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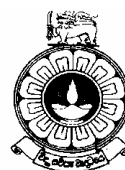
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Editorial

This is the Volume 17, Number 1 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 Architecture and Pedagogy in the English Literature classroom, Agriculture, Chemistry, Cultural Studies, ICT Education and Research Culture in universities.

The study entitled *Architecture for Engaged Pedagogy: How Classroom Design Affects the Teaching and Learning of English Literature* is a unique analysis which observes the link between classroom design and the teaching and learning of English Literature in the secondary school context. The author's own experience as a teacher of English and English Literature has assisted him to understand the correlation between the two aspects analysed in this paper. Moreover, author's familiarity with the observed participants and environments has facilitated the gaining of authentic data. Overall, the paper analyses a unique area of study and discusses an often-overlooked aspect of the Sri Lankan secondary school system. The paper draws on renowned theories by Freire and Miklitsch on pedagogy and classroom design, respectively. The study also draws on modern and effective classroom designs from around the world and applies elements from these studies to the observed environment. The paper emphasises on the awareness of the study's limitations, especially in terms of the effect it would have on the students' interest in Literature in the case of wide-spread use of space and dialogic learning by other subjects. The study also stems from a place of privilege: an environment which has access to space and resources. Therefore, resourcefulness plays a significant role in implementing learner-centric classroom designs recommended by the author. Nevertheless, the study substantially contributes to the national dialogue on pedagogic practices and school architecture in Sri Lanka.

Shade level is a predominant factor that greatly influences the growth, quality and yield of exotic vegetables that are grown in low

and mid country dry zone areas in Sri Lanka. Accordingly, a field trial was conducted to investigate the impact of shading on growth and yield of cabbage var. "Green Coronet" in the Ampara district of Sri Lanka. Levels of shades were defined in two treatments as open field condition (40% shade) and 70% shade levels. Growth Measurements were recorded at six and eight weeks after transplanting and Analysis of Variance was performed to determine the significant difference among treatments ($p < 0.05$). Further, the head weight and yield were recorded at the harvesting stage and the results revealed that cabbage plants grown at 70% shade level showed significantly ($p < 0.05$) better performance in the measured growth parameters especially after 50 days of transplanting (8WAP) and yield parameters, average head weight and final yield. The lowest performance was observed in plants grown at open field conditions with 40% shade level. The findings of the paper titled *Impact of Shading on Growth and Yield of Cabbage in the Low Country Dry Zone, Ampara, Sri Lanka* revealed that plants grown at 70% shade level would obtain high growth and yield with the modified temperature, relative humidity level and optimum light intensity in the protected environment. The findings will be beneficial for the farmers to grow cabbage in low country dry zone at commercial scale to obtain higher yields rather than cultivating in open field conditions.

The paper titled "*Like Mother, like Daughter?*" *Perspectives on Mother to Daughter Succession in Diasporic Culinary Fiction by Women* is based on the role migrant females have played in history as preservers of culture especially through the culinary domain. The focus of the paper is on fictional representations of migrant women, with the understanding that imaginative fiction mimics the material reality of its surroundings at the time of creation. Popular culinary fictions by migrant female writers typically highlight the notion of 'cooking mother from home' as a symbol for continuing traditions and for nostalgic reminiscences of nurturing. This study attempts to look beyond this familiar paradigm and to explore the significance of these mother figures in new and insightful ways which draw attention to their cooking as a powerful cultural motif as well as their ability to influence the way in which

their daughters navigate their diasporic existence. This work analyses mother-daughter bonds which are focused upon in the fictions of two writers, namely Chitra Bannerjee Divakaruni and Amulya Malladi. How the “traits” of these fictional mothers are “carried forward” by their daughters is discussed, highlighting the way in which the mothers’ skills often undergo a process of transformation in their daughters’ hands, thus opening up a discussion on the notion of female being the cultural preserver in literary fiction.

Cancer is one of the leading causes of death around the world and the article titled *Mononuclear (Arene)Ruthenium Complexes as Anticancer Agents: A Review* undertakes a content analysis of the available cancer medicines in the world. The discovery of cisplatin which inhibits antitumoral properties marked the beginning of a new era of metal-based anticancer research. In the search of anticancer agents containing metals other than platinum, the most promising was found to be ruthenium. It was experimentally proven that ruthenium-based anticancer drugs showed high potential as cytotoxic and cytostatic drugs. Ruthenium is a desirable alternative to platinum as it mimics iron plays an active role in the physiological functions of the human body.

Remarkable features of ruthenium(II) centers are: (i) ruthenium and iron are biologically similar (ii) they are in the same group (iii) they have similar characteristics and many ruthenium complexes are not toxic and (iv) they are quite selective for cancer cells, which is due to the ability of ruthenium to imitate iron in binding with biomolecules.

The cytotoxicity of these (arene)ruthenium complexes were determined using various assays such as tube formation assay, adhesion assay, migration and invasion assay, wound healing assay, colony formation assay, RT-PCR, and western blotting.

Various (arene)ruthenium(II) complexes $[(\eta^6\text{-arene})\text{Ru}(\text{L})(\text{X})(\text{Y})]$, $[(\eta^6\text{-arene})\text{Ru}(\text{L}^{\wedge}\text{L})\text{X}]\text{Y}$ and $[(\eta^6\text{-arene})\text{Ru}(\text{L}^{\wedge}\text{X})(\text{Y})]$ are known, where arene = cymene, benzene, toluene, hexamethylbenzene; L = amine,

phosphine; L^2L = diamine, diphosphine, (X^2Y) = oxalate, (L^2X) = acetylacetonate; and (X) , (Y) = halides, triflate *etc.*

(Arene)ruthenium complexes are an emerging class of anticancer drugs, owing to their fewer side effects compared to platinum anticancer agents. The relationship between the structure and cytotoxicity of (arene)Ru(II) complexes of the types $[(arene)Ru(L)(X)(Y)]$, $[(arene)Ru(N^2N)X]Y$, $[(arene)Ru(N^2O)X]Y$, $[(arene)Ru(N^2S)X]Y$, and $[(arene)Ru(O^2O)X]$ is elaborated in this review paper.

The paper titled *Flattening the Hate Speech Curve in Today's Digital Age: An Appraisal of Regulatory Frameworks in Nigeria* discusses hate speech as one of attendant ills associated with the pervasiveness of the digital (especially social) media, despite their great potentials. Lack of ethical concern, manipulation of contents, preference for speed over accuracy and sensationalism has led to the rise in the curve of hate speech on social media with resultant consequences of conflicts and violence among different groups in Nigeria. It conceptualises hate speech and identifies its characteristics to include intentionality, stigmatisation, manipulation of social characteristics, capability of denigrating targets and possibility of reprisal from victims, leading to violence. The paper identifies and analyses the regulatory frameworks to flatten hate speech curve in Nigeria such as the Cybercrime (Prohibition, Prevention, etc.) Act 2015; the Independent National Commission for the Prohibition of Hate Speeches Bill sponsored by Senator Muhammed Musa Sani in 2019, which is awaiting passage in the Senate of the Federal Republic of Nigeria; and the Reviewed (6th edition) National Broadcasting Code of 2020. The paper concludes that the rising hate speech curve needs to be checked in today's era of digital communication. However, the multiplicity of regulation and absence of a clear-cut constitutional provision for hate speech in Nigeria make regulation ineffective. It recommends a holistic legislation on hate speech derived from the constitution and citizens' reorientation towards ethical consciousness social responsibility as measures to flatten the curve of hate speech in Nigeria.

The research study on *Perceived Research Publication Pressure of Academics: An Exploratory Study at The Open University of Sri Lanka*, attempts to explore the research publication experience of academics of The Open University of Sri Lanka (OUSL) using a survey research design. The sample comprises 41 academics of all levels and the objectives of this research were to identify the level of publication pressure experienced by those academics at OUSL and to find out the factors that influence their research performance. The revised Publication Pressure Questionnaire (PPQr) by Haven, Bouter, Smulders, and Tijdink (2019) has been used for data collection. In addition to the quantitative data, qualitative data on academics' publication experience has been collected through an open-ended question. The findings showed that the academics in the sample experienced research publication pressure to a considerable extent. However, according to the researcher, findings can be generalized only after a confirmatory study. The researcher emphasizes the value of enhancing facilities for research and creating a research friendly culture in the university.

Globally, information and communication technology (ICT) is seen as an indispensable part of the contemporary world. In fact, culture and society must be adjusted to meet the challenges of the information age. ICT is a force that has changed many aspects of education system. It is on this premise that the present study titled *An Assessment of ICT Competence Among Academic Staff in Kwara State Colleges of Education, Nigeria: Implications for Management* examined the ICT competence among academic staff of colleges of education in Kwara State, Nigeria. Survey research design was adopted in the study. The population consists of all academic staff in government owned colleges of education in Kwara State. An instrument titled ICT Competence among Academic Staff of College of Education Questionnaire (ICASCOEDQ) was used to collect data from a sample size of 152 academic staff. The results revealed that academic staff are competent in word processing, Microsoft power point, e-payment and mobile phone browsing; electronic mail (e-mail) and social networking. Inadequate funding, internet connectivity/low internet bandwidth, inadequacy of ICT facilities


at workplace and low ICT literacy by staff are the biggest challenges to the ICT competence among academic staff. Better interactivity and connectivity, ability to type, process and store work for later use, facilities for easy information retrieval and timely and quicker information processing are some of the benefits gained by the effective usage of ICT by academic staff. It was recommended that the government and school management should encourage academic staff to participate in ICT training programs to improve their level of ICT competence, which would lead to high productivity.

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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Architexture for Engaged Pedagogy: How Classroom Design Affects the Teaching and Learning of English Literature

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Abstract

English Literature as a subject challenges the traditional notion of accuracy and demands negotiation between teachers and learners. It is a discipline that requires discussion, innovation and enquiry. Therefore, teaching and learning English Literature requires an environment that facilitates and accommodates engaging pedagogies as opposed to classrooms which exercise authority. Studies have shown that engaging pedagogies are enhanced within classrooms that are designed to encourage modern pedagogic practices. However, an often overlooked area of Sri Lankan schools is the effect classroom design has on learning and teaching. This in particular affects English Literature due to its engaging pedagogic practices. This study aims to evaluate and understand classroom designs that help maintain engaging pedagogies for English Literature and the effect classroom design has on student learning. Data for the present study were collected through a

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lesson observation as well as semi-structured interviews of learners and a teacher of Advanced Level English Literature. Additionally, the school library was observed and discussed to understand the effects of learning environments on student learning. Through deductive data analysis, this study analyses features that contribute to the culture of learning required for Advanced Level English Literature. The implications of this study highlight that classroom design and culture promote learner thinking and collaboration. These factors enhance the learning experience of English Literature as they instill democratic values among learners and encourage learner participation.

Keywords: *Architexture, Classroom Design, English Literature, Literary Pedagogy*

Introduction

The ways in which knowledge is acquired help to understand the ways in which teachers transfer knowledge to their students. Freire (1968) elaborates that “Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other” (p.53). Moreover, Socrates (circa 470 B.C.) famously engaged others in conversations with the aim of broadening ideas. He did this by discussing the ambiguities and complexities of topics with them. By engaging in dialogue, he took on the role of a student and forced his respondents to act the role of a teacher (Delic & Bećirović, 2016). Likewise, English Literature also has the capacity to help students to transform from remaining “passive consumer(s)” in the classroom to “active participant(s)” (Hooks, 1994, p.14). This can be achieved by defying “banking” information and following a form of open discussion, listening, criticism and independent learning that shapes a “problem-posing education” (Freire, 1968, p.67).

Advanced Level English Literature demands many skills from students such as writing, reading for inference and analytical skills. However, their experiences of the learning process may

largely differ from each other due to the learning environment and design which Miklitsch (1990) refers to as the “architexture” (p. 105). This factor may cause a considerable difference in the entire learning experience among different learning communities. Located in the understanding that knowledge emerges through innovation and inquiry, this study will conceptualize the importance of classroom design in the teaching of English Literature in secondary schools of Sri Lanka.

Those who identify the teacher as a guiding agent assert that the teacher’s job is to facilitate teaching as a motivator (Schwarz, 2008). Teachers must prompt students to think in sophisticated terms, which in turn would generate sophisticated writing. While there are many ways in which teaching can be made interesting and learning more empowering, many critics have termed discussion-based learning as a primary pedagogic practice within the Literature classroom. Meaningful social interactions (Gill & Illesca, 2011), authentic conversations (Petrosky, 2011) and literature circles (Shelton-Strong, 2012) are some terms for discussion-led literature learning. Discussion-based learning in fact functions as a microcosm of democracy for students (Gill & Illesca, 2011). In these pedagogies, the teacher may function as the link between learners and knowledge (Erdem, 2015). Moreover, Miklitsch (1994) views the teacher as the pedagogic subject-position sans autocratic authority.

Certain dialogic and cooperative pedagogic practices such as literature circles directly affect the structure of the classroom. For such activities, it is important to have flexible physical spaces to teach in, which can be altered according to the teaching activity. Unfortunately, the importance of physical space has often been overlooked in the educative process.

Classroom design and its impact on teaching and learning Literature is an under-examined field of pedagogy, especially in the Sri Lankan context. However, it is understood that classroom design directly affects teaching methods employed in the classroom. Studies have presented that there are many pedagogic

practices and classroom designs that have proven to be successful and impactful. Thus, this study hopes to understand the following.

1. Which classroom designs facilitate engaging pedagogies?
2. What is the effect of classroom design on student learning?

Therefore, by observing a Literature classroom of a Sri Lankan secondary school and by interviewing its participants, this study aims to analyze and discuss the effectiveness of classroom design for problem-posing and engaging pedagogies in the teaching and learning of English Literature.

Review of Literature

Architecture for Engaging Pedagogies

Miklitsch (1994) relates an anecdote of a class he conducted at Tufts. He elaborates on how he would usually arrange the seats in a circle so as to encourage discussion. However, the classroom allocated for the seminar was of a traditional layout, with desks nailed to the floor and a platform at the front with a lectern to teach from. Consequently, he had taught from the back of the class and experienced an unsuccessful seminar due to the layout of the classroom. This, he says, allowed him to think about the “pedagogic subject-position” as it relates to the physical space of the classroom which he terms as the “architecture” (p. 105). He further states,

“...the materiality of the classroom is ineluctably a practical and theoretical affair. In other words, the classroom is one of the contexts – a material, not negligible one – within which both the discourse of knowledge and the student – teacher relation is constructed.” (Miklitsch, 1994, p. 106).

According to this understanding, physical spaces in which teaching and learning occur are as essential to the pedagogy as tools and material used for the lesson. Stemming from Miklitsch’s study (1994), the present study focuses on the impact of physical

learning spaces on the learning process since certain pedagogic practices directly affect classroom design and vice versa.

Both Freire (1968) and Hooks (1994) highlight the notion of an active learning environment, those which pose problems, enquiries and discussions. This helps us to understand the impact modern pedagogic practices based on discussion and enquiry have in understanding the subject matter in a better and interesting way. In a study conducted in the UK by Turvey and Yandell (2011), a teacher entry is recorded in which the teacher's perception of the word "marooned", meaning isolated or cut off was challenged by a Jamaican student in a lesson on Jean Rhys' *Wide Sargasso Sea*.

"Nathalie's challenge resulted in a discussion about different races, isolation, leaving home, moving away, which then lopped back to the word 'marooned'. By this stage the word had assumed a significance for all of us, a meaning in fact that was steeped in a history of colonialism and slavery. Nathalie had in effect insisted that I attend to that history and to her knowledge of it. She did this in ways I could not have predicted or controlled." (Turvey & Yandell, 2011, p. 157).

This account links to Freire's (1968) understanding of how the learner's thinking authenticates the teacher's thinking. It is understood that this form of authenticity which Petrosky (2011) identifies as "authentic conversations" that make "students thinking visible" (p. 140) could be achieved through discussion-led and problem-posing pedagogies.

Significance of Physical Spaces

The correlation between student behavior, development and classroom design has proven to be a vital element in student education. In a study on whether space matters in cooperative learning, Espey (2008) analyses the impact of classroom design on undergraduates' attitudes towards learning experiences within team-based learning environments. Espey (2008) employs three set-ups: rows with large tables facing the front of the room, desks, and office type chairs with small desks on wheels for easy mobility. In her study, she identifies that students who learn in small groups

demonstrate better academic achievements and more favorable attitudes towards learning than their peers who study in traditional classrooms. Consequently, classroom design impacts the learning that occurs within groups. For instance, she identifies that individual seating choices within groups lead to casual conversation and cooperative studying; predetermined seating influences communication patterns and the role and perception of individuals within groups; and decentralized networks such as circular seating arrangements promote quicker problem solving. To form these networks and groups within the classroom, comfortable and flexible furniture are essential. While her study does not display significant statistical differences in using small group activities, it impacts individual learning because the main idea behind small group activities is to increase individual learning by actively engaging students in the learning process. This classroom design also echoes the principles of cooperative learning, which is not only to gain knowledge but to also hone important social skills that will benefit learners in the long run (Johnson & Johnson, 2018).

Close (1992) recalls her experience through the primacy of classroom design and literature discussion in the creation of a classroom environment for thinking and sharing. The research strand has looked at how classroom teachers can help students to think more deeply about the literature they read. The study has also considered the students as collaborators as they shared their reactions to class in frequent interviews. She states that through discussion students are validated as thinkers. It taps students' knowledge, scaffolds students' process of understanding and gives students control to work through their understandings. Furthermore, they connect discussion and classroom activity to the layout which contributes to this thought sharing process. Instead of desks, eight large tables are arranged in an octagon, leaving a large open space in the center. This permits students to work in small groups of three or four and move into the circle when a class discussion is to take place. Therefore, Close (1992) draws on the fact that pedagogic practices and physical space design in the Literature classroom have a direct correlation that influences

sound learning. Educational intervention such as classroom design experimented by both Espey (2008) and Close (1992) will benefit learners to progress intellectually, socially and emotionally, resulting in holistic development (Tomlinson, 2006).

