analyzed using one sample T-test. Descriptive analysis was used to identify the institute-wise student dropout rate of each HND programme and

to identify the mean dropout rate of each institute. Multiple comparison analysis tests were used to compare the significance of the dropout rate of each HND programme compared to other progreammes.

**Calculations**

Dropout rate of a programme = [(Input – Output)/Input] x 100

# Results and Discussion

**Programme-wise student dropout rate**

**HNDT Agriculture programme**

Figure 1 shows the mean dropout percentage of the HNDT Agriculture programme. The Ampara centre has achieved the least dropout percentage (32%) compared to Galle and Gampaha centres (40%). There were no significant differences in mean dropout percentage among the centres. Hence, the Ampara centre is the most popular centre for Agriculture programme compared to the other centres.
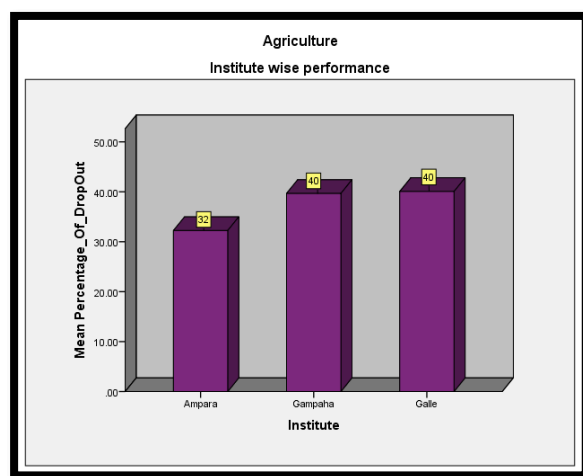


**Figure 1**. Mean dropout percentage of the HNDT Agriculture programme

## HNDM programme

HNDM programme is offered by seven centres. The dropout rate for the HNDM programme is shown in Figure 2 the highest dropout rate was recorded from the Ampara centre (72%) and the lowest was recorded from the Dehiwala centre (38%). It shows that conducting a Management programme in Ampara requires rethinking due to the severe dropout rate of students.
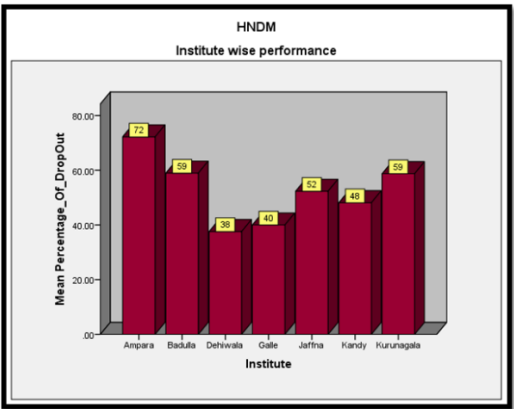


**Figure 2**. Mean dropout percentage of HNDM programme

## HNDTHM programme

HNDTHM programme is offered by seven centres SLIATE. Figure 3 shows the mean dropout rate of the HNDTHM programme for the last five years. The Dehiwala centre showed the least dropout rate (39%) whereas Ampara centre showed a significantly higher student dropout rate in the HNDTHM programme. Hence, the demand for the HNDTHM programme in Ampara is low.
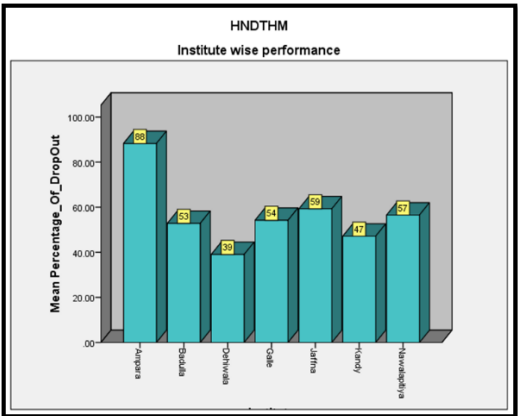
**Figure 3**. Mean dropout percentage of the HNDTHM programme

**HNDIT programme**

Figure 4 shows the mean dropout rate of the HNDIT programme for the past five years. Hence, it is important to look into the reasons for the huge dropout of students from this programme. When considering the entry qualification of the HNDIT programme, students who pass the A/L from any stream could apply for this programme and there is a selection test to select students for the HNDIT programme. A huge number of A/L art stream students applied for this programme and were selected to follow the programme. This may be one reason for the higher dropout rate as IT is a science-based subject and art stream students face difficulties when following certain subjects of the programme. It is important to revisit the entry qualification of the students and the introduction of different majoring tracts for the students based on their capabilities also would help to retain students.
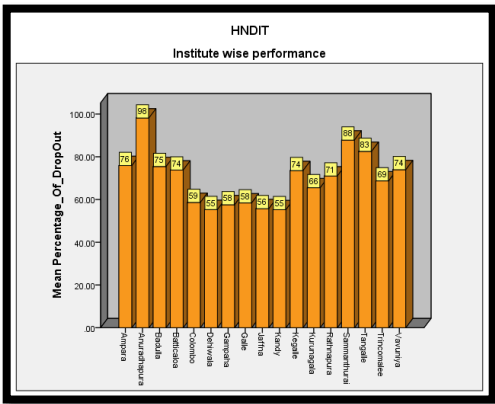
**Figure 4.** Mean dropout percentage of the HNDIT programme

## HNDFT programme

The HNDFT programme is only offered by the Gampaha centre. Figure 5 shows the dropout rate of HNDFT students at this centre (41%).
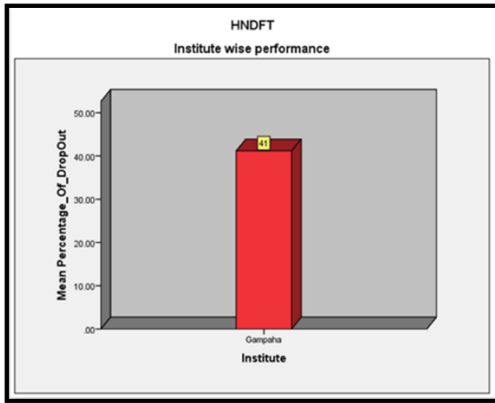


**Figure 5**. Mean dropout percentage of the HNDFT programme

## HNDBF programme

This programme is only offered in the Dehiwala centre. Figure 6 shows the mean dropout rate for this programme (31%).
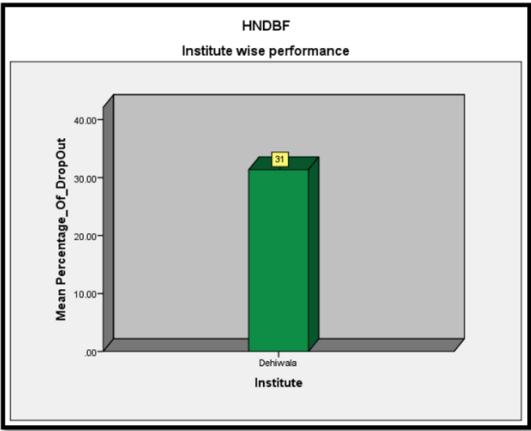
**Figure 6**. Mean dropout percentage of the HNDBF programme

## HNDBA programme

The HNDBA programme is offered by three centres. Figure 7 shows the mean dropout rate of the HNDBA programme. The highest dropout rate was noted in the Kandy centre (50%).
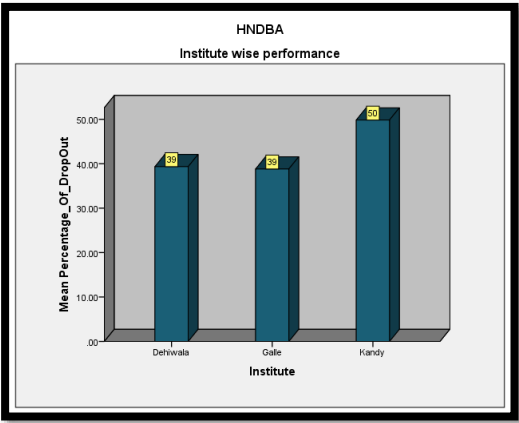


**Figure 7**. Mean dropout percentage of the HNDBA programme

## HNDQS programme

Colombo and Galle centres offer the HNDQS programme and figure 8 shows the mean dropout rate of the HNDQS programme. Compared to other courses less dropout rate could be observed in the HNDQS programme.
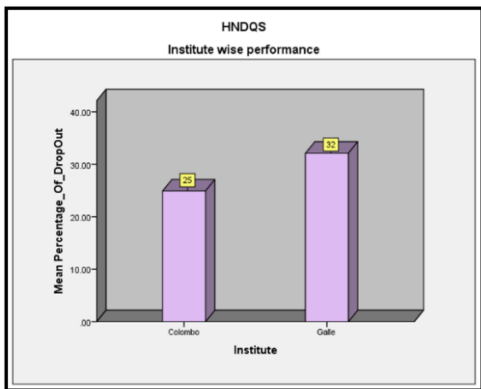


**Figure 8**. Mean dropout percentage of the HNDQS programme

## HND English programme

The HND English is offered by 16 regional centres of SLIATE. Students qualified in any A/L stream could apply for the programme and there is a selection test to recruit students to the programme. The lowest dropout rate (25%) was recorded from Rathnapura centre and the highest dropout rate was recorded (64%) from Batticaloa centre (Figure 9).
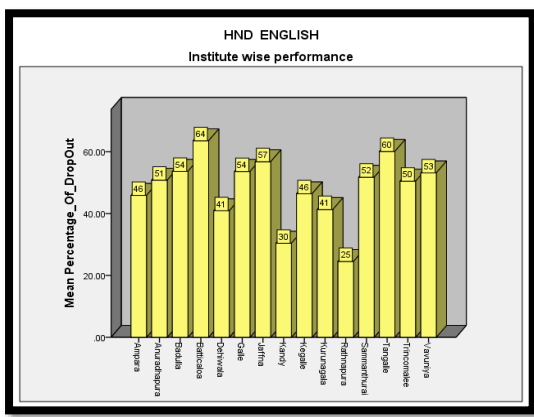


**Figure 9**. Mean dropout percentage of the HND English programme

**HNDA programme**

The HNDA programme is offered by 16 centres and students qualified in the commerce stream T A/L are eligible to apply. Students were recruited based on the Z score of A/L results. The highest dropout rate (66%) was recorded from the Ampara centre and the lowest dropout rate (28%) from the Kegalle centre (Figure 10). HNDA is a four-year programme and According to the Public Administration Circular No. 46/90, the Higher National Diploma in Accountancy has been recognized to accept as an alternative qualification to a General Degree in Commerce awarded by a recognized university for recruitment purposes. Hence, there is demand for this programme in student recruitment. However, the result revealed that most of the students do not complete the diploma after registration. The programme is offered as a full-time programme and as a part-time programme. Only Kegalle and Dehiwala centres showed lower student dropout rates compared to the other institutes.
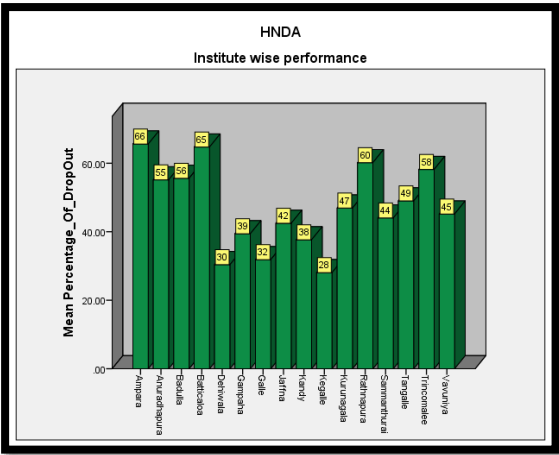


**Figure 10**. Mean dropout percentage of the HNDA programme

**HNDBSE Programme**

The HNDBSE programme is offered by the Colombo centre and physical science stream students are eligible to apply for the programme and Z score is the basis for selection. The mean dropout rate was 54% which is considerably a higher rate (Figure 11). This programme is a 3 ½ year programme.
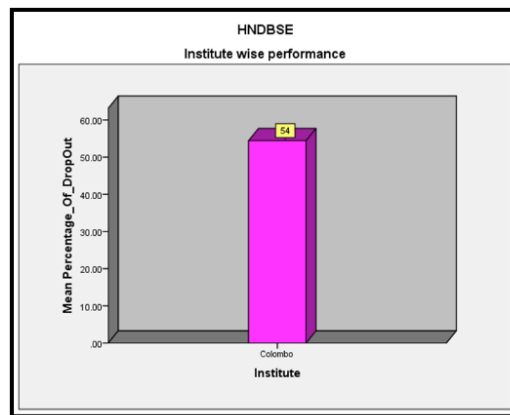


**Figure 11**. Mean dropout percentage of the HNDBSE programme

**HNDE Civil programme**

Figure 12 shows the dropout rate of the HNDE Civil programme. Accordingly, the Gall centre recorded the lowest dropout rate (20%) and the Colombo centre reported the highest (31%). Considering other HND programmes, the Civil engineering programme showed the highest demand due to the lowest dropout rate. This reveals that around 70% of students complete the programme in all three institutes.
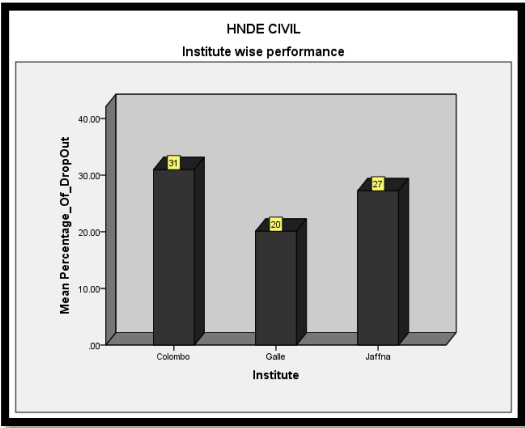
**Figure 12**. Mean dropout percentage of HNDE Civil programme

### HNDE Electrical programme

Students qualified in the mathematics stream in A/L are eligible to apply for this programme and the Z score is the base for the selection of students. The dropout rate of all three institutes was almost the same and there was no significant difference at the p =0.05 level (Figure 13). The Jaffna centre showed the highest dropout rate which was not significantly different to the dropout rate of the other centres.
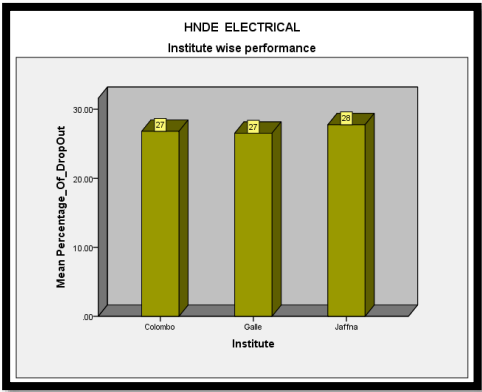


**Figure 13**. Mean dropout percentage of the HNDE Electrical programme

## HNDE Mechanical programme

The HNDE Mechanical programme is offered by only two centres. The Colombo centre showed the highest dropout rate compared to Galle (Figure 14). There were no significant differences in dropout rates among institutes.
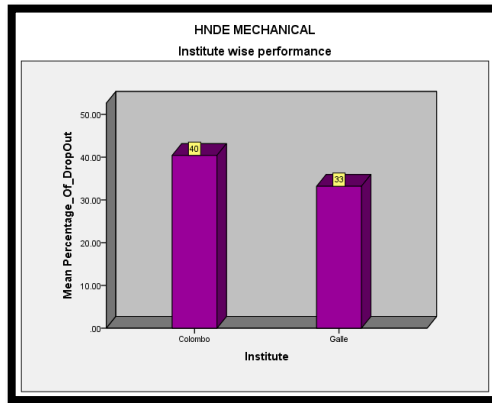


**Figure 14.** Mean dropout percentage of the HNDE Mechanical programme

## Programme wise performance

The significance of the mean dropout rate of the HND programmes was analysed using one sample T-test. As per the SPSS descriptive analysis, the mean dropout rate was 48 per cent. The mean student dropout rate (48%) was compared with the sample mean dropout rate of each programme and checked whether the sample dropout rate is significantly different from the population dropout rate.

Table 2 showed the results of one sample T-test for the dropout percentage of HND programmes. Accordingly, the significantly highest mean dropout rate was noted in the HNDIT programme compared to other programmes and it was 67%. Out of all HND programmes, HNDE Civil and HNDE Electrical programmes showed the significantly lowest dropout rate and those dropout rates were 26% and 27% respectively for the last five years. However, dropout rates of Civil and Electrical Engineering

programmes did not show a significant difference at a p = 0.05 level. HNDBF programme also showed a significantly lower dropout rate at p= 0.05 level except for Civil and Electrical programmes. All the other programmes were not significantly different to each other and they were not significantly different from the mean population dropout rate.

According to the results, it is clear that most of the students recruited for the HNDIT programme give up the programme without completing the diploma and the annual percentage is 67%. Students who complete the diploma and received the diploma was 33% annually. When considering the background of the students, they were from the art stream. However, there is a selection test to recruit students to this programme. On the other hand, students who were recruited to HNDE civil and HNDE electrical programmes continued their education and the majority of them become eligible for diplomas. When considering the student demand, HNDE civil and HNDE electrical programmes recorded high demand whereas the HNDIT programme was lower.

**Table 2.**

*Results of one sample T-test for dropout percentage of HND programmes*

| HND programme | Mean Dropout % | Significance (2-tailed) | Std. deviation | Mean difference | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| HNDT Agriculture | 43.0642 | 0.320 | 17.14723 | -4.93581 | -15.2978 | 5.4262 |
| HNDM | 52.5382 | 0.166 | 18.98167 | 4.53821 | -1.9822 | 11.0586 |
| HNDTHM | 52.2574 | 0.270 | 18.44793 | 4.25743 | -3.5325 | 12.0473 |
| HNDIT | 66.6612 | 0.000* | 13.47456 | 18.66121 | 15.2393 | 22.0831 |
| HNDFT | 41.1728 | 0.254 | 11.47251 | -6.82716 | -21.0722 | 7.4178 |
| HNDBF | 31.3707 | 0.011* | 8.196 | -16.6293 | -26.8060 | 6.4526 |
| HNDBA | 42.6618 | 0.201 | 15.40337 | -5.33822 | -13.8683 | 3.1919 |
| HNDQS | 28.5008 | 0.020* | 21.88387 | -19.49919 | -35.1540 | -3.8444 |
| HND English | 48.3655 | 0.873 | 18.67590 | .36548 | -4.1899 | 4.9209 |
| HNDA | 46.7236 | 0.654 | 21.38850 | -1.27636 | -6.9515 | 4.3988 |
| HNDE civil | 25.8760 | 0.000* | 16.97505 | -22.12405 | -30.0686 | 14.1795 |
| HNDE electrical | 27.0266 | 0.000* | 14.06166 | -20.97341 | -29.9078 | 12.0391 |
| HNDE mechanical | 36.8037 | 0.167 | 20.52586 | -11.19630 | -28.3564 | 5.9637 |
| HNDBSE | 54.4260 | 0.705 | 30.90760 | 6.42597 | -42.7549 | 55.6069 |

*Note.* *Significant at p <0.05 level

### Institute wise performance

Table 3 shows institute wise mean student dropout rate of each Institute. The lowest student dropout rate (35%) was observed in Colombo. The second lowest dropout rate (39%) was recorded by the Dehiwala and Galle centres. Tangalle and Batticaloa centres achieved the highest dropout rate (65%) out of all centres. When considering the dropout rate as a performance indicator, Colombo, Dehiwala and Galle centres could be identified as centres with the best performance and higher demand centres.

**Table 3.**

*Institute-wise Mean student Dropout percentage*

| Institute | Mean Dropout % | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| Ampara | 59.2527 | 23.68632 | 4.73726 | 49.4755 | 69.0300 |
| Anuradhapura | 57.2592 | 19.60016 | 6.19812 | 43.2381 | 71.2803 |
| Badulla | 60.0388 | 13.17006 | 2.80787 | 54.1995 | 65.8781 |
| Batticaloa | 65.0319 | 19.51895 | 6.17243 | 51.0689 | 78.9949 |
| Colombo | 35.2875 | 23.30770 | 4.57102 | 25.8733 | 44.7017 |
| Dehiwala | 39.3796 | 14.45266 | 2.47861 | 34.3368 | 44.4224 |
| Gampaha | 47.1919 | 13.84306 | 3.26284 | 40.3080 | 54.0759 |
| Galle | 39.1238 | 19.18725 | 2.61105 | 33.8867 | 44.3609 |
| Jaffna | 47.1909 | 22.85335 | 4.03994 | 38.9514 | 55.4304 |
| Kandy | 44.8924 | 18.71428 | 3.53667 | 37.6358 | 52.1491 |
| Kegalle | 51.1815 | 25.29443 | 7.01541 | 35.8963 | 66.4668 |
| Kurunegala | 53.4451 | 16.57426 | 3.80240 | 45.4566 | 61.4337 |
| Nawalapitiya | 56.5217 | . | . | . | . |
| Rathnapura | 50.8538 | 25.19958 | 8.90940 | 29.7864 | 71.9211 |
| Sammanthurai | 52.2556 | 23.11868 | 7.31077 | 35.7175 | 68.7937 |
| Tangalle | 65.7272 | 16.40638 | 5.80053 | 52.0111 | 79.4433 |
| Trincomalee | 59.1886 | 19.98150 | 5.34028 | 47.6516 | 70.7256 |
| Vavuniya | 59.8640 | 17.60171 | 7.87173 | 38.0086 | 81.7194 |
| Total | 48.4605 | 21.15610 | 1.15245 | 46.1936 | 50.7275 |

*Note.* Percentage of Dropout is constant when Institute = Nawalapitiya.It has been omitted.

**Multiple Comparisons of HND programmes**

Results of multiple comparisons of HND programmes (Table 4) reveal that HNDFT and HNDBSE programmes have not shown significant dropout rates compared to other HND programmes. When comparing the HNDT agriculture programme with other programmes, only a significant difference in dropout rate was identified with the HNDIT programme. Similarly, HNDBA, HNDBF and HNDE Mechanical programmes also showed significantly lower dropout rates compared to the HNDIT programme. HNDIT

programme showed a significantly higher dropout rate compared to all HND programmes except HNDFT and HNDBSE programmes. HNDE Civil and Electrical programmes showed a significantly lower dropout rate compared to HNDM, HNDTHM, HNDIT, HNDENGL and HNDA programmes.