Classroom design is essential for all age groups within a school context. Thomsen (2014) highlights three important elements in designing a classroom, primarily an all-purpose learning environment focused on children in the middle school age category.

1. Furniture arrangement: the most effective arrangement of furniture is desk clusters of 2-3 desks with distinct separations of different areas in the classroom. Additionally, placing the teacher's desk in the corner proved to be effective as the teacher was encouraged to move a great deal in the classroom, paying attention to all the students. Furniture arrangements also stimulate classroom discussions.
2. Activity centers: activity areas are distinct areas designated for small themed activities such as science corners, art centers or drama centers. These centers allow students to explore their interests and find out what they like to do best.
3. Literature center: it is recommended that every classroom has a library corner from which students may pick and read a book of their interest.

Though the above study on classroom design is not solely for Literature classrooms, it certainly encourages disciplines of literary studies and therefore can be adopted for Literature classes in Sri Lankan secondary schools as well.

Wulsin Jr. (2013) explores the impact of physical settings of tertiary educational institutes in the U.S.A. on learner interest and continuous education which can also be viewed in relation to Literature learning in secondary schools. The following are the elements that have been explored which induce learning in these settings.

1. **Learner-Centered Pedagogy:** refers to classroom design in new contexts which detach the teacher from an information transferring role to a guide. Hence, the study explores designs which focus on knowledge generation than transfer. These designs are referred to as hives and circular layouts.
2. **Natural Systems:** explores how classroom architecture brings in nature into the classroom such as natural light by equipping natural building material.
3. **Space Outside Classrooms:** this element explores how in-class learning is promoted in outside classroom environments through a seamless transition. Thus, outside environments are designed to connect classrooms to common spaces where students and faculty can meet informally and engage in subject-related discussions.
4. **Flexibility:** refers to reorienting from lecture-based, teacher-centered set up to whole-group and small-group discussions using flexible furniture and learner spaces. Relationship making, networking and creative problem solving are encouraged.
5. **Technology:** refers to classroom designs that support online learning and digital content-based learning via built-in technologies.

Peer group interactive approaches to learning are viewed as bearing positive outcomes on both academic and social elements of support learning (Nind & Wearmouth, 2006). A vital element of such pedagogies such as discussion-based and collaborative learning is teacher movement and interaction. A study on the same by Jakonen (2018) shows that mobility creates prospects for task-related guidance and supports addressing such guidance to specific recipients. The study addresses how, in traditional classrooms, there is a distinction between teacher – student territories and how modern pedagogies challenge these boundaries. As a teacher leaves the desk and enters the student territory, the teacher involves themselves in desk interactions, thus, the teacher’s movement away from the blackboard towards the students transforms the activity from a visual presentation of a concept to its conversational elaboration with students. This also

allows the teacher to provide students individual instruction based on their individual needs. This directly affects the classroom design. Teacher mobility and peer collaboration depend on the layout of desks and other furniture within the room. While student groups need to be seated appropriately, the teacher should also have sufficient room to walk about and pay equal attention to every student group and have equal access to all the students of the groups. However, the study also acknowledges the authoritative position embedded in the role of the teacher. At moments where the teacher needs to address the entire class and provide further instruction, positioning themselves in front of the blackboard or behind the teacher's desk provides the teacher the authority associated with their position and also makes them salient to the classroom. This asserts that classroom design plays a vital role in the pedagogic practices we employ within our Literature classes.

These studies demonstrate the impact classroom designs in terms of physical layout, facilities and furniture have on the learning process of students within classrooms. Through these studies, it is evident that classroom design creates a positive learning environment and determines the students' attitude towards learning. It is also understood that certain classroom designs suit only certain learning objectives. Therefore, purpose specific designs need to be used according to lesson objectives, such as circular seating for discussions which may not suit large lecture-based learning. These studies do not necessarily indicate better grades as a result of better environments. Nevertheless, they demonstrate an increased sense of learning and a hands-on approach to continuous learning that is instilled within learners.

Methodology

This paper stems from a larger study that primarily evaluates pedagogic practices utilized in the teaching of English Literature at the Advanced Levels. An observation from the said study is the role of classroom design in facilitating pedagogies for literature learning. Thus, this paper attempts to evaluate and understand the following.

1. Which classroom designs facilitate engaging pedagogies?
2. What is the effect of classroom design on student learning?

Data was gathered for this paper via semi-structured interviews and observations to evaluate the importance of classroom design in secondary school English Literature learning.

Rationale

The studies reviewed above demonstrate the importance of modern pedagogic practices. These practices primarily rely on discussion-based teaching to empower student voices and interpretations within classrooms for the enhancement of student interest in the subject (Espey, 2008; Jakonen, 2018; Thomsen, 2014). Moreover, these studies also highlight the importance placed on classroom design for carrying out these pedagogies.

One common methodology of cited studies is the use of qualitative approaches to understand the research motives. According to Denzin & Lincoln (2005), qualitative research stresses “the social constructed nature of reality, the intimate relationship between the researcher and what is studied, and the situational constraints that shape inquiry” (p. 10). As such, in enquiry, research studies elements in their natural environments according to the meaning people bring to them (Denzin & Lincoln, 2000).

This study is also based on the rationale that the best perception of pedagogic and architectural impact on English Literature learning in the Sri Lankan Advanced Level context can be achieved by examining how teaching and learning occur in the physical learning space of the classroom. Moreover, student and teacher views gathered through interviews have been incorporated into the study to understand how teaching and learning experiences within their environments shape individual experiences.

Participants and Observational Environments

This study followed a descriptive research design which observed

an Advanced Level English Literature lesson in a private boys' school in Colombo. Furthermore, the participants of this study, both students and the teacher took part in semi-structured interviews.

This convenience sample of five students and one teacher are known to the researcher as students and colleague, respectively. Moreover, the observed environments (both a classroom and a library) were from the same school. During this research, the researcher was attached to this school as a part-time teacher.

Table 1. Participants' Information

Participant Code	Other Subjects pursued for A/Ls
Student A	IT and History
Student B	Economics and GRC
Student C	Economics and GRC
Student D	Economics and GRC
Student E	Economics and Mathematics
Teacher	n/a

Despite the researcher's familiarity with research participants and environments, necessary steps were followed to facilitate an ethical study. Thus, permission was received from the observed school, and all participants took part in the study willingly and voluntarily. The participants' familiarity with the researcher and the researcher's familiarity with the environment may be considered limitations of the study; however, as presented in the discussion that follows, it invariably benefited the study.

In keeping with Denzin and Lincoln's (2000) interpretation of enquiry in qualitative research, the study first observed a lesson conducted in the students' usual English Literature classroom. This ensured that the observation and interviews took place in their natural settings. The researcher placed himself at the back of the classroom, behind the students. It was decided that the participants' familiarity with the researcher as their teacher/colleague would allow a natural flow of events as they are used to the researcher being present in their classes.

The Classroom Assessment Scoring System (CLASS) developed by Stuhlman, et al. (2014) was used as the overarching structure for the observation. Therefore, factors such as classroom climate, regard for student perspectives and strategies for engaging students were observed.

Secondly, semi-structured interviews were conducted by the researcher. Student interviews were conducted in the classroom, while the teacher was interviewed in her office adjoining the classroom.

Data Analysis

This study adopts a deductive qualitative content analysis approach. The primary reason for this is the availability of previous literature on pedagogical and architectural impact on teaching and learning English Literature. Therefore, with available data obtained from a representative local context of Advanced Level English Literature, this study evaluates how classroom design is key to successful teaching and learning of English Literature in secondary schools.

Discussion

Miklitsch (1994) has posited that the design of the classroom is essential to conduct successful learning. Likewise, Jakonen (2018) highlights the importance of mobility within the classroom which creates more opportunities for task related guidance. Therefore, it is apparent that classroom design is pivotal for engaging pedagogies.

Classroom Environment

The observed school has a classroom for English Literature which is decorated and organized differently to other classrooms of the school. The students sit around the teacher's desk (Figures 1 and 2), similar to that of a meeting rather than a typical secondary school classroom with rows of desks and chairs and the teacher in

front. As seen in Figure 1, on one side of the teacher is a big whiteboard across the wall and on the other side is a wall full of charts with pictures and details of the poets, authors and playwrights in the syllabus. A bookrack is placed against the east wall of the classroom which contains many subject related books (Figure 3). A movable blackboard is placed at the back of the classroom which contains useful material such as essay writing techniques and points of analysis (Figure 4). The west wall is painted in blue. There are windows on three sides of the classroom, behind the teacher's chair and on either side (east and west) of the room. The door to the class is directly in front of the teacher, at the back of the room. This room also functions as the drama room; hence it contains many cupboards with costumes and props.



Figure 1. *South view of the Literature classroom*



Figure 2. *South-west view of the Literature classroom*



Figure 3. *South-east view of the Literature classroom*



Figure 4. *North-west view of the Literature classroom*



Figure 5: *A classroom in the Commerce Section*

The participants, both students and the teacher, unanimously agreed that classroom design is essential for learning Literature. Students study two other subjects alongside English Literature. Nevertheless, the student participants agreed that they enjoy the classroom environment they have for English Literature because it is different to the other classrooms.

The classroom in the Commerce Section (Figure 5) where most of the other classes are held does not seem to provide the same peaceful setting for learning. Therefore, one of the primary reasons that Students A, B, D seem to agree on is that the quiet atmosphere of the English Literature room creates a learner-friendly environment.

Moreover, according to Student A, they have "... charts and stuff to look at unlike in other classrooms", while Student D stated that "the books, the props, the charts, the layout, they all help". Both the charts and in-class library are not often used by the students; nevertheless, both Students A and D claim that they are motivated to study in the Literature classroom which is visually pleasing. This idea can be justified because students find the other classrooms rather dull as they are monochromatic and empty. Student E stated that "the Commerce Section might be new and better, but it has dull colors". Bell (2013) identifies visual impact as an essential factor for student interest in the subject. Though she primarily refers to visual prompts, it incorporates the use of color and prompts for visual impact. The teacher participant further justified this by stating that many students are visual learners, thus are motivated to learn in a room that is colorful and visually pleasing.

According to Student C, the seating arrangement is an important factor which contributes to successful learning in this classroom. The fact that the students sit around the teacher's desk, facing each other, generates conversation. Student E said, "...the attitude to learn is impacted because I am not at the back and the mind is not allowed to wander. I'd say that the round-table setup is helpful." Student D commented that "there's equal attention for

everyone. Everyone is in the front row here.” Thus, the students feel integrated in the lesson as they all receive equal attention in the classroom due to the seating arrangement. This quality of cooperation leads to higher levels of participation as learners feel heard and feel important, leading to positive attitudes towards their work and contribution (Munoz-Martinez, et al., 2020). Moreover, this proves that knowledge emerges in an environment which encourages enquiry. Enquiry makes students’ thinking visible (Freire, 1968). Thus, the layout contributes to allowing student thinking to take prominence in the classroom. This reflects Miklitsch’s (1994) understanding of architecture, reviewed above. The teacher in this study has attempted to change this structure to provide students a different environment for a change from routine. However, according to her, it was unsuccessful because it consisted of two rows which resulted in poor response rates.

The impact the classroom has on students seem to border on respect (and sanctity even) that is associated with the room. Student A stated that “There is a kind of respect for the Lit room when you think about it. It is *the Lit room*.” This view is shared by many. Student D commented that “there is a vibe and I like that vibe”, while Student E claimed that they feel special about having a room of their own for the subject. He further stated, “We feel special when we say we are going for Lit. It makes the subject elite almost. Like it deserves its own room and the atmosphere is necessary for the subject.” However, this form of elitist idea associated with the subject may be harmful and may be criticised by many. This mentality may distance the students from reality, similar to that of the ‘kaduwa’ effect which the English academia has attempted to move away from in recent years (Gunsekera, 2005).

The space concerned fulfills two of the three requirements of classroom design presented by Thomsen (2014): furniture arrangements and literature centers. Thomsen (2014) suggests desk clusters for students. While this recommended arrangement allows better small group activities and suits younger age groups, the arrangement used in this particular study assists in creating

conversation and contributes to discussion-based learning that is more suitable for the age group and the discipline in concern. Likewise, the literature center (in-class library) also contributes to student interest in the subject even though as reiterated before is not in full use in the context of the sample community.

Certain parallels can be drawn between this study and Wulsin Jr.'s (2013) study on the impact of physical settings. For instance, the round table layout in the observed environment facilitates discussion by removing the teacher from the role of a narrator and placing her almost as an equal within the classroom. The prominent location of the teacher, however, allows her sufficient authority to control discussion (Jakonen, 2018). Moreover, although the observed classroom is located in a building which is nearly a century old, there is sufficient natural light. The view of the school's green quadrangle from the windows of the class provides students sufficient engagement with nature while being present in the class. However, there is a stark difference in environment inside and outside the Literature classroom. Therefore, learning outside the classroom environment is not promoted due to the absence of a seamless transition. The multi-purpose classroom also consists of furniture that cannot be rearranged for different activities, and lacks digital facilities. Consequently, the layout remains static, and while technology is used for teaching, in-class usage of digital equipment is limited to the teacher's personal resources.

The observed lesson generated dialogue among students on the character of Amanda in Tennessee Williams' *The Glass Menagerie*, resulting in differing interpretations of Amanda's role as a mother being discussed openly. This instance depicts Gill and Illesca's (2011) understanding that the interpretation of a text is negotiated rather than given. For the latter, the teacher may follow a transmissive method while the former is achieved through discussion as done in this context. Moreover, this asserts that discussions assist students to build sound analysis independently within a collective environment. That is to say that the student's thinking is independently generated with the assistance and

justification by the class community, including the teacher. As Johnson & Johnson (2014) state, a democracy is achieved within a cooperative setting in which participants aim to achieve mutual goals. Therefore, in addition to independent learning, this pedagogy also demonstrates democratic values inculcated within the classroom as students arrive at interpretations taking into consideration the different opinions of their peers.

In considering the importance of discussion-based teaching according to the observations and understandings mentioned above, it is undeniable that the classroom design is essential to creating and maintaining discussion. In this study, the participants were able to engage in meaningful discussion because the students sat at a U-shaped, or roundtable-like arrangement at the head of which the teacher presided. This allows the teacher to control the discussion while engaging in it. Thus, the layout of the classroom seems to be an essential element for successful teaching and learning. Additionally, it is also evident that classroom culture and teacher-student relationships affect discussions as free discourse among students is encouraged by the teacher.

According to a study by Jakonen (2018), mobility is also important to carry out successful learning activities. This means that the teacher should be able to move from one group to another to guide the students. In the present study, since the existing small group of students is hardly separated into smaller groups, this may not be needed. Nevertheless, if this is to be initiated, as mentioned above, the furniture is neither sufficiently flexible for this purpose nor does the multi-purpose classroom have sufficient space to rearrange its furniture. Yet, the way in which the furniture has been arranged facilitates age appropriate discussion activities during the lesson. In fact, many students stated their preference for the existing layout for discussion purposes.

Library Environment



Figure 6. *Library tables (during renovation)*



Figure 7. *Library shelves (during renovation)*

This study also analyses the design of the newly revamped library of the school. Prior to refurbishment, the library contained tall bookshelves which were unreachable for younger students. Moreover, the tables and seats were unsuitable for a library as the room was previously utilized as a science laboratory. Additionally, the space did not have any form of technology. Consequently, the library was not used by any students and few students obtained their library cards to borrow books. Figures 6 and 7 are photographs taken of the library during renovation which illustrate the layout of the space before refurbishment.

However, as illustrated in the photographs below, the refurbishment project transformed the space into a contemporary layout. The library has been made more vibrant, with the use of colorful and comfortable seating, carpeted floors and the display of house flags and wallpaper. Hettiarachchi & Nayanathara (2017) further justify the impact of color in learning environments through a case study on primary schools in Sri Lanka. Although the age groups of the two studies are different, a significant finding in the said study is the enhancement of creative artistic expression of students through shades of blue which is also the primary color used in the refurbished library. Secondly, by lowering bookshelves and rearranging them against the wall, they have been made more accessible for younger students. As a result of lowering bookshelves, more natural light is made available inside the library which Wulsin Jr. (2013) identifies as an important element of learning environments. Moreover, one round table and two square tables have been placed which encourage reading in companionable silence and teamwork within this environment. This eliminates total silence and individual learning associated with traditional libraries which may at times be viewed as a disturbance to other students.



Figure 8. *Layout of the renovated library*



Figure 9. *Computer hub of the renovated library*

Schwarz (2008) highlights the possibility of creating a community of enquiry through the use of technology. Thus, learners may use devices to both broadcast content and communicate for collaborative learning (Chambers & Gregory, 2006). Thus, the inclusion of a television and six laptops in the revamped library aims to promote the concept of virtual learning and online research-based learning among students.

After the revamp project, there is an overall increase in student association with the library which was previously unused by both teachers and students alike. The participants of this study are actively involved in the new library. While Students B and C are active members of the revived Library Club, all the students have been to the library for educational purposes. The teacher participant of this study encourages students to use the library facilities. Other teachers have begun to bring students more often to the library and students have begun to register for library membership. Moreover, a handful of teachers have begun to discuss texts in small groups in the form of literature circles. As Shelton-Strong (2012) identifies, literature circles encourage learner autonomy. As such, students lead discussions and the teacher only takes part in the process as a guide. Additionally, the laptops and television communicate the idea that technology can replace traditional library usage methods as well.

However, this process also has a few drawbacks. Many students tend to misuse the newly revamped space. The students who are familiar with strict seating arrangements and restricted spaces in classrooms see the open environment within the library as an opportunity to play. Moreover, the round table and other seating areas encourage talking more often than reading or cooperative learning. As a result, the teacher's duty within this new space which is to encourage independent learning is often doubled by the need to discipline students. An area which requires a significant amount of attention is the computer hub. The students have begun to use the library to primarily use the laptops more so for entertainment than educational purposes. Hence, strict monitoring of student activities is in progress.

Students are used to rote learning and teachers as narrators which has resulted in a lack of exposure to independent and cooperative learning in general classroom settings. Therefore, due to a gap that exists between regular learning environments and this new facility, learners are unable to utilize this resource suitably. Nevertheless, it is evident that the design of the refurbished library contributes to enquiry-based, autonomous and group-based learning which the students need to learn to utilize appropriately.

Conclusions

This study presents the importance of classroom design and pedagogic practices for the teaching and learning of literature. It is evident that pedagogic practices such as dialogic approaches depend on the layout of furniture and other design elements which may generate students' interest in the subject (Espey, 2008; Close, 1992). It also presents that student engagement in the lesson does not depend merely on newer facilities but on engagement and overall environment. Therefore, it is evident that pedagogies which are preferred by students require practical and enjoyable environments.

Classroom culture is an important element for pedagogical success. The classroom that was observed for this study has an open and friendly atmosphere. Students find it easy to communicate their opinions in class and are encouraged to do so. Moreover, the teacher's support may impact the general attitude of the class as students are encouraged to use democratic practices (Johnson & Johnson, 2014); permitting their peers' voices to be heard and accepting different opinions which are justifiable. Therefore, the important factors are the feeling of belonging to the community and being heard in the classroom which encourage such progressive pedagogies to take place in the classroom. The positive bond the teacher has developed with her students may have created a supportive space in which students belong and are heard, which contributes to successful learning. However, in classrooms that do not share a positive teacher-student relationship, this culture may not exist; as a result, practices that

were discussed in this study may not be effective in authoritative and traditional environments.

As discussed in this study, technological and classroom design implementations encourage independent research-based learning and support better communicative pedagogies. However, this study emphasizes the importance of gradually normalizing the use technology, and flexible and alternative classroom designs. Sudden implementations may cause inexperienced students to misbehave and misuse resources as seen in the library context herein.

This study also contains limitations and avenues for further research in the field of classroom design and pedagogic practices. While this study understands the importance of classroom design for conducting productive and more learner-centered lessons, it is important to consider what more can be done to increase student interest if similar and appropriate classroom designs and pedagogies are implemented for other subjects. The students' interest in this subject perhaps occurs because it is the only subject of this school with a room of its own, apart from laboratories for subjects such as Information Technology and Science. Therefore, the teacher needs to consider how she would retain student interest if other subjects are also provided spaces of their own. Moreover, it is evident that classroom culture and teacher-student relationships are areas of this study that can be further researched to measure pedagogical success.

In conclusion, this study highlights that classroom design is a key element for the successful teaching and learning of English Literature via a dialogic and cooperative approach. Some of these design features include furniture arrangement, visual effects and even technology. It is also evident that classroom design may only be effective if the culture within the classroom facilitates the atmosphere required for the successful implementation and maintenance of engaged pedagogies.

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The Impact of Shading on Growth and Yield of Cabbage (*Brassica oleracea* L.) in the Low Country Dry Zone, Ampara, Sri Lanka

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Abstract

Shade level is a predominant factor that greatly influences growth, quality and yield of exotic vegetables that are grown in low and mid country dry zone areas. Accordingly, a field trial was conducted to investigate the impact of shading on growth and yield of cabbage var. “Green Coronet” in Ampara District of Sri Lanka during the period of July to November 2020. The experiment was laid out in Completely Randomized Design (CRD) with four replicates. Levels of shades were defined in two treatments as open field condition (40% shade) and 70% shade levels. The growth measurements, plant height, the number of leaves and diameter of rosette were recorded at six and eight weeks after transplanting and Analysis of Variance was performed to determine significant differences among treatments ($p < 0.05$). Further, the head weight and yield were recorded at the harvesting stage and the results revealed that the cabbage plants grown at

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70% shade level showed significantly ($p < 0.05$) better performance in the measured growth parameters *viz.* plant height, diameter of rosette, number of leaves especially after 50 days of transplanting (8WAP) and yield parameters, average head weight and final yield. The lowest performance was observed in plants grown at open field conditions with 40% shade level. It can be concluded that the plants grown at 70% shade level would obtain high growth and yield with the modified temperature, relative humidity level and optimum light intensity in the protected environment. These findings will be beneficial for the farmers to grow cabbage in low country dry zone at commercial scale to obtain higher yields rather than cultivating in open field conditions.

Keywords: *Growth, Light intensity, Relative humidity, Shade levels, Yield*

Introduction

Cabbage (*Brassica oleracea* L. var. *capitata*) is one of the most important high nutritive leafy vegetables belonging to the family Brassicaceae. It is a herbaceous biennial species originated from the South and Western part of Europe (DOA, 2018). Prior to cultivation, cabbage was mainly used for medicinal purposes as it prevents constipation, increases appetite, speeds up digestion and is very useful for diabetic patients (Silva, 1986). Due to its nutritional value (Diputado, 1989) and delicious taste, cabbage is highly popular and is extensively grown in hill country of Sri Lanka as a year-round crop. It is one of the most important and an economical and rotational vegetable crop and is mainly grown in Badulla, Nuwaraeliya and Kandy districts.

Climate is a vital factor that is reported to have a greater influence on cabbage production. Pornsuriya & Teeraskulchon (1997) have revealed in their studies that exotic vegetables such as cabbage and broccoli can be planted in hill areas where the climatic condition is cool or in lowlands during the cool season. The optimum temperature for growth and development of cabbage is 15°C to 20°C and the required amount of water per crop vary from 380 mm to 500 mm based on environmental conditions.

Therefore, high light intensity, high temperature and low humidity levels in the low country are problems to produce cabbage. Unfavorable or dry atmospheric environments lead to impaired quality of head, poor yield and trigger the increase of pest in cabbage cultivations. The findings of Jeong et al. (2009) and Vendrame et al. (2004) concluded that light intensity can affect plant canopy, flowering, leaf size and color in herbaceous species. Due to that, yield contributing characteristics are highly affected by extreme external environmental conditions during the growing period.

In the Sri Lankan context, to reduce the crop damages from heavy rainfall and high light intensity, cabbage and other exotic vegetable crops are grown under shade nets. Shading is an important method to create suitable environment for higher growth and high yields of vegetable crops (Sampet, 1993). Wheeler (2008) stated that plant growth and productivity can be controlled by modifying the light quantity. Cabbage is a cool seasonal crop (Decoteau, 2000), and growing of cabbage under shade condition is crucial in dry zone of Sri Lanka to improve the productivity. Also, it is pertinent to note that there are limited studies conducted in low country dry zone in relation to cool seasonal crops under different shade levels. Considering the above facts, the present experiment was undertaken with the objectives of evaluating the impact of shading on growth and yield parameters of cabbage in low country dry zone of Ampara District.

Materials and Methods

A field experiment was carried out in agro-ecological region of DL 2b in the Ampara District of Sri Lanka to investigate the impact of shading on growth and yield of cabbage in low country dry zone during July to November 2020. Geographically, it is located at latitude of 07° 17' 51.14" N and longitude of 81° 40' 55.27" E at an elevation of 30 m above mean sea level. The soil of the experimental site is sandy loam. The annual mean temperature of the area is 30°C and it receives most of the rainfall from the Northeast Monsoon. Experimental design was laid out in Completely Randomized Design (CRD) with four replicates. The

variety Green Coronet was selected for the study as it is a widely cultivated hybrid in most of areas and develops a good crop stand. It comprised of two treatments namely: T1: Open field condition with 40% shade and T2: 70% shade levels. For both treatments, cabbage seedlings were raised using nursery tray with rooting media (top soil and compost at the ratio of 1:1). Cabbage seeds were planted in every cell of the tray. After 30 to 35 days, healthy seedlings were transplanted in 3m x 1m size raised bed according to recommended spacing of 50cm x 40cm as an open field condition with 40% shade level. Conversely, seedlings were planted in 50-60 cm height and 25-30 cm width poly bags for raising plants and kept those in 70% shade level of net house and poly bags were arranged at the spacing of 50cm x 40cm. All other management practices were carried out as recommended by the Department of Agriculture. Growth parameters; namely plant height, diameter of rosette and the number of leaves per plant were taken at two weeks interval commencing from 6 weeks after transplanting. At harvesting (90 days from transplanting), the head weight and the yield of cabbage were measured. Statistical differences between the treatments under study were determined by analysis of variance (ANOVA) using Statistical Analysis System (SAS) software package and the mean separation was undertaken using least significant difference (LSD) at $P = 0.05$ probability level.

Results and Discussion

Plant growth parameters

Plant height

Mean values for growth parameter of plant height under different shade levels are shown in Table 1. It is revealed that weeks after transplanting, there was a significant difference ($P < 0.05$) (Figure 1 and Figure 2) between the treatments. The result agrees with Israt Jahan et al. (2020) who reported that statistically non-significant variation was obtained in terms of plant height at the transplanting stage of cabbage whereas significant variations were noted in plant height at 50 days after transplanting.

Accordingly, the highest plant height was obtained in T2, in which the cabbage plants were treated with 70% shade level whereas the lowest was recorded in the plants which were grown under open field conditions with 40% shade level. Therefore, it was observed that different shades levels or different climatic conditions will impact the growth of cabbage a cool seasonal crop immensely. Findings of the study is supported by Abey et al. (2002), that the performance of any vegetable crop could be linked to environmental influences including climatic conditions.

Table 1. *Mean values of Plant height (cm)*

Treatments	Days after Planting	
	6 WAP	8 WAP
T1	21.9 ± 0.4	23.3 ± 0.7
T2	24.9 ± 0.7	26.7 ± 0.6
P-value	P<0.05*	P<0.05*
LSD _{0.05}	1.92	2.2

Values are means with ± standard error of the mean.

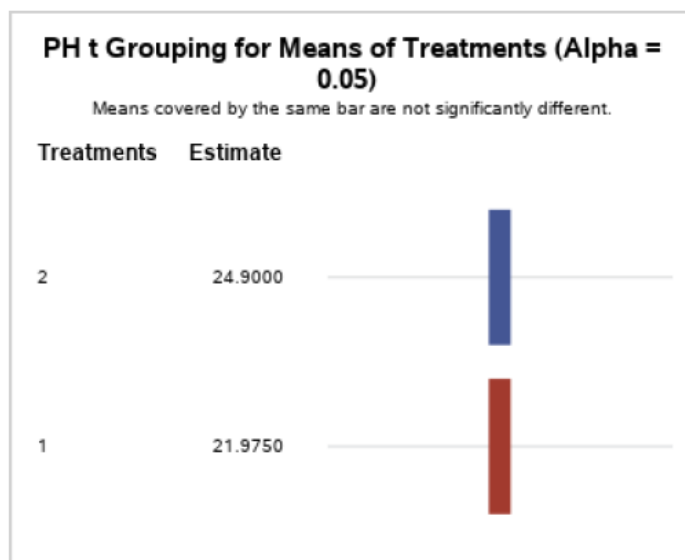


Figure 1. *Plant Height (cm) (6WAP)*

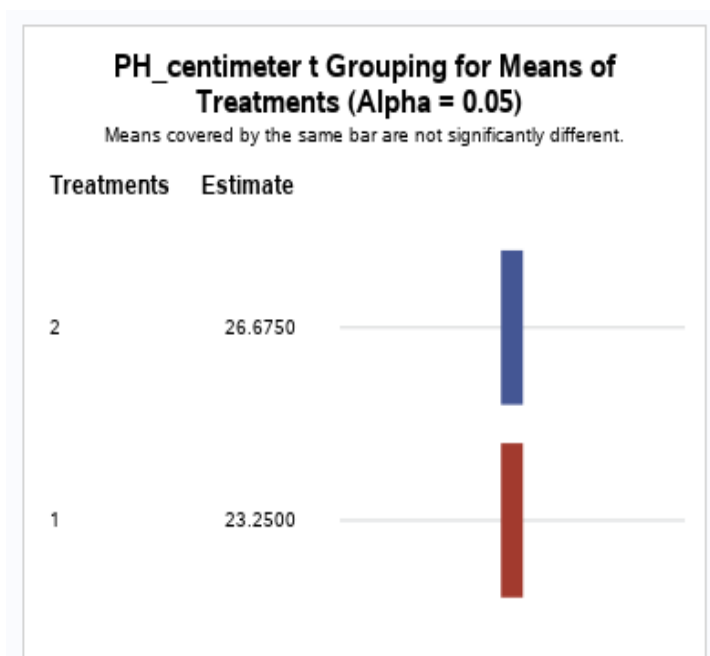


Figure 2. *Plant Height (cm) (8WAP)*

PH: Plant height

Means covered by the same bar are not significantly different by Duncan's post-hoc test at $P < 0.05$.

Number of leaves

Statistically significant variations ($P < 0.05$) (Figure 3 and Figure 4) were observed among the treatments in terms of number of leaves per plant throughout the cultivation period (Table 2). These results were like that of Sajib et al. (2015). The highest number of leaves was noted in plants which were treated with 70% shade level compared with plants treated with open field conditions (40% shade level).

The reasons for the observed variations can be that shade nets play a vital role in controlling the light intensity, temperature and increase the relative humidity level in the specified micro environment. As a result, the nets provide the required favorable climatic conditions for the growth and development of cabbage to gain the maximum yield. It is also the fact that the photosynthesis is the key physiological process which determines the expected yield of any economical crop like cabbage. As already proven, the leaves are the primary source of photosynthesis. It is revealed that

70% shade level has created favorable micro climatic conditions significantly increasing the photosynthetic process and the leaf count of cabbage. Similar, results were recorded by Teshome (2019) stating that varying environmental conditions influence the expression of crop growth characters.

Table 2. *Mean values of number of leaves*

Treatments	Days after Planting	
	6 WAP	8 WAP
T1	18 ± 0.2	20 ± 0.6
T2	20 ± 0.5	23 ± 0.5
P-value	P<0.05*	P<0.05*
LSD _{0.05}	1.7	2.4

Values are means with ± standard error of the mean.

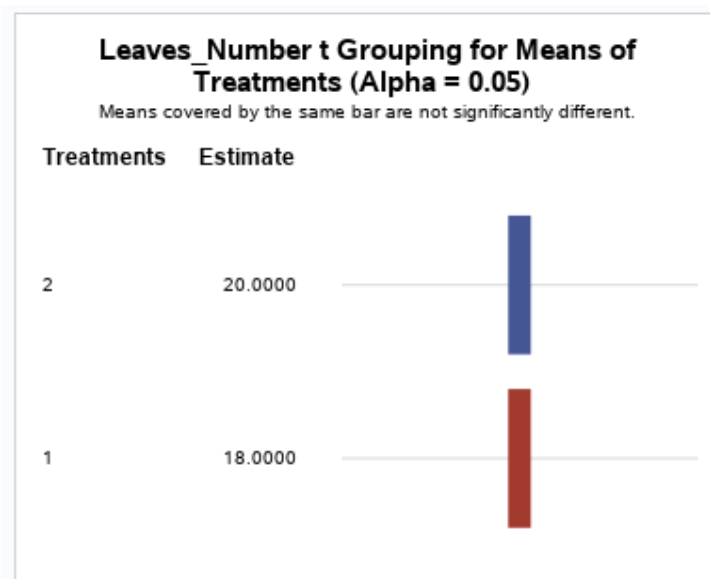


Figure 3. *Number of leaves (6WAP)*

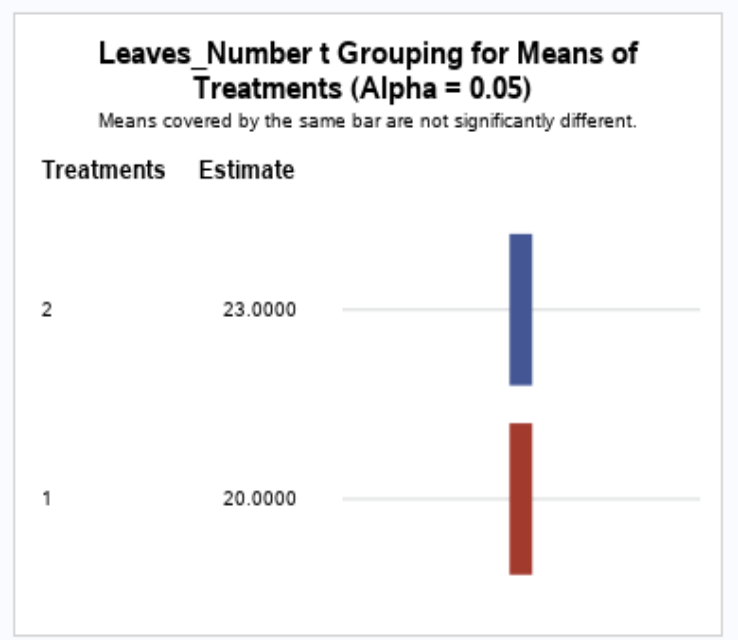


Figure 4. *Number of leaves (8WAP)*

Means covered by the same bar are not significantly different by Duncan’s post-hoc test at $P < 0.05$.

Diameter of rosette

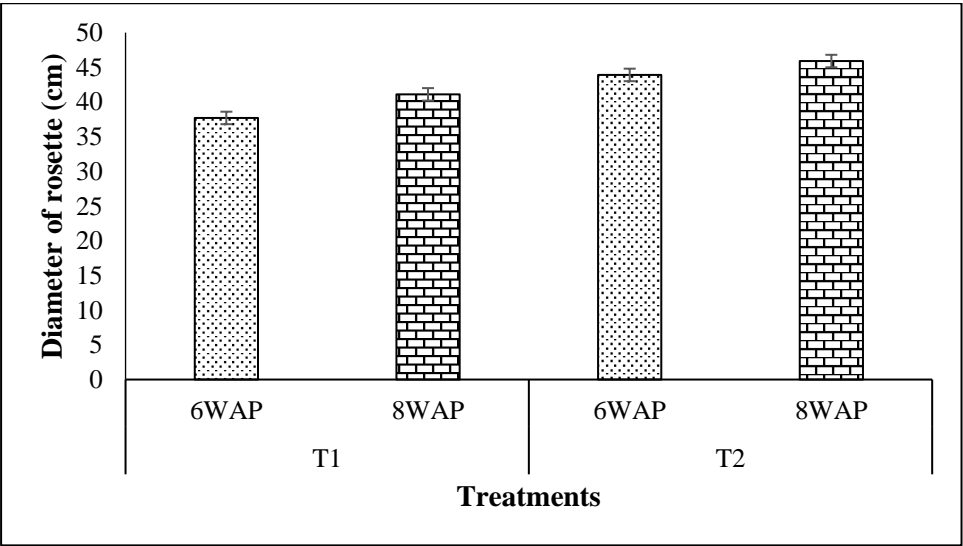


Figure 5. *Diameter of rosette (cm)*

The effect of different shade levels on mean diameter of rosette was found (Figure 5) as statistically significant ($P < 0.05$) (Figure 6 and 7). The highest mean diameter of rosette was measured as 45.9 cm from T2 at approximately after 50 days of transplanting (8WAP). However, the lowest result was recorded in T1 as 41.1 cm. Dry atmospheric environmental conditions may negatively impact the outcome of a cool seasonal crop like cabbage, which may lead to drop in growth and yield attributes. In order to grow cabbage in a challenging environment, the condition has to be modified to obtain the maximum return by using the shade nets. Therefore, the growing of an upcountry vegetable in an unfavorable environmental condition such as low country dry zone under the shade nets will significantly influence on its agronomical parameters like diameter of rosette.