**Table 4.**

*Multiple Comparisons of HND programmes*

| Programme Type | | Mean Difference | Std. Error | Sig. | 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | LB | UB |
| HNDT Agric. | HNDIT | -23.59702* | 5.5054 | .002 | -42.203 | -4.991 |
| HNDM | HNDIT | -14.12300* | 3.8158 | .018 | -27.019 | -1.227 |
| | HNDQS | 24.03740* | 6.4714 | .017 | 2.167 | 45.908 |
| | HNDEcivil | 26.66226* | 5.0589 | .000 | 9.565 | 43.759 |
| | HNDEelectrical | 25.51162* | 6.0374 | .002 | 5.106 | 45.915 |
| HNDTHM | HNDQS | 23.75661* | 6.7930 | .035 | .799 | 46.714 |
| | HNDEcivil | 26.38147* | 5.4643 | .000 | 7.915 | 44.848 |
| | HNDEelectrical | 25.23084* | 6.3809 | .007 | 3.666 | 46.796 |
| HNDIT | Agriculture | 23.59702* | 5.5054 | .002 | 4.991 | 42.203 |
| | HNDM | 14.12300* | 3.8158 | .018 | 1.227 | 27.019 |
| | HNDBF | 35.29050* | 8.3904 | .003 | 6.935 | 63.646 |
| | HNDBA | 23.99943* | 5.1932 | .000 | 6.449 | 41.550 |
| | HNDQS | 38.16039* | 6.1503 | .000 | 17.375 | 58.946 |
| | HNDENGL | 18.29573* | 3.1804 | .000 | 7.547 | 29.044 |
| | HNDA | 19.93757* | 3.3118 | .000 | 8.745 | 31.130 |
| | HNDEcivil | 40.78525* | 4.6411 | .000 | 25.100 | 56.470 |
| | HNDEelectrical | 39.63462* | 5.6919 | .000 | 20.398 | 58.871 |
| | HNDEmechanical | 29.85751* | 6.7801 | .001 | 6.944 | 52.771 |
| HNDBF | HNDIT | -35.29050* | 8.3904 | .003 | -63.646 | -6.934 |
| HNDBA | HNDIT | -23.99943* | 5.1932 | .000 | -41.550 | -6.449 |
| HNDQS | HNDM | -24.03740* | 6.4714 | .017 | -45.908 | -2.167 |
| | HNDTHM | -23.75661* | 6.7930 | .035 | -46.714 | -.799 |
| | HNDIT | -38.16039* | 6.1503 | .000 | -58.946 | -17.375 |
| HNDENGL | HNDIT | -18.29573* | 3.1804 | .000 | -29.044 | -7.547 |
| | HNDEcivil | 22.48952* | 4.5987 | .000 | 6.948 | 38.031 |
| | HNDEelectrical | 21.33889* | 5.6573 | .014 | 2.219 | 40.458 |
| HNDA | HNDIT | -19.93757* | 3.3118 | .000 | -31.13 | -8.745 |
| | HNDEcivil | 20.84769* | 4.6905 | .001 | 4.996 | 36.699 |

|  | HNDEelectrical | 19.69705* | 5.7322 | .042 | .325 | 39.069 |
|---|---|---|---|---|---|---|
| HNDE Civil | HNDM | -26.66226* | 5.0589 | .000 | -43.76 | -9.565 |
|  | HNDTHM | -26.38147* | 5.4643 | .000 | -44.85 | -7.915 |
|  | HNDIT | -40.78525* | 4.6411 | .000 | -56.47 | -25.100 |
|  | HNDENGL | -22.48952* | 4.5987 | .000 | -38.031 | -6.948 |
|  | HNDA | -20.84769* | 4.6905 | .001 | -36.699 | -4.996 |
| HNDE Electrical | HNDM | -25.51162* | 6.0374 | .002 | -45.915 | -5.108 |
|  | HNDTHM | -25.23084* | 6.3809 | .007 | -46.796 | -3.666 |
|  | HNDIT | -39.63462* | 5.691 | .000 | -58.871 | -20.398 |
|  | HNDENGL | -21.33889* | 5.6573 | .014 | -40.458 | -2.219 |
|  | HNDA | -19.69705* | 5.7322 | .042 | -39.069 | -.326 |
| HNDE Mech. | HNDIT | -29.85751* | 6.7801 | .001 | -52.771 | -6.944 |

*Note.* * The mean difference is significant at the 0.05 level.

Further, HNDENGL and HNDA programmes showed a significantly lower dropout rate compared to the HNDIT programme and a significantly higher dropout rate compared to HNDE Civil and Electrical programmes. Further, the dropout rate of the HNDQS programme was significantly lower than the HNDM, HNDTHM and HNDIT programmes.

The dropout rate of the HNDTHM programme was significantly higher than HNDQS, HNDE Civil and HND Electrical programmes. The dropout rate of the HNDM programme was significantly lower than HNDIT programmes and significantly higher than HNDQS, HNDE Civil and HNDE Electrical programmes. Results revealed that the HNDIT programme was the programme that showed the highest dropout rate and HNDE Civil and HNDE Electrical were the programmes that showed the lowest dropout rate compared to other programmes.

## Conclusions

Based on the results of this study, the following conclusions were arrived at:

The average student dropout rate of SLIATE for the past five years (2015-2019) is 48%. This average dropout rate reflects the dropout from all HND programmes of the SLIATE. When considering the dropout rate programme-wise, HNDIT programme showed a significantly higher dropout rate (67%) compared to all other HND programmes and the mean dropout rate of SLIATE. This is a considerably higher amount as it exceeds the 50% dropout rate. HNDBF, HNDQS, HNDE Civil and HNDE Electrical programmes showed significantly lower mean dropout rate (<31%) compared to the overall population mean dropout rate (48%) SLIATE. These programmes can be identified as the most demanding programmes of the SLIATE. When consider the institute-wise student dropout rate, the lowest student dropout rate (35%) was observed from Colombo compared to other institutes. The Colombo center only offers Engineering programmes (HNDQS, HNDE Civil and HNDE Electrical, HND Mechanical and HNDBSE programmes) and less student dropout rate of Engineering programmes contributed to less dropout rate of the institute. The second lowest dropout rate was noted from Dehiwala and Galle centers and it was 39%. These centres offer a higher number of programmes compared to other institutes. Tangalle and Batticaloa centres have recorded the highest student dropout rate (65%) out of all centres. This reflects the less demand for the centre may be due to the remote location of the institute. The programmes with the highest demand at SLIATE are Civil and Electrical Engineering programmes offered by the Colombo center.

## Recommendations

Further studies are recommended for identifying the reasons for such student dropouts to develop strategies to minimize dropouts from the alternative higher education sector. A survey to identify the reasons for student dropouts should be implemented targeting the stakeholders specially targeting the student community. Such identified reasons can be used to develop strategies to minimize student dropout of the Institute. Further SWOT analysis and PESTEL analysis also will be helpful to identify the present

situation of the institute and to develop strategies to compete with rival institutions.

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# Control of Anthracnose in Banana Cultivar Kolikuttu (*Musa* sp.) with Essential Oils and Bio-safe Fruit Coatings

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## Abstract

Anthracnose caused by the fungus *Colletotrichum musae* is a widespread disease found among banana resulting in high postharvest losses in Sri Lanka. The use of essential oils (EO) to control postharvest diseases has become an ecologically friendly alternative to synthetic chemicals due to their antimicrobial properties while fruit coating is an effective method to increase shelf life. This study focused on controlling anthracnose and extending the shelf life of banana by incorporating selected EOs into a fruit coating. The gel matrix was extracted from the cortex of *Aloe vera* and mixed with a gelatin agent to serve as the fruit coating material. EOs was screened against *C. musae* which was isolated from banana cultivar *Kolikuttu* under *in vitro* bio-assay.

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Four different treatments were carried out under *in vivo* conditions. Two concentrations of gelatin (G) in 200 ml of *Aloe vera* (AV) coating material (2% GAV and 4% GAV) were independently mixed with the most effective EO at optimal concentration and one treatment with AV coating without EO. Untreated fruits with no EO or coating served as the control. Post-harvest quality parameters, % weight loss, total soluble solids (TSS), titratable acidity (TA), and flesh color were monitored and showed no significant undesirable effects when compared with the control. Disease severity was significantly low in coated fruits with Basil oil at 1000 $\mu LL^{-1}$ in 2% or 4% GAV. The Most effective EO for controlling banana anthracnose was basil oil (70.28%) at 1000 $\mu LL^{-1}$ followed by cardamom oil (53.06%). A sensory evaluation with untrained panelists showed that quality parameters were not affected by the treatments. Results indicated basil oil incorporated *A. vera* as a suitable bio-safe fruit coating against anthracnose in banana.

**Keywords:** Essential oil, Basil oil, *Aloe vera*, Fruit coating, Anthracnose, Banana

## Introduction

Banana *(Musa* sp.) which belongs to the family Musaceae, is one of the most important food crops next to rice, wheat, and maize (Perrier et al., 2011). It is one of the most desirable fruits in the international market because of its delicious taste and high caloric value (Sidhu & Zafar, 2018). Banana evolved in the humid tropical regions of Southeast Asia with India as one of its centers of origin. The total annual world production of banana is estimated at 86 million tons of fruits (FAO, 2010). In Sri Lanka banana is one of the most extensively cultivated fruits accounting for around 54% of total fruit-cultivating land (Ranathilaka et al., 2019). From the total production in the country, about 35-45% is lost at the post-harvest stage (Department of Census and Statistics, 2014).

Field diseases result in crop loss while postharvest diseases are directly linked with losses in the export and domestic market (Essien et al., 2005). One of the limiting factors that influences the economic value of the banana fruit is its short shelf life due to post-

harvest fungal attacks (Kuyu & Tola, 2018). Because of high nutrient reserve along with its low pH, banana fruits are highly susceptible to fungal decay (Singh & Sharma, 2007). Anthracnose, caused by *Colletotrichum* sp. is one of the most serious postharvest diseases of ripe bananas (Zakaria et al*.,* 2009). It is the most common post-harvest banana disease in Sri Lanka (Imthiyas et al*.,* 2021) affecting a wide range of commercial banana cultivars and resulting in post-harvest losses (Adikaram, 1986). It is reported that Anthracnose reduces the annual yield by 20%, along with crown rot (Anthony et al*.,* 2004).

The most widely used approach for managing postharvest infections is the application of synthetic fungicides such as benomyl and thiabendazole (Khan et al*.,* 2001). Even though synthetic fungicides have proven to be helpful in controlling postharvest infections, continuous use of synthetic fungicides may result in the pathogen developing fungicide-resistant strains, and the presence of fungicidal residues on the fruit surface causes serious health hazards to consumers and the environment (Maqbool et al*.,* 2011).

Thus, there is a need for new disease-preventive technology which is safe for humans and environment friendly. Among the various alternatives, natural plant products, including essential oils that are safe, economic, and environmentally friendly are ideal candidates for use as alternatives to agrochemicals (Maicas et al*.,* 1997).

It has been reported that essential oils have some fungicidal properties against postharvest diseases of tropical fruits and vegetables (Wilson et al*.,* 1997; Meepagala et al., 2002; Imelouane et al*.,* 2009). It has been found that cinnamon oil and lemon grass oil have antifungal activity against Anthracnose of banana caused by *C. musae* (Maqbool et al*.,* 2010a, b). EO s from cinnamon, thyme, bitter and sweet almond were effective in controlling crown rot disease of banana (Abd-Alla et al*.,* 2014). Study by Idris et al*.* (2015) confirmed the antifungal effect of basil, cinnamon, and rosemary essential oils on anthracnose of banana fruits.

In Sri Lanka, extensive work on fungal pathogens associated with banana and the use of essential oils for the control of postharvest diseases of banana fruit has been carried out by Abeywickrama and co-workers (Anthony et al*.,* 2004; Anthony, Abeywickrama & Wijerathnam, 2003). EO s of *Cymbopogon nardus* and *Ocimum basilicum* were found to be directly fungitoxic to common postharvest disease-causing pathogens such as *Colletotrichum musae, Lasiodiplodia theobromae*, and *Fusarium proliferatum* (Anthony et al*.,* 2004) while a study by Siriwardena et al*.* (2019) reported the effectiveness of basil oil and modified atmosphere packaging on Cavendish banana.

However, due to the highly volatile nature of essential oils, these oils need to be incorporated into coating material to exert a long-term effect on the fruit. The oils are mixed with a coating material and then applied to the fruit peel, so that essential oils and coating material have a beneficial effect on the quality of fruits by reducing water loss, rate of respiration and therefore delaying ripening and extending shelf life. Recently, the use of edible coatings has been widely studied for the preservation of fruits and vegetables (Senna et al*.,* 2014).

Currently, scientific research on *Aloe vera* (AV) gel as a bio-safe fruit coating has gained much attention due to its antioxidant and antimicrobial properties (Lapena et al*.,* 2020). AV gel has been used for postharvest application on various fruits as an edible coating. Sicari et al*.* (2020) reported reducing total soluble solids (TSS), increasing concentrations of total phenolics compounds and ascorbic acid and improving antioxidant activity of strawberry fruits in comparison to non-coated fruits. Similarly, another research revealed AV coating to be an effective, eco-friendly and non-chemical substitute treatment for maintaining the postharvest quality of guava fruit (Rehman et al*.,* 2020). Mendy et al*.* (2019) indicated that coating fruits with AV can effectively extend the shelf life of papaya fruit.

The aim of the present study was to investigate the most effective combination of essential oil with *A. vera* coating in controlling anthracnose caused by *C. musae* of banana cv. *Kolikuttu* fruit and

to evaluate its effect on shelf life, physicochemical, and organoleptic properties of the fruit.

## Methodology

### Plant Essential oils

Pure grade essential oils, basil (*Ocimum basilicum*), cardamom (*Elettaria cardamomum*), mustard (*Brassica juncea* L.) and orange (*Citrus sinensis*) were obtained from 'Herbal Exotics', Pugoda, Sri Lanka. The composition of the EO s was analyzed as described by Herath et al. (2017) using a Trace 1300 Gas Chromatograph coupled with a single MS (Model: ISQ QD, Thermo Scientific, USA) at the Industrial Technology Institute, Colombo to confirm the constituents of the oils.

### Fruits

Healthy unripe banana cv. *Kolikuttu* fruits at harvesting maturity were obtained from an orchard in Galle (6.0535° N, 80.2210° E) within 24 hours of harvest. Fruits of approximately uniform size, shape and maturity (eight fruits per treatment) were used in experiments. Diseased banana cv. *Kolikuttu* were obtained from the Narahenpita (6.5332 ° N, 79.5237 ° E) market to isolate the causal agent of banana Anthracnose.

### Fungus isolation and Culture conditions

The pathogen-causing banana anthracnose was isolated from the diseased banana peel onto Potato Dextrose Agar (PDA) following the standard protocol described by Wijesundara et al. (2015). Fungal species were identified based on mycelial/conidial morphology (CMI descriptions).

Pathogenicity of the causal agent was confirmed by performing Koch's Postulates. Conidia were obtained from the isolated pure culture of *C. musae* and a suspension was prepared ($10^5$ conidia/ml) to inoculate onto healthy fruits and reisolate the causal agent to confirm pathogenicity as described by Wijesundara et al. (2015). The pure cultures of *C. musae* causing Anthracnose

were maintained in the Research laboratory of the Open University of Sri Lanka under ambient conditions at 28±2 ˚C during the experiment.

### *In vitro* screening of essential oils against anthracnose causing *C. musae* of banana cultivar *Kolikuttu*

Poisoned food bioassay was carried out to examine the inhibitory effect of selected essential oils (basil, cardamom, mustard, and orange) against growth of *C. musae* of banana anthracnose under laboratory conditions. EO s were incorporated into molten PDA at concentrations 400, 500, 600, 750, 1000 $\mu LL^{-1}$ and the PDA was allowed to solidify. Mycelial plugs (1cm x 1cm) of the isolated fungus were obtained from the leading edge of a pure culture and introduced onto the center of each PDA plate. This procedure was repeated for each concentration of the essential oil. The increase in diameter of the fungal colony was noted daily. An equal volume of sterile distilled water was incorporated into molten PDA, which served as the negative control and Daconil a commercial fungicide was used as the positive control at the recommended concentration. The experiment was repeated to confirm the most effective concentration of EO in controlling *C. musae.*

The percentage of mycelial growth inhibition was calculated by the formula given below (Tripathi et al.*,* 2008).

Percentage % mycelial Inhibition = [(dc-dt)/dc] x100

dc= mean colony diameter of the negative control sets

dt=mean colony diameter of treatment sets

### Composition of essential oils

The composition of the EOs was analyzed as described by Herath et al. (2017) using a Trace 1300 Gas Chromatograph coupled with a single MS (Model: ISQ QD, Thermo Scientific, USA) at ITI, Colombo.

**Preparation of *Aloe vera* coating material**

Mature leaves of *A. vera* plants were harvested, washed, and kept under ambient conditions for some time to get rid of moisture. Then the gel matrix was extracted from the cortex of the leaves, by scraping the inside of the fleshy leaves. This matrix was then blended and filtered to remove fiber. The resulting mixture was then pasteurized at standard pasteurizing temperatures (72 °C for 15 seconds) using a water bath (Sabarien et al., 2013). Gelatin agent (2% or 4%) was added to increase the gelling potential (Adetunji et al., 2018). This coating was stored (4 °C) in amber bottles and used when necessary.

**Preparation of the essential oil mixed *Aloe vera* coating**

*Aloe vera* (AV) coating material was mixed with the optimal concentration of the most effective essential oil determined by *in vitro* trials. About 200 mL of AV coating material was applied to fruits in the following four treatments: (1) AV with 2% gelatin without essential oil, (2) AV with 2% gelatin with the most effective essential oil at the optimal concentration, (3) AV with 4% gelatin without essential oil (4) AV with 4% gelatin with the most effective essential oil at the optimal concentration and (5) Untreated control that was coated with water alone. The four coating material were applied separately on the fruit peel of individual fruits of the respective four treatments using a paint brush.

***In vivo* effect of essential oil mixed *Aloe vera* coating on postharvest quality**

Mature healthy banana fruits of cultivar *Kolikuttu* at harvesting maturity were obtained directly from a cultivation orchard in Galle (6.0535° N, 80.2210° E), which does not practice the use of chemical fungicides. Eight fruits were used per treatment as replicates. The fruits, both treated and controlled were arranged as a Completely Randomized Design (CRD) and kept on laboratory tables in clean plastic trays under ambient conditions for 5 days. Readings were taken on the weight of fruits in each treatment and recorded daily. This was used to calculate physiological weight loss.

## Physiological weight loss (%)

Weight of fruits was measured daily using a digital balance (Radwag, PS6000.R2). Percentage (%) weight loss was calculated using the formula given below (Gerefa et al., 2015).

$$\text{Physiological loss in weight \%} = \frac{\text{Initial weight of banana fruits} - \text{Final weight of banana fruits}}{\text{Initial weight of banana fruits}} \times 100$$

## Effect of the treatments on physico-chemical and sensory properties

### Total Soluble Solids (TSS) (°Brix)

Ripe banana fruits from each treatment were selected and fruit pulp was made into juice without adding water. The Brix value of the pulp of each treatment was recorded by using a portable refractometer (Brix/ATC 0 ~ 32%) of 0-30 Brix range at room temperature (28± 2 °C) and expresses as °Brix (Samane et al., 2012). The readings were taken three times for each treatment and averaged.

### Titratable Acidity (TA)

Ripe banana fruits from each treatment were selected, peeled, and juiced. From each fruit, 10 mL of juice sample was taken and three (3) drops of phenolphthalein were added as a pH indicator. Titration was done against 0.1 M NaOH until the solution starts to turn pink, this was taken as the end point of the titration. The titratable acidity percentage for malic acid was calculated by the following formula given by Dadzie et al. (1997).

$$\% \text{ TA} = \frac{\text{Average titre} \times \text{multiplication factor}}{10\text{mL juice}} \times 100$$

% TA = Number of grams of malic acid per 100mL of juice

Average titre = Average number of ml of NaOH

Multiplication factor (acid Factor) = 0.0067

### *Flesh color*

At the ripe stage of the fruit, the pulp was taken, and the flesh color was noted with the colorimeter (CR-400-CHROMA METER, Japan).

### Sensory evaluation

A panel of 20 untrained adults (aged above 21 years old), comprising males and females, were randomly selected for the sensory evaluation. Out of the 20 panelists, 50% were males and 50% were females. A five-point hedonic scale as described by Larmond (1977) was used, where 5 = very high, 4 = high, 3 = moderate, 2 = low and 1 = very low. Five samples (five-day-old, treated fruits) were served on identical plates and the organoleptic properties of interest were color (both peel and flesh color), appearance, texture, odor, and taste (Umuhozariho et al.*,* 2013).

### Effect of the treatments on postharvest disease development

Eight replicate fruits were used per treatment.  Both curative and preventive methods were used. Fruits were coated with different essential oil mixed with AV coatings either one day prior to inoculation with the causal organism for banana Anthracnose (*C. musae*) (preventive) or 1 day following inoculation (curative). Preparation of the conidial suspension was done as described (Wijesundara et al.*,* 2015) and the fruit surface was inoculated with 20 µL drops of the conidial suspension (4 drops per fruit) and maintained in a moist chamber (28 ± 2 $^{o}$C, 100% RH). Daily observations were made and once symptoms developed, disease lesions were measured on two axes at right angles to each other for five consecutive days.

### Statistical analysis

The experiments were run in triplicate and data are reported as the mean ± standard deviation (SD). Data were analyzed using the statistical package, SPSS version 20.0. Analysis of variance

(ANOVA) among means was performed using one-way ANOVA. After applying the least significant (LSD) test, differences of $P \leq 0.05$ were significant. For sensory evaluation data, Principal Component Analysis (PCA) & cluster analysis were used to identify the preferences of the panelists for the samples

## Findings and Discussion

### Isolation and maintenance of the causal agent

The fungi isolated from banana anthracnose showed typical morphological characteristics of *Colletotrichum* spp. The colony of the isolated fungus was initially greyish white, it became salmon pink colored, and production of conidia was observed by the sixth day. By the sixth day, Petri plates were fully covered with the fungus (Figure 1-A, B). Mature conidia of the fungus were typical of *C. musae* being hyaline, aseptate, one-celled, mostly ellipsoid to cylindrical with an obtuse apex and a truncate base (Figure 1-C). The causal agent was tentatively identified as *Colletotrichum musae* based on colony characters and morphology of the conidia as previously described by (Prusky & Plumbley 1992, CMI descriptions).
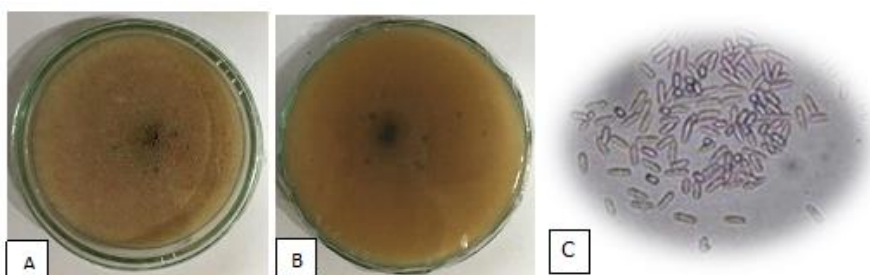


**Figure 1.** Colony characteristics of the fungus isolated from Banana cultivar *Kolikuttu*. (A). Top view of colony in Petri plate (day 6); (B). Reverse view of colony in Petri plate (day 6); (C). Conidial morphology of C. *musae* under light microscope (high power: 10 x 40 x 1 magnification).

## *In vitro* bio-assay of plant essential oils against *C. musae*

*In vitro* studies revealed that the EO s basil and cardamom significantly inhibited the growth of *C. musae* compared to other EO s tested (Table 01). After 96 hours (day 4), basil oil caused the highest significant reduction (70.30%) of fungal colony growth at 1000 µLL[-1] whereas the reduction was low (38.11%) at 400 µLL[-1]. However, basil and cardamom showed a moderate effect on reducing the fungal growth at 500, 600, 750 µLL[-1]. Similarly, studies by Anthony et al. (2004) and Abeywickrama et al. (2009) also report the activity of basil oil against banana fruit pathogens. Idris et al. (2015) showed that *in vitro* test of basil oil completely (100%) inhibited the growth of the pathogen *C. muasae* of banana at a concentration of 0.15-0.2% (v/v). Several researchers have also previously reported the antimicrobial activity of basil oil against various microbes (Bozin et al., 2006; Sokovic & Griensven, 2006). *In vitro* studies by Abeywikrama et al. (2012) showed that basil oil can be used as an alternative to fungicidal treatment against postharvest pathogens of papaya fruit. A similar study by Abeywickrama et al. (2010) reported an integrated treatment of basil oil (*Ocimum basilicum*) and Alum with modified atmosphere to control crown rot disease in embul banana.

**Table 1.**

*Percentage mycelial inhibition of C. musae in Petri plates enriched with different essential oils at the time when control reached its maximum growth (90 mm) at 96 h (Day 4) after inoculation*

| Concentration (µLL[-1]) | Inhibition (%) by different EOs | | | |
|---|---|---|---|---|
| | **Basil** | **Cardamom** | **Mustard** | **Orange** |
| **400** | 38.11(7.67)[ab] | 20.28(10.06)[a] | 16.57 (11.20)[a] | 21.67 (8.60)[a] |
| **500** | 46.39 (6.73)[b] | 38.22 (8.94)[ab] | 17.31 (11.55)[a] | 22.60 (6.35)[a] |
| **600** | 48.89 (5.00)[b] | 49.35 (7.30)[b] | 18.43 (11.53)[a] | 31.00 (18.74)[ab] |
| **750** | 54.26 (8.47)[b] | 51.85 (7.05)[b] | 22.78 (13.35)[a] | 32.96 (13.31)[ab] |
| **1000** | 70.28 (7.72)[c] | 53.06 (5.30)[b] | 28.55 (11.34)[a] | 43.00 (20.06)[ab] |

*Note.* Values followed by the same letters in a column are not significantly different at (p ≤ 0.05), Standard deviation is given in parenthesis, Inhibition % = Mean inhibition of six replicates as a percentage.

## Composition of essential oils

According to the GCMS results, the highest percentage of constituents were estragole and linalool (Table 2) and results are comparable with constituents of basil oil reported in the literature. Many scientists have linked the antimicrobial effects of basil with the higher level of linalool which is the main component of the oil (Juliani & Simon, 2002). In the present study also the basil oil, had a high percentage of linalool (23%) and hence would have been one of the factors responsible for the observed antifungal effect. According to Kocic-Tanackova et al. (2012) estragol is the main constituent in the basil extract (86.72%). The present study also showed estragol (70%), as the main constituent of basil oil and estragol is also known to exhibit antifungal effects (Hussain et al.*,* 2008). Both linalool and estragol are known to have antifungal and insecticidal properties (Chalchat & Ozcan, 2008; Rodrigues et al.*,* 2016; Hussain et al.*,* 2008). Similarly, Koba et al. (2008) also reported the antimicrobial activity of estragole and linalool along with other constituents of basil oil.

**Table 2.**

*Principal constituents of basil oil and their relative percentages of total chromatogram area (CTS 1813269)*

| Compound | Retention time | Area % |
|---|---|---|
| α -Pinene | 3.16 | 0.05 |
| B- Pinene | 4.13 | 0.04 |
| D- Limonene | 5.50 | 0.04 |
| B-Phellandrene | 5.69 | 0.25 |
| Trans-β-Ocimene | 6.43 | 0.10 |
| Sulcatone | 8.62 | 0.09 |
| Linalool | 13.00 | 22.99 |
| Trans-α-bergamotene | 13.8 | 0.43 |
| Caryophyllene | 14.12 | 0.35 |
| Levomenthol | 15.13 | 0.38 |
| Estragole | 15.9 | 70.83 |
| α- Citral | 16.17 | 0.61 |
| Humulene | 18.01 | 1.29 |

### *In vivo* effect of essential oil-mixed *Aloe vera* coating on postharvest quality

### Physiological weight loss

Banana fruits treated with *A. vera* coating showed a lower physiological weight loss (%) compared to untreated control fruits, however, it was not significant. Weight loss in fruits and vegetables is a sign of water loss and increases due to desiccation and metabolic activities (Zhu et al*.,* 2008). Low weight loss is critical for preserving the quality of the fruits over time. A lower (%) weight loss was observed in fruits treated with 400 µLL$^{-1}$ basil oil in 2% GAV compared to the other treated fruits (table 3).  Karunanayake et al. (2020) also report that basil oil in beeswax significantly reduced physiological weight loss in treated mango fruits compared to untreated control fruits. However, there are reports where weight losses were not significantly different ($P<0.05$) among treatments with oils from *O. basilicum, Cymbopogon nardus* and *Cymbopogon fexuosus* on banana fruits (Anthony et al*.,* 2003).

Coating of banana fruits with *A. vera* creates a barrier to moisture loss and therefore, reduces weight loss (Mahmoud & Savello, 1992; Avena-Bustillos et al*.,* 1997). *A. Vera* extract is composed of many complex ingredients including polysaccharides, glycoproteins, phenolic compounds, salicylic acid, lignins, hormones, amino acids, vitamins, saponins and enzymes (Larotonda et al*.,* 2005). Maan et al. (2018) reported that the polysaccharides in *Aloe vera* act as a natural barrier to moisture and oxygen which can speed up food deterioration. Loss of water from guava fruit has been effectively reduced by *A. vera* gel coating (Rehman et al*.,* 2020), reduced weight loss and increased shelf life have been reported in sapodilla (Khaliq et al*.,* 2019), and cherry fruits (Ozturk et al*.,* 2019).

**Table 3.**

*Physiological weight loss (%) in control banana cv. Kolikuttu fruits and fruits coated with A. vera, with or without basil oil treatment from day 1 to 5 after treatment*

| Treatment | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|
| **Control** | 0.00(0.00)[a] | 1.87(0.74)[a] | 2.07(0.23)[a] | 2.65(0.35)[a] | 3.00(0.34)[a] |
| **2% GAV** | 0.00(0.00)[a] | 1.17(0.52)[a] | 1.73(0.21)[a] | 1.99(0.45)[a] | 2.65(0.42)[a] |
| **4% GAV** | 0.00(0.00)[a] | 1.35(0.57)[a] | 1.68(0.17)[a] | 1.87(0.64)[a] | 2.50(0.45)[a] |
| **Basiloil400+2%GAV** | 0.00(0.00)[a] | 1.06(0.65)[a] | 1.19(0.22)[b] | 2.05(0.65)[a] | 2.47(0.24)[a] |
| **Basiloil400+4%GAV** | 0.00(0.00)[a] | 1.08(0.43)[a] | 1.89(0.22)[a] | 2.54(0.57)[a] | 2.60(0.34)[a] |
| **Basiloil500+2%GAV** | 0.00(0.00)[a] | 1.37(0.57)[a] | 1.93(0.32)[a] | 2.58(0.45)[a] | 2.65(0.47)[a] |
| **Basiloil500+4%GAV** | 0.00(0.00)[a] | 1.47(0.39)[a] | 1.88(0.48)[a] | 2.63(0.47)[a] | 2.87(0.47)[a] |
| **Basiloil600+2%GAV** | 0.00(0.00)[a] | 1.56(0.69)[a] | 1.65(0.57)[a] | 2.65(0.58)[a] | 2.98(0.47)[a] |
| **Basiloil 600+4%GAV** | 0.00(0.00)[a] | 1.78(0.41)[a] | 1.89(0.37)[a] | 2.35(0.57)[a] | 2.87(0.58)[a] |
| **Basiloil750+2%GAV** | 0.00(0.00)[a] | 1.60(1.63)[a] | 1.86(0.48)[a] | 2.30(0.64)[a] | 2.58(0.47)[a] |
| **Basiloil750+4%GAV** | 0.00(0.00)[a] | 1.70(0.41)[a] | 1.90(0.37)[a] | 2.25(0.57)[a] | 2.57(0.47)[a] |
| **Basiloil1000+2%GAV** | 0.00(0.00)[a] | 1.76(0.85)[a] | 1.98(0.45)[a] | 2.72(0.96)[a] | 2.97(0.48)[a] |
| **Basiloil1000+4%GAV** | 0.00(0.00)[a] | 1.85(1.42)[a] | 1.98(0.56)[a] | 2.73(0.78)[a] | 2.98(0.57)[a] |

*Note.* Values followed by the same letters within the column are not significantly different at ($p \leq 0.05$), Standard deviation is given

in parenthesis. 2% GAV – 2% gelatin + *Aloe vera*  4% GAV – 4% gelatin + *Aloe vera*

## Titratable acidity% (TA %), total soluble solids (Brix) and flesh color

There was no significant difference in TA for all treated and control fruits except basil oil at 500 µLL$^{-1}$ in 4% GAV and basil oil at 750 µLL$^{-1}$ in 2% or 4% GAV where significantly higher TA was seen (Table 4). Abeywickrama et al. (2009) also reported application of basil oil on banana fruits to control crown rot disease did not show a significant difference in physico-chemical properties (titratable acidity, total soluble solids, pH, fruit firmness) when compared with the control.

**Table 4.**

*Physicochemical parameters in the control fruits and fruits coated with Aloe vera, with or without basil oil treatment at table ripe stage of maturity*

| Treatment | Titratable acidity% | Total Soluble Solids (%) | Flesh Color |
|---|---|---|---|
| Control | 0.06(0.00)[a] | 13.34(0.22)[a] | Yellow |
| 2% GAV | 0.06(0.00)[a] | 14.31(0.17)[b] | Yellow |
| 4% GAV | 0.06(0.00)[a] | 14.43(0.15)[b] | Yellow |
| Basiloil400+2%GAV | 0.06(0.00)[a] | 14.00(0.13)[b] | Yellow |
| Basiloil400+2%GAV | 0.06(0.00)[a] | 14.07(0.15)[b] | Yellow |
| Basiloil500+4%GAV | 0.07(0.00)[b] | 14.50(0.15)[b] | Yellow |
| Basiloil500+2%GAV | 0.06(0.00)[a] | 14.38(0.15)[b] | Yellow |
| Basiloil600+2%GAV | 0.06(0.00)[a] | 14.24(0.08)[b] | Yellow |
| Basioil 600+4%GAV | 0.06(0.00)[a] | 15.02(0.12)[c] | Yellow |
| Basiloil750+2%GAV | 0.08(0.01)[c] | 14.51(0.03)[b] | Yellow |
| Basiloil750+4%GAV | 0.07(0.00)[b] | 14.14(0.11)[b] | Yellow |
| Basiloil1000+2%GAV | 0.06(0.00)[a] | 14.26(0.11)[b] | Yellow |
| Basiloil1000+4%GAV | 0.06(0.00)[a] | 14.27(0.21)[b] | Yellow |

*Note.* Values followed by the same letters within the column are not significantly different at (p ≤ 0.05), Standard deviation is given in

parenthesis. 2% GAV – 2% gelatin + *Aloe vera*  4% GAV – 4% gelatin + *Aloe vera*

Fruits were tested for total soluble solid content at the table ripe stage of maturity (in five days after treatment. The highest Brix value (15.02) was observed in Basil oil at 600 µLL$^{-1}$ in 4% GAV coating. The lowest Brix value 13.34 was observed in the control fruits (Table 4). According to Harrill (1998), Brix value for sugar content was given as 4% for poor, 6% for average, 10% for good and 14% for excellent in banana fruits. In the present study, all samples showed over 10% Brix value which is considered as a good sugar content, and it suggested that the treatment had not negatively affected the sugar content of treated fruits. However, TSS represents the carbohydrate content, and increased TSS could indicate cell wall deterioration (Rehman et al., 2020). Kaushik et al. (2021) showed breakdown of organic acids and accumulation of soluble solids were slower in bananas protected with edible coatings of Aloe gel and Lemon peel extract. Mendy et al. (2018) showed *A. vera*-coated papaya fruits were able to reduce loss in weight and firmness and maintained higher soluble solid concentration, pH, and titratable acidity.

Flesh color was yellow in each treatment and there was no significant difference in flesh color between the treatments and the control (Table 4).

**Effect of the treatments on postharvest disease development**

Lesion development was observed in banana fruits following 3 days of inoculation. The highest disease severity was observed in untreated control fruits and disease severity was significantly low in basil oil at 1000 µLL$^{-1}$ 2% GAV and 4% GAV coated fruits at day 5 compared to other treatments (Figure 2). Abeywickrama et al. (2009) reported controlling of crown rot of banana with integrated treatment of alum and basil oil (at 0.16% or 0.2%). Linalool and Estragol are known to have antifungal and insecticidal properties (Chalchat & Ozcan, 2008; Rodrigues et al., 2016; Hussain et al., 2008; Kumar et al., 2015) which could be the reason for the reduced disease severity.
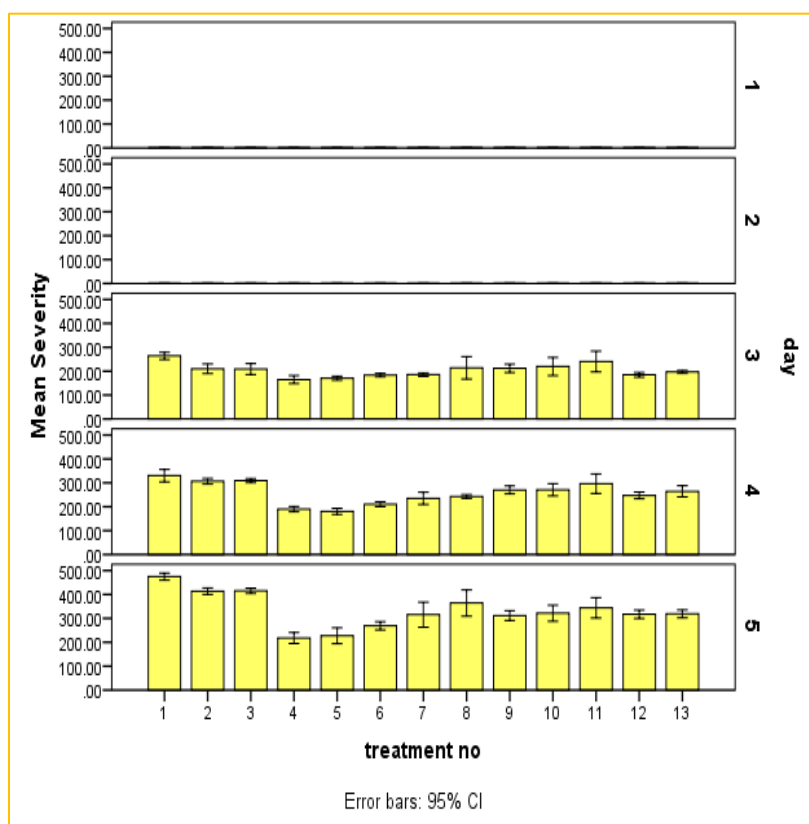
**Figure 2.** Mean disease area (Severity) at different days (5 days) of storage of cultivar *Kolikuttu* banana fruits after treating with different concentrations of basil oil mixed *Aloe vera* (AV) coating using two methods. **1**-Control, **2**- 2% AV, **3**- 4% AV, **4**- Basil oil 1000 µLL$^{-1}$ +2%AV, **5**- Basil oil 1000 µLL$^{-1}$ +4%AV, **6-** Basil oil 750 µLL$^{-1}$ +2%AV,**7**- Basil oil 750 µLL$^{-1}$ +4%AV, **8**- Basil oil 600 µLL$^{-1}$ +2%AV, **9**- Basil oil 600 µLL$^{-1}$ +4%AV, **10-** Basil oil 500 µLL$^{-1}$ +2%AV,**11**- Basil oil 500 µLL$^{-1}$ +4%AV, **12**- Basil oil 400 µLL$^{-1}$ +2%AV,**13**- Basil oil400 µLL$^{-1}$ +4%AV

**Sensory evaluation effect of the treatments on sensory properties**

The Principal Component Analysis (PCA) extracted a total variance of 91.83% of total data set. According to the results, the quality parameters such as appearance, peel color, hardness, freshness, softness, flesh Color, sweetness, dry/wrinkled, fruity were not

significantly affected by the treatments compared to untreated fruits (Figure 3). Similarly, Mohmmadi et al. (2021) also showed that fruit coating with basil oil-incorporated *A. vera* could be a treatment for maintaining the quality of strawberry fruit during cold storage. But according to Abeywickrama et al. (2009) taste, flavor and odor of untreated 72-day mature embul banana with carbendazim treatment was preferred by the taste panelists over banana treated with basil oil and the differences were statistically significant.
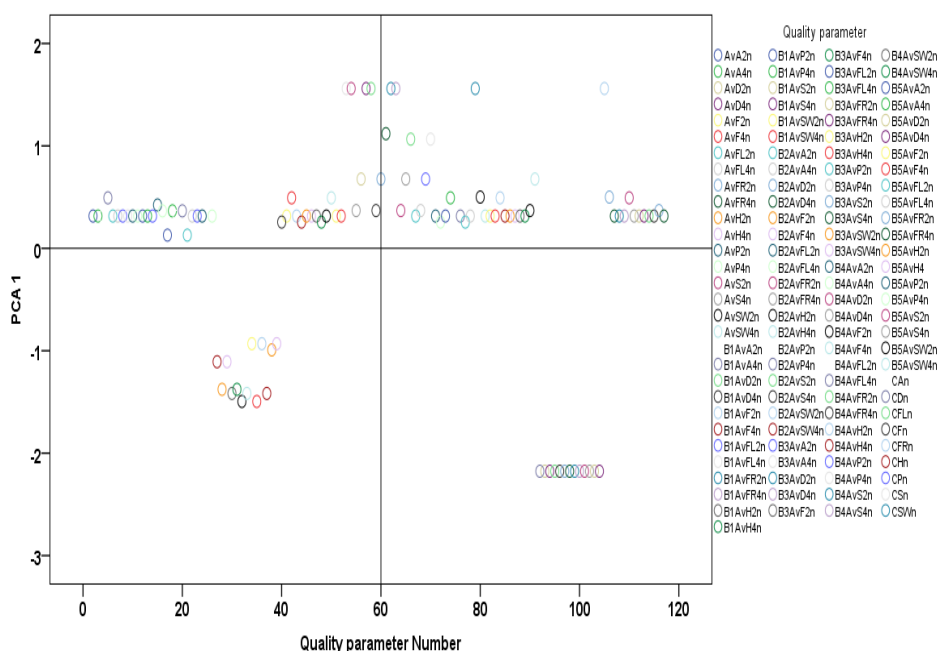


**Figure 3**. Quality parameters of sensory evaluation depicted in one plot. B1- Basil oil 1000 µLL$^{-1}$, B 2- Basil oil 750 µLL$^{-1}$, B 3- Basil oil 600 µLL$^{-1}$, B 4- Basil oil 500 ppm**,** B 5- Basil oil 400 µLL$^{-1}$, CAn - Control Appearance, AvA2n - 2%AV Appearance, AvA4n - 4%AV Appearance,  CPn- Control Peel color, AvP2n- 2% AV Peel color, AvP4n- 4%AV Peel color, CHn- Control Hard, AvH2n -2%AV Hard, AvH4n- 4%AV Hard, CFn- Control Fresh, AvF2n-2%AV Fresh , AvF4n-4%AV Fresh ,  CSn- Control Soft,   AvS2n-2%AVSoft, AvS4n-4%AVSoft, CFln-Control Flesh Color, AvFl2n-2% Flesh Color, AvFl4n-4% Flesh Color, CSWn-Control Sweet, AvSW2n-2%AV Sweet, AvSW4n- 4%AV Sweet, CDn-Control Dry, AvD2n-

2%AVDry, AvD4n-4% AV Dry, CFRn- Control Fruity, AvFR2n-2% AVFruity, AvD4n-4%AVFruity

## Conclusions

The results of the present study showed the possibility of using basil oil as a herbal fungicide and *Aloe vera* as a good coating material and carrier material for the essential oils. Basil oil at 1000 $\mu LL^{-1}$ incorporated in *A. vera* was the most effective combination to control anthracnose in banana var. *Kolikuttu* fruit. The *A. vera* coating or the EO had no detrimental effects on any of the quality parameters tested and also had no undesirable effects on sensory properties either. Therefore, basil oil incorporated *A. vera* can be effectively used by organic farmers to reduce postharvest disease development while increasing the safety for consumers and increasing the quantity of Banana available for the local and export market.

## Acknowledgements

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# Nurses' Knowledge, Attitudes, Practices and Associated Factors in the Care of Women Subjected to Intimate Partner Violence in the Western Province of Sri Lanka

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## Abstract

Intimate partner violence (IPV) is recognized as a preventable public health problem. Previous studies in Sri Lanka report high prevalence rates of IPV. Nurses as the largest healthcare force can take on a significant role in the care of women subjected to IPV. This study aimed to describe nurses' knowledge, attitudes and practices related to providing care for women subjected to IPV in the Sri Lankan context. A cross-sectional study was conducted with 407 female nurses from 17 hospitals in the Western Province, using a stratified random sampling

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strategy. A pretested self-administered questionnaire was used. Most (85%) participants had poor overall knowledge related to IPV. Higher knowledge scores were found for: acts indicating IPV (80±28.2), health problems related to IPV (74.6±24.4), and reasons preventing disclosure (81.4±19.6). Knowledge scores were low for root causes of IPV (49.7±19.0), laws pertaining to IPV (31.0±25.9), and the available services (19.1±25.07). Good overall attitudes were evident among 54%, specifically, in the areas of inquiring about IPV (91%), offering the assistance (79.8%), and maintaining confidentiality (57%). Most (86.5%) had met women subjected to IPV, and the most frequent (52.3%) action they had taken was to inform a doctor. Higher levels of education, in-service learning, and learning about IPV in basic nursing education, were positively associated with knowledge and attitude levels. The results call for an urgent need for inclusion of IPV related content and skills-training in nursing curricula to enable nurses to identify, support, and provide care to women subjected to IPV.

**Keywords:** intimate partner violence, nurses, knowledge, attitudes, Sri Lanka

## Introduction

Intimate partner violence (IPV) is one of the most common forms of violence against women, and includes physical, sexual, and emotional abuse and controlling behaviours by an intimate partner [World Health Organization (WHO), 2019]. Both men and women can be subjected to violence by their partners, but women are the majority of victims of IPV worldwide (WHO and Pan American Health Organization, 2012). Compared to a global prevalence of one in three women experiencing violence, a recent scoping review of the studies conducted in Sri Lanka revealed that the prevalence of IPV in Sri Lanka ranged from 20-72% (Guruge et al., 2015). Women suffer many short and long-term health consequences of IPV, including physical injuries, sexually transmitted infections, negative pregnancy outcomes, mental health problems, and poor overall health (WHO, 2019).

 Although women subjected to IPV often visit healthcare professionals, most victims do not disclose violence during such visits (WHO & Pan American Health Organization, 2012; Guruge et al., 2015). Among the

healthcare professionals, nurses are the largest work force in most countries around the world and in Sri Lanka (Ministry of Health and Indigenous Medical services, 2017), and as such, more likely to come in contact with women experiencing IPV.