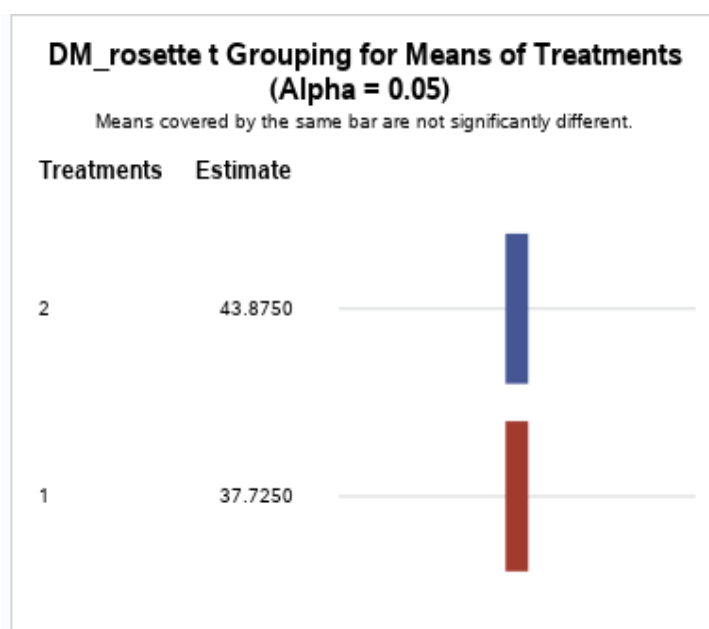


Figure 6. Diameter of rosette (cm) (6WAP)

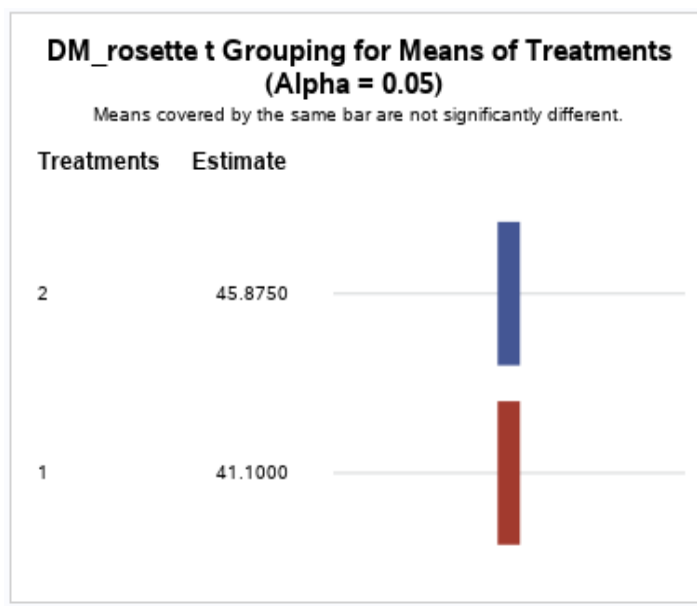


Figure 7. Diameter of rosette (cm) (8WAP)

Means covered by the same bar are not significantly different by Duncan's post-hoc test at $P < 0.05$.

Average weight of head and yield

Table 3.

Mean values of cabbage head weight and yield

Treatments	Head weight per Plant(Kg)	Yield (Kg/m ²)
T1	0.9 ± 0.03	4.5
T2	1.4 ± 0.04	7.0
P-value	P<0.05*	P<0.05*

Values are means with \pm standard error of the mean.

As given in Table 3 and Figure 8, there was a significant difference ($P < 0.05$) in average head weight and cabbage yield among the treatments under varying shade levels. The factors may have contributed to a significantly higher ($P < 0.05$) yield due to contribution of vegetative, reproductive characters and higher rate of photosynthetic process took place under the shade net conditions in T2 whereas the lowest was recorded in the T1.

Generally, under a shading net, the growth and quality of crop is affected both by light quantity and quality. When a shading net is used in agricultural crop production, the quality and quantity of light within the shade should be considered. These optimum environmental conditions encourage photosynthesis and partitioning of photo-synthesis rate into economic parts of the plant. Hence, it could be concluded that the yield of cabbage head was influenced greatly by light intensity, temperature and relative humidity and increased number of leaves per plant leading to increased average weight of cabbage head. It is in par with the statement of Meena et al., (2010) that yield and its component characters are polygenic in nature, thus influenced by the environmental factors. Further, Sundstorm & Story (1984) also found that growing season influenced head development as well as temperature had a significant effect on cabbage head shape as average head length/width ratios.

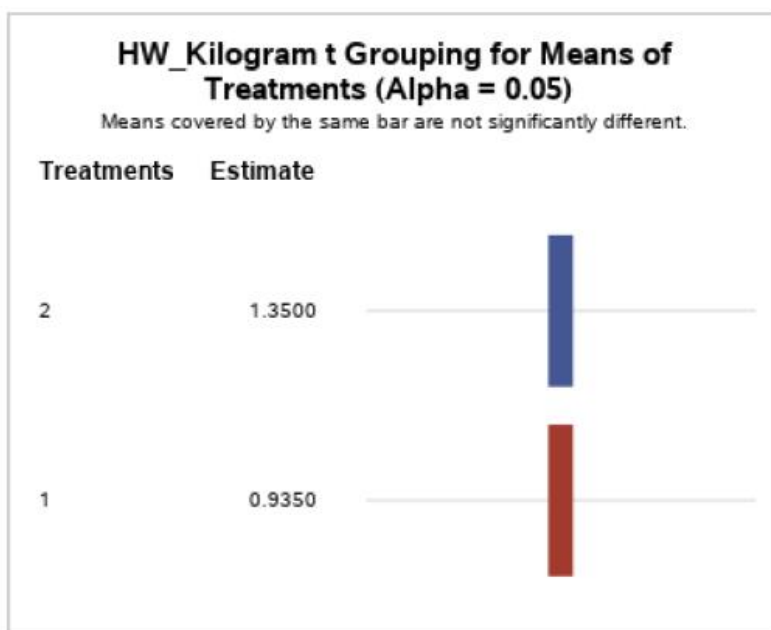


Figure 8. *Average Head weight (Kg)*

Means covered by the same bar are not significantly different by Duncan's post-hoc test at $P < 0.05$.

Conclusions

In Sri Lanka, particularly in the dry zone, shade nets are specified to provide protected environmental conditions for successful growth and development of exotic vegetables like cabbage against extreme external environmental conditions. Growth and physiology of a crop can vary due to environmental factors which ultimately result in high or low yield. Accordingly, results stated that, there was a significant difference among treatments in the growth parameters of plant height, the number of leaves per plant and the diameter of rosette with different shade levels throughout the cultivation period. The highest results were recorded with the treatment of 70% shade level compared to open field conditions with 40% shade level especially after 50 days of transplanting. Thereby, head weight and yield could be improved further by modified environment and eventually the overall impact of the photosynthetic capacity. As cabbage is a nutritional crop and generates high yield to farmers, it is suggested to grow cabbage under shade nets in low country dry zone like Ampara District to harness better benefits.

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"Like Mother, Like Daughter?" Perspectives on Mother to Daughter Succession in Diasporic Culinary Fiction by Women

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Abstract

This work is based on the role migrant women have played in history as preservers of culture especially through the culinary domain. Then shifted the focus to fictional representations of migrant women. Popular culinary fictions by migrant women writers typically highlight the cooking mother 'from home' as a symbol for continuing traditions and for nostalgic reminiscences of nurturing. This study attempts to look beyond this familiar paradigm and to explore the significance of these mother figures in new and insightful ways which draw attention to their cooking as a powerful motif as well as their ability to influence the way in which their daughters navigate their diasporic existence.

This work analyzes mother-daughter bonds represented in the fictions of two writers, namely Chitra Bannerjee Divakaruni and Amulya Malladi and then studied how the 'traits of these fictional mothers are 'carried forward' by their daughters highlighting the way in which the mothers' skills often undergo a process of

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transformation in their daughters' hands. This type of lineage or succession which resonates with the idea of a matrilineal traditions expounded by feminist theorists can be further complicated by the associations with queer diasporas and global capitalism.

Keywords: *Migrant Women, Culinary Fictions, Mother-Daughter bonds*

Introduction

Mother- to -daughter succession in culinary fictions

Virginia Woolf in *A Room of One's Own* has declared famously that "(w)e think back through our mothers if we are women" (Woolf, 1929), invoking the primacy of the mother figure in the consciousness of women from which perhaps the need or desire to trace a matrilineal history/ legacy has sprung especially in the context of women who seek to express themselves in a creative context.- Sandra Gilbert and Susan Gubar deal extensively with the impact of a (lost) matrilineal legacy or tradition upon the female creative artist in their path-breaking *The Madwoman in the Attic*. They argue: "it is possible, as Mary Shelly's introduction tells us, for the woman poet to reconstruct the shattered tradition that is her matrilineal heritage. Her trip to the cavern of her own mind despite (or perhaps because of) its falls in darkness, its stumbling, its anxious wanderings, begins the process of remembering". (Gubar, 2000)

Therefore, the desire to connect oneself with a maternal tradition can be sometimes discerned in certain aspects of feminist writing. In this study, I will particularly deal with how fictional mothers' traits or skills are carried on to the next generation, usually through a process of succession from mother to daughter in selected South Asian diasporic writing by women. I hope to investigate the manner in which such 'legacy' bestowed by mothers would impact the lives these daughters' lives as migrant women interacting with the host culture. However, I would also like to inquire as to which of the values associated with the older women are 'allowed' to come into the diasporic setting. What a mother has passed on will, I hypothesize, often be modified/

remodeled so that it 'fit' the host culture. Therefore, the question whether the mothers and the values they are associated with are being 'refashioned' to suit the values upheld by the host culture is also worth asking. While the image of younger women incorporating the mothers' skills into their diasporic existence might come across as a classic instance of assimilationist east-west blending, it would be interesting to consider which traits of the mothers are deemed 'desirable' or 'undesirable' in the new diasporic setting. I hope to demonstrate that while often positive nostalgic sentiments are associated with the carrying forward of a mother's traits, such succession is often fraught with complexities. There may be instances where a mother's skills are transformed, suppressed or excised entirely from a daughter's life. I would like to contend that often a suppression of the "mother element" accompanies the daughter's integration into the host culture. Exploring the manner in which this is done would add fresh insights to the study of matrilineal traditions and mother-daughter bonding in literature.

A sense of cultural continuity or succession is often seen to be established within culinary and related fields. This is perhaps due to the fact that food is often associated with nostalgic reminiscences involving 'home'. Mothers, due to their (assumed) association with domesticity and the production of food, are posited in literature and elsewhere as a repository of knowledge about culinary and related arts. A certain validity given to their skills (most of which are enacted in the domestic sphere) makes us reevaluate the domestic site and motherhood associated with it as well. Annette Svenson, (Svenson, 2010) comments on how family recipes from home are often passed on from mothers to daughters. Tulasi Srinivas too speaks of the pressures on diasporic Indian women to reproduce 'authentic' Indian fare, as "mother made it" (Srinivas, 2006). It becomes clear therefore that older women and their relationships to younger women as setter of standards, model, critic and guide (especially in the domestic sphere) form an integral part of the lives of the migrant women

reflected in the works of migrant women writers (see (Ranaweera, 2022)).

I will be engaging in a close literary analysis of two novels by popular Indian migrant women writers. *The Mistress of Spices* by Chitra Bannerjee Divakaruni and *Serving Crazy with Curry* by Amulya Malladi will be closely analyzed while a few selected works by other similarly placed migrant women writers will be referred to. I will be engaging with feminist critics working on matrilineal genealogies, theories on migration and Homeland and would also look at the possibility of a queer reading of kinships and connections integral to the South Asian diasporic narratives.

Findings and Discussions

Handing down recipes and other things: the politics of inheriting culinary traditions

This sense of cultural succession through a matrilineal line is depicted clearly in *The Mistress of Spices* by Chitra Bannerjee Divakaruni. The writer creates a setting in which ancient knowledge about spices and magic is passed on to young women, budding “spice mistresses” by the “Old One” an archetypal mother figure. The novices are seen to learn and train in their art in an unknown, mysterious island, which if we go by the description Divakaruni provides us with defies and transcends boundaries of location and time: “If you ask me how long I lived on the island, I cannot tell you, for time took on a different meaning in that place”. The island also refuses to be located in geological or historical terms: “the island has been there forever ... the Old One also. Even we who saw the mountains grow from buds of rock . . . do not know their beginning” (Divakaruni, *The Mistress of Spices*, 1997, p. 24) .

References to Tilo and the other students as the old one’s “daughters” evoke a sense of a matrilineal community. Portraying a line of continuity through which knowledge has passed on, Divakaruni traces the origins of the line to spring from a “grandmother” as opposed to a male or patriarchal source; “The old rules which keep the world in its frail balance, which have

been there forever, before me, before the other Old Ones, before even the grandmother" (Divakaruni, *The Mistress of Spices*, 1997, p. 148). In fact, this form of succession could also be understood in the light of Rajayashree Khushu -Lahiri's and Shwetha Rao's reading of the oral-based transfer of knowledge depicted in Divakaruni's *The Mistress of Spices*, where knowledge and skills are passed on from woman to woman. (Lahiri, 2012) Khushu-Lahiri and Rao see this to constitute an alternative to the strictly male system of *Gurukul*, where knowledge is passed on from men to men in a male-only enclosure. (Lahiri, 2012) The "daughters" in turn are seen to perpetuate the Old One's legacy in their respective diasporic location through the spices and other cultural artifacts they dispense to other Indian women residing in the diaspora. Not unlike many diasporic daughters seeking to create food which tastes 'as mother made it', the knowledge/power associated with the spices from its mystical source, the "Old One's" island, is transmitted to the domestic sphere of the Indian migrant kitchen; "but here is another image. A woman in a kitchen, cooking my rice. . . . Is she one, is she many, is she not the woman in a hundred Indian homes who is sprinkling, over sweet kheer that has simmered all afternoon, cardamom seeds from my shop for the dreams that keep us from going mad" (Divakaruni, *The Mistress of Spices*, 1997, p. 64)?

Amulya Malladi in "Serving Crazy with Curry" (from now on *Serving Crazy*) also deals with a mother's traits being passed along a matrilineal line of descent in a diasporic context. This time the focus is strictly on culinary accomplishments. Devi's sudden and hitherto unknown passion for cooking after her thwarted suicide attempt puzzles all her family members. Her uncharacteristically creative cooking is ascribed to many factors, a bout of insanity or a healing mechanism to deal with her trauma. However, Devi in a moment of self-realization understands that she "inherited" her culinary skills, albeit in an almost unconscious manner, from her mother. Having never shown any respect for Saroj's identity as a traditional home-maker Devi begins to appreciate anew the mother's "genes" in her as a powerful factor enabling her to deploy

her creativity in an influential manner; “she who has never cooked, never been part of the kitchen militia, was a general now. She loved it. And she realized that she owed her culinary epiphany to her mother” (Malladi, *Serving Crazy With Curry*, 2004). The sense of continuity is evident in the following lines; “even now as Devi started to pick out the spices . . . her fingers automatically went through the ingredients she had seen her mother pickup” (Malladi, *Serving Crazy With Curry*, 2004, p. 133)

It is interesting that she begins to appreciate the mother as the source of her skills at the same time that she discovers the power cooking and serving offers women. Shari Daya sees the cooking scenes in the novel subverting notions of Indian femininity, tradition and domesticity. Daya points out that “Devi turns the traditionally feminine, subservient practice of feeding others into an act of violence” (Daya, 2010, p. 485). She further states, “as with Margaret and Akhila, food is clearly an expression of frustration at the equation between traditional ‘proper’ Indian femininity and sexual oppression and repression, with the added complexity of her second generation identity” (Daya, 2010, p. 485). The fact that Devi acknowledges her mother as the source from which her culinary instincts (which in turn enable her to claim an amount of subjectivity and power) spring can be seen to echo a womanist notion of a mother-daughter lineage as envisaged by Alice Walker (1984) in her *In Search of Our Mother’s Gardens*, Walker observes: “yet so many of the stories that I write, that we all write are our mother’s stories. Only recently did I fully realize this. that through years of listening to my mother’s stories of her life, I have absorbed not only these stories themselves, but something of the manner in which she spoke, something of the urgency that involves the knowledge that her stories –like her life– must be recorded”. (Walker, 1984, p. 407)

It is possible to read Devi’s appreciative acknowledgment of her “ordinary” mother in the light of Walker’s comment given above; “no matter how much she resented her mother’s interference in her life, now she was starting to realize that every part of her life was touched in some way or the other by Saroj . . . pesky, annoying Saroj, . . . a woman with no career and no self-respect, a doormat, had given her so much (Malladi, *Serving Crazy With*

Curry, 2004, p. 135). Both Devi in *Serving Crazy* and Tilo in *The Mistress of Spices* are seen then, to perpetuate the cultural traditions of their "mothers" in the diasporic setting by cooking and performing magic respectively.