Limited knowledge about IPV was reported in previous studies of nurses in many countries (Alem et al., 2015; Alhalal, 2020; Aljomaie et al., 2022; Ambikile et al., 2020; Ramsay et al., 2012; Sharma et al., 2018). Lack of knowledge and skills of Sri Lankan nurses related to the care of women experiencing IPV was identified in a qualitative study conducted with nurses from across the country (Guruge, 2012). A recent cross-sectional study reported that only 17% of nurses had received training on IPV (Guruge et al., 2021). Stigmatizing attitudes among nurses towards women survivors who seek hospital care have also been reported from Sri Lanka (Jayasuriya et al., 2011). Patriarchal attitudes and gender biases internalized by women themselves are evident in the Sri Lankan society, with many women believing that they should tolerate IPV (Kuruppuarachchi et al., 2010). Further, a survey of 1658 men and 653 women between the ages of 19-49, in four districts in Sri Lanka, revealed more gender inequitable attitudes among females than males; for example, more female than male participants believed that one should consider whether a rape victim had a "bad reputation" (De Mel et al., 2013). The findings of these studies indicate an urgent need to further assess attitudes of healthcare professionals in Sri Lanka towards IPV, as well as their competency in providing support and care to women experiencing IPV. The current study aimed to describe nurses' knowledge, attitudes and practices related to providing care for women subjected to IPV, and to identify factors that can enhance their knowledge and attitudes.

## Methodology

### Study design, sampling and participants

A descriptive cross-sectional study was conducted among female nurses working in 17 primary, secondary, and tertiary government hospitals from the Western Province of Sri Lanka, which comprises three districts and a population of 5.822 million. The province was selected because of two factors: a high lifetime prevalence of IPV

(Jayasuriya et al., 2011) of 34%, and the highest population and nursing density within the country (WHO, 2018). The target population consisted of female nurses from the Accident and Emergency (A&E) Units, Outpatient Departments (OPD), Primary Care Units (PCU), Obstetrics and Gynaecology Units (ObGyn), and Eye care Units (Eye), as these are the places where women subjected to IPV have primarily sought medical care in most countries (WHO and Pan American Health Organization, 2012).

Stratified random sampling used in this study is described below. The government hospitals in the Western Province that provide care for adults (excluding the specialized care hospitals) were stratified, according to the classification by the Ministry of Healthcare and Nutrition, Sri Lanka in 2008, to include primary, secondary and tertiary care. The hospitals within each stratum were selected randomly by a lottery draw method to achieve a representative sample of 17 hospitals from the three Districts in the Western Province. The draw was repeated when too many hospitals were drawn from one stratum. A proportionate number of nurses from the above-mentioned units of each selected hospital was obtained to achieve the sample size of 422 calculated according to Lwanga & Lemeshaw (1991). At the time of data collection, the participants were selected through systematic random sampling using nurses' attendance registers in each unit specified above. Within this study, the term 'care' was defined as intentional activities that a nurse will perform, within the multidisciplinary team, for the well-being of a patient.

## Study instruments

A semi-structured questionnaire was developed by the researchers based on the literature and expert opinion. A panel of three subject experts made decisions on selecting the knowledge domains/areas to be assessed through the questionnaire and prioritized according to their relative importance for nurses in their practice. The questionnaire consisted of three sections: Section A: socio-demographic information (10 items) and practices (09); Section B: attitudinal statements (17) in a five-point Likert scale (Strongly Agree to Strongly Disagree); Section C: knowledge questions (13) consisting of 10 multiple choice questions (to elicit Yes/No/Don't know responses) and three short answer

questions, covering 12 domains of knowledge related to IPV (Figure 2). Content and face validity of the questionnaire were assessed by the same panel of three subject experts. The questionnaire was then pre-tested with a sample of 20 nurses from a hospital in another province that was not included in the final sample. Based on their input, the questionnaire was revised to include an illustrative scenario of a woman subjected to IPV, as well as slight wording changes to one attitudinal item and two knowledge items to provide a clear understanding of the questions. The order of questions was also changed.

**Ethical considerations**

Ethics approval was obtained from the Ethics Review committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura (Ref. 74/14). Permission to collect data was obtained from the Ministry of Health Sri Lanka, and the authorities of each hospital. Nurses from each of the selected hospitals were informed about the study through their own Chief Nursing Officers. Written informed consent was obtained from all potential participants prior to their completion of the questionnaire.

## Data analysis

The completed questionnaires were analysed, using SPSS version 21. Descriptive and inferential statistics were used. One mark was allocated for correct answers to knowledge questions, and a zero mark for incorrect or 'Don't know' answers. A weighted system was employed to calculate overall knowledge scores, because of the use of an unequal number of questions for different knowledge domains (Streiner et al., 2015). The weighted system was reviewed and finalized, and the knowledge cut-off mark was decided by an expert panel of six members, consisting of consultant community physicians (02), a sociologist with research experience on IPV, a senior lecturer in forensic medicine, a GBV expert from the Ministry of Health and a senior lecturer in nursing using a modified Delphi technique. The marks for each of the 12 domains (out of 100) were multiplied by the respective weight and were added to get the overall knowledge score. The cut-off mark was established by the experts as the level of

knowledge that a nurse should possess to function as an effective healthcare team member in the care of a woman subjected to IPV. Accordingly, an overall mean knowledge score of ≥60 was categorized as 'Good' knowledge, and ≤59 as 'Poor' knowledge. An overall mean attitude score of ≥7.82 was considered to represent 'Good' attitudes, and below the mean as 'Poor' attitudes.

Identification of factors that enhance knowledge and attitudes was done using binary logistic regression to control confounding factors. The final model was selected on the basis of theoretical and statistical significance of factors for knowledge and attitudes to care for women subjected to IPV. The model estimates were presented with adjusted odds ratios and 95% CI (p<0.05).

## Results

### Study participants

A total of 407 completed questionnaires were received (The response rate was 96%). The mean age of the study participants was 38.6 (±7.9) years (range 26-61).

As shown in Table 1, 188 (46.2%) participants were between 31-40 years of age; 339 (83.3%) were married; and 268 (65.8%) were raising children. In total, 146 (35.9%) had 11-20 years of work experience; and 168 (41.3%) worked in ObGyn units. Most of the participants (370, 90.9%) were educated at the nursing diploma level, and 352 (86.5%) did not have any form of training related to IPV. Of the total sample, only 98 (24%) had learnt IPV related content at the pre-registration level, only 55 (13.5%) had undergone some form of in–service training related to IPV and only 24 (5.9%) participants stated that their learning was adequate to care for women who are subjected to IPV.

### Knowledge on the care for women subjected to IPV

The mean knowledge score of the participants was 48.10 (±11.19). The number of nurses who had good overall knowledge was 62 (15.2%), and poor overall knowledge was 345 (84.8%).

**Table 1.**

*Demographics, Workplace Characteristics and Prior Learning on IPV (N=407)*

| Characteristic | Frequency | (%) |
|---|---|---|
| Age | | |
|     <30 years | 68 | 16.7 |
|     31-40 years | 188 | 46.2 |
|     Above 40 years | 151 | 37.1 |
| Marital status | | |
|     Married | 339 | 83.3 |
|     Unmarried | 68 | 16.7 |
| Having children | | |
|     Yes | 268 | 65.8 |
|     No | 139 | 34.2 |
| Highest educational level | | |
|     Diploma | 370 | 90.9 |
|     Degree and above | 37 | 9.1 |
| Total years of service | | |
|     < 5 years | 67 | 16.5 |
|     6-10 years | 104 | 25.6 |
|     11-20 years | 146 | 35.9 |
|     >20 years | 90 | 22.1 |
| Work area/Unit | | |
|     Gynaecology & Obstetrics | 168 | 41.3 |
|     Accident/Emergency | 69 | 17.0 |
|     Eye | 19 | 4.7 |
|     Outpatient Dept./PCU | 112 | 27.5 |
|     Surgical Casualty | 39 | 9.6 |
| Prior learning on care for women subjected to IPV | | |
|     Diploma/Undergraduate level | | |
|       Learnt | 98 | 24.1 |
|       Not learnt | 309 | 75.9 |
|     In-service training | | |
|       Attended | 55 | 13.5 |
|       Not attended | 352 | 86.5 |
| Adequacy of learning to care for women subjected to IPV | | |
|     Adequate | 24 | 5.9 |
|     Not Adequate | 383 | 94.1 |

High levels of (mean) knowledge scores were found in the domains of: acts indicating IPV (80±28.2), health problems women were presented with (74.6±24.4), reasons preventing disclosure (81.4±19.6), reasons for women staying in violent relationships (79.2±23.1), and nurses' contribution in providing support for women experiencing IPV (67.8±15.6). Lower levels of knowledge were evident in the domains of root causes of IPV (49.7±19.0), non-health consequences (53.5±24.0), laws pertaining to IPV (31.0±25.9), services available in state sector (19.1±25.07) and in non-state sector (7.4± 22.1), and principles in providing women-centred care (33.7±26.5). Knowledge scores for each of the 12 domains are presented in Table 2.

**Table 2.**

*Mean Scores of Knowledges related to Care for Women Subjected to IPV in each Domain*

| Knowledge domain | Mean | ±SD |
|---|---|---|
| What may prevent women disclosing IPV | 81.4 | 19.55 |
| Acts indicating IPV | 80.1 | 28.18 |
| Reasons for women staying longer in violent relationships | 79.2 | 23.11 |
| Health problems presented in women subjected to IPV | 74.6 | 24.41 |
| Consequences of IPV affecting children | 69.7 | 14.58 |
| Contribution of a nurse in providing support for women experiencing IPV | 67.8 | 15.56 |
| Non-health consequences of IPV | 53.5 | 24.02 |
| Root causes of IPV | 49.7 | 19.03 |
| Principles in providing women-centred care | 33.7 | 26.47 |
| Existing law in Sri Lanka to help women subjected to IPV | 31.0 | 25.86 |
| Services available in government sector to help women subjected to IPV | 19.1 | 25.08 |
| Services available in non-government sector to help women subjected to IPV | 7.4 | 22.11 |

**Table 3.**

*Frequency Distribution of Practices of Participants related to Care for Women Subjected to IPV*

| Response | Frequency | (%) |
|---|---|---|
| Have ever met a woman subjected to IPV in the hospital (n=407) | | |
|     Ever met a woman survivor | 352 | 86.5 |
|     Never met a woman survivor | 55 | 13.5 |
| Have ever met a woman subjected to IPV in the hospital and talked with them regarding their experiences of violence (n= 352) | | |
|     Talked regarding woman's experience of violence | 263 | 74.7 |
|     Did not talk about woman's experience of violence | 89 | 25.3 |
| Last encounter of participants with a woman subjected to IPV at the workplace (n=407) | | |
|     During the last seven days | 67 | 16.46 |
|     During previous month (8-30 days) | 82 | 20.15 |
|     During past three months (31-90 days) | 56 | 13.76 |
|     More than three months (Above 90 days) | 52 | 12.78 |
|     No encounter reported | 150 | 36.85 |
| Have come across anyone in their social circle (relative, friend, neighbour) outside their work settings, subjected to IPV (n=407) | | |
|     Yes | 323 | 79.40 |
|     No | 84 | 20.60 |
| Actions taken when they met women subjected to IPV# (n=352) | | |
|     I brought it to the notice of a doctor | 184 | 52.3 |
|     I let her speak and listened to her | 180 | 51.1 |
|     I gave information about services available to help women | 164 | 46.6 |
|     I asked her to tell everything to the Police | 135 | 38.4 |
|     I helped her by contacting one of the services available | 76 | 21.6 |
|     I advised her to be tolerant | 21 | 6.0 |

#Multiple responses elicited

## Attitudes of participants towards care for women subjected to IPV

The mean (±SD) attitude score of the participants was 7.82 (±5.00). About half of the study sample 218 (53.6%) had 'good' attitudes and 186 (46.4%) had 'poor' attitudes. Favourable attitudes were evident in the areas of: inquiring about IPV 370 (91%), offering assistance though there is a lack of resources 327 (79.8%), and maintaining confidentiality 232 (57%). However, 139 (34%) agreed that violence by a husband is justifiable if the wife behaves in a way to provoke him, and 147 (36%) agreed that women should tolerate violence for the sake of their children. Sixteen (3.9%) participants strongly agreed, and 131 (32.2%) agreed that a wife should continue to live with an abusive husband because of the welfare of their children, while 160 (39.3%) disagreed. Further, 156 (38.3%) disagreed, and 76 (18.7%) strongly disagreed while 117 (28.7%) agreed and 5 (1.2%) strongly agreed, that it was appropriate to talk about a survivor's problems with a colleague if the survivor is not present. About half of the participants, 54 (13.3%) strongly disagreed, and 177 (43.5%) disagreed, while 90 (22.1%) agreed and 13 (3.1%) strongly agreed with the statement, "Being a man, a husband should always be able to have power and control over his wife." A total of 221 (54.3%) disagreed, and 16 (3.9%) strongly disagreed with the statement, "There is no use of talking with women survivors, without addressing their social and financial problems," while 106 (26%) agreed and 14 (3.4%) strongly agreed.

## Practices related to care for women subjected to IPV

Participants' responses about their practices related to the care of women subjected to IPV are shown in Table 3. Of the 407 participants, 352 (86.5%) reported ever having met an IPV victim at the hospital where they work, and 263 (74.7%) reported having talked with an IPV victim about their experience of violence. In total, 67 (17%) of participants reported having had an encounter with a woman subjected to IPV during the previous week, while 92 (20%) reported having had an encounter with a woman subjected to IPV during the previous month. A total of 93 (35.3%) participants reported having personally identified a woman subjected to IPV (not identified by others) during the last three months. Further, 323 (79.4%) had come across a victim of IPV in their social circle.

The actions taken to help IPV victims are presented in Table 3. The most frequent actions taken were: 'bringing it to the notice of a doctor' 184 (52.3%), 'letting them speak and listening to them' 180 (51.1%), 'giving information on the services available' 164 (46.6%), and 'asking them to tell everything to the Police' 135 (38.4%).

Of the 117 participants who responded to the question on reasons for not being able to talk with women subjected to violence, 32 (7.9%) chose 'women did not like to talk', and 30 (7.4%) chose 'being busy and not having time to attend' as their reason. Primary barriers that prevented participants from asking women about violence, selected as their priority were: workload, lack of time, lack of privacy, no guidelines, and lack of specific knowledge on IPV (Figure 1).

**First Priority Barriers that Prevented Nurses Asking About Violence**
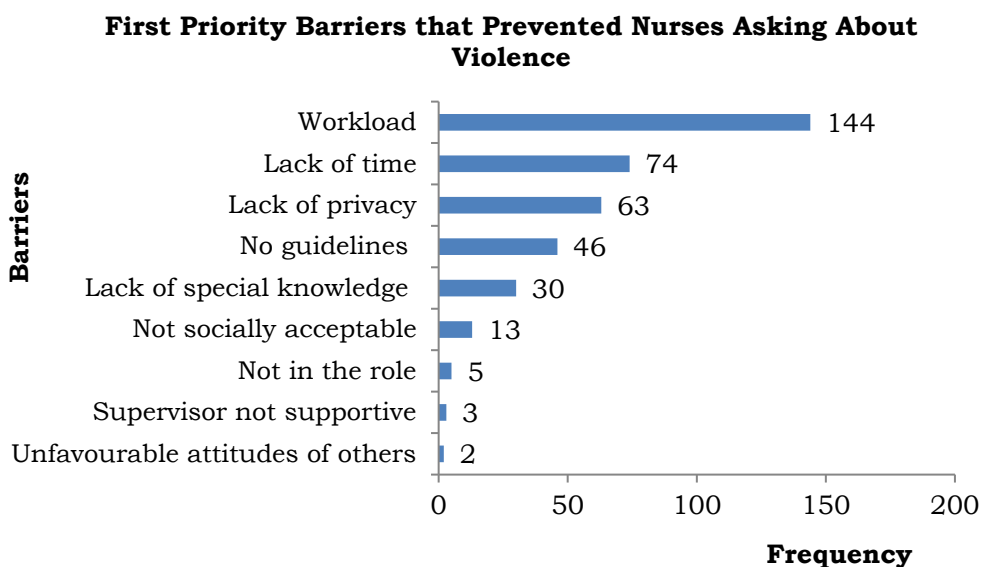


**Figure 1.** Frequency Distribution of First Priority Barriers that Prevented Nurses asking Women about Violence (multiple answers elicited)

**The factors enhancing knowledge and attitudes of participants**

Among the socioeconomic and work-related factors, only level of education and in-service learning on IPV facilitated the knowledge and

attitudes of nurses (Table 4). The participants who had obtained a bachelor's degree in nursing had better knowledge regarding IPV compared to the nurses prepared at the diploma level (OR 2.26, 95% CI = 1.4 - 4.95). The knowledge level of the nurses who had received in-service learning on IPV is nearly four times higher than the nurses who had not undergone such training (OR 3.79, 95% CI = 2.00 – 7.20). Regarding attitudes towards the care of women experiencing IPV (Table 3), nurses with a bachelor's degree had more positive attitudes towards the care of women subjected to IPV than those with a nursing diploma (OR 2.19, 95% CI = 1.05 - 4.56). The nurses who had in-service learning on IPV reported better attitudes than the nurses who have not had such training (OR 2.36, 95% CI = 1.26 – 1.34).

In addition, the level of knowledge (on IPV) acquired during basic nursing education showed a significant association with the attitudes of the nurses (OR 2.89, 95% CI = 1.57 – 5.30). Nurses with better knowledge levels showed more positive attitudes towards the care of women subjected to IPV than their counterparts (OR 2.89, 95% CI = 1.58 – 5.31).

## Discussion

The findings of this study show that nurses in the Western Province of Sri Lanka are not adequately prepared to care for women subjected to IPV. These findings corroborate the previous Sri Lankan qualitative study by Guruge in 2012 and are similar to the findings in studies of nurses in other countries (Alhalal, 2020; Aljomaie et al, 2022; Alshammari et al., 2018; Ambikile et al., 2020; Cortes et al., 2015; Djikanovic et al., 2011; Papadakaki et al., 2013; Sundborg et al., 2012). The current study found that about 85% of the participant nurses in the Western Province of Sri Lanka had inadequate overall knowledge of IPV, while about 55% showed good overall attitudes. The fact that half of nurses in the current study show good overall attitudes despite their inadequate knowledge of IPV could be due to their commitment to support women as their professional responsibility and duty. This could also be due to the increased awareness of the need for gender equality in Sri Lankan society as a result of its higher literacy rate (Gunawardena, 2015).

**Table 4**. *Socio-demographic Factors Enhancing Knowledge and Attitudes of Participants (N=407)*

| Characteristics | Good Knowledge (n =62) n (%) | Poor knowledge (n = 345) n (%) | Unadjusted Odds Ratio (95% CI) | Good attitudes (n =218) n (%) | Poor attitudes (n = 189) n (%) | Unadjusted Odds Ratio (95% CI) |
|---|---|---|---|---|---|---|
| Age | | | | | | |
| &lt;40 years | 37 (59.7) | 219 (63.5) | 0.85 (0.49 -1.48) | 140 (64.2) | 116 (61.4) | 1.13 (0.75 - 1.69) |
| &gt;40 years | 25 (40.3) | 126 (36.5) | | 78 (35.8) | 73 (38.6) | |
| Having children | | | | | | |
| Yes | 36 (58.1) | 232 (67.2) | 0.67 (0.38 -1.17) | 142 (65.1) | 126 (66.7) | 0.93 (0.62 -1.41) |
| No | 26 (41.9) | 113 (32.8) | | 76 (34.9) | 63 (33.3) | |
| Marital status | | | | | | |
| Married | 47 (75.8) | 292 (84.6) | 0.57 (0.29 -1.09) | 180 (82.6) | 159 (84.1) | 0.89 (0.53- 1.51) |
| Other | 15 (24.2) | 53 (15.4) | | 38 (17.4) | 30 (15.9) | |
| Level of education | | | | | | |
| Degree and above | 10 (16.1) | 27 (7.8) | 2.26 (1.04 - 4.95) | 26 (11.9) | 11 (5.8) | 2.19 (1.05 - 4.56) |
| Diploma | 52 (83.9) | 318 (92.2) | | 192 (88.1) | 178 (94.2) | |
| In-service learning on IPV | | | | | | |
| Yes | 19 (30.6) | 36 (10.4) | 3.79 (2.00 - 7.20) | 39 (17.9) | 16 (8.5) | 2.36 (1.26 - 4.34) |
| No | 43 (69.4) | 309 (89.6) | | 179 (82.1) | 173 (91.5) | |
| Learnt IPV in basic nursing education | | | | | | |
| Yes | 18 (29.0) | 80 (23.2) | 1.35 (0.74 - 2.47) | 61 (28.0) | 37 (19.6) | 1.60 (1.01 - 2.51) |
| No | 44 (71.0) | 265 (76.8) | | 157 (72.0) | 152 (80.4) | |

The current study found that only 24% of respondents received prior learning about IPV in their basic nursing education, either at diploma or undergraduate levels, and only 13.5% had received in-service education related to IPV. These findings confirm the results from a recent Sri Lankan study reporting only 17% having undergone prior training, and 80% expressing the need for more training on IPV (Guruge et al., 2021).

Regardless of prior education on IPV, most of the nurses (86.5%) in the current study have, in the course of their work, met a woman subjected to IPV, and (79.4%) have come across women victims of violence within their social circles, which indicate a high level of the problem of IPV and nurses' awareness of it. With regard to actions taken, out of 352 nurses who had met a woman subjected to IPV, 51% reported that they encouraged the woman to talk and listened to them, compared to most (82%) healthcare professionals in a previous study (Guruge et al., 2021). Further, 47% in the current study reported giving information about the available services compared to 20% providing IPV related information from the same (previous) study (Guruge et al., 2021).

In the current study, higher educational levels, total years of service, and having received in-service training on IPV were significantly associated with the level of overall knowledge, at $p<0.05$. In contrast to the above result, a study from Kuwait found that higher knowledge scores were significantly associated with nurses having fewer years of experience (Alsafy & Kamel, 2011), while a study from India also found that higher scores of knowledges and attitudes are associated with a younger age and less total years of experience (Sharma et al., 2018). The latter groups may have gained knowledge from informal sources as reported in a previous study (Seneviratne et al., 2020).

The findings of this study show that nurses in the Western Province of Sri Lanka are not adequately prepared to care for women subjected to IPV. These findings corroborate the previous Sri Lankan qualitative study by Guruge in 2012 and are similar to the findings in studies of nurses in other countries (Alhalal, 2020; Aljomaie et al, 2022; Alshammari et al., 2018; Ambikile et al., 2020; Cortes et al., 2015; Djikanovic et al., 2011; Papadakaki et al., 2013; Sundborg et al.,

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The latter groups may have gained knowledge from informal sources as reported in a previous study (Seneviratne et al., 2020).

## Conclusions

Overall knowledge levels about IPV were poor among a majority of nurses in this study. Although they showed positive attitudes, some possessed traditional patriarchal attitudes and biases towards women experiencing IPV and majority have not offered adequate help. Poor knowledge was evident on principles of women-centred care, legal aspects, and resources available to IPV survivors within practice settings and in the community. Those with better knowledge of IPV had favourable attitudes regarding the care of women subjected to IPV. The study highlights the need for the authorities to take steps to include IPV related content and skills-training in nursing curricula so that nurses will develop favourable attitudes and practices needed to identify, support and provide care for women subjected to IPV.

## Acknowledgements

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# Student Perceptions on the Use of Zoom Technology for French Language Teaching: with Special Reference to Students in a French Language Institute

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## Abstract

Conducting teaching-learning activities using online technologies such as video-conferencing applications (e.g. Zoom) has become essential in the present Sri Lankan context due to the prevalence of the COVID-19 pandemic. The objective of this study is to examine Sri Lankan students' perceptions on the use of Zoom technology for French language teaching. The study is done with twenty Sri Lankan female students whose first language is Sinhalese from the pre-intermediate level classes at the French Language Institute of Alliance Française de Kotte. The data were collected from a pre-test, a post-test and questionnaires. The method used is qualitative research where the data were analysed thematically focusing on the data driven codes. The findings of the study indicated that the majority of the students considered the use of Zoom in French language teaching is effective and efficient in terms of time and the current pandemic situation and they agreed that teaching French language via Zoom can help them in practicing language skills and acquiring new vocabularies.

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However, lack of collaboration, loss of identity, difficulty in meeting the expectations of the students, distance and technical issues are considered to be the major challenges in using Zoom technology for French language teaching. The results implied the necessity to conduct blended classes rather than using only online technologies such as video conferencing applications (e.g.- Zoom). At a time when the world is trying to cope with the COVID-19 pandemic, the study carried out is significant in developing strategies to teach French language effectively and further research can be conducted on other video conferencing applications to manage the challenges that the students face in French language teaching.

## Introduction

The online distance learning has become essential in the present day due to the COVID-19 pandemic in Sri Lanka. Hence, infusing online technologies such as video conferencing applications (e.g.- Zoom) into French language teaching has become a necessity. The classroom environment, today, is completely different from the traditional classroom. More and more French language classes are taking place online. This often offers the students to continue their French language learning despite the pandemic. The video conferencing application Zoom has helped to introduce a number of innovations into French language instruction. The widespread use of methods, activities and tools of computer assisted language teaching enable many teachers at the French language institute of Alliance Française de Kotte to enhance their teaching and maximize learning opportunities for their students.

Zoom is a cloud-based service which offers meetings and webinars and provides content sharing and video conferencing capability. It helps French language teachers of Alliance Française de Kotte to bring their students together in a frictionless environment to continue the studies. Alqahtani (2019) points out that new technologies open the doors for better distance learning programs, allowing those in disadvantaged areas to have access to the same education as the privileged. Zoom application which is usually

used for video conferences, is accessible from nearly any location with a mobile device or a laptop. In other words, information technology has widened access to education during the COVID 19 pandemic.

However, Erben, et al. (2008) remind that those who are working with new technologies need to be aware of the potential frustrations and how to avoid them. In the real practice, there are some problems and challenges found. Several researchers have also raised doubts about the effectiveness of these online learning systems. In language teaching, communicative approach which is considered as the most effective theoretical model since early 1970s demands natural language learning strategies and more open-ended types of activities, such as role-plays, information gap activities, and simulations in a communicative situation, in order to understand the potential communicative functions.

Hence, it is crucial to identify the students' perception on language learning via Zoom in order to develop strategies to teach French language effectively and to manage challenges they face. Through this study, the researcher attempts to study the perception of students on French language teaching via Zoom at the French language institute of Alliance Française de Kotte. The researcher also attempts to explore the difficulties students face when learning French language online. Therefore, the objectives of this study are to examine the students' perceptions on French language teaching through Zoom application at the French language institute of Alliance Française de Kotte and to identify the challenges faced by the students. Moreover, to examine the progress of the students and their proficiency in French language over the selected period of time, a pre-test and a post-test focusing on the four main language skills reading, writing, speaking and listening were given.

## Methodology

This study was conducted as a descriptive qualitative study on the perceptions of students on conducting online French language teaching via Zoom. The data were analysed thematically focusing

on the data driven themes. The descriptive qualitative approach is used to analyse the data because through this approach the perception of the students and the experiences of individual students can be understood and examined well. The data were collected from a pre-test, a post-test and a student questionnaire. A pre-test and a post-test are done to measure the progress of the students and a student questionnaire is given to examine the perception of the students towards the Zoom sessions. The participants of this present study are limited to twenty Sri Lankan female students whose first language is Sinhala from the pre-intermediate level classes to maintain the effectiveness of the online learning process. Their ages range from 16 to 30 years. Regarding their French language learning experience, they have been learning French for two to six years. They have been familiar with computer around five to thirteen years for studying, working, and entertainment purposes.

The pre-test and the post-test are given before the online learning process started and after the online learning process finished to measure the improvement of the students in French language. At the end of the process of online teaching via Zoom, a questionnaire is given to find out their attitudes towards the Zoom sessions. The whole process of online teaching was done for three months. Through the questionnaire, a special attempt has been made to extract answers to questions on how effective the online teaching methods are compared to traditional classroom methods especially when students interact with peers and teacher. Moreover, the questionnaire was made in a manner that students' perception towards French language learning via Zoom takes primary focus. Students were asked to give their opinion when it comes to pertaining to the online method, and their feelings towards the overall effectiveness of learning French language via Zoom. They were also asked to rate the effectiveness when learning with fellow students and the teacher in a traditional class and in a purely online setting.

The data analysis was conducted based on the collected data from the questionnaire and the tests. In the pre-test and the post-test, the four main skills of reading, writing, listening and speaking were assessed to see how effectively they learn in an online setting as

compared to a classroom environment. All the qualitative data gathered from the questionnaire is divided into four main parts and analysed to examine the students' perception towards French language learning via Zoom. At the end of the research, after analysing the data, the answers to the objectives were found out.

## Results and discussion

Evidence from previous studies show that the Zoom application could help students to interact directly with the teacher However, scientific investigations could not provide significant support for examining research findings regarding student perceptions and the challenges associated with employing the Zoom application in French language teaching. Blum (2020), a professor of Anthropology at the University of Notre Dame, mentions that over her decades of teaching, she has learned to read a room well: the harmonized posture, the breaths, the laughter, the eye gaze. According to Blum, her classes are successful when everyone is so excited that they want to speak over each other out of their enthusiasm, when the affect and the cognition and the interaction work together, when a classroom aims for conversation and when all the tools of human interaction are recruited. She has thus discovered the power of anthropology in language teaching classrooms. Hence, teaching a foreign language via Zoom can be quite challenging if effective strategies are not correctly identified. In order to develop such strategies, awareness of students' perception on online French language teaching is crucial.

Based on the results of the pre-test and the post-test, the researcher could notice a progress in the students. Majority of the students got more than 65% for each language skill tested in the post-test. According to the students, it is essential and important to continue their French language learning during the pandemic via online teaching. And most of their responses towards online French language learning were positive. Students further mentioned that they could see their improvement in French language. However, the data collected from the questionnaire indicate that students face several challenges when learning French language via Zoom. Learners' issues mostly included

learners' expectations, readiness, identity, and participation in online courses. If these issues found out through this study are well addressed, a more effective online teaching process can be implemented.

## *Lack of collaboration and active participation on online instruction*

Collaboration is an event initiated by a community of learners that usually leads to a product or culminating project. Collaboration is thus a working practice whereby individuals work together for a common purpose to achieve a benefit. When talking about collaboration, active participation of each individual is vital. The first part of this study focuses on the collaboration and the active participation of the students when learning French language via Zoom at the French language institute of Alliance Française de Kotte.

This study found that 80% of the students lack active participation and collaboration when they are in Zoom sessions. The students indicated several reasons for their lack of collaboration and active participation. 75% of the students said that the lack of instant feedback both from teacher and their fellow students is perceived as a challenge for them. It is found that low participation by members and lack of feedback both from teacher and fellow students are a major hindrance to collaborative learning. Furthermore, 70% of the students mentioned that the difficulty in representing their feelings and emotions impedes communication. 50% of them also said that the inconsistency of participants presents another barrier to effective collaboration and active participation of each individual. 30% of the students mentioned that slow internet connectivity as one of their worst experiences which could be due to low internet bandwidth.

This study took into consideration the definition offered by Dillenbourg which locates collaborative learning as a situation in which two or more people learn or attempt to learn something together. The situation is termed collaborative if peers are at the same level, can perform the same actions, have a common goal and work together (Dillenbourg, 1999). In the pedagogy of teaching,

teachers are encouraged to assign group work that gives students the freedom to learn from one another. The idea of group work in learning finds its root in work from the Russian psychologist, Vygotsky who explored the causal relationships that exist between social interaction and individual learning providing a foundation of the social constructivist theory of learning (Vygotsky, 1978).

In French language learning, it is proven that the construction of knowledge through group work outperforms individual learning. When learning a foreign language, collaboration and active participation of the students are crucial. In a traditional class, teacher gives often the students a chance to collaborate face to face, critique one another, share knowledge and compare their new ideas with one another. However, according to the study carried out, in the French language classes conducted via Zoom, it is very difficult to have the same social affective and cognitive benefits realized in face-to-face classes. Virtual platform in the Zoom sessions pose communication obstacles because of the distance and differences in technology between collaborators. It is revealed that the students do not tend to speak up even though sometimes they want to: they say that since they get the feeling that no one is paying attention to them and that they are simply behind a screen, they do not want to even make an effort by unmuting their microphones. They also mention that they do not want to correct their peers or even share their ideas due to this virtual barrier. Thus, the study revealed that there is no instant feedback from the teacher and their peers. This demotivated each individual. Since French is a foreign language for all the students in this study, collaborative work and active participation of each individual is necessary to improve their language.

Virtual communication in the Zoom sessions does not allow the students to show their feelings, emotions and nonverbal cues. Emotion indicates social presence, but in a virtual environment, representing feelings become difficult and lack of emotions impedes communication when collaborators often rely on the interpretation of interaction. Several students mentioned that they miss the traditional classroom atmosphere. Majority of the students mentioned that since they are new to this language which is not used in their day today life, they do not dare to ask direct

questions from the teacher or to ask him or her to explain the lesson again. In the traditional classroom, teacher identifies quickly their difficulties by looking at their facial expressions. However, this understanding did not happen on Zoom sessions and the students mentioned that they stay silent most of the time. Moreover, the students indicated that they cannot understand the reactions of their fellow students most of the time which result in interruption of proper communication. It is discovered that without social cues, online communication and collaboration frustrate participants. Visual cues are a significant mode of communication in face-to-face situations and the lack of visual prompts act as a barrier in virtual collaboration and make students more and more passive observers rather than active participants in the class.

The inconsistency of participants presents another barrier to effective online collaboration and active participation. It is found out that the instability of participants leaves a collaborative group in an indeterminate state. Majority of the students mentioned that they find instability of their fellow students as a barrier to their communication. The sudden disappearance and the silence of the peers make them demotivated and disturbed. It is revealed that the longer periods of collaboration and meaningful dialogue increase the levels of sustainability; yet according to the study, the students hardly get a chance to have longer periods of collaboration due to the limited time allocated for the Zoom sessions. The opinion of every student is that the ability to cooperate in Zoom sessions does not equate to social connectivity or guarantee the development of a relationship with others as it was used to be in the traditional class.

Moreover, 30% of the students mentioned that slow internet connectivity as one of their worst experiences which could be due to low internet bandwidth. Even though this issue is connected to technical side, it directly affects their participation in the class. The students mentioned that when they get back in the Zoom session after having a connection issue, they feel like total strangers since they missed some parts of the lesson. They also noted that when they face such technical issues, they lose their interest and motivation.

Thus, collaboration and active participation of the students in French language learning have been shown to exert positive influences on students' learning. There is evidence that in a classroom where learners articulate, share their understandings and actively participate, there is potential for sharing the cognitive load of the learning task for greater on-task engagement and for more effective learning. However, according to the analysis of the data, effective collaboration and active participation of the students in Zoom sessions are at a low level which need to be improved with different strategies.

This study reveals that even though the students had positive attitudes towards online learning because of its benefits (flexibility and continuation of their learning), they are faced with some challenges such as difficulty in communication with their fellow students, lack of sense of community and absence of real-time feedback which results in lack of activeness of the students. Existence of these challenges is an indication that the students participating in Zoom sessions with the aim of improving their French language could not realize the maximum benefits of collaborative learning.

### *Lack of visible body language of the teacher and the fellow students*

Nonverbal communication is often considered to be more subtle and more effective than verbal communication and is capable of conveying meaning better than words. For example, a smile might convey a feeling easier than words. It is a known fact that the most of our face-to-face conversations are nonverbal language, and that the gestures express our feelings and attitudes without saying a word. When it comes to French language teaching, there is a significant correlation between the teacher's appropriate and timely nonverbal behaviours and students' achievement and good behaviour. The findings of this study indicated that there was a correlation between the teacher's nonverbal communication and students' learning and motivation.

Total Physical Response is a language teaching theory which tries to teach a language through physical activities. It emphasizes

comprehension and the use of physical actions to teach a foreign language. In teaching a foreign language, James Asher, the advocate of the theory, believes that the Total Physical Response sees successful adult second or foreign language learning as a process paralleled to child first language acquisition. He feels that adults should follow the processes by which children acquire their mother tongue in learning a second or a foreign language. Asher also shares with the teachers that when they are teaching a foreign language, they would better use the Total Physical Response teaching mind to facilitate students' learning (Asher, 1977).

According to the data gathered from the students, 75% of the students mentioned that they are not capable of properly understanding the body language of their teacher through the screen in their Zoom sessions and this situation made them feel a little lost. Majority of the students stated that they can hardly understand the gestures of the teacher and the other students. According to the students, facial expressions, eye contact and the physical appearance of the teacher make them feel engaged in the lesson and these gestures are more effective than other modes of nonverbal cues and help them to even understand the language better.

65% of the students said that they feel a little lost since most of them rely on nonverbal behaviour of the teacher to recognize when to speak, when to let others speak, and how to speak. According to them, teacher's body language is effective when he or she is present in front of them rather than seeing him or her sitting in front of a screen. It is found out that the activeness of the teacher that the students noticed in the traditional class motivates them to stay engaged in the lesson and to learn French enthusiastically. The students said that the lack of visible body language of the teacher in Zoom sessions make them feel demotivated and distant. Moreover, the absence of proper eye-contact of the teacher with students make them feel ignored. According to the students, the eye-contact of the teacher and the look given for each individual is really important for them to feel recognized in the class. The teacher must look at individual students. Otherwise, the students will have the impression that the teacher is ignoring them; hence, the effect of looking at the students is undeniable. However, when

teaching French language via Zoom, proper eye-contact cannot be maintained properly.

60% of the students mentioned that they feel anxious and fearful when the teacher says their name and asks questions. They said that they tend to forget the answers when they hear their name all of a sudden. They mentioned that in traditional class they easily understand the flow of the lesson and they anticipate the questions from the teacher and also their turn to answer, however, in Zoom sessions, they feel very distant and do not anticipate. According to them, the main reason is the lack of visible body language. This lack of visible body language of the teacher thus affects the relationship with the students. The students tend to feel little by little distant and demotivated to engage in the lesson.

Brophy, an American educational psychologist defines motivation as a theoretical construct to explain the initiation, direction, intensity, persistence, and quality of behaviour, especially goal-directed behaviour. Motivation has been centre of attention among language teachers throughout the years because it constitutes the backbone of language learning process (Brophy, 2010). Through this study, it was found out that when teaching French language via Zoom, the students do not get to understand the body language of the teacher and their fellow students due to the lack of proper visibility. Owing to this situation, students tend to slowly lose their willingness and interest towards lesson, which puts a major barrier in front of effective language learning in the long run.

### *Absence of the traditional classroom setting and the company of fellow students*

According to the findings of this study, 85% of the students feel a sense of isolation owing to absence of the company of their fellow students and the traditional classroom setting. Even though, the interactions are considered to be the central emphasis in French language learning, majority of the students of Alliance Française de Kotte who are learning French language via Zoom do not get the opportunity to interact properly. According to many studies, one of the greatest drawbacks of online French language teaching is isolation. Being in different areas across the country, it can be

easily felt for the students that they are on their own, rather than being a part of the learning community.

Several students mentioned that when they are learning French language in Zoom sessions, they get the feeling that they are in separate rooms and do not get the urge to interact like in the traditional classroom. This is especially true in the asynchronous classroom environment. Majority of the students do not feel as a part of their learning community. They also said that they miss the face-to-face interaction that a traditional class gives them. Due to the lack of interaction, the students do not get the opportunity to practice what they have learnt.

Traditional classrooms have positive social aspects that can be lost in online learning environments. There are certain activities that are beneficial to complete when learning a foreign language within a team-oriented environment. Think-pair-share and roundtable-style discussions are classic active learning strategies that benefit from face-to-face student interaction. Traditional face-to-face classes also provide teachers with opportunities to have a more personal interaction with students. This helps to create the feeling of community in the classroom, which is an important factor in student retention. Moreover, several students stated that face-to-face learning enables their teacher to visualize whether or not students are truly comprehending the material that is being taught. According to the study, it is discovered that the absence of the traditional classroom setting and the company of the friends tend to slowly erode the desire of the students to learn French language.

A student stated that a lot of grammar lessons are difficult to understand and to get excited about when they are on their own and that if they get to discuss and argue with their friends like in the traditional classroom, it would be much easier and interesting. It was felt that verbal and written communication could not be a complete substitute for hearing a human voice or seeing another person for real in classroom.

85% of the students felt a sense of isolation which arose from the geographical separation and lack of contact with fellow students.

They mentioned the term isolation specifically and said that they felt it was a problem for their French language learning, with one describing her learning as "boring" and a "solo mission". Moreover, it is also found out that the absence of face-to-face communication with the teacher during Zoom sessions, causes social isolation, and causes students to feel a lack of pressure. The lack of pressure can be a disadvantage in the sense that it could cause students to abandon their studies more easily. Even though, constant nudging by the teacher may be undesirable for many students, it is considered to be an effective method for improving student retention.

Hence, it is necessary to give the students an opportunity to engage in active cognitive processing; it demands that they participate in making meaning out of content; and, it forces them to contextualize that meaning among a social group. Discussions are thus an excellent way to allow students to make meaning together by comparing and contrasting various perspectives of the content which cannot be practiced effectively in Zoom sessions when learning French language like in a traditional classroom. Hence, it is important to have frequent encouragements from teacher as a proactive measure to make students feel like they are not studying alone and to help with motivation and to encourage a dialogue between the student, teacher and the fellow students. According to the results, it is necessary to mingle traditional classroom atmosphere in the Zoom sessions as much as possible to keep students motivated and interested.

### Preference between learning French language via Zoom and face-to-face class

The last part of the questionnaire attempts to examine the preference of French language learning method of the students: traditional classroom or the Zoom sessions. After the analysis of the data, it was revealed that 75% of the students would prefer to learn French in a traditional classroom; if they are given a choice between Zoom sessions and a traditional classroom for French language learning, they would select the second option. According to students, the traditional class significantly gives a deeper understanding of French language while giving them a lot of

freedom to practice what they have learnt and to share their ideas with the fellow students. Moreover, it is found out that 60% of the students find it quite difficult to feel motivated enough to study via Zoom; due to lack of liveliness and the interaction in Zoom sessions, their desire to learn French language erodes slowly. Even though majority of the students said that continuing to learn French language via Zoom is better than doing nothing during the pandemic, they do not find learning French language via Zoom as effective as learning French language in the traditional class owing to various challenges. 84% of the students mentioned that when learning a foreign language, they need to have a lot of interactions, liveliness, body language and also the company of their fellow students.

The study of the data thus implies that the students' preference is to learn French language in the traditional classroom. In Zoom sessions, the student is not directly interacting with the others. Therefore, when they get questions, students find it rather difficult to ask it from their teacher, as communication is often very impersonal. Majority of the students thinks that interacting with their teacher live is the best way to learn, as it is interactive and allows for two-way communication. In the traditional class, students can directly share their views and clarify their questions with the teacher, thus getting their questions answered right away. It is considered that social presence as a quality of the communication medium itself (Preisman, 2014).

One student remarked, "Languages are hard to learn without any direct face-to-face instruction time from the teacher". Although groups can be created in Zoom that allow students to complete collaborative work and converse online, some students indicated a lack of value associated with such collaborations. Thus, the researcher found that although learning French language via Zoom did promote learning, it did not necessarily motivate students by creating an effective outcome.

## Conclusions

In congruence with the fast-developing world of ICT and the current situation of the world due to the COVID-19 pandemic,

there is a radical transformation of French language teaching from traditional class to online teaching via Zoom. Teaching French language online has become a necessity. The objectives of this study were to examine the students' perceptions on French language teaching through Zoom application at the French language institute of Alliance Française de Kotte and to identify the challenges faced by the students. According to the findings, although the students improved their French language to a certain extent and perceived online learning via Zoom beneficial, this study found out a certain number of challenges faced by the students when learning French language via Zoom at the French Language Institute of Alliance Française de Kotte which are substantial in making online French language teaching more effective and productive in the future. Learners' issues included learners' expectations, readiness, identity, participation in online courses, the inadequate interaction and lack of immediate feedback. It was observed that the lack of collaboration on online instruction tend to slowly turn students into passive observers rather than active participants and the lack of visible body language of their teacher and the other students slowly reduces their motivation which will affect their learning negatively in the long run. Moreover, it was proven that without the classroom setting and the company of their fellow students, some students began to feel a sense of isolation that slowly erodes their desire to learn.

In conclusion, the study showed the efficacy of French language teaching via Zoom was not at par when compared to teaching in the traditional class. The data also reflected an unsatisfactory improvement of speaking skills which is a serious matter of concern. A key factor affecting the development of speaking particularly was the lack of speech practice tools on Zoom and online. It is suggested that it can be addressed by the use of synchronous tools such as video conferencing and online classroom environments which increases the efficiency of online learning.

Thus, there is a lot of efforts to be put by teachers and the students to improve the educational quality of teaching and learning of French language when applying new technologies such as Zoom. In order to minimize the drawbacks of French language teaching

via Zoom, it is essential to blend with classroom-based approaches rather than simply making Zoom a substitute for classroom courses. Based on the findings, it is recommended to coordinate virtual group activities using chats, discussion boards or cloud tools for collaboration and to schedule regular check-ins with students via email or chat to maintain the classroom dynamic in a digital environment. Further research can be conducted in order to find out ways to develop French language teaching and learning experience via online technological platforms such as Zoom.

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# How to Read "Silence" in a Literary Text without a Teacher: ODL Learners' Perceptions of Studying Literary Texts through the Online Mode

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## Abstract

Teaching literature is a complex and challenging task, particularly because of the multiple interpretive possibilities of literary texts. It is even more so when teaching English poetry to learners for whom English is a second language. Further, Literature has been traditionally been a subject that needs the presence of a teacher to assist students in their quest to read for deeper understanding and interpretation of texts. This study investigated second-year undergraduates' perceptions on learning T.S. Eliot's epic poem *The Waste Land* - a notedly difficult text to access, owing to its length as well as the need for compulsory background reading on history, mythology, Eastern and Western philosophy and the Classics - via both an online intervention and an in-person Day School, using a qualitative research design and in-depth semi-structured interviews. The study found that the BA in English and English

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Language Teaching students view the online component of the course as useful but supplementary in its function, that online learning cannot replace the teacher in a physical classroom and that they prefer the physical presence of a teacher when attempting to read, understand and interpret the literary text. However, they value the online component especially when it facilitates feedback on writing about Literature, and when it offers language-related feedback with regard to assessments.