This pattern is also discernible in many other popular works by migrant women writers, some of which I will briefly mention before moving on to the implications of these patterns. In Preeti Nair's *100 Shades of White* the protagonist's mother's cooking and later her pickle- making is deeply influenced by the grandmother's presence and memory. In *Haunting Jasmine* by Anjali Bannerjee the protagonist is seen to inherit her aunt's powers to communicate with ghosts. (Bannerjee, 2011) In *The Queen of Dreams*, yet another novel by Divakaruni the grandmother's ability to interpret dreams is inherited by the granddaughter. (Divakaruni, 2004) Roma Tearne's *Bone China* also reflects this pattern, where the grandmother's looks and personality and her culinary skills are replicated in her granddaughter and daughter-in-law. In Yasmine Gooneratne's *A Change of Skies* (Gooneratne, 1991) the expatriate daughter Jean constantly refers back to her mother's, mother-in-law's and grandmother's skills and advice in the domestic sphere.

Taking into account several nationalist discourses which link motherhood (Narayan, 1997) and the nation together it is possible to see this 'perpetuation of the mother' as a desire to bring a part of the homeland into the diasporic setting reinforcing once more the position of women as creators of nostalgia and preservers of cultural traditions. However, the question of what exactly is taken forward or carried on in a process of intergenerational and intercontinental succession remains. Generally speaking, the carrying forward of a mother's skills or a mother's traits is seen as a "positive" factor which brings comfort and nostalgic pleasure to the diasporic subjects, both men and women. The notion that one's bonds with a mother are not completely severed, and that 'she lives in us' is often seen to add a sense of security and an assurance of continuity to their lives. However, are the mother's

skills and her traits ‘inherited’ or ‘reproduced’ as they are, without any mediation or alteration? One must go back to the texts concerned to determine this.

In *The Mistress of Spices* (1997) as shown in the previous chapter the mother figure, ‘the Old One’ keeps a strict vigilance over the activities of her representative Tilo with the help of a strict code of conduct and the spices in the store which act as her accomplices. Like other native mothers from more “realist” fiction, “the Old One” literally seeks to establish her claim on “her daughters” chiefly through the domestic sphere, through the artifacts of the culinary art. Yet Tilo is seen constantly to question the status-quo, and at several instances she directly transgresses the First Mother’s orders when carrying out her duties. Her transgressions are seen to have a considerable impact on the way she dispenses her cures among her immigrant clientele. Portrayed as an imaginative woman constantly craving more autonomy than is granted by her First Mother she basically rewrites the “usual” cures taught and sanctioned by her. Refusing to play the part of a selfless, passionless preserver of Indianness (Divakaruni, 1997, p. 71) she reinvents and recreates both the prescribed cures and the laws of conduct governing a mistress’ life. She ventures out of the store to help troubled customers, buys and wears American clothing, interacts with non-Indian customers including African Americans and the Native Indian American Raven with whom she later has a sexual relationship.

We see this type of transgression in the cuisine of Devi in *Serving Crazy* (Malladi, 2004) although she does acknowledge that she is carrying forward her mother’s skill in cooking. Devi too like Tilo displays a disregard towards the mother’s strict rules regarding what is acceptable as authentic Indian food as shown in; “‘why can’t we add parsley in the *dal*?’” Devi would ask. “‘Because Indians don’t use parsley, only coriander’”, Saroj would say’ (Malladi, *Serving Crazy With Curry*, 2004, p. 19) and in “‘You can eat all the nonsense you like outside this house, in here, I will only make *good* Indian food” (Malladi, *Serving Crazy With Curry*, 2004, p. 90).

Interestingly, Devi starts her cooking career after her suicide attempt when her emotions are seen to be "unstable". Her initiation to the rarely visited mother's kitchen starts on a note of violence and disruption. Devi's frustration with her own life encompasses her anger with her mother:

Damn her mother, always cooking the same old food. First she saves her life, and then she cooks boring food. Unexplained anger bubbled through Devi as she let her hands fly over spices and vegetables while Saroj watched, in wide-eyed horror, as her fridge and spice cabinet went from neat and tidy to something completely the opposite.

(Malladi, *Serving Crazy With Curry*, 2004, p. 77)

Thus, the results of Devi's cuisine are shown to be outrageous and unpredictable, in the same vein that Tilo's ministrations which violate her first mother's rules also produce unexpected, even violent results. The spices (invested of a life of their own) warn her of impending danger when she reworks an ingredient in a customer's cure; "*Tilo you should not have played with forces beyond your understanding, the destruction you have set in motion will touch every life around you. The entire city will shake with it* [emphasis in original]" (Divakaruni, *The Mistress of Spices*, 1997, p. 307).

Saroj's rigid "strictly Indian" recipes are thus "transformed" in Devi, her daughter's hands. The food Devi creates is invested with more modern, hybridized and cosmopolitan traits; "Devi made a ginger, apricot, and mint chutney, along with a good amount of chipotle chili peppers found in a bottle . . . the end result was a fiery, smoky, tangy concoction that beat the pants off of Saroj's mint chutney" (Malladi, *Serving Crazy With Curry*, 2004, p. 72). Often the merging of American and Indian ingredients is seen to symbolize Devi's hybrid identity and probably her more successful assimilation into America.

The nature of the fusion emanating from Devi's food imagines much more than a simple union of white Americanness merging with Indianness. Anita Mannur (2010) comments on the complex notion of hybridity that involves merging with other ethnic or minority food traditions which is reflected in *Serving Crazy*. According to her; "Devi's culinary repertoire reimagines fusion, not as a transaction between groups of color but as a strategy that would reverse the direction of fusion" (Mannur, 2010, p. 214) . Mannur further points out that:

more often than not the best-selling fusion cuisine cookbooks in the United States allow for a combination of white and Asian, but implicitly disallow fusion between other "colors" or races. The difficulty of imagining Black-Asian fusion cuisine in the cookbook market suggests that in many cases, fusion is acceptable only when it incorporates cultural markers of whiteness. (Mannur, 2010, p. 214)

Devi's defiant incorporation of American and more importantly, Black and ethnic ingredients into Indian cuisine shock her mother in the same way her liaisons, sexual or otherwise with other minority groups appall her: "everyone heard of that one. Devi Veturi was dating a black hippie with dreadlocks and was seen kissing him outside some Indian restaurant in Fremont. Saroj was furious" (Malladi, *Serving Crazy With Curry*, 2004, p. 157). Tilo's transgression of the First Mother's dictum "Help your kind only" (Divakaruni, *The Mistress of Spices*, 1997, p. 70) also involves forming links with other ethnic/minority groups at times through the sharing/ exchange of food.

Conclusions

Both Devi's and Tilo's rebellious acts involving culinary items and cooking can be seen as a protest against firstly, the nationalist, patriarchal forces that confine the migrant woman's role to that of an agent of nostalgia and secondly against an American (especially White) notion of a seamless assimilation of migrants into the American (white) mainstream culture as "model minority"

subjects. (Inkelas, 2006) These transgressions from the normative, accepted White-Asian duality in diasporic cultures also point at a possibility of a queer reading. As David.L Eng points out, a queer reading of diasporic culture draws our attention to relationships, subjectivities and "other relations of affect and desire dissonant to traditional conceptions of diaspora." (Eng, 2010, p. 14)

What most critics have not considered however, is the disruption or the violence inflicted on the mother's presence in the course of a daughter's assimilation into the more cosmopolitan, hybridized culinary domain. Anita Mannur (2010) dwells on the tendency to modulate Indian excesses in fusion cooking, suppressing the "excesses" such as oiliness, greasiness and fieriness to suit the western palate. I would like to hypothesize that suppressing the "excesses" resonates closely with the suppression of the "mother presence" in the daughter's diasporic and culinary ventures. In *The Mango Season* (2003), another novel by Malladi, a telling instance where excess is inscribed in no other place than the mother's body is captured in these lines:

Her face, along with the rest of her body, had puffed up and any remnants of beauty were submerged by obesity. Ma blamed her weight problem on birth control pills. They did the damage, she would accuse, as if eating mountains of white rice with lots of fat smeared on it was not responsible for the abundance of fat tissue in her body. (Malladi, *The Mango Season*, 2003, pp. 29-30)

In a forthcoming paper titled *Mother - Goddess or Control Freak? The Maternal Presence In Diasporic Women's Lives* (Ranaweera, 2021 forthcoming) I examine in further detail how the mother presence from home has the potential to be nurturing as well as violent and destructive especially with relation to the culinary arts. Although the possibility of a psychoanalytic reading in which the oedipal rupture from mother figures necessitates the

progression of the diasporic daughters is aligned with my premises, I am aware that other more recent critical developments, such as the discourse surrounding the queer diaspora, question and complicate matters related to mothering and diaspora. As Eng puts it in *The feeling of Kinship: Queer Liberalism and the Racialization of intimacy*, a queer reading of diasporic lives “forces us to imagine an alternative sphere of family and kinship relations lived outside the sanctioned boundaries of the Oedipus complex and incest taboo.” (Eng, 2010, p. 19)

It is significantly the mother’s dictums that Tilo bends in order to serve a more cosmopolitan (and not exclusively Indian) clientele. (Divakaruni, 1997) It is mainly the frustration with the “same old boring” (Malladi, *Serving Crazy With Curry*, 2004, p. 77) mother’s Indian food that propels Devi to engage in a more global approach to cooking which constantly substitutes the mother’s ingredients with other more international ones. They may have inherited the art of healing/cooking from their mothers, but to advance themselves and to survive in the diasporic setting they constantly “rewrite” their mother’s recipes. Saroj, after her daughter’s descent into the kitchen finds herself ousted from it and the First Mother upon learning of Tilo’s disobedience gradually “fades away” from the narrative, literally shrinking in size and looking older and weaker (Divakaruni, *The Mistress of Spices*, 1997, p. 250). It is hinted that Tilo’s reworking of the cures of the spices is somehow responsible for the First Mother’s decline. This interesting duality rendered by the kitchen as both private and public sphere(s) recalls premises upheld by critics that Divakaruni’s and Malladi’s writing demonstrates a post-feminist concern about the integration of public and private spaces. (Singh and Goswami 2019) (Jayshree Singh, 2019)

For Tilo in *The Mistress of Spices*, rupture with her First Mother is quite painful. Tilo’s act of “editing” the mother’s cures and especially her increasing interactions with the outer American world with its multiple communities diminish the mother-presence in her life. The result is a spice mistress who is willing to share her skills not just with the Indian community, but is ready to “go global.” She will wear American clothes, eat American food and engage in rituals signifying her entry into the American

consumer culture. Although Divakaruni is careful to trace Tilo's path as that of a woman battling racism and resisting nationalist pressures by venturing out of the confines of her spice store, the implication that Tilo will start employing her spice mistress skills in a more global setting are there (Divakaruni, *The Mistress of Spices*, 1997, pp. 335-338). Devi too in *Serving Crazy* rewrites her mother's exclusively Indian recipes and the resulting fusion dishes can be argued to represent her more cosmopolitan, globalized outlook earning her a chance to study culinary arts professionally in an American or British school. Similarly, to quote a few brief examples from works by other migrant writers; Nalini who owes her pickling skills to her mother in *100 Shades of White* opens a pickle business to serve a growing clientele in London. There are several instances in Roma Tearne's *Bone China* where altered versions of the grandmother's recipes are served and eaten in a diasporic setting. In Gooneratne's *A Change of Skies* Jean who used to seek her mother's and grandmother's guidance in her culinary endeavors in her early days as a migrant Sri Lankan living in Australia later opens up her own restaurant which specializes in fusion food in Australia.

These younger women seem to stress the need to assimilate themselves into the mainstream culture by altering and sometimes deemphasizing the mother presence in their lives. Responding often to a pressure to assimilate into the host culture that Anita Mannur points out is a defining characteristic of many young expatriates (Mannur, 2010, p. 187), they often subdue or erase all traces of their mother "in" them. This pressure to conform can be linked to what critics have termed as the "model minority myth" (Inkelas, 2006) and is discernible at many levels in many works of South Asian women writers. Therefore, the lineage or the mother-to-daughter succession as envisaged by Feminist thinkers appears to be negotiated by a global appeal or a tendency to "standardize" as far as diasporic culinary fiction is concerned. In a previous study I have observed further how these fictional mother figures and their culinary legacies stand in

conflict with the global consumerist trends of the countries where their daughters reside (Ranaweera, 2018)

Alleviating this pressure in the works of many diasporic writers seem to amount, I maintain, to an erasure or suppression of the mother-presence in the lives of their fictional characters. The shedding of “migrant excess” that Mannur argues is reflected in streamlining migrant cooking for the western palate, and in streamlining migrant *lives* to suit mainstream White America is, I contend, a shedding of the mother –presence which is portrayed as volatile, excessive and even violent in the lives of these fictional diasporic women. Taking this line of conjecture further, one might want to explore how mother figures in diasporic situations are essentially racialized when they are deemed excessive or “moderate enough”. (Eng, 2010, p. 21)

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Development of Mononuclear (Arene)Ruthenium Complexes as Anticancer Agents: A Review

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Abstract

(Arene)ruthenium complexes have displayed promising activity against cancer and showed fewer side effects compared to platinum-based drugs. Activity tuning of arene complexes have been explored by varying, amines, phosphines and other N^N, N^O, N^S, N^C, S^O chelating ligands. (Arene)Ru(II) complexes of the type $[(\eta^6\text{-arene})\text{Ru}(\text{X})(\text{Y})(\text{Z})]$, $[(\eta^6\text{-arene})\text{Ru}(\text{L})(\text{X})(\text{Y})]$, $[(\eta^6\text{-arene})\text{Ru}(\text{L}^{\wedge}\text{L})\text{X}]\text{Y}$ and $[(\eta^6\text{-arene})\text{Ru}(\text{L}^{\wedge}\text{X})(\text{Y})]$, where arene = cymene (**C**), benzene (**B**), toluene (**T**), hexamethylbenzene (**H**); L = amine, phosphine; L[^]L = en, diamine, diphosphine, (X[^]Y) = oxalate, (L[^]X) = acylacetonate; and (X), (Y) = halides, triflates *etc.* exhibit a high structural variety, and offer much potential in drug design. In this review, an overview of the progress in the field of mononuclear ruthenium complexes containing arenes and other co-ligands such as, PTA (1,3,5-triaza-7-phosphaadamantane), ethylenediamine (en), phosphines, thiosemicarbazone, acylthiourea and their bioactivity is presented.

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Keywords: (Arene)ruthenium complexes, Anticancer agents, metallodrugs, Cytotoxicity, Platinum complexes, Bioactivity

Introduction

Cancer is one of the leading causes of death around the world (Acharya et al., 2021), ranking second for economically developed countries, and the third for developing countries (Süss-Fink, 2010). As a consequence of the development of anticancer drugs, rates of survival for cancer in females and males have shown a steady decrease since 1970 and 1985, respectively (Haberland et al., 2010). All credits go to the scientists for introducing efficient anticancer drugs, which made a visible contribution towards treating cancers. The discovery of cisplatin (**1**) which inhibits antitumoral properties marked the beginning of a new era of metal-based anticancer research. Platinum-based complexes like, carboplatin (**2**), oxaliplatin (**3**) (Figure 1) were also discovered later, which had significant influence on the field of metal based anticancer drugs.

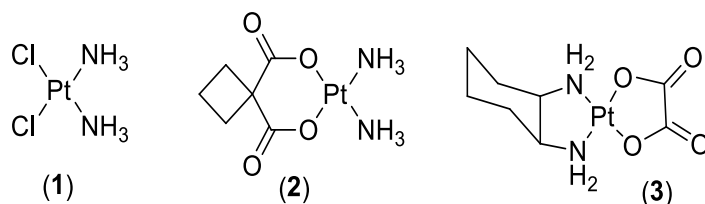


Figure 1. First examples of Pt(II) complexes approved for clinical use in cancer treatment

Evolution of metal-based anticancer drugs

In the investigation on anticancer drugs, in 1931, Collier and Krauss studied the effect of inorganic metal salts and complexes on anticancer activity (Collier & Krauss, 1931). About 40 years later, in 1969, Rosenberg claimed platinum-based complexes as a new class of potent antitumor agents because cisplatin, [PtCl₂(en)], *cis*-[PtCl₄(NH₃)₂] and [PtCl₄(en)] demonstrated antineoplastic effects (Rosenberg, 1973). In 1978, cisplatin was clinically approved as an anticancer drug after Pascoe and Roberts confirmed that the cellular target of cisplatin is DNA (Pascoe & Roberts, 1974). Cisplatin presented an immense potential as an anticancer drug by demonstrating its antitumor activity for several tumour types. But it showed severe side effects

such as neurotoxicity (nerve damage), alopecia (hair loss), vomiting, nephrotoxicity (kidney damage), drug resistance, bone marrow suppression, ototoxicity (loss of high frequency hearing) and vomiting when it was combined with chemotherapy (Prestayko, 1979; Lazarević et al., 2017; Allardyce et al., 2016; Zhao et al., 2019).

Generations of platinum anticancer drugs

Cisplatin, $[\text{PtCl}_2(\text{en})]$, *cis*- $[\text{PtCl}_4(\text{NH}_3)_2]$ and $[\text{PtCl}_4(\text{en})]$ belong to the first generation of anticancer drugs, which are platinum complexes containing chloride ligands; the binding of these platinum complexes takes place replacing chloride ligands. In the second generation of anticancer drugs, the chloride ligand was replaced by different ligands as in carboplatin (**2**) and $[\text{Pt}(\text{C}_2\text{O}_4)(\text{NH}_3)_2]$. In 1992, carboplatin (**2**) was introduced to the market and it showed less side effects than cisplatin due to its reduced neurotoxicity and nephrotoxicity (Lokich & Anderson, 1998). Though cisplatin showed low cytotoxicity in colorectal and breast tumors (Keppler et al., 1990), the third generation Pt(II) complex, oxaliplatin (**3**), was able to treat colon cancer liver metastases (Ono et al., 2012).