**Keywords:** Teaching Literature, Teaching Literature online, Open and Distance Learning, T.S. Eliot

## Introduction

Teaching of literature in English has particularly been practiced through the face-to-face mode, an attitude that to a great extent has even permeated teaching literature via the ODL mode. The complexities of texts considered as 'literary', their connectedness to the socio-political-economic contexts in which they were written and multiple interpretive possibilities inherent in the texts are the common causes such practitioners would often cite for their choice. The notion of multiple-interpretive possibilities is what makes teaching literature a challenging task, whereby a teacher would be called upon to float the possible interpretations in the class and construct new knowledge through negotiation with the students—a challenge overtly familiar to the present researchers who are practitioners of teaching literature, and a task that offers a formidable challenge in Open and Distance Learning (ODL) settings. As Owens (2010), who himself is a teacher of literature via the ODL mode, says "learning involves human relationships, and engages the emotions as well as the cognitive processes" (Owens, 2010) and thus "face-to-face contact remains important even in…open and distance teaching of literature" (Owens, 2010). Literary critic Pierre Macherey succinctly articulates the nucleus of this concern when he suggests that literary texts are not what they appear upon a surface reading. He points out that the speech of a book comes from a certain "silence" (Macherey, 2006) and this 'silence' informs us of the "precise conditions for the appearance of an utterance,…its limits…real significance" (Macherey, 2006). Macherey's assertion, just as it might serve to justify the acts of a face-to-face practitioner of literature pedagogy, also makes the task of

an Open and Distance Learning (ODL) teacher of literature seem daunting. It would be even more formidable to a novice teacher of Literature, who would have begun teaching entirely online during the COVID-19 pandemic. How could an ODL teacher deal with the complexities in teaching literary texts in an environment where the teacher-presence need not be compulsory? How could one effectively interpret the 'silence' in a text and construct new knowledge in an essentially ODL settings? And, most importantly, how do students in an ODL setting—specifically in asynchronous settings— read, absorb and interpret literary texts? The present study wishes to explore these questions with the objective of aiding the cause of teaching literature in ODL settings through critical discourse and opening up further research areas in the sparsely researched area of teaching literature from a distance.

The teaching of a literary text in a classroom (ODL/online or otherwise) would necessarily involve building competence in the demonstration and dissemination of reading skills, interpretive ability, patient endurance of complex texts, negotiation of socio-cultural contexts which could have motivated the creation of the text and which also imprint upon the text, and most importantly, writing responses to a literary text within a structured academic discourse. The tendency would be to (uncritically) assume that a traditional face-to-face classroom could deal with such challenges better than an asynchronous or synchronous online platform where the teacher is not literally standing in front of the students. Another tendency would be to place undue challenges upon an ODL teacher of Literature, since there is an innate understanding that ODL teaching pedagogy of literature needs to be, as Kayalis (2010) articulates it, "intuitive approximation of what goes on in face-to-face teaching". At the same time, such tendencies cannot ignore the reality of the (largely unsung) vast potential for education created by the ODL practitioners via video and digital technology, and how such technologies are absorbed into the folds of education in the pandemic-affected world to the extent that online learning, which used to be a blended mode of study offered to ODL students is now the common property of even primary schools around the world.

There is no solid research to indicate how online learning/teaching

affects the acts of learning and teaching literature per se, though Koskima (2010) notes that in Finland there has been a decrease in the number of students "not reading literature at all" (Kosima 2010). In place of literacy, digital technology is seemingly creating 'electracy' Kosima (2010) points out, quoting a term coined by Gregory Ulmer (2002). The present study is motivated by the sudden necessity of, and interest in, online learning due to the COVID-19 pandemic. It aims to locate how the teaching of literature is best achieved through the online mode, and is an exploratory means of attempting to understand the rewards/limits of teaching literary texts online. Using an online component designed for undergraduate students studying English at The Open University of Sri Lanka (OUSL), this study monitors their responses to literary texts online, and conducts interviews with the participants to assess their perceptions and experiences with the online intervention. The study is motivated by what Kayalis (2010) succinctly articulates as "making literary teaching in distance education competent and meaningful, through constant experimentation and improvisation through all aspects of literary pedagogy including the use of digital tools." At the same time, the COVID-19 pandemic has made it imperative for ODL teachers of Literature—at OUSL and elsewhere—to take Kayalis's notion of 'experimentation' and 'improvisation' seriously as teachers engage in the online mode to sustain the deep interest and enthusiasm the students showed for literary texts prior to the pandemic through blended modes of learning, with face-to-face learning sessions playing a central role. Bergstrand & Savage (2013) point out that, despite the proliferation of online courses, universities and researchers have only begun to systematically investigate what they can and cannot teach effectively in this mode. This research intends to go beyond these binary assumptions and locate 'why' and 'how' some practices of online teaching are considered effective and less effective, and hopes to offer suggestions to potentially nurture or mitigate such concerns.

## Review of the Literature

There is a dearth of research related to online teaching/learning of Literature in the Sri Lankan ODL context to recreate an in-depth discourse on the topic. There is one study of using the ODL mode with students of English Literature at OUSL, albeit with a different focus.

Medawattegedara (2019) in a study of an online intervention with a group of OUSL students studying poetry of the First World War found the responses offered by students to the online component in this poetry course variegated with complex thoughts. He used the online platform to familiarize students with the complex socio-political context surrounding World War I. The students found the readings on the online forum helpful and 'interesting'. Yet, the online poetry engagement which they undertook after their exposure to the historical context became problematic owing to the complexity of the poetic expressions, difficulties in language and hidden thematics of the poems. The study found that although online learning of literature has its specific and subtle rewards, further research and exploration is needed in order to hone and moderate this medium as an effective tool for teaching literature.

Poidloue (1987) argues that in the domain of literature, distance teaching offers the inconvenience of a dialogue between the teacher and the student which is limited to three exchanges only: the lesson, the essay and its correction. However, Medawattegedera's (ibid.) study found more optimistic results: the students engaged with the online platform as long as the readings were uncomplicated and disengaged from the online medium when they encountered the literary texts, which required extensive teacher intervention.

Heble (2010) in a study aimed at locating whether online interventions could help develop students' critical thinking and literacy abilities used both the online and face-to-face mode of teaching on two groups of students in the Sultan Qaboos University in the Sultanate of Oman. The students were taught the subject *Introduction to Drama*, which the researcher says, falls into the category of a "touchy-feely" subject which requires "a more personalized approach" (Heble, 2010). Her study indicated that the students who got personalized instructions with teacher presence seemingly performed better than those who received online instruction. Those who received face-to-face instruction obtained more A grades and D grades, whereas those who got B and C grades were mostly the students who received online instruction. She concludes that on the one hand traditional teaching seems to favor students who are already performing well in class while online teaching helps students at all levels. On the other hand, she argues against coming to strong

conclusions about the merits and demerits of either online or face-to-face teaching of Literature, reiterating that "both experiences are valuable" (Heble, 2010).

Owens in a study whose main focus was uncovering the potential challenges of designing an MA in Literature program at the Open University in UK found that teaching of Literature via the face-to-face mode was the most critical part of students' experience at the university. Online exposure to the subject has its own advantages such as the ability of students to make "more measured and thoughtful contributions" (Owens, 2010) and more active student participation owing to the asynchronous nature of the engagement. Yet, his study favors face-to-face teaching of literature suggesting that "learning involves human relationships, and engages the emotions as well as the cognitive processes" (Owens, 2010). Thus he concludes that "face-to-face contact remains important even in…open and distance teaching of literature" (Owens, 2010).

The present study in its objectives is more aligned to Heble's work in the sense that this study too attempts to locate the middle ground between online and face-to-face teaching of Literature through an extensive analysis of students engaged in an ODL study course of Literature.

## Methodology and Procedure

The study adopted a qualitative approach in order to collect data on the complexities of students' experiences while engaging with the online component of learning literature

### Participants

The participants in this study are students of the BA in English and English Language Teaching (BAEELT) programme which is a 4-year Honours degree offered by the Department of Language Studies of the OUSL. This program, as the title implies, combines the study of both English Literature and English Language Teaching. During their second year of study (Level 4) the students of this program enroll for a course titled *LEU4506: Poetry*, whereby they are required to read the Modern Poetry of T.S. Eliot, Phillip Larkin, Robert Frost and Y.B. Yeats. The

present study is related to the teaching and learning of one of those poets, namely T.S.Eliot. His epic master-piece *The Waste Land,* a challenging text for students of English literature, possibly in many contexts, is one of the texts in this course. Reading *The Waste Land* is better achieved with a thorough knowledge of Greek classics, eastern and western philosophy, mythology and classical opera. The poem thus requires a specialized mode of reading and consequently is not a popular text among students—at least until they surmount the initial difficulties of reading.

**Sample**

Ten students from Level 04 were selected for this study. The selected students' age range was 22-40 years. There were 09 female students and 01 male. English literature classes in Sri Lanka are mostly populated by female students, as any other such class worldwide. The participants were selected based on the marks they obtained at the final exam of this course, and these students' marks ranged from 55% (B- grade) and 70 (A- grade). In English Literature classes students who are struggling with reading and interpreting texts tend to obtain very low marks. (The department employs special methods of supporting low-achieving students - a discussion of which is beyond the scope of this article). A student who is struggling with the fundamental aspects of learning a literary text might find it difficult to engage with the researchers on a dialogue about the nature of learning-teaching, modalities of interacting with online components, and their reading experiences with the material uploaded onto the online platform. Hence, the selection of students who obtained marks of a specific range to participate in this study.

**Online Intervention**

The present online component was planned as an intervention for teaching this very difficult and challenging poem, Eliot's *The Waste Land.* Prior to this intervention, this course was taught in the traditional classroom, which now, in the light of the increased prevalence of online teaching, is referred to as the "face-to-face mode".

This planned online intervention could be illustrated as shown in Figure 1 below:

**Intervention I**
- Day School
- Participants read supportive **text** of the poem online after the Day School (DS)
- They engaged with the Continuous Assessment **(CA)** component

**Intervention II**
- The **CA** returned to students with tutor comments / feedback
- The **best CA** was uploaded with corrections and tutor comments online

**Intervention III**
- **Final Examination** writing exercise and online discussion
- **Final Examination Preparattion**

**Figure 1.** Online Intervention for Eliot's *The Waste Land*

Unlike the usual mode of teaching Eliot's *The Waste Land*, where the face-to-face Day School (DS) took precedence, in this exploration the order was reversed: the DS became the scaffolding through which the students were prepared for the online component. The idea was to evaluate whether students could be trained to become independent readers of a complex literary text with minimal teacher intervention. A specific example is provided to make the point clear. Eliot's long poem begins with an excerpt from the Greek myth, Sybil of Cumae. The DS interaction kept the explanation of this myth minimal; in other words, this myth was explained only as far as it added an immediate meaning to the overall poem[†]. In the online component, this mythical aspect of the poem was explored in detail from a wider perspective. For instance, the online platform presented the entire mythical narrative of Sybil along with illustrations, and most importantly interpretations of the myth based on folkloric postulates. This enhanced meaning provided in the

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[†] Pre-text in a poem tends to offer an overall thematic support to the meaning of the poem

online component was meant to expand the knowledge already gathered in the DS, and it was presumed that the model would actually work only if the students engaged with the online component intensely after the DS

In addition to issues concerning interpretation of texts, the other major issue that concerns a student of literature is articulation—i.e. articulating abstract ideas using the academic register. This online component took the initiative to help students with their academic writing. Writing is the mode by which students produce an output in literature and this output is critical for a teacher since it is a measure of a student's understanding of a text. Also writing is the means by which a student passes/fails an exam. Thus, though the focus of this article is on understanding literary texts, the findings on academic writing are included here since the two cannot be separated in learning-teaching literature. As indicated in Figure I, the best Continuous Assessment assignment response was uploaded to the forum with track-change edits. Thereafter, a mock exam question was uploaded and students were asked to write an introduction, or the first paragraph, as a response to that question. The best three answers were selected and were uploaded with edits. The process was repeated and the students who could not upload answers were encouraged to do so. Three such cycles were run before the actual Final Examination.

This intervention is connected and sequenced, in the sense that each stage is expected to be helpful for the challenges of the next stage. An assumption was made that if students followed the online course as per the design, the total experience would prepare them to face the Final Examination component successfully. The expected aims of this online intervention were pragmatic:

- To encourage students to engage with Eliot's poem intensely prior to the CA component
- To locate the challenges faced by the students when engaging with the CA and discuss those challenges with the students
- To enable students to write meaningful answers at the Final Examination

## Data Collection

This study had as its focus the information gathered from in-depth interviews conducted with a sample of ten (10) randomly selected students who had participated in the online component of Eliot's poetry consistently and who had scored above 55 marks at the final examination. The interviews were conducted after they completed their Final Examinations. The onset of the COVID-19 pandemic in Sri Lanka‡ did not affect the dissemination of this course because OUSL shifted their Day Schools (face-to-face lectures) to the online mode (video conferencing). Though these interviews were to be conducted face-to-face, owing to the pandemic situation they were conducted via email and Zoom calls. Further, although the researchers wished to analyze the Final Examination scripts, that idea had to be shelved because although the students were prepared for a 3-hour written final examination, the Department of Language Studies was forced to change the structure of the entire examination at the last moment owing to the pandemic situation.

## Data Collection Instrument

Qualitative semi-structured interviews are often used to consider experience, meanings and the 'reality' of participants' experiences (Braun & Clarke, 2006). The comprehensive, semi-structured and in-depth interviews were conducted in the form of focus group discussions in a friendly informal manner and the students were briefed on the objective of the exercise prior to the interview. The interview schedule was based on the two topics listed below; however, in keeping with the semi-structured nature of the interviews, the topics merely were an approximate guide. The intention was to encourage free and open responses to the questions in keeping with the principles of a literature classroom where free expression, multiple interpretations and "sympathetic imagination" (Popper, 2002), are encouraged. Listed below are the broad questions in the interview schedule which are built around

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‡ Sri Lanka's first COVID-19 patient was discovered in February 2020, and the nation went into a nearly 3-month lockdown from March to June 2020.

the objectives of the study.

### Topic 1: Learning Eliot's Poetry Online

- How helpful to your learning was the online component you read after the Day School?
- Do you think you could manage learning poetry entirely online? If yes, why? If no, why not?

### Topic 2: Student Perceptions of the Online Intervention in Writing an Answer§

- To what extent would you say that the online discussion forum on answering examination questions was helpful to you in answering the questions in the Final Examination?

The interviews were recorded and transcribed and a thematic analysis was carried out on the interview data.

**Ethical Issues**

The study was incorporated into the overall Course Evaluation which is an inherent part of online courses on the Learning Management system, and therefore it was not considered necessary to obtain informed consent from the students separately. However, all participants were informed that their participation in the interviews was for research purposes as well as to improve the online component of the course, and that they would remain anonymous and the findings of the study would be used to enhance the effectiveness of the course under consideration. Further, the interviews took place after the final examination results were released, and students knew that their response in the interviews could not in any way affect their academic performance/grades on the

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§ Writing an answer is the means by which a student demonstrates her knowledge of a literary text, thus the information gathered on writing is also presented here since both interpreting a text and writing an answer are inseparable.

course.

## Findings and Discussion

The findings of the study are presented as per the two above-mentioned topics that guided the interview schedule for ease of discussion and understanding.

### a) *Learning Eliot's Poetry online*

The following themes emerged from the data in the interview transcripts

(1) Useful as a supplement

All the participants were of the view that the online component was "useful' for them as a "supplement" for the learning in the Day School. They all understood that the online component and the classroom were connected in <u>time</u> (they had to engage with it immediately after class) and in <u>progressive learning </u>(online component was planned as the next step of their learning ladder).

Female student I said:

"I did not read the online section on that day itself, though we were asked to do so. I had work at office and home. I only read it about two to three days later, and suddenly, the classroom came back to me"

Female student II said:  "I remembered what we discussed in class vividly," and another female student III qualified her statement adding: "it was as if the classroom learning was recaptured in a very well-written note."

Male student I who had engaged with the online segment immediately after the class felt that the classroom was reenacted as he read the online component. This frequently-occurring notion of "classroom re-enactment" experienced by them needs a careful analysis. On the one hand it could suggest that the ladder-effect of the experiment was lost because the students did not feel that the online component enhanced their learning which happened in the day school. On the other hand, the term 'classroom re-enactment' is an articulation that captures the

desired effect.

The researchers asked the participants to explain some critical sections of the poems back to them and noted down the nature of their responses. At least four (04) participants, out of the ten (10), articulated responses that were clearly influenced by the content disseminated by both the class and the online component. The rest of the students offered responses which were more influenced by the classroom discussion than by a combination of the classroom-online mode. The four students whose responses were influenced by both the modes of learning scored high-marks for the question related to *The Waste Land* at the Final Exam.

(2) Online learning cannot replace the classroom

Another theme that emerged was that the online component could never be used in place of the teacher.  Female student IV said:

"The teacher has to be there. If you had asked us to read the online component before attending the class then most of us would not have done that." Male student I said:

"You made us read it by showing interesting ideas in the class, and that did it."

Female student I suggested that though the online component was a safe mode of teaching during the pandemic, yet that did not mean that teacher's live presence should be eliminated from the teaching learning situation.

"I like that I do not have to travel for classes, but I always feel comfortable and cared for when a teacher is physically there to tell me things in a classroom"

As the discussion progressed the students overtly asserted that Literature lessons should opt for both options—"one cannot replace the other,"

(3) Literature cannot be learned without a teacher present.

Another theme that emerged from the data was that even an online course with much more extensive details and components than the present course would not make them more independent learners. All ten participants articulated this idea.  Male student I stated:

"If a teacher could simply "animate" the online text in class, then life would be much easier." Female student V said:

 "Online is important due to COVID-19 but we want more human interaction."

        Female student I said:

"Wasn't Eliot saddened by how humans have become engines in *The Waste Land?* We should not take away the human element from our Literature class".

The majority of the participants experienced the online component as an extension of the classroom, and specifically as a means of reclaiming the memory of learning in the Day School. Learning Literature, they felt, was essentially a human activity, and any additional technology-based learning component had to be secondary to the Day School, with the presence of a teacher.

### b) Student Perceptions of the Online Intervention in Writing an Answer

(1) The continuation of receiving feedback on writing is important

A theme that emerged is that participants needed the writing support given online and therefore writing support as per given in this intervention was extremely useful. Although they had studied Academic Writing as a subject at the beginning of their degree study program, they felt that they needed frequent feedback on their writing. Some of the responses during the focus group interviews were as follows:

Female student VI:  "Writing for literature takes time to master. So this type of micro support is important."  Male student I:

"Application of the rules of academic writing to literature takes a while to learn, and this online component exposed our weaknesses in that aspect." (This statement received the support of all the other participants)

Thus, the students felt that this online intervention in writing was overall, helpful. It must be understood at this point that any type of intervention with academic writing in this BAEELT program would be appreciated by the students. Thus, the researchers probed into specifics: what were the special features of the online writing intervention that they found helpful? The researchers elaborated that there had been two types of feedback from the tutors: on language and on concepts.

(2) Language editing of students' papers helps them improve their overall language ability

The participants felt that language edits, which were demonstrated on the best answers were helpful owing to their deeply felt need to master the English language with all its intricacies. One student added that she saved the edited document to read it over and over so that she would be motivated to be careful when she writes. The majority felt that language edits were more closely linked to the world outside than conceptual editing. English mastered at the scale of general accuracy was one of their dire needs and this writing forum helped them achieve that.

Female student VI said: "Learning to write in English without making errors is very important, because most of us are teachers. So, when we look at the red coloured edits done to an answer, we learn a lot,"

Female student VI said:

"I work in the media and am expected to work independently. So it's very important that I master general language skills,"

(3) Feedback on the quality of an argument improves students' thinking and helps in revision for final exam

One of the participants who engaged intensely in the online writing forum, Female student VII said:

"Conceptual edits, help improve our thinking. In my answer I have written some terrible comments about Marie in Eliot's poem. At the time of writing, it felt good to write that. But after the comments you made in red, I was, let us say, woken up…that was new learning,"

Male student I suggested that conceptual editing taught them new things about the poem. "When you challenge us about a view point in the poem, then I see that there are many ways of looking at something. That makes me happy because the same text that you and I have read has given us two different ideas."

Female student II: "Both types of editing deal a major blow to our ego. Because without such feedback we feel we have mastered literature and writing."

In conceptual (content) edits the discussions were longer, because they offered fresh means of looking at the poem. As a result the students said that they ended up revisiting the poem—"that was good revision for the exam"

(4) For improving writing skills in literature, the online forum is better than the face-to-face mode.

Some responses included the following:

Female student: VIII "In a class individual feedback would have been given and we would not have had access to many scripts like the online forum. Reading many edited scripts in an open platform gave us many learning experiences."

Female student V said: "In a normal class other students would not show us their script,"

Female student IX said that the online forum gave them time to learn. "The fact that the edited scripts were there on the forum gave us ample opportunities to study and discuss them."

The researchers gently urged him to narrate the nature of those discussions, and he answered that the discussions were primarily those focused on language and content.

When it came to language, students discussed the edits in detail, and what emerged in these discussions was how they were not aware of a specific language rule, how formal grammar lessons in the past failed to predict the errors they would make. Also if a specific language error (e.g. a misplaced modifier) was discussed, students who did not make the error also brought their own knowledge thus increasing their knowledge.

## Conclusions

The online forum for an academically challenging literary work like *The Waste Land* was a leap of faith for these researchers who have been teaching this poem primarily through the mode of face-to-face lectures (Day Schools). This online forum was designed very much prior to the pandemic crisis and it became critically important during the Covid-19 lockdown in Sri Lanka. The objective of this exercise was exploratory and the study attempted to understand the 'experience' of teaching literature through different modes of delivery. One of the important findings about teaching literature using the online mode was that Day Schools needed to take center stage: DS is the main motivation for encouraging the students to engage with the online component (whether these DSs are face-to-face or video conferencing DS would be the topic of another study). This finding does not suggest that a DS offers more possibilities of learning for an ODL literature student. Rather, it suggests a possible sequence of events for a successful blended-learning session for students of literature—that a DS might be a good way to encourage students to engage with online components.  In summary, the students who benefitted the most from the online component were the students who were high scorers at the exam—this finding aligns with Heble's findings where she found similar results in her engagements with students in Oman

Although this experiment used a ladder-process to connect the Day School and the online component of the course, students did not view the process that way; rather they viewed the online course component as a summary of the Day School. Although the students viewed it as such, as teachers of literature, the researchers feel that such views expressed by students are an indication that they have engaged with Eliot's poem deeply and done extensive reading. At the same time,

whether a poem as complex as *The Waste Land*, or for that matter any literary text, could—or should—be customized for evolutionary kind of learning is a theoretical issue that needs further research in this context. Literature in the online mode seemingly favors the self-motivated students who have cultivated the ability to sustain their interests in literary texts regardless of their complexity. Thus, a student who is struggling with literary texts could perhaps benefit more from a face-to-face classroom. This finding contradicts Heble's findings in Oman whereby students who struggled with their studies did not necessarily benefit from traditional modes of teaching.