Ruthenium complexes with anticancer properties

In the search of anticancer agents containing metals other than platinum, the most promising one was found to be ruthenium. Ruthenium and osmium metallodrugs were originally designed to mimic the action of platinum in which, DNA was considered to be the primary target (Pragti et al., 2021). However, this perspective changed considerably during the last decade, because it was experimentally proven that ruthenium based anticancer drugs showed high potential as cytotoxic and cytostatic drugs which followed novel action mechanisms. One of the crucial factors that affects the anticancer activity of metal complexes is the ligand exchange kinetics in aqueous solutions. It varies in different metal cations (rates in the range of 10^{-6} to 10^8 s^{-1}). It was found that the rates of ligand exchange in ruthenium and platinum complexes are in the same range of 10^{-3} to 10^{-2} s^{-1} (Ranade, 2007). Therefore, ruthenium is considered to be a desirable alternative to platinum, as it mimics iron, which plays an active role in the physiological functions of the human body.

Remarkable features of ruthenium(II) centers are: (i) ruthenium and iron are biologically similar, (ii) they are in the Group 8, (iii) they have similar characteristics and many ruthenium complexes are not toxic, and (iv) they are quite selective of cancer cells, which is due to the ability of ruthenium to imitate iron in binding with biomolecules (Allardyce & Dyson, 2001).

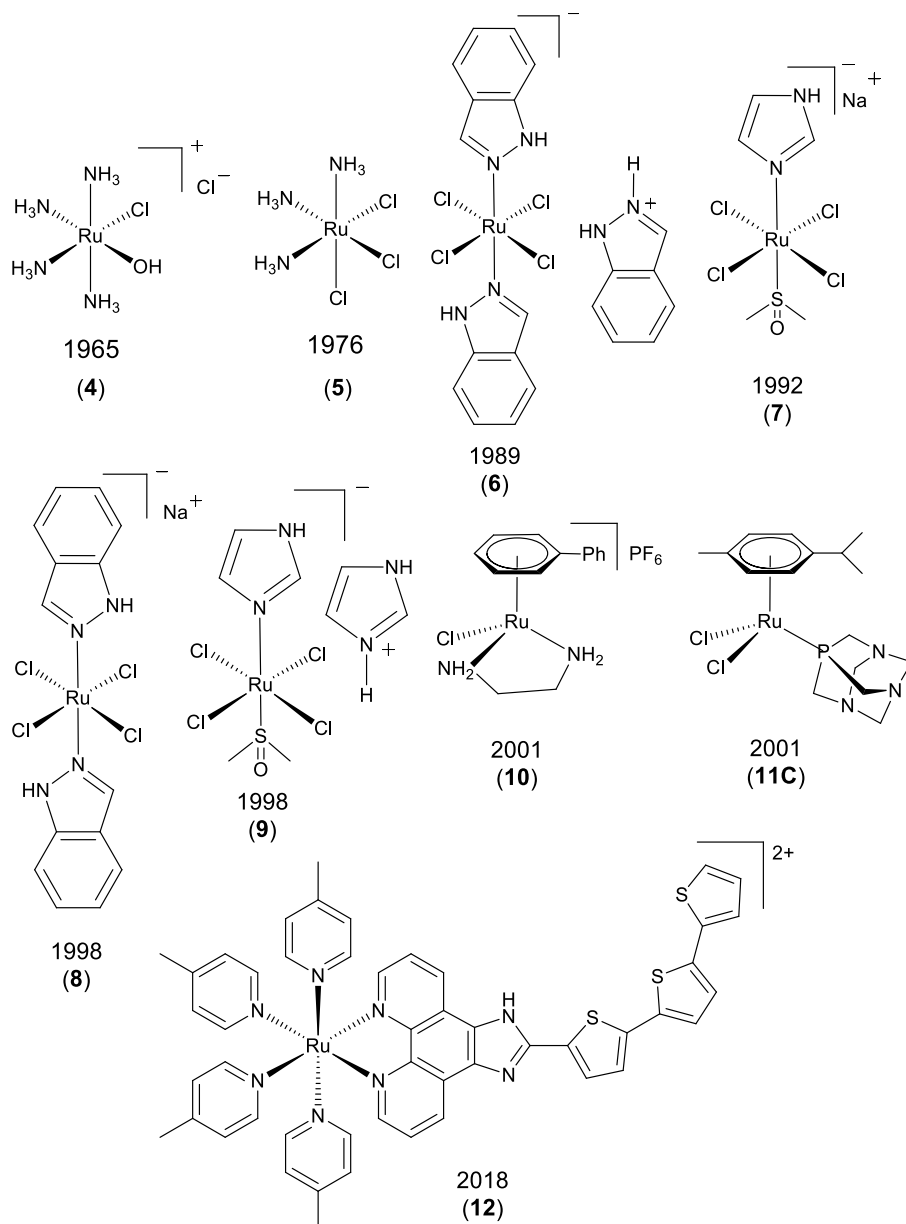


Figure 2. Timeline of discoveries of Ru-based anticancer drugs

Because of this ability, ruthenium complexes have been able to take the advantage of a human body's power to efficiently uptake and transport iron. Therefore, by imitating iron, ruthenium also has the ability to bind to transferrin and serum albumin proteins and transport within the body. Overexpression of transferrin receptors around cancer cells leads to an increased demand of iron. Hence, ruthenium based drugs can be delivered with high efficiency to the target cancer cells (Sava et al., 2011).

The ruthenium-arene unit has amphiphilic properties, because the arene unit is relatively hydrophobic, and that effect is counterbalanced by the metal centre which is relatively hydrophilic. The synthetic diversity provided by the arene ligand makes it an excellent scaffold for targeted chemotherapy (Dyson, 2007).

Evolution of ruthenium based anticancer drugs

Chloro-ammine complexes of ruthenium were the first to be studied as anticancer agents in a similar manner to well-known platinum complexes (**1**) - (**3**) (Figure 1).

In 1965, the ruthenium complex $[\text{Ru}(\text{NH}_3)_4\text{Cl}(\text{OH})]\text{Cl}$ (**4**) (Figure 2) was used in initial investigations owing to its structural resemblance to Pt(IV) analogues. *fac*- $[\text{RuCl}_3(\text{NH}_3)_3]$ (**5**) showed induced-filamentous growth in *E.coli* which resembled cisplatin (Durig et al., 1976). Inert Ru(III) complexes were activated by reduction into the labile Ru(II) species inside the cellular surrounding (Kelman, Clarke, & Edmonds, 1976). The reduction of ruthenium diminished the π -acceptor property of the metal, which lead to the increased labiality of the chloride ligand, by facilitating hydrolysis, leading to activation. After that, they reacted with DNA, which paved the path for the anticancer activity.

After the discovery of the drugs featuring: (i) indazole (Ind) ligand *e.g.*, *trans*- $[\text{RuCl}_4(\text{Ind})_2][\text{IndH}]$, KP1019, (**6**); *trans*- $[\text{RuCl}_4(\text{Ind})_2]\text{Na}$, IT-139 (**8**); and (ii) imidazole (Im) ligand $[\text{RuCl}_4(\text{DMSO})(\text{Im})]\text{Na}$, NAMI (**7**); $[\text{RuCl}_4(\text{DMSO})(\text{Im})]\text{H}$, NAMI-A (**9**) (DMSO = dimethylsulfoxide) which were subjected to clinical development, a new era of ruthenium-based anticancer drugs was born (Hartinger et al., 2006; Kenny & Marmion, 2019).

The complex (**7**) has undergone active clinical development and delivered phase I data which showed distinct anticancer activity (Fuereder & Berger, 2017). In 2001 [Ru(biphenyl)Cl(en)]⁺ RM175 (**10**) was introduced by Sadler as a novel anticancer agent (Sadler et al., 2005) which was a diamine-based Ru(II) arene complex with a chloride leaving group. This agent was said to yield high efficiency against human ovarian cancer (Iida et al., 2016). The anticancer drug (**11C**) was introduced by Dyson, and was particularly investigated as an antimetastatic agent (Dyson et al., 2001; Meier-Menches et al., 2018). In 2018, a novel Ru(II) complex, TLD 1433 (**12**) (Thota et al., 2018) completed its phase I trial for bladder cancer. This complex (**12**) is undergoing phase 1 and phase 2a clinical trials for non-muscle invasive bladder cancer treatment *via* photodynamic therapy (PDT) (Thota et al., 2018; Kar et al., 2020; Smithen et al., 2017; Balaji et al., 2020; J. Liu et al., 2019). Other clinically approved ruthenium arene complexes such as [(η⁶-flu)Ru(en)Cl]⁺, (AH54, flu = fluorene) and [(η⁶-dihyphen)Ru(en)Cl]⁺, (AH63, dihyphen = 9,10-dihydro-phenanthrene) are utilized in radio sensitization of human colorectal cancer cells (Moharana et al., 2021; Carter et al., 2016).

Synthesis of (arene)Ru(II) complexes

Various (arene)ruthenium(II) complexes [(η⁶-arene)Ru(L)(X)(Y)], [(η⁶-arene)Ru(L[^]L)X]Y and [(η⁶-arene)Ru(L[^]X)(Y)] are known, where arene = cymene (**C**), benzene (**B**), toluene (**T**), hexamethylbenzene (**H**); L = amine, phosphine; L[^]L = en, diamine, diphosphine, (X[^]Y) = oxalate, (L[^]X) = acylacetonate; and (X), (Y) = halides, triflate *etc.* They were prepared by using (arene)ruthenium(II) dimers such as [(η⁶-C₆H₆)RuCl(μ-Cl)]₂ (**13**), [(η⁶-cymene)RuCl(μ-Cl)]₂ (**14**) and [(η⁶-toluene)RuCl(μ-Cl)]₂ as the starting materials (Perera, 2007; Perera, 2021) (Figure 3).

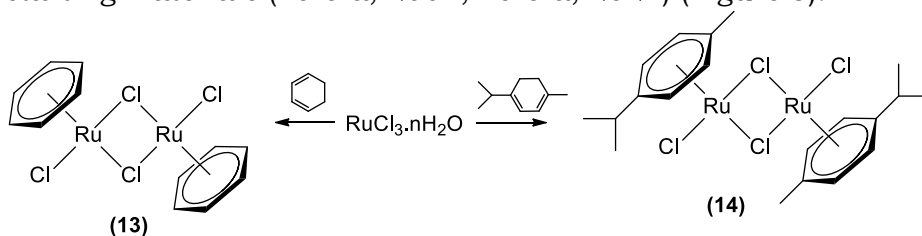


Figure 3. Synthesis of starting material [(arene)RuCl(μ-Cl)]₂

A large number of synthetic routes have been developed for (arene)Ru(II) complexes with many different monodentate, bidentate and tridentate ligands. Simple monodentate amines (NR_3) react with $[(\text{arene})\text{RuCl}_2]_2$ dimers to give neutral complexes such as $[(\text{arene})\text{RuCl}_2(\text{NR}_3)]$. For example, by using **(13)**, the neutral complex $[(\eta^6\text{-C}_6\text{H}_6)\text{RuCl}_2(\text{NH}_2\text{C}_6\text{H}_4\text{Me})]$ **(15)** and disubstituted salt **(16)** can be obtained (Figure 4) (Bates & Begley, 1990).

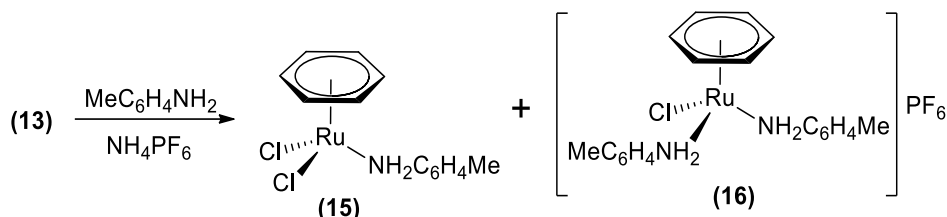


Figure 4. Preparation of (benzene)Ru(II) complexes with amines

Many phosphine complexes of the general formula $[(\eta^6\text{-arene})\text{RuCl}_2(\text{phosphine})]$ are known (Biancalana et al., 2017). For example, a series of $[(\eta^6\text{-arene})\text{RuCl}_2(\text{PTA})]$ **(11C/B/T/H)** were obtained by adding PTA ($\text{L}^1 = 1,3,5\text{-triaza-7-phosphaadamantane}$) to the corresponding precursor $[(\eta^6\text{-arene})\text{RuCl}_2]_2$, and thereby splitting the chloride bridge of the dimer (Figure 5) (Weiss et al., 2014).

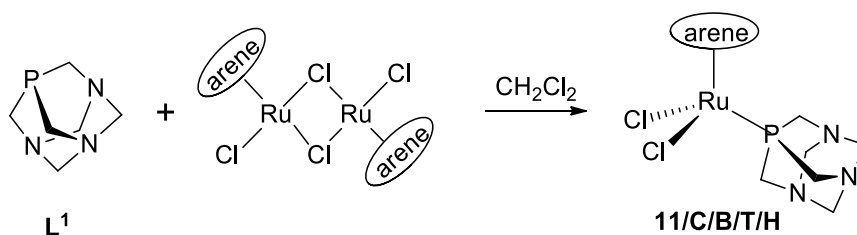


Figure 5. Synthesis of $[(\eta^6\text{-arene})\text{RuCl}_2(\text{PTA})]$ **(11C/B/T/H)**
 {arene = *p*-cymene (**C**), benzene (**B**), toluene (**T**) or hexamethylbenzene (**H**)}

A mixture consisting of starting materials $[(\eta^6\text{-arene})\text{RuCl}_2]_2$ and ($\text{L}^2\text{-L}^4$) was allowed to react at room temperature to produce neutral (arene)Ru(II) benzhydrazone complexes **(17)** containing anionic chelating ligand (N^-O^-) (Figure 6) (Subarkhan & Ramesh, 2016).

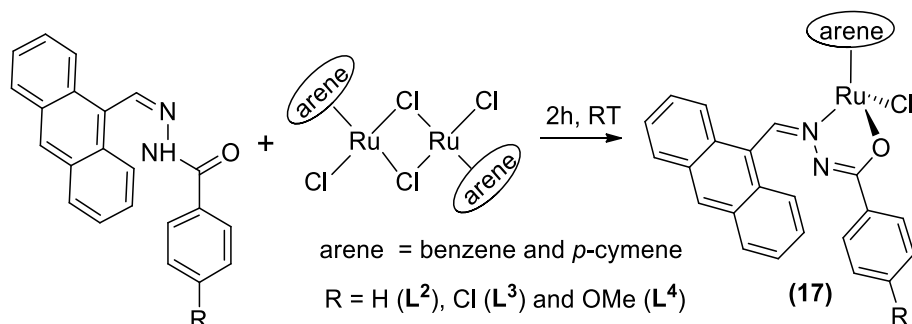


Figure 6. Synthesis of (arene)Ru(II) benzhydrazone complexes

The neutral Ru(II) complex $[\text{Ru}(\eta^6\text{-toluene})(\text{dppz})\text{Cl}]\text{PF}_6$ (**18**) containing a N^{^N} bidentate ligand was obtained by adding a solution of dipyridophenazine (dppz) (**L**⁵) to a suspension of $[(\eta^6\text{-toluene})\text{RuCl}_2]_2$ and NH_4PF_6 in methanol (Nikolić et al., 2019) (Figure 7).

As shown in Figure 7, (arene)Ru(II) complexes of the type $[(\text{arene})\text{Ru}(\text{N}^{\wedge}\text{N})\text{X}]\text{Y}$, $[(\text{arene})\text{Ru}(\text{N}^{\wedge}\text{O})\text{X}]\text{Y}$, $[(\text{arene})\text{Ru}(\text{N}^{\wedge}\text{S})\text{X}]\text{Y}$, $[(\text{arene})\text{Ru}(\text{N}^{\wedge}\text{P})\text{X}]\text{Y}$ and $[(\text{arene})\text{Ru}(\text{O}^{\wedge}\text{O})\text{X}]$ have been prepared (Suss-Fink G, 2010).

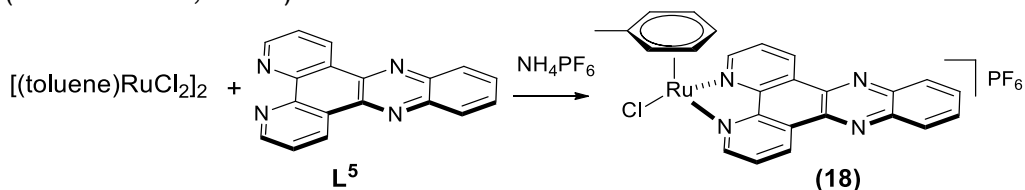


Figure 7. Synthesis of $[(\eta^6\text{-toluene})\text{Ru}(\text{dppz})\text{Cl}]\text{PF}_6$ (**18**)

Cytotoxicity of Ruthenium Complexes

Among the most investigated and advanced non-platinum anticancer metallodrugs are, ruthenium-based anticancer drugs, which have undergone considerable advances over the past two decades. Two representatives of ruthenium-based anticancer drugs are currently undergoing clinical trials, due to its high cytotoxic activity.

Indazole-based KP1019, KP1339 and IT-139 as anticancer agents

Ruthenium(III) complex, *trans*-[RuCl₄(Ind)₂][IndH] KP1019 (**6**) (Figure 2) was investigated for its activity using freshly explanted human tumour cells *in-vitro* (Depenbrock et al., 1997). Based on experimental data, the tumour specific activity and its mode of action were found to be controlled by the mechanism of substantial binding to serum proteins in blood (Clarke, 1989). When appropriate plasma levels were reached, (**6**) was able to achieve clinical activity against various tumour types. The sodium salt of (**6**), which is KP1339 is also under clinical trials (Sonkar et al., 2021). The ruthenium(III) complex, IT-139 (**8**) (Figure 2) has been used to treat cancer cells by targeting metastatic development in cancer patients (Lizardo et al., 2016), which was very effective in combination treatments and also as a single agent for carcinoid neuroendocrine tumours and colorectal cancer (Trondl et al., 2014).