As for using the online mode for teaching writing, the students felt that the medium offered many an advantage like the exposition of an edited text for a wider audience for a lengthy period of time. This kind of effect is difficult to achieve in a Day School where individual feedback would remain with individual students and someone with more errors in his/her text—which is a good learning opportunity for the rest of the class—might not prefer to show the script to the rest of the class. At the same time, this writing exercise unwittingly crossed its own boundaries and became a literature class for students—for they learned much more about the poem through the writing class. This opens up new possibilities for the practitioner of teaching literature, whereby an online writing class could also be exploited to engage a student with a literary text.

In conclusion, this exploratory study demonstrated that both the traditional teacher-in-class sessions and online learning offer vast potential for a literature teacher. If 'fear' is an element that prevents literature teacher practitioners from using online forums for teaching, and if the loss of a 'human presence' is the 'fear' that haunts a learner of literary texts as he or she engages with a text over an online forum, this study demonstrated that those 'fears' were concerns that would not disappear easily. Over time and space, literary texts thrive on their complexity and concealed meanings, and perhaps, as Hebel (2010) suggests, it is up to the teacher practitioner of literature to exploit both online and traditional teaching methods to unlock such meanings without one overwriting the other. As students say, if an online writing session is also an opportunity to learn a poem better, then perhaps some of literature teachers' own apprehensions about the teacher 'absence' in

an online forum could, to paraphrase Eliot, turn to dust.

## Acknowledgements

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# The Effect of Video Feedback on Adult ESL Learners' Paragraph Writing Skills

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## Abstract

Writing and the provision of feedback in English as a Second Language classrooms are crucial factors. Feedback provision is one of the productive approaches to improving learners' writing performance in the ESL context. With the continuous evolution of technology, the methods of feedback have also varied and advanced. Even though teacher-written feedback is the most frequently used type of feedback, studies have discovered the use of teacher-written feedback is indecisive since the learners face difficulties in comprehending the teacher's feedback. Therefore, there is a continuing dispute over the efficacy of teacher-written

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feedback. The present study addresses the dearth of research in the provision of video feedback for ESL writings in Sri Lanka and aims to contribute to the areas in which further research is needed. For this, an experimental quantitative research design was used. The empirical data for the study was gathered through the comparison of 20 participants' multiple drafts of writing paragraphs over a five-week period and error analysis sheets were employed to track the errors in their writings. The results reveal that the participants in the experimental group incorporated higher levels of correction from two respective video feedback into their proceeding drafts than the participants in the control group who received two particular written feedback for two written texts during the study. The findings obtained from this study convey that video feedback is a pertinent practice in ESL writing. Hence, the requirement for more research to recognize cause and effect relationships of video feedback for writing is highlighted in the present study.

## Introduction

Writing is a process that involves thinking, planning, and evaluating using language to express exact meaning. Feedback is a counterpart that always accompanies writing and which might help in future improvements of learners' writing skills (Wang, 2006 as cited in Klimova, 2015). Feedback provision is often seen as one of the teacher's most important tasks in the ESL classroom. According to research, students prefer to follow their teachers' comments and pay attention to teachers' feedback (Montgomery & Baker, 2007). Teachers tend to provide written feedback, written feedback with oral explanations, and conferencing. However, in ESL writing classrooms, teachers use peer feedback as a method of providing feedback to promote students' independent learning (Bao, 2015) as well.

Although Bao (2015) states that in the process of providing feedback through written formats with oral explanations learners receive detailed written feedback, and they have opportunities to ask questions face-to-face if they do not know how to correct the mistakes. Yet, at present, ESL teachers neither have the capacity nor the time to provide individual feedback mainly due to the fact that the time frame allocated for a particular subject is limited.

Similarly, with the continuous evolution of technology, the methods of feedback have also differed and advanced. Consequently, computer technology can also offer ways to improve the effectiveness of the provision of feedback for writing activities. In this respect, ESL teachers used to provide feedback via audio and video content. Syncox (2003) mentioned that audio feedback endorses students' clear understanding of the teacher's feedback and improves students' awareness of instructor feedback. On the other hand, video feedback is perceived as being more personal, caring, conversational (Anson, 2015; Turner & West, 2013), and more engaging than other types of feedback (Hope, 2011; Seror, 2012). Considering the gap in research exploring the pedagogical and practical appropriateness of video feedback in ESL learners' paragraph writing in Sri Lanka, the present study has aimed to examine the impact of video feedback as a teacher feedback method for the paragraphs written by ESL undergraduates in Sri Lanka. Moreover, it attempted to discover whether the learners who receive video feedback incorporate higher levels of correction into their written work when compared to students who receive written feedback.

## Literature Review

### *Writing in English in a Second Language Classroom*
In the English as a Second Language classroom, there are four language skills to be learned: listening and reading skills as receptive skills and speaking and writing skills as productive skills. Amongst them, writing is a predominant skill for ESL learners to master (Jing, 2010). Hence, writing is a salient communication skill and has a vital role in the second language learning process

(Chastain, 1988 as cited in Simin & Tavangar, 2009). Moreover, writing skill is one of the most difficult skills that second language learners are expected to acquire as it requires the mastery of a variety of linguistic, cognitive, and sociocultural competencies (Barkaoui, 2007).

Scholars have interpreted writing in different ways. "Writing is a thinking process which demands intellectual effort and it involves generating ideas, planning, goal setting, monitoring and evaluating what is going to be written as well as what has been written and using language for expressing exact meanings. According to Komariyah (2015), the fact is that "writing consists of some stages that should be done by the writer in conveying the message of writing" (p.7). Further, writing skill has been seen as the most complex skill among other skills (Kolade, 2012). As such, it is carried out in accordance with certain principles which underlie the use of language in communication. Syameducation (2011) argues that a written product is the final outcome of a teaching and learning process.

### *Feedback in writing*

Feedback has become an obvious necessity in ESL writing. According to Lightbown & Spada (2006), feedback manifests to learners that their target language output is inaccurate (as cited in Su & Tian, 2016). In general, feedback is the most accepted approach to support students during the application of their recently acquired knowledge and a moment when they lack enough understanding to know if they are executing it correctly (Borup et al., 2015). Overall, Kulhavy & Wager (1993) probed three broad meanings for feedback. First, in a motivational sense, some feedback like praise could be considered as a motivator that increases the writing or revision activities. Second, in a reinforcement sense, feedback rewards or amerces prior efforts like spelling errors or a particular approach to a concluding paragraph (Thorndike, 1927). Third, in an informational sense, feedback consists of information used by a learner to change performance in a particular direction (Pressey, 1927). In the context of ESL writing, all three elements are prominent.

Parthasarathy (2014) voiced that students are required to engage in a great deal of writing in the ESL classroom. Yet, unless they are given reliable feedback on their writing, the positioned writing tasks may not help them much in improving their writing skills. Nevertheless, students' ability to incorporate the provided feedback into their drafts is a decisive aspect for better revisions (Ozkul, 2014). Hence, not only the provision of feedback but the manner in which they should be incorporated into the written text should also be taught to the learners.

Effective feedback should be focused, clear, applicable, and encouraging (Lindemann, 2001). When students are provided with this type of feedback, they are able to think critically and self-regulate their own learning (Nicol & Macfarlane-Dick, 2006; Strake & Kumar, 2010). Moreover, Stern & Solomon (2006) identified three possible features of efficient feedback whereby the instructor should provide positive as well as negative points, narrow down the feedback to several selected areas, and mention patterns of strengths and weaknesses. Moreover, the fact that an educator should contemplate facts such as the provision of immediate or delayed feedback, the amount and frequency of feedback, and the type of feedback (Brookhart, 2008). These reflections fluctuate according to the circumstance and depend upon the instructors' as well as the learners' feedback preferences as there is no single method of feedback that has proven convenient in all contexts (Tasdemir & Arslan, 2018). Accordingly, the source of feedback is a crucial component.

Teachers' response to students' writing is a significant technique in developing the writing process (Seow, 2002). As teachers spend a lot of their time responding to learners' work, teacher feedback has been a main area of research in literature (Ozkul, 2014). Prior research on teacher feedback considered it a useful tool to promote students' revision and to foster the writing process (Hattie & Timperley, 2007). Silver & Lee (2007) assets that teacher feedback is crucial to pinpoint students' strengths and weaknesses as well as to motivate them during the writing process. Hence, Harmer (2007) highlights the role of the teacher as a "feedback provider"

(p.261). Park (2006) demonstrates how teacher feedback has different focuses. Teacher feedback can be summative feedback, formative feedback, form focused, content focused, or integrative. With regards to this distinction, Ferris (2003) explains that feedback should be on content focused on preliminary drafts followed by form focused feedback on the final draft. Hadzic (2016) mentions that it is crucial for teachers to be aware of feedback channels in order to make improvements in their own teaching. Hence, it is evident that the provision of feedback should be well-thought and methodical for it to be efficient and useful for the learners.

As Agbayahoun (2016) stated teachers provide feedback in two different methods; namely, written and oral feedback. Teacher-written feedback can be "questions, error corrections, praises, suggestions, or criticisms" (p.1896). Previous studies on teacher written feedback investigated the nature of teacher-written feedback, positive facts as well as its pitfalls.

Prior studies claim that teacher-written feedback is a beneficial artifact for students' writing. Montgomery & Baker's (2007) study investigate the quality and the quantity of teacher feedback integrated into learners' work and the procedure of teacher feedback. The findings of the study reveal that learners appreciate teacher-written feedback, although teachers do not always provide the same amount of feedback to learners and they prioritize local feedback over global feedback. Furthermore, prior studies declare that written feedback provides a potential value in motivating students to revise their draft (Leki, 1991; Saito, 1994; Zhang, 1995) and in improving their writing (Fathman & Whalley, 1990; Ferris, 1995; Ferris et al., 1997). Hyland & Hyland (2006) determined teacher-written feedback as purely informational with its position as a teacher to advertise responses and advice in assisting students' enhancement. Teacher-written feedback promotes students' revision of their texts in the context of the L2 when the feedback given is more specific, idea - based and meaning level in multiple drafts (Paulus, 1999). This is because written feedback from the teacher highlights the most important aspects

of students' writing that need to be enhanced. Through this, students would be able to make adjustments to improve their grades (Vardi, 2009). Silver & Lee (2007) confirm in their study that teacher-written feedback is crucial for ESL students' revision process as it helps to pinpoint their strengths and weaknesses. Other than helping students to revise their texts, teacher-written feedback allows students to be better motivated in writing.

Even though written feedback is the most commonly used teacher feedback form, it is disadvantageous for certain reasons (Ozkul, 2014). This is further corroborated in the sense that Truscott (2007) admits that there is a minute possibility that teacher-written feedback actually has many advantages. According to Hyland & Hyland (2006), teacher written feedback is frequently misinterpreted by learners, ambiguous, inconsistent and authoritarian. Further, such feedback mostly considers errors and often functions to fit student texts by being too direct. Zamel (1985) emphasizes a similar perception in that learners often find teacher comments unclear, confusing and inconsistent or vague. In addition, Hyland (2003) questioned whether students "understand the corrections made by their teachers" (p, 179). Hence, it is evident that teachers' written feedback consists of advantages as well as disadvantages.

In addition, teacher oral feedback was suggested as another method to provide feedback for learners' written work. Mahdi & Saadany (2013) defined oral feedback as "one of many communication forms where students receive feedback from their teacher who either corrects them implicitly or explicitly or asks them to clarify what they say" (p. 7). Hawe, Dixon & Watson (2008) explore four types of oral feedback during writing classes which specify attainment and improvement, construct achievement, and the way forward. Previous research studies have identified positive as well as negative explanations about the role of oral teacher feedback in ESL writing classrooms.

Besides the benefits, there are drawbacks to using this technique. Oral feedback is time-consuming, especially when the learners are

unfamiliar with the process (Rahmawati, 2017). Gulley (2009) states that oral feedback does not seem to have any appreciable effect on the development of students' revision of content, structure, grammar or style in their writing. Further, Hawe et al. (2008) claims a similar perception to the aforementioned interpretation stating that oral feedback does not address substantive, profound characteristics of the writing. According to Abdulkhaleq (2013), oral feedback may even be harmful to weak or struggling students. Therefore, the necessity to move towards an effective and less advantageous method of feedback provision is highlighted.

### *Computer technology in providing feedback for learners' writings*

Computer technology has found its place in ESL classrooms in different forms (Ozkul, 2014). According to Dudeney & Hockly (2007), there is nothing more natural than adopting computer technology into ESL classrooms since "our learners are digital natives" (p.9). Accordingly, most of the ESL classrooms in Sri Lanka are computer integrated at present. Thus, in a context where students mostly prefer computer integrated technology, ESL teachers intend to relate learner feedback via computer integrated technology (Ozkul, 2014). Therefore, it is evident that there are avenues for the provision of feedback with the support of computer technology.

### *Video feedback in writing*

The provision of video feedback for learners' written work is associated with many advantages. Borup, West, Thomas & Graham (2014) conducted a study on the provision of video feedback for learners' writing. This study indicates that instructors' perceptions of the use of video feedback were positive.

Video feedback helps instructors to know their students on a personal level (Griffiths & Graham, 2009 as cited in Borup et al., 2014). Yet, the students' perceptions of the video feedback were not considered in this study. Moreover, Henderson & Phillips (2015) conducted research to propose an alternative in the form of

individualized video recordings of the lecturer discussing each assignment. The findings of this study substantiate the positive perceptions of video-based assessment. In particular, video feedback is rendered as being "individualized, personal, supportive, clear, prompting reflection and constructive" (p.58). An analysis of student interviews on the use of video feedback found that students' abilities to hear and see their instructor made students feel more real (Borup, West & Thomas, 2015). Further, ESL teachers can offer conversational, natural feedback and use humour, thereby simulating a conversation, and fostering a personal connection through video feedback (Anson, Dannels, Laboy & Carneiro, 2016; Borup et al., 2014). Moore & Filling (2012) state that the use of screencasts serves instructors in creating feedback that is more detailed, targeted, and tailored for each individual student. Additionally, the use of video feedback permits the instructor to provide an in-depth explanation of why something is working or is not within the writing. Therefore, video feedback is a productive mode to eliminate these pitfalls (Dagen et al., 2008). Prior studies have found that ESL instructors enjoy providing video feedback and that it may prompt a renewed enthusiasm for providing feedback (Henderson & Phillips 2015; Lamey, 2015; Parton et. al, 2010). Henderson & Phillips's (2015) study declares that video feedback "no longer felt like an exercise in defending a grade but rather providing valuable advice" (p.63).

Students also consider video feedback to be more extensive and informative than written and oral feedback (Anson et al., 2016; Borup et al., 2015). Furthermore, Vincelette & Bostic (2013) explored whether learners could make more effective revisions from video feedback than from written comments because hearing why something was a mistake from their instructor made it easier for learners to understand how to revise their writing. Students typically favour video feedback and consider it to be beneficial to their learning and report a preference for video feedback over written feedback (Chiang, 2009; Crook et al., 2012; Grigoryan, 2017; Henderson & Phillips, 2015; Jones, Georghiades & Gunson, 2012). Hence, the literature mentions that provision of video feedback is advantageous for both learners and teachers.

On the other hand, previous studies identify that there are certain drawbacks to using video feedback as a teacher feedback method in ESL learners' written work. Some learners might have been in different developmental stages and sometimes it is difficult to understand and interpret the teacher feedback correctly (Ozkul, 2014). Henderson & Phillips (2015) identified potential weaknesses of using video feedback including the "initial anxiety" about seeing the assessor's face while receiving feedback as well as difficulty in matching feedback to assignment (p.58). Armagan et al. (2016) highlight, one potential pitfall in using video feedback which is the high expectations of students. Despite these drawbacks, the literature suggests that video feedback has already found its place in ESL classrooms, serving different purposes.

When considering the Sri Lankan context, Mudiyanse (2013) conducted a study on students' perceptions of teacher feedback and the educational environment in a medical faculty in Sri Lanka. He employed the Dundee Ready Education Environment Measure (DREEM) framework to analyse the feedback and the students' perceptions. Furthermore, two studies related to peer feedback were conducted by Pushpakumara (2012) and Kaduwela (2017). However, Pushpakumara's study examined how peer assessments (feedback) are more effective than teachers' feedback while Kaduwela (2017) conducted a study on how peer feedback impacts developing Academic Writing at a private higher education institution. Moreover, Marambe et al. (2020) conducted a study on feedback provided by clinical teachers during undergraduate medical training in Sri Lanka. In addition, Mendis, Wickramasinghe & Hettiarachchi (2021) conducted a study on a mobile-based feedback system for the Sri Lankan higher education system. Yet, this study does not focus on the ESL context and learners' learning. Hence, the prior research on this aspect highlights the dearth of research in this respect in Sri Lanka and this study aims to contribute to these areas in which further research is necessary.

# Methodology

## *Research questions*

Though written feedback is the most commonly used mode of teacher feedback, recent studies have found that the teacher-written feedback method is disadvantageous for several certain causes. Therefore, as a preferable alternative to the identified drawbacks and limitations, video-based feedback offers several new ways of addressing the aforementioned drawbacks and limitations. Hence, this study aims to explore whether video feedback has an impact on learners' paragraph writing in ESL writing classes. To investigate whether video feedback has an ascendency on ESL learners' paragraph writing, the present study probed answers to the following research questions.

1. What is the impact of video feedback as a teacher feedback method in ESL undergraduates' paragraph writing in a state university?

1.1. Do students who receive video feedback report higher levels of correction in their written work as compared to students who receive written feedback?

The Statistical Package for the Social Sciences (SPSS) was used to check whether the null hypothesis (H0) would be rejected or not. The hypotheses are as follows:

H0 : Students who receive video feedback do not report higher levels of correction into their written work as compared to students who receive written feedback.

H1 : Students who receive video feedback report higher levels of correction in their written work as compared to students who receive written feedback.

## *Research design*

In order to address the aforementioned research questions, the present study adopted a true experimental research design. In accordance with the basic concepts of a true experimental design, the present study was conducted in an authentic setting. The subjects for the study were randomly selected based on their regular turn up for the lectures from the Department of Industrial

Management and the sample was separated into the treatment group and the control group based on a random assignment. Thereby, each participant was given a number and then, a random number generator was used to place each participant in one of the two groups. The study manipulated feedback as the dependent variable and teacher written feedback and video feedback were the independent variables. Furthermore, the current study occupied the quantitative research approach to expand and strengthen the conclusions of the study.

### Setting and sample of the study
A sample of 20 undergraduates from the Faculty of Science, Department of Industrial Management of a state university in Sri Lanka was employed for the present study. Cohen et al. (2007) stated that it is important to specify that the "experimental methodologies demand at least 15 participants" (p.102) and the experimental methodologies requisites at least 15 participants (Cohen et al., 2007). Due to the prevalent epidemic in the country, students' attendance was not systematic and caused a constraint when selecting the sample. The undergraduates belonging to the intermediate proficiency level were selected for the study because the study focused on learners belonging to CEFR benchmarks B1 and B2 ("Common European Framework of Reference for Languages (CEFR): Learning, teaching, assessment", 2001). Since most courses offered at state universities are taught in the English language, undergraduates are supposed to attend English language courses conducted by the Department of English Language Teaching (DELT) of the university and the medium of instruction at the university for this particular selected sample is English. The study was conducted during different times when the learners were free and was not conducted during the teaching hours allocated for the DELT.

### Research instruments
Research instruments are able to produce a form of data appropriate to address the research questions and to test the research hypotheses (Yaya, 2014). Accordingly, there were two sets of instruments used in the study; namely, the instruments that

were used to collect data and the instruments that were used to analyse the collected data.

### *Data collection instrument*
The empirical data for the study was gathered from the participants' multiple drafts of paragraphs written over a five-week period. Students were asked to develop a descriptive paragraph and a narrative paragraph in two respective weeks. The first writing was a descriptive paragraph. As Oshima & Hogue (2006) suggested, students were supposed to select one topic from the given topics including "A place from my childhood", "The view from my window", "My ideal room or apartment" and "A scene from a dream" with a 100-to-150-word limit during 20 minutes (p.73). The second writing was a narrative paragraph and students were called upon to write a paragraph on one of the given topics including "An unpleasant personal experience', "The best achievement you have ever accomplished", "A person you are afraid to lose the most" and "If you had a time machine" with a 100 to 150-word limit during 20 minutes ("Good narrative essay writing topics",n.d.). The foremost basis to provide these topics was as a result of the participants falling under CEFR benchmarks B1 and B2 levels. According to the CEFR framework, learners who belong to B1 and B2 levels should be able to write clear, detailed texts on a variety of subjects related to his/her field of interest. Furthermore, they should be able to synthesize, and evaluate information and arguments from a number of sources and can write straightforward connected texts on a range of familiar subjects within his/her field of interest. The learners are also expected to link a series of shorter discrete elements into a linear sequence. The researchers considered the aforementioned CEFR expectations when designing and marking the paragraphs of the learners.

The provision of video feedback is always associated with the integration of technology. Therefore, the technology employed in the study involved a screen capture software named 'Screencast-O-Matic' and a Learning Management System (LMS) named 'Edmodo'.

The researcher focused on both the content and the form of the writing. Accordingly, feedback for the writings was provided under three criteria as content and organization, grammar and vocabulary, and mechanics. The first criterion, content and organization, focused on the development of the topic sentence, clearly established supporting sentences and the development of the closing sentences in the paragraphs. The second criterion, grammar and vocabulary focused on the demonstration of the mastery of CEFR benchmark A1, A2 and B1 grammar topics and the usage of a variety of lexis. Eventually, participants' mastery of CEFR benchmark A1, A2 and B1 spelling control, correct use of punctuation marks, and capitalization were marked under the mechanics. Feedback for the control group was delivered in the form of endnotes and side notes in participants' writings itself. On the other hand, feedback for the experimental group was delivered in the form of videos with the help of Screencast-O-Matic screen capture recorder and the LMS. The writings of the participants from the experimental group were checked and the writings were captured in a snapshot so the drafts were ready to process digitally. Then, the Screencast-O-Matic screen capture recorder was used and the researcher created a personalized video with the researcher's detailed feedback about the writings.

### Data analysis instrument
The pivotal data analysis instrument was IBM SPSS Statistics. The fact that it comes with an open-source version fairly serves the process of statistics and formulation of data manipulation techniques based on the employment of this method ("Differences between SPSS and Excel", 2019).

### Data collection procedure
The participants were instructed about the research procedure. Along with that, a guideline sheet for each participant with further details about the study and instructions to follow when engaged in the study was provided. Subsequently, each participant was asked for his/her consent to use, present and publish the findings.

The sample of 20 participants was separated into the treatment group and the control group based on random assignment. Afterward, the e-mail addresses of the participants in the experimental group were collected so that the researcher could add the participants to the LMS. Subsequently, participants were called upon to develop a descriptive paragraph on one of the given topics.