Imidazole-based NAMI, NAMI-A and KP418 as anticancer agents

In 1975, [RuCl₂(DMSO)₄] was explored for induced filamentous growth in E.coli and was found to possess similar properties as cisplatin (Monti Bragadin et al., 1975). However, *trans*-[Ru^{II}Cl₄(DMSO)₂] displayed only a slight effect on primary tumors, but a significant reduction was shown in the volume of lung metastases (Pacor et al., 1991). The *trans*-[Ru^{III}Cl₄(DMSO)₂] complex was unstable in aqueous solution during hydrolysis, immediately liberating DMSO. Investigation of Ru(III) complexes with imidazole ligands lead to the discovery of Na[RuCl₄(DMSO)(HIm)] NAMI, (**7**) (Figure 2). The complex (**7**) containing both N and S donor ligands was found to be an anti-tumor metastasis inhibitor (Mestroni et al., 1993) due to : (i) the effective inhibition of spontaneous metastasis formation (ii) good solubility and (iii) higher stability. Additionally, the S donor displayed a strong kinetic *trans*-effect, resulting in an increment of lability of the ligands of (**7**) in biological media. The reduction of the metal occurred before the hydrolysis of (**7**), which could be catalysed by biological reductants (Mestroni et al., 1993). NAMI (**7**) was also investigated for its antitumor activity (Meier-Menches et al., 2018). *trans*-[RuCl₄(DMSO)(Im)][HIm] (NAMI-A (**9**) (Figure 2) displayed increased stability in air compared to (**7**), but both showed similar pharmacological effects (Pillozzi et al., 2014). Phase I studies of complex (**9**) was completed in 2004, and it was the first ruthenium based anticancer agent to enter clinical trials (Rademaker-Lakhai et al., 2004).

KP418, *i.e.* $trans$ -[RuCl₄(Im)₂][ImH], and **(6)** were shown to induce apoptosis through the mitochondrial pathway in the cell lines of SW480 (colorectal carcinoma) (Kapitza *et al.*, 2005). KP418, showed therapeutic activity against B16 melanoma and P388 leukaemia (Trondl *et al.*, 2014).

Cytotoxicity of (arene)ruthenium(II) complexes

The activity of arene ruthenium complexes can be identified based on many properties, but the main focus regarding the activity would be the cytotoxicity of these complexes, involving their antitumoral and antimetastatic properties. Cytotoxicity of ruthenium complexes with phosphines, amines, and other N^N, N^O, N^S, N^C, S^O chelating ligands are presented below.

PTA as a P donor ligand

Among the monodentate ligands used in (arene)ruthenium complexes, the PTA ligand (L¹) is one of the most widely employed. The anticancer activity of [(η⁶-arene)Ru(PTA)(X)(Y)] was studied by Dyson *et al.* by varying the arene, X and Y, where arene = cymene (**C**), benzene (**B**), toluene (**T**), hexamethylbenzene (**H**); X,Y = oxalate, acylacetone and halides *etc.* The complexes [(η⁶-arene)Ru(PTA)Cl₂] (**11**) (Figure 8) demonstrate very specific interactions with proteins compared to cisplatin (Scolaro *et al.*, 2005).

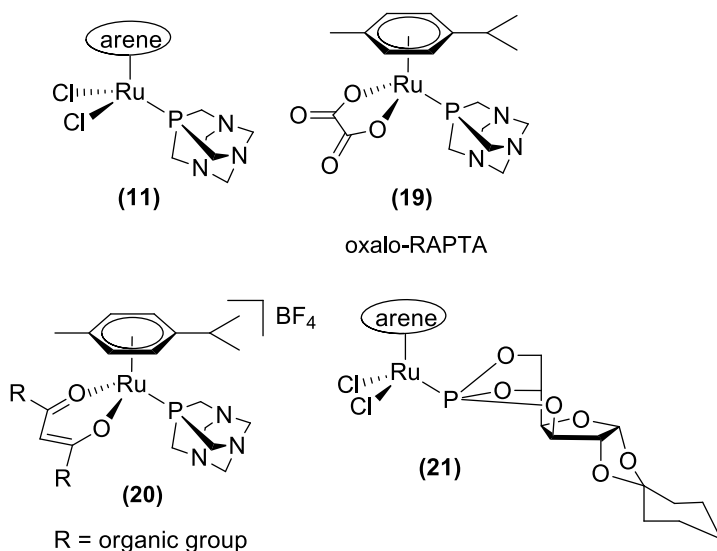


Figure 8. (Arene)Ru(II) complexes with P-donor ligands {arene = *p*-cymene (**C**), benzene (**B**), toluene (**T**) or hexamethylbenzene (**H**)}

Both RAPTA-C (**11C**) and RAPTA-B (**11B**) inhibited metastasis growth, and RAPTA-T (**11T**) and RAPTA-H (**11H**) displayed cytotoxicity (Nowak-Sliwinska et al., 2011). Two mechanisms were proposed to explain the effective hindrance of metastatic formation by (**11T**): (i) by the inhibition of detachment from the primary tumor and (ii) by the inhibition of re-adhesion to a new substrate. Both the above mechanisms were prominent in the MDA-MB-231 breast cancer model. Complexes (**11T**) and (**11C**) displayed anti-angiogenic properties as well (Portoghese, 1990). Variation of the anionic ligands of (**11C**) by replacing the chloro ligand with iodo, bromo and isocyanato ligands paved the way to new complexes which were able to show antimicrobial activity, but in contrast, antiviral activity was not seen (Allardyce et al., 2003). The second generation oxalo-RAPTA complex [(cymene)Ru(PTA)(O,O-C₂O₄)] (**19**) and the dikenato complex [(cymene)Ru(PTA)(O,O-R₂acac)]⁺ (**20**) (Figure 8) showed an increase of cytotoxicity due to the replacement of chloride ligands by the oxalate ligand (Wee et al., 2006).

The aquation of (**11C**) in water has been studied using NMR and UV-Vis spectroscopy (Scolaro et al., 2008), and it was determined that the activation step in the cytotoxicity is aquation. Suppression of hydrolysis was observed in the blood plasma, because of the high chloride concentration in blood plasma, approximately around 100 mM, but once the compound penetrated the cell cytoplasm, aquation was activated due to the sudden drop of chloride concentrations in the cell cytoplasm, allowing the labile aqua ligand to undergo substitution by biomolecules (Dyson, 2007).

The complexes (**19** and **20**) were resistant to hydrolysis, but also cytotoxic, presumably activated using a different mechanism which involved the slippage of the arene ring (Vock et al., 2008). RNA or DNA are generally considered as the drug targets inside the cancer cells, but serum proteins can also act as targets. RAPTA compounds are strong inhibitors of cathepsin B, and can slightly inhibit thioredoxin reductase as well (Ang et al., 2011). The complex (**11C**) has the ability to slow down cell division in cancer cells, and also to induce apoptosis. The primary target of

(**11C**) is presumed to be proteins instead DNA as proposed in platinum metallodrugs (Wu et al., 2008).

With Carbohydrate phosphine ligands

In order to tune and enhance the biological behaviour of drugs, a bioactive molecule can be incorporated to a metal complex. To perform that, various bioactive fragments within phosphine ligands have been used in the arene ruthenium frame (Biancalana et al., 2017). The cancer cell selectivity is provided by the carbohydrate fragment in the arene ruthenium complex against several cancer cell lines (Patra et al., 2016). The complexes (**21**) containing a carbohydrate-based ligand (Figure 8) showed intermediate anticancer activities, but they demonstrated lower cytotoxicity against nontumorigenic cells, which showed that it has cancer cell selectivity (Berger et al., 2008; Pelletier et al., 2010). By enhancing the lipophilicity of the carbohydrate moiety, the performance of this complex could be improved (Berger et al., 2008).

With monodentate phosphine ligands

Phosphine Complexes containing silicon-side groups with the general formula $[\text{Ru}(\text{cymene})\text{Cl}_2(\text{phosphine})]$ showed IC_{50} values which were in the same range as of cisplatin in human leukemia cancer cells (HL-60) (Aznar et al., 2013). Similarly, complexes with aminomethylphosphanes (**22**) $[\text{Ru}(\eta^6\text{-}p\text{-cymene})\text{Cl}_2(\text{PPh}_2\text{R})]$ (Figure 9) showed cytotoxic activities close to cisplatin against the MCF7 (human breast adenocarcinoma) and A549 (human lung adenocarcinoma) cell lines.

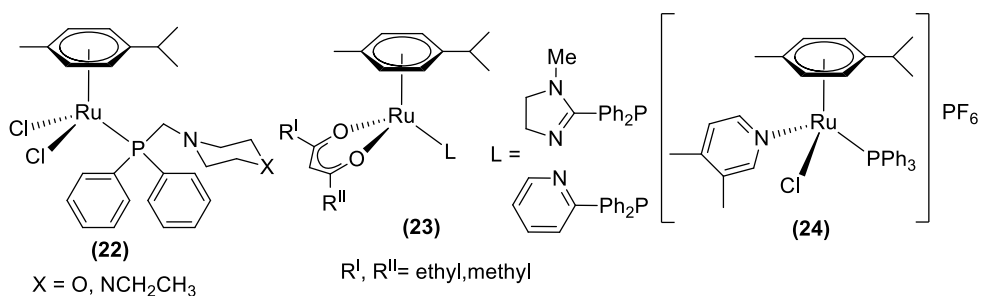


Figure 9. (Arene)Ru(II) complexes with P-donor ligands
Hydrophobicity enhancement of the ruthenium arene complex was observed with the introduction of a triphenylphosphine

ligand, which lead to increased cytotoxicity. Aminophosphine complexes with the general formula of $[\text{Ru}(\text{cymene})(\text{O},\text{O-acac})(\text{L})]$ in which (L = 2-pyridyl or imidazolyl phosphines) (**23**) showed better cytotoxicity *in vitro* against pancreatic cancer cell line (CAPAN-1) and breast cancer cell line (MCF-7) (Biancalana et al., 2017).

Cationic (arene)ruthenium complex (**24**) with both PPh_3 and 3,4-dimethylpyridine (Me_2py) ligands, $[\text{Ru}(\text{cymene})(\text{Me}_2\text{py})\text{Cl}(\text{PPh}_3)]^+$, demonstrated cytotoxicity comparable to that of cisplatin, against the human leukaemia tumour cell line (Biancalana et al., 2017). Ruthenium arene complexes with triphenylphosphine ligands showed enhanced ability to bind with DNA and changed its secondary and tertiary structures, in contrast to neutral complexes in which the PPh_3 ligand was absent, that could bind to DNA solely in a covalent manner (Sáez et al., 2014).

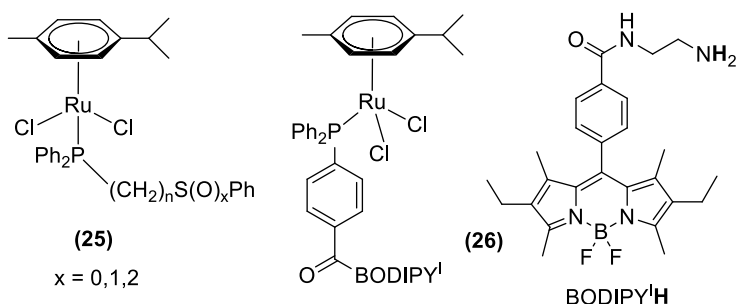


Figure 10. (Arene)Ru(II) complexes with bulky P-donor ligands

(Arene)ruthenium complexes with S-functionalized phosphine ligands (**25**) (Figure 10) showed cytotoxicity in the cancer cell lines 8505C, SW480, 518A2, MCF-7 and A253 (Biancalana et al., 2017).

The R group of PPh_2R ligands has a variety of roles which includes its employment as a scaffold for tethering specific functionalities to the ruthenium center. The (arene)ruthenium complex tethered to BODIPY to the phosphino moiety *via* an amide bond (**26**) is highly florescent (Bertrand et al., 2018).

With monodentate N donor ligands

(Arene)ruthenium complexes of the type **(27)** had the ability to induce cell death through inhibition of DNA synthesis. In comparison to the free anthracene-based ligand, the uptake and the accumulation of the complex in the cells was accelerated (Vock et al., 2007).

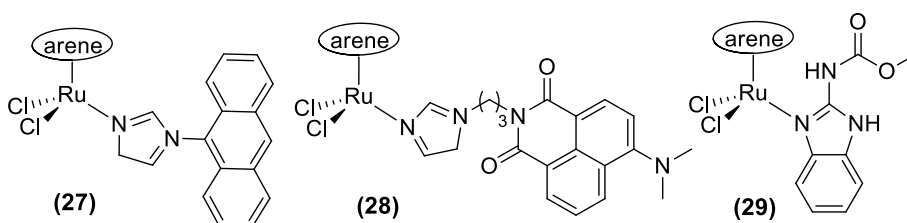


Figure 11. (Arene)Ru(II) complexes with N-donor ligands {arene = *p*-cymene (**C**), benzene (**B**), toluene (**T**) or hexamethylbenzene (**H**)}

Ruthenium arene complexes tagged with naphthalimide **(28)** showed reasonable cytotoxicity towards cancer cells and in contrast, their cytotoxicity towards model healthy cells was less (Kilpin et al., 2012). Naphthalimide-based complexes **(28)** showed higher antitumor activity than the prototype complex **(11C)**, which illustrated that the naphthalimide moiety induced higher cytotoxicity than the prototype complex **(11C)**. Ruthenium complex of mebendazole **(29)**, which was a widely known anthelmintic drug showed activity against HeLa cancer cell (Akhtar et al., 2017)

With ethylenediamine as a N^N donor ligand

Cationic (arene)Ru(II) complexes containing ethylenediamine (en) displayed elevated cytotoxicity both in *vivo* and in *vitro*. Complexes **(30A)** and **(30B)** containing the cymene ligand and the complex **(31)** containing the biphenyl (bph) ligand retarded the growth of the human ovarian cancer cell line (A2780), which had IC₅₀ values similar to carboplatin. In contrast, the complex **(32)** with the tetrahydroanthracene (tha) ligand was hydrophobic, and showed similar antiproliferative ability as cisplatin (Aird et al., 2002).

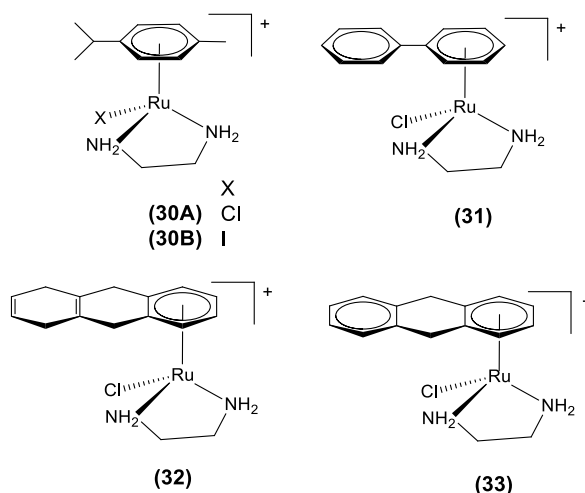


Figure 12. (Arene)Ru(II) complexes with ethylenediamine

Arene-ruthenium-ethylenediamine units showed favorable binding towards N7 of guanine in DNA (Chen et al., 2003). When two monodentate N-donor ligands were replaced by a chelating diamine ligand, the (arene)Ru(II) complexes were found to be inactive towards the A2780 cell line. In terms of structure-activity relationship, the complexes with a more hydrophobic arene ligand and a stable bidentate N^N-donor ligand along with exchangeable halide ligand showed a higher cytotoxicity (Iida et al., 2016).

The complex with the biphenyl ligand **(31)** acts as a potential DNA intercalator (Liu et al., 2006). The complex **(31)** showed powerful stereospecific hydrogen bonding between its NH group and the C6 carbonyl group in guanine in DNA, suggesting that simultaneous stereospecific hydrogen bonding, intercalation, and covalent coordination are involved in the recognition behaviour of DNA in arene-ruthenium-diamine complexes (Chen et al., 2002).

It was suggested that DNA binding of complexes containing bph **(31)**, tha **(32)** and dihydroanthracene (dha) **(33)** are due to a combination of (i) non-covalent hydrophobic interactions, (ii) covalent Ru–N (guanine N7) coordination between DNA and the arene ligand, (iii) minor groove binding, and (iv) arene intercalation. In contrast to complexes containing multiple arene rings (*e.g.*, bph, tha, dha), complexes with single arene rings such as benzene and cymene ligands were unable to interact with DNA using intercalation (Kostrhunova et al., 2008).

With guanidine as N^N and N^O donor ligands

Guanidine plays an important role in both inorganic and organic chemistry, which is found in many natural compounds. Guanidines were tested for its nuclease activity and it showed cytotoxic properties (Jeyalakshmi et al., 2019). Due to the Y-shaped CN₃ unit present in the guanidine ligand (**34** and **35**), it is an electronically and sterically flexible ligand and can be used in a wide range of biological applications, such as, antitumor, anti-inflammatory, antimalarial and urease inhibition (Murtaza et al., 2011). The donor atoms of guanidine differ as N^N and N^O, in the complexes (**34** and **35**) respectively, and it has a direct influence on the rate of hydrolysis, and thereby on cytotoxicity (Habtemariam et al., 2006).

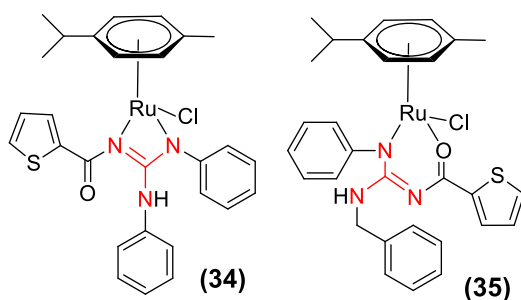


Figure 13. (Arene)Ru(II) complexes with N^N & N^O donor ligands

With dipyridophenazine as a N^N donor ligand

The (arene)Ru(II) complex (**18**) with dipyridophenazine (dppz, L⁵) as the chelating ligand (Figure 7) facilitated the transport of the complex cation across the cell membrane and contributed to DNA binding due to the high lipophilicity of the dppz ligand (Nikolić et al., 2016).

With β -ketoamine as a N^O donor ligand

Electronic and steric properties around the ruthenium ion can be fine-tuned using the β -ketoamine ligand in a (arene)Ru(II) complex (**36**) (Figure 14) by varying the arene and the properties of the R group. These complexes showed significant anticancer properties *in vitro*, and cytotoxicity against human ovarian cancer cells (Pettinari et al., 2013).

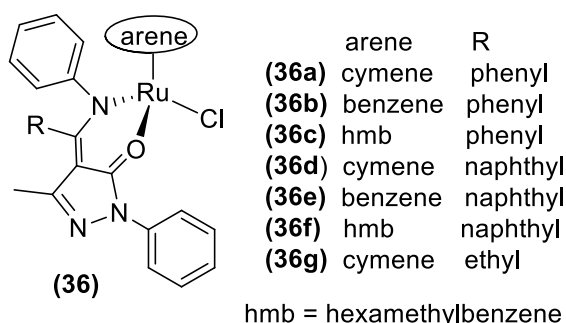


Figure 14. (Arene)Ru(II) complexes with N[^]O donor ligands

With picolinate as a N[^]O donor ligand

The (arene)Ru(II) complex [(cymene)RuCl(picolinate)] (**37**) bound efficiently to DNA and showed antimetastatic activity and anti-proliferative activity, despite its low level of genotoxicity and cytotoxicity (Sonkar et al., 2021).

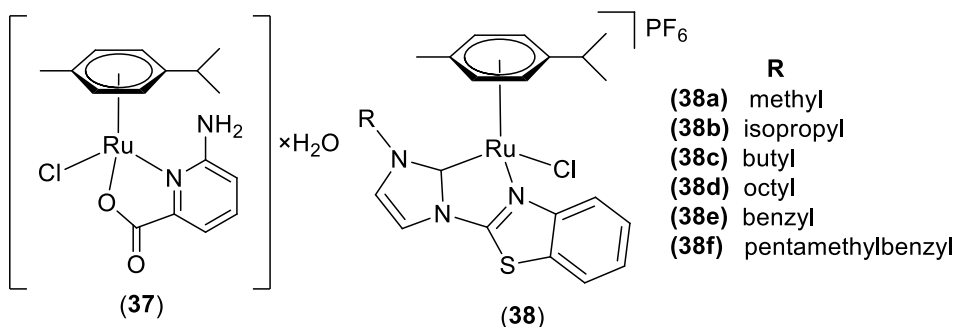


Figure 15. (Arene)Ru(II) complexes with N[^]O & N[^]C donor ligands

With NHC as a N[^]C donor ligand

Cationic (arene)Ru(II) complexes (**38a-f**) (Figure 15) with benzothiazole-functionalized NHC ligand (NHC = nitrogenheterocarbene) were studied for their cytotoxic activity. Their *invitro* cytotoxicity was evaluated using six cancer cell lines, A549, HT-29, HeLa, A2780, LoVo and HCT-116 (colon cancer) (Chen et al., 2020). The complexes (**38a**) and (**38b**) were found to be inactive against these cell lines, and (**38d**) demonstrated significant cytotoxicity against the cell lines A2780 and HT-29,

which occurred due to the increase in the length of the alkyl substituent.

With acylthiourea as a S^ΛO donor ligand

(Arene)Ru(II) complexes (**39**) with the formula [Ru(cymene)(PPh₃)(S^ΛO)]PF₆ having acylthiourea were evaluated for the cytotoxic activity on five cell lines, MCF-10A, DU145, A549, MRC-5 and MDA-MB-231 (Cunha et al., 2020). These complexes showed high selectivity towards breast cancer cells compared to cisplatin, and they were cytotoxic against the A549 and DU145 cell lines. The complex (**39a**) with thienyl as R¹ was cytotoxic to all the above cell lines. The cytotoxicity was enhanced by the increase of the chain length of R², because the increase of chain length amplified the lipophilicity of the complexes, thereby increasing the cellular uptake of these agents.

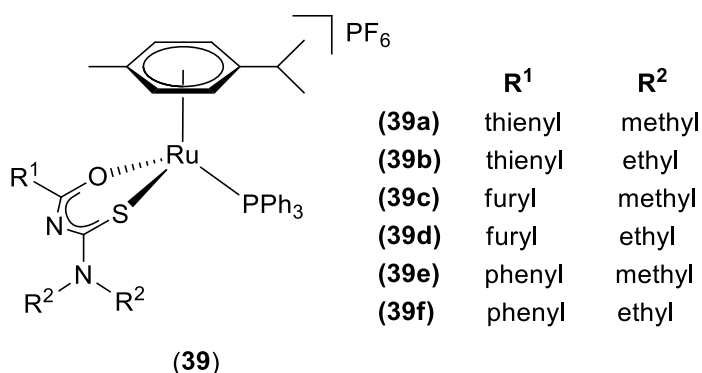


Figure 16. (Arene)Ru(II) complexes with S^ΛO donor ligands

Activity tuning of (arene)ruthenium complexes

The cytotoxicity of these (arene)ruthenium complexes were determined using various assays such as, tube formation assay (Yamamoto et al., 2003), adhesion assay (Gurgul et al., 2020), migration and invasion assay (Chambers et al., 2002), wound healing assay (Zamora et al., 2015), colony formation assay (Chen et al., 2021), RT-PCR, and western blotting.

Various (arene)Ru(II) complexes [(η⁶-arene)Ru(L)(X)(Y)], [(η⁶-arene)Ru(L^ΛL)X]Y and [(η⁶-arene)Ru(L^ΛX)(Y)] where arene = cymene (**C**), benzene (**B**), toluene (**T**), hexamethylbenzene (**H**); L =

amine, phosphine; L^L = en, diamine, diphosphine, (X^Y) = oxalate, (L^X) = acylacetate; and (X), (Y) = halides, triflates *etc.* can be tuned using various ligands.

(i) Fine tuning of the bidentate ligand (L^L , L^X and X^Y) is used as one such method. Chelate ligands generally exhibit higher resistance towards substitution, and as a result the aquation is controlled by the suitable choice of the other ligands in the molecule. The toxicity of these complexes can be changed by the appropriate choice of the X ligand (Aird et al., 2002). One such example is, the change of the bidentate ligand from en to acac. Apart from increasing the pK_a of the aqua complex significantly (Fernández et al., 2004), acac influenced the recognition of the complex by DNA and other targets. This selective recognition is critical for the activity of the drugs that mainly targets DNA. (Arene)Ru(II) complexes with indoloquinolines as N^N ligands have been used, because they can act as kinase inhibitors.

(ii) The nature of the exchangeable ligand (X/Y) is another factor that can be varied in order to tune the cytotoxicity of arene ruthenium complexes, because it affects the extent of hydrolysis of the Ru-X bond. For an example, though the hydrolysis difference between chloride and bromide is negligible, the hydrolysis of iodide as a halide is up to seven-fold slower than the chloride and bromide ligands. Ruthenium-pyridine bond is even more inert than iodide, and it completely blocks the hydrolysis. These inert halides are not cytotoxic and these inert species can be triggered to undergo hydrolysis using various strategies. $[(cym)Ru(bpm)(py)](PF_6)_2$ (bpm = 2,20-bipyrimidine) in which pyridine is inert, is activated using visible light to dissociate the pyridine ligand (Barragán et al., 2011). By using controlled irradiation, reactive aqua species can be cleanly generated, and it gains ability to bind with DNA, through photo-triggered binding of anticancer pro-drugs.

(iii) Activation by ligand oxidation is another mechanism for fine tuning of ruthenium arene complexes. Redox mechanisms are involved in ruthenium arene thiolato-complex activation (Jaouen & Dyson, 2007). For an example, the tripeptide glutathione (GSH) is involved in the activation by oxidation of RM175 (**10**) in buffered solutions (Wang, Xu et al., 2005).

(iv) Another main factor is the nature of the arene ligand. The arene complexes are not static, where benzene or hexamethylbenzene in (arene)Ru(II) complexes, can rotate around the perpendicular axis compared to biphenyl, which allows the optimization of arene interactions with DNA (Palermo et al., 2016). Thermodynamic properties and DNA recognition can be modified site-specifically in ruthenium arene complexes by varying the type of arene as, *para*-, *meta*- and *ortho*-isomers (Palermo et al., 2016). It is shown that the *para* complex displays higher cytotoxicity towards cancer cells, compared to the *meta*- and *ortho*- isomers (Bugarcic et al., 2008). *para*-Arene complexes can bind to DNA bases through both intercalation and coordination, whereas the other less toxic isomers are able to bind only through monofunctional coordination.

Conclusions

(Arene)ruthenium complexes are an emerging class of anticancer drugs, owing to their fewer side effects compared to platinum anticancer agents. The relationship between the structure and cytotoxicity of (arene)Ru(II) complexes of the types [(arene)Ru(L)(X)(Y)], [(arene)Ru(N[^]N)X]Y, [(arene)Ru(N[^]O)X]Y, [(arene)Ru(N[^]S)X]Y, and [(arene)Ru(O[^]O)X] is elaborated in this review. The properties of these complexes depend on the arene, and the choice of the co-ligands. The researchers hope that this review would provide an insight on the development of ruthenium complexes as emerging anticancer agents.

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Flattening the Hate Speech Curve in the Digital Age: An Appraisal of Regulatory Frameworks in Nigeria

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Abstract

The internet and its emerging technologies have expanded global communication landscape to the extent that citizens have unbridled access to social media, just as the mainstream media integrate them into their operations. Despite the productive and interactive potentials of social media, there has been a rise in the cases of hate expression as one of the pitfalls of the digital revolution. Nigeria has had her share of the menace of hate expressions among its citizens, prompting legal and regulatory measures to check the menace. This paper discusses the recent efforts of the Nigerian government in the areas of legislation and regulation in checking hate speech. It critically examines the extant Cybercrimes (Prohibition, Prevention, etc.) Act of 2015; the Independent National Commission for the Prohibition of Hate Speeches Bill introduced in the Nigerian Senate

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in November 2019; and the Reviewed Broadcasting Code as recent regulatory measures. It observes that while the Cybercrimes Act partly addresses hate speech in its provisions against racist and xenophobic contents on computer systems and networks, the proposed hate speech bill is a duplication which wrongly includes abusive and insulting words in its determination of hate speech. The Reviewed Broadcasting Code, which places a penalty of N5million on any erring broadcast station derives no legitimacy in extant laws. The paper recommends a holistic legislation derived from the Constitution, strengthening of the judicial system, socially responsible media practice and citizens' ethical revolution to check hate speech.

Keywords: *Hate speech, Digital age, Social Media, Legislation, Regulatory framework*

Introduction

The digital revolution witnessed by the world the turn of the 21st century has continued to advance, opening new frontiers and opportunities in all spheres of human endeavour. Propelled by the internet, the emerging digital technologies have opened up productive capacities for individuals, groups and societies 20 years into the century. The Economic Commission for Latin America and the Caribbean (ECLAC) (2018) identifies the digital technologies that drive the global trajectory to include the internet of things (IoT), big data analytics, mobile broadband and cloud computing, increased social media penetration, enhanced connectivity and ubiquity, low latency ultra-fast broadband, and industrial internet. These advancements have opened up new communication frontiers for individuals, groups, firms, industries, nations and the global community at large. As citizens utilise the potentials of advanced technologies for a wide range of communicative purposes, the media industry also strives to utilize the full potentials of the emerging technologies to improve their operations (Oriola, 2019). As digital technology continues to advance, competition between the new digital platforms and traditional media becomes more intense. Responsively, traditional media have embraced media convergence—the practice of incorporating new media technologies into traditional news production practices (Dominick, 2011)—in order to

strengthen their news operations. Thus, apart from their organisational online presence, traditional media now incorporate social media platforms into their news operations and encourage citizen journalism practice.

The digital media platforms possess great communication potentials, which account for the challenge they pose to traditional news media. McQuail (2010) identifies interactivity, co-presence of vertical and horizontal communication models, disintermediation, low cost of media usage, great speed of transmission and narrowness of information boundaries. Despite these merits, there are pitfalls associated with the use of digital media for information dissemination. These include preference for speed at the detriment of accuracy, preference on entertainment and sensationalism, limited access to authoritative news sources, poor production quality of contents, low credibility of news materials and the possibility of manipulating contents (Ojomo & Oriola, 2016). Arising from these pitfalls is the possibility of dissemination of hate speech, the prevalence of which is notable on social media in recent times.

Hate speech, according to Foxman & Wolf (2013) refers to expression of hatred directed to an individual or group resulting in certain consequences based on social interaction. The dissemination of such expressions is inimical to victims' rights as it could debase their sexual orientation, gender, disability, religious belief, race or ethnicity, health status, age limitations, language and political affiliation (Hernandez, 2011). In the words of Hernandez (2011), "when hate speech is permitted to be propagated, it encourages a social climate in which particular groups are denigrated and their discriminatory treatment is accepted as normal" (p. 808). As a reprisal, such denigrated groups could resort to violence – ethnic, religious or ideological – the sort that has become prevalent in Nigeria. The rise in the hate speech curve, noticeable in the multi-ethnic Nigerian society, especially on the digital media platforms that are so pervasive, has been attracting concerted debates among media scholars, social crusaders, rights activists and the government in Nigeria. Government has even taken the crusade against hate speech from the level of administrative regulation to legislation, the recent of which are the moves to pass bills against the menace into laws in the National

Assembly. In view of the issues associated with hate speech dissemination and the potentials of the digital media to spread it fast, this paper examines the adequacy of extant and proposed laws as well as regulations in flattening the curve of the scourge in Nigeria.

Statement of the Problem

One of the digital revolutions that characterise the global communication landscape is increased social media penetration. Ogbuoshi, Oyeleke & Folorunsho (2019) assert that social media operate with limited institutional guidelines and ethical regulations, which allows the dissemination of all manners of content, some of which could portray hatred of targeted individuals or groups in society. According to McQuail (2010), one of the strengths of the digital space, which social media users exploit, is narrowness of information boundaries in which citizens can partake in the information production-consumption chain. The fact that professionalism is not a necessary requirement in the usage of social media makes the digital platform an all-comer affair. Lack of ethical concern, manipulation of contents, limited access to authoritative information sources, the urge to disseminate contents in a rush and preference for sensationalism, to mention a few, could result into dissemination of hateful expressions either intentionally or inadvertently (Oriola, 2019). Once an expression of hatred is disseminated on the digital space, it spreads like wildfire and the extent of its transmission could determine the extent of harm on the victims. Hate speech denigrates individuals and groups targeted. Such denigration could have negative consequences which include alcoholism, smoking, high blood pressure, anxiety, depression, post-traumatic stress disorder, crime and violence (Nielsen, 2017). It could breed disaffection between or among groups in a culturally sensitive society like Nigeria, leading to conflicts and violence. Also, it is a violation of gender, sexual, racial, religious, social and political rights and equality of people in the society. In a society where expression of hatred is allowed to flourish without ethical measures to curb the scourge, violent conflicts could hold sway. In the light of the problems associated with dissemination of hate expressions, this paper examines the Nigerian digital communication space within the context of the rise

in the curve of hate speech. It analyses relevant existing and proposed laws and the regulation as measures to check the scourge of hate speech.

Purpose

The purpose of the discourse in this paper is to situate the rise in the curve of hate speech in Nigeria within the pervasiveness of digital media. On the one hand, increased social media penetration has broadened the communication landscape among citizens through improved devices, broadband and connectivity. On the other, the competition that mainstream media face in the wave of the ongoing digital revolution has led to media convergence, which in turn has integrated newsroom operations into the digital space. At the level of the citizenry, there have been a prevalence of hate speech dissemination on social media while at the mainstream media level, such is controlled through institutional and ethical guidelines, though hate expressions still occur occasionally due to ethical laxity and poor fact-checking on information from the digital space. This paper aims to examine Nigerian government's recent legislative and regulatory measures to check hate speech dissemination, with a view to determining their strengths and weaknesses in checking the menace within the confines of democratic ideals.

Review of Literature

Internet and Digital Communication: Social Media in Perspective

Since the discovery of the internet in the 1960s, several innovations have emerged from what the world considers the most expansive and ever-dynamic invention. The emerging innovations have in turn shaped all spheres of human endeavour globally. The initial invention has been further developed into new features and technologies, leading to a digital revolution that has greatly impacted the post-modern world - the present era of "information superhighway" (Andrews, 2019). Henry-Nickie, Frimpong & Sun (2019) asserted that the digital technologies of today have become prominent and critical propellers of economic growth, national security and international competition in various spheres. The

world economy has become a digital economy, societies with more digital technologies are wealthier, private consumption is greatly impacted by the internet, social interactions are shaped by digital technologies, to mention a few (ECLAC, 2018). One area of lasting influence of the digital revolution that characterises the invention and advancements of the internet is communication.

The popularity of the internet can be associated with the invention of the World Wide Web in 1990 by Tim Berners-Lee through which the global community accesses a wide range of information (Andrews, 2019). Hence, the nomenclature of information and communication technology describes an array of internet-driven applications, platforms and devices. Communication is the nucleus of the digital revolution era from which numerous fields of endeavour derive their leverage and productive opportunities. Digital platforms create fora of communicative interaction at formal and informal levels. These interactions facilitate commerce and other productive exchanges on the one hand, and social interaction necessary for the functioning of society as a web of social relations, on the other (Ireton & Posetti, 2018). Notable among the digital platforms that perform this function are the various social media, which have now become easy means of production and dissemination of news and information.

As a result of the growth and penetration of digital communication technologies, social media have become avenues for sharing and receiving news and information about events in society by both citizens and mainstream media organisations. Citizens participate in the production-consumption chain of news through citizen journalism, blogs, news sites and other forms of digital communication avenues. Mainstream media organisations, realizing the potentials of digital communication technologies, integrate social media into their news operations in a practice termed media convergence (Dominick, 2011). The relative advantages of digital media over the mainstream media that make the former a veritable resource for news and information are identified in Oriola (2014) to include audience segmentation, convergence, audience control, multiple platforms, user-generated content and mobility. These unique features make digital communication media, especially social media, exert pervasive

surveillance effect. News and information thus spread at a fast