Written feedback was provided to the control group and video feedback was shared with the experimental group. The writings of the participants were marked according to the rubrics developed by adapting the Common European Framework of Reference for Languages (CEFR): Learning, teaching, assessment and Descriptive Paragraph Scoring Rubric. Accordingly, feedback for the writings was provided under three criteria as content and organization, grammar and vocabulary and mechanics (See Appendix A).

Feedback for the control group was delivered in the form of endnotes and side notes in participants' writings themselves. On the other hand, feedback for the experimental group was delivered in the form of videos with the help of the Screencast-O-Matic screen capture recorder and the LMS. The writings of the participants from the experimental group were checked and the writings were captured in a snapshot so the drafts were ready to process digitally. Then, the Screencast-O-Matic screen capture recorder was used and the researcher created a personalized video with detailed feedback about the writings. Subsequently, invitations to join the LMS were sent to the participants so the researcher could upload the individualized video feedback to the LMS.

In the second week, all the participants in both the control and experimental groups were provided feedback for their first writing, and copies of their writings were taken for data analysis. Simultaneously, video feedback was uploaded to Edmodo. Hence, the participants of the experimental group could receive their
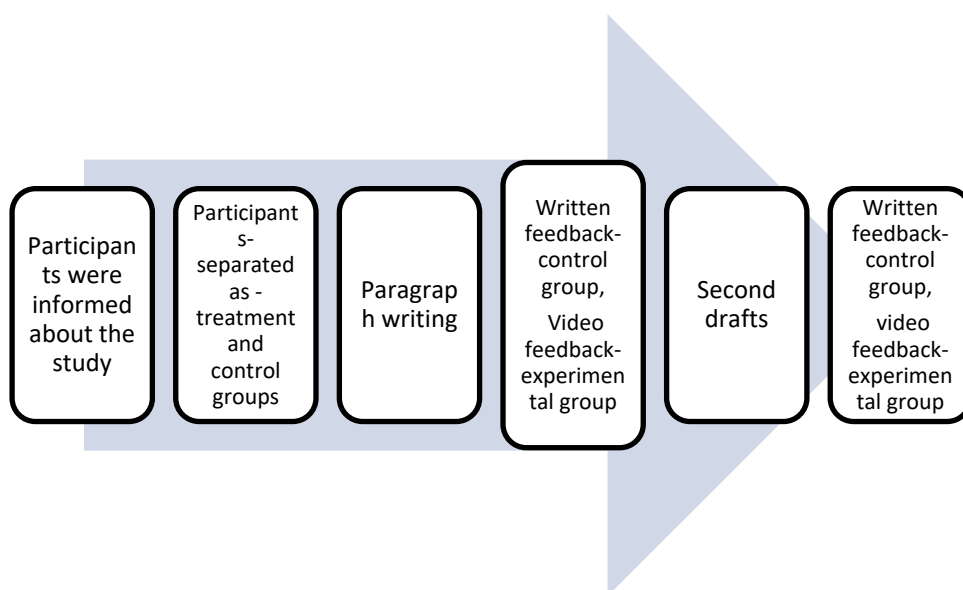
respective feedback. Then, they were requested to submit their second drafts in the third week.

The researcher obtained the second drafts by the following week. An error analysis sheet was used for each participant to track how participants interpreted and used different feedback forms. The error analysis sheet included six categories including content, organization, grammar, vocabulary, spelling, punctuation and capitalization to trace how each participant has used the feedback in their second drafts. Error analysis was used to fathom whether participants have redrafted their writings using the feedback provided.

The second drafts were collected by the third week and participants were called upon to develop a narrative paragraph on one of the given topics. The same procedure was followed in the feedback provision process. So, the control group received written feedback while the experimental group received video feedback on their third writing in the fourth week, and participants were requested to submit their second drafts in the fifth week.

Error analyses were employed for two drafts and they only recorded the number of feedback items provided in the first drafts and how the addressed feedback items were corrected in the second drafts by each participant. The new errors that occurred in the second drafts were reported separately.

The following figure shows the process of data collection for one cycle.

```
┌──────────┐ ┌──────────┐ ┌──────────┐ ┌──────────┐ ┌──────────┐ ┌──────────┐
│Participan│ │Participant│ │          │ │ Written  │ │          │ │ Written  │
│ts were   │ │s-        │ │          │ │feedback- │ │          │ │feedback- │
│informed  │ │separated │ │Paragrap  │ │control   │ │Second    │ │control   │
│about the │ │as -      │ │h writing │ │group,    │ │drafts    │ │group,    │
│study     │ │treatment │ │          │ │Video     │ │          │ │video     │
│          │ │and       │ │          │ │feedback- │ │          │ │feedback- │
│          │ │control   │ │          │ │experimen │ │          │ │experimen │
│          │ │groups    │ │          │ │tal group │ │          │ │tal group │
└──────────┘ └──────────┘ └──────────┘ └──────────┘ └──────────┘ └──────────┘
```

**Figure 1.** Data collection procedure

*Ethical consideration*

Initially, the purpose of the study was explained to the participants verbally. The participants were then given the guideline sheet which also explained the purpose of the study. To comply with ethical considerations in conducting the current research, all participants were provided with an informed consent form prior to the study. It was composed in English, Sinhala and Tamil languages. Since the researcher was not aware of the participants' ethnographic details, the consent form was prepared in all three languages. Then, the informed consent form was administered to every participant to affirm that they did not have any objection to information collected in the study for future use, presentation or any publication.

## Data analysis and discussion

In order to respond to the research question, two hypotheses were suggested and their validity was examined with the parametric test, Independent Samples T-test. The foremost basis to select this parametric test for the present study was due to the study comparing the means of two independent variables in order to

determine whether there was statistical evidence that the associated means are significantly different. The test investigated whether the null hypothesis would be rejected or not according to the comparison of how adequately the experimental and the control groups incorporated the feedback they were provided.

As for the initial phase, the total amount of feedback provided and the total amount of feedback incorporated correctly into the proceeding drafts were retrieved. Then, the total number of incorporated feedbacks in the second draft out of the total number of feedbacks provided in the first draft was used to calculate the percentage as to what extent the feedback provided by the researcher took place in its corrected form in learners' second drafts. The following formula was used to calculate the achievements of each participant.

The total amount of incorporated feedback in the second draft
------------------------------------------------------------------------- x 100
The total amount of feedback provided in the first draft

These percentages were used as performance values in the overall analysis. Finally, the data were entered into SPSS to investigate whether there were any significant differences between the two feedback channels. The data analysis employed A to T block letters to define each participant and the same participant will be defined by the same block letter in both writings. The incorporation of feedback in proceeding drafts in two separate writings by the two groups will be addressed individually.

### *Data analysis and discussion of the first writing*
The total amount of feedback provided in the first writing and the total amount of incorporated feedback in the proceeding drafts of each participant were recorded in the error analysis sheets. Table 1 shows the total number of feedbacks provided for each participant in their first writing and their performance in the proceeding draft as a percentage.

**Table 1.**

*Total number of feedbacks provided in the first writing and participants' performance in proceeding drafts*

| Control group (10 participants) | | | Experimental group (10 participants) | | |
|---|---|---|---|---|---|
| Participant | Number of feedbacks provided | Performance in the second draft | Participant | Number of feedback provided | Performance in the second draft |
| A | 11 | 54% | K | 10 | 80% |
| B | 14 | 57% | L | 10 | 70% |
| C | 07 | 71% | M | 13 | 92% |
| D | 09 | 67% | N | 14 | 71% |
| E | 14 | 50% | O | 09 | 100% |
| F | 08 | 63% | P | 12 | 83% |
| G | 12 | 75% | Q | 10 | 60% |
| H | 11 | 54% | R | 11 | 82% |
| I | 09 | 67% | S | 13 | 69% |
| J | 08 | 63% | T | 23 | 87% |

As shown in Table 1, the calculated percentages were then entered into SPSS to investigate whether there were any significant differences between written feedback and video feedback. The statistical results of the first writing obtained from the Independent Samples T-Test are as follows:

**Table 2.**

*Independent Samples T- Test*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Incorporation of feedback as a percentage | Equal variances assumed | 1.369 | .257 | -3.785 | 18 | .001 | -17.400 | 4.598 | -27.059 | -7.741 |
| | Equal variances not assumed | | | -3.785 | 15.819 | .002 | -17.400 | 4.598 | -27.156 | -7.644 |

*Note. p = 0.05*

As shown in Table 2, in the output of the pooled t-test, Levene's Test for Equality Variances perceives whether the variance of the two samples is equal or not. If Levene's test indicates that the variances are equal across the two groups (equal variance is represented with a p-value (denoted as "Sig") greater than 0.05 (p>0.05)), then one has to rely on the first row of output, Equal variances assumed and focus on the results for the actual Independent Samples t-test under t-test for Equality of Means. If Levene's test indicates that the variances are not equal across the two groups (unequal variance is represented with a p-value (denoted as "Sig") smaller than 0.05 (p<0.05)), then one needs to rely on the second row of output, Equal variances not assumed and consider the results of the Independent Samples t-test under the t-test for Equality of Means.

According to the output of the present study, Levene's test evinces that the p-value is 0.257, so that the variance of the two samples is equal as the p-value is greater than 0.05 (0.257>0.05). Therefore, the study relies on equal variances assumed so that it demands to focus on the p-value of the t-test for Equality of Means. The p-value is then denoted as "Sig. (2-tailed)". Most studies are performed on a 95% confidence interval; thus, a p-value less than 0.05 (p<0.05) is to be taken as significant meaning that there is a significant difference in the means of the two sample populations tested. According to the output of the present study, the p-value is 0.001 (0.001 <0.05), which reveals that the p-value is smaller than 0.05. Hence, there is a significant difference between written feedback and video feedback.

Accordingly, these findings imply that participants in the experimental group incorporated higher levels of feedback into their second drafts than the participants in the control group, which means that the null hypothesis (H0); students who receive video feedback do not report higher levels of correction into their written work as compared to students who receive written feedback and video feedback, is rejected and the finding is statistically significant.

### *Data analysis and discussion of the second writing*

The total amount of feedback provided in the second writing and the total amount of incorporated feedback in the proceeding drafts of each participant were recorded in the error analysis sheets. Table 3 shows the total number of feedback provided for each participant in their second writing and their performance in the proceeding drafts as a percentage.

**Table 3.**

*Total number of feedbacks provided in the first writing and participants'*
*performance in proceeding drafts*

| | Control group (10 participants) | | | Experimental group (10 participants) | |
|---|---|---|---|---|---|
| Particip ant | Number of feedbacks provided | Performan ce in the second draft | Participa nt | Number of feedback provided | Performance in the second draft |
| A | 04 | 50% | K | 06 | 100% |
| B | 10 | 53% | L | 12 | 67% |
| C | 03 | 100% | M | 13 | 69% |
| D | 06 | 33% | N | 07 | 71% |
| E | 09 | 44% | O | 08 | 75% |
| F | 17 | 59% | P | 09 | 78% |
| G | 09 | 56% | Q | 08 | 63% |
| H | 11 | 64% | R | 09 | 67% |
| I | 04 | 75% | S | 10 | 80% |
| J | 10 | 50% | T | 13 | 77% |

As shown in Table 3, the calculated percentages were then entered into SPSS to explore whether there were any significant differences between written feedback and video feedback. The statistical results of the second writing obtained from the Independent Samples T-Test are as follows:

**Table 4.**

*Independent Samples T- Test*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Incorporation of feedback as a percentage | Equal variances assumed | 1.506 | .236 | -2.429 | 18 | .026 | -16.300 | 6.710 | -30.398 | -2.202 |
| | Equal variances not assumed | | | -2.429 | 14.246 | .029 | -16.300 | 6.710 | -30.669 | -1.931 |

 *Note.  p = 0.05*

Proceeding with the same approach applied for the first writing, according to the output of the second writing, Levene's test indicates that the p value is 0.236, so that the variance of two samples is equal as the p value is greater than 0.05 (0.236>0.05). Therefore, reliance on Equal variances assumed and focus is given to the p value of the t-test for Equality of Means.
In accordance with the output of the second writing, the p value is 0.026. Accordingly, the p value is smaller than 0.05 (0.026 <0.05). Hence, there is a significant difference between written feedback and video feedback.

Accordingly, these findings denote that participants in the experimental group incorporated higher levels of feedback into

their second drafts than the participants in the control group, which means that the null hypothesis (H0), students who receive video feedback do not report higher levels of correction into their written work as compared to students who receive written feedback and video feedback, does not convey an effect on students' written work and is, thus, rejected and the finding is regarded as being statistically significant.

In accordance with the statistical findings obtained from the two writings, both writings signify that the p value obtained from the Independent Sample T-test is lower than 0.05 ($p < 0.05$). It expresses that the participants in the experimental group incorporated higher levels of correction into their proceeding drafts than the participants in the control group who received written feedback in two writings throughout the study so there is a statistically significant difference between these two folds.

Therefore, the statistical results investigated that the null hypothesis (H0), students who receive video feedback, does not report higher levels of correction in their written work as compared to students who receive written feedback. Thus, it is rejected according to the comparison of how adequately the experimental and the control groups incorporated the feedback they were provided.

To conclude, the null hypothesis (H0), that students who receive video feedback do not report higher levels of correction in their written work than students who receive written feedback is rejected. Therefore, the alternative hypothesis (H1), students who receive video feedback report higher levels of correction in their written work as compared to students who receive written feedback validates the claim that video feedback has a positive effect on ESL learners' paragraph writing skills.

The outcomes presented indicate that video feedback can be used as a potent feedback channel to eliminate the drawbacks of teacher written feedback. Thereby, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is validated in the sense that video

feedback can be used as an alternative to teacher written feedback. To conclude, the results of the present study convey that video feedback, as a teacher feedback method, has a statistically positive impact on ESL learners' paragraph writing achievement.

## Conclusions

According to the outputs of the first and second writings, Levene's test revealed that the p values were 0.257 and 0.236 respectively so that the variance of the two samples was equal as the p values were greater than 0.05 (0.257>0.05, 0.236>0.05). Therefore, depending on Equal variances assumed the present study focuses on the p-value of the t-test for Equality of Means. In statistical analysis, most studies are performed on a 95% confidence interval; thus, a p-value less than 0.05 (p<0.05) is to be taken as significant meaning, that there is a significant difference in the means of the two sample populations tested. It is apparent that the p values of Equal variances assumed in the first and second writings were 0.001 and 0.026 respectively (0.001<0.05, 0.026 < 0.05) and the p-values were smaller than 0.05. Accordingly, the results of the first and second writings conveyed that there is a statistically significant difference between written feedback and video feedback in terms of incorporating feedback into their respective writings.

In addition, the present work corroborated that the experimental group incorporated the feedback items provided to their writings with a mean value of 79.40 in their first writing. In contrast to that, the control group incorporated the provided feedback items with a mean value of 62.00 in their first writing. Further, in relation to the second writing, it can be declared that the experimental group has incorporated the feedback provided to their writings with a mean value of 74.70. On the contrary, the control group incorporated written feedback with a mean value of 58.40. Hence, the results grasped from the independent sample t-test and mean values can convincingly support the rejection of the null hypothesis (H0): Students who receive video feedback do not report higher levels of correction in their written work as compared to students who receive written feedback is rejected.

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**Appendices**

Academic writing correction symbol

| Symbol | Meaning |
|--------|---------|
| Ab | - Abbreviation inappropriate/incorrect |
| adj | - Adjective missing/incorrect |
| Adv | - Adverb missing/ incorrect |
| Art | - Article error |
| Awk. | - Awkward |
| Cap | - Capitalization error |
| coh | - Sentences are not well connected |
| Coll | - Slang/Colloquialism |
| comb | - Sentences should be combined |
| cl | - Clarity |
| Dic | - Inappropriate word choice |
| dev | - Development needed |
| frag | - The sentence is not complete. Group of words is a fragment |
| focus | - Paragraph lacks a clear focus |
| nsw | - No Such Word |
| NS | - Not a sentence |
| om | - Omit |
| org | - Organizing problems |
| pos | - Possessive lack/incorrect |
| Prep | - Preposition error |
| P | - Punctuation incorrect |
| q | - Quotation or quotation marks mishandled |
| red | - Redundancy |
| Rep. | - Repetitive |
| S/V | - Subject/Verb error |
| S/P | - Singular/Plural error |
| Sp | - Spelling error |
| sub | - Subordination needed |
| tr | - Lack of transitions |
| VF | - Verb Form error |
| VT | - Verb Tense error |
| var | - Variety lacking |
| WF | - Word Form error |

| | |
|---|---|
| WM | - Word Missing |
| WO | - Word Order error |
| WW | - Wrong word |
| Wordy | - Sentences are short |
| weak | - Sentence is vague or general |
| ?? | - Difficult to understand |
| ¶ | - Problems with paragraphing |
| ! | - Silly mistake |
| # | - Space needed |
| + | - Excellent beginning, ending, use of detail and word choice |
| // | - Similar ideas are not expressed in identical grammatical constructions |

Retrieved from
http://www2.vobs.at/ludescher/testing/correction%20symbols.html, https://www.rong-chang.com/correctionsymbols.pdf and https://www.kau.edu.sa/Files/0007198/Files/60170_writing%20correction%20symbols.pdf

Appendix A

| Component | Marks | | | |
|---|---|---|---|---|
| *Content and organization* | *15 marks* | | | |
| 1. **Topic sentence** (TS) (The roadmap for the paragraph. Introduces main idea and tells reader what to expect from rest of paragraph in terms of content) | The TS opens the paragraph clearly establishing the target of the description. It grabs attention and invites to continue reading. | The TS is dull and uninviting (e.g., "In this paragraph, I am going to describe my grandmother") and/or does not provide the reason why the description is relevant/necessary. | There is no TS establishing the target of the description. Instead, the writer jumps directly into description. | |
| | 4.5 marks | 2.5 marks | 0 mark | |
| 2. **Supporting sentences** (SS) (The body of the paragraph: SSs develop TS with facts, details, and/or examples. All SSs must relate to TS (i.e., no irrelevant facts, details, or examples should be included). Relationshi | There are two to four fully developed SSs (with relevant facts, details, and/or examples). The relationship of each SS to the TS and to other SSs (prior or next) is clearly established via the correspon ding | The SSs are unequally developed. Some are neatly packed with relevant facts, details, and/or examples while others resemble neutral statements instead of descriptive sentences. | There are more than four SSs but they are not sufficiently or clearly developed with relevant facts, details, and/o | The body of the paragraph is constituted by one, excessively long SS or, on the contrary, of a series of short and/or disconnected SSs (e.g., no connecting words or incorrect connecting words are used). The SS(s) do not |

| p of each SS to TS must be clearly indicated with connecting words. Same applies to relationship of one SS to next or previous one.) | connecting words. | The candidate has aimed at establishing a relationship between the SSs and the TS and among the SSs themselves, successfully in some cases and unsuccessfully in others (i.e., correct or incorrect use of connecting words). | r examples. There is no attempt (i.e., no use of connecting words) to establish the relationship between the SSs and the TS or among the SSs themselves. | provide enough facts, details, or examples to develop the TS or they seem unrelated to it. The relationship of each SS and the TS and among the different SSs is not established or is not clear enough. |
|---|---|---|---|---|
| | 6 marks | 4.5 marks | 3 marks | 0 mark |
| 3. **Closing sentence** (CS). (CS ends paragraph reminding reader of person, thing, or place described in SSs. Must clearly show that the | The CS adequately reformulates the TS and/or elements of the SSs and leaves the reader with a lasting image of the person, thing, or place | The CS a) fails to show or does not clearly show its relationship to the TS and/or to the SSs, and b) does not seem to provide a sense of closure to | There is no CS. The paragraph ends while still providing information about the target of the description and without | |

| writer has completed the message presented in TS restating it with different words and/or leaving the reader with | described. It neatly closes the paragraph. | the paragraph (e.g., details / facts / examples that are new or unrelated to the TS/SSs may have been introduced). | adding a final sentence to wrap it all up and close the paragraph. | |
|---|---|---|---|---|
| a lasting image of the person, thing, or place described. Does not include new ideas.) | 4.5 marks | 2.5 marks | 0 mark | |
| ***Grammar and vocabulary*** | **20 marks** | | | |
| 4. **Grammar** (Candidates must demonstrate mastery of A1, A2, and B1 grammar topics. Two (or more) instances of the same error will be penalized only once). | No "penalizable" errors. | One to three "penalizable" errors. | One to three "penalizable" errors. | Six or more "penalizable" errors. |
| | 10 marks | 7.5 marks | 5 marks | 2.5 marks |
| 5. **Vocabulary** (Candidates must use a variety of lexical items). | A wide variety of precise, vivid, sense-reaching words/phrases is used. These | A variety of vivid, sense-reaching words/phrases is used. These words/phrases draw | Sense-reaching words/phrases have not been sufficiently | No sense-reaching words or phrases are used, or they are used incorrectly. |

| | | | | |
|---|---|---|---|---|
| | words/phras es draw pictures in the reader's mind and linger there. Their placement in the sentence seems accurate, natural and not forced. At least one simile or metaphor has been used. | pictures in the reader's mind and may even linger there. Occasionally, however, some of those words/phras es are used inaccurately or seem overdone. | develope d (i.e., there are not enough of them to capture the reader's interest, or their use is incorrect) . Word choice is vague, mundane , and/or repetitive (i.e., words/p hrases communi cate clearly, but the paragrap h lacks variety, punch, and/or flair). | Word choice is bland, repetitive, limited, and fails to accurately describe the target person, object, or place. It also fails to communica te meaning at the denotative/ representati ve level. |
| | 10 marks | 7.5 marks | 5 marks | 2.5 marks |
| ***Mechanics*** | ***5 marks*** | | | |
| **6. Spelling** (Suppos edly already acquired words (A1, A2, | No "penalizable" errors. | One or two "penalizable" errors. | Three "penaliza ble" errors. | Four or more "penalizable " errors. |

| B1) must be correctly spelled (i.e., A1, A2 and B1 lexical items are considered "penalizable"). | | | | |
|---|---|---|---|---|

Note 01 - Candidates must demonstrate mastery of CEFR bench mark A1, A2, and B1 grammar topics

| B1 | generally good control though with noticeable mother tongue influence. Errors occur, but it is clear what he/she is trying to express. |
|---|---|
|  | Uses reasonably accurately a repertoire of frequently used "routines" and patterns associated with more predictable situations. |
| A2 | Uses some simple structures correctly, but still systematically makes basic mistakes for example tends to mix up tenses and forget to mark agreement; nevertheless, it is usually clear what he/she is trying to say. |
| A1 | Shows only limited control of a few simple grammatical structures and sentence patterns in a learnt repertoire. |

Note 02 - Candidates must demonstrate mastery of CEFR bench mark A1, A2, and B1 spelling control.

| B1 | Can produce continuous writing, which is generally intelligible throughout. Spelling, punctuation and layout are accurate enough to be followed most of the time. |
|---|---|
| A2 | Can copy short sentences on everyday subjects - e.g. directions how to get somewhere Can write with reasonable phonetic accuracy (but not necessarily fully standard spelling) short words that are in his/her oral vocabulary. |
| A1 | Can copy familiar words and short phrases e.g. simple signs or instructions, names of everyday objects, names of shops and set phrases used regularly. Can spell his/her address, nationality and other personal details. |

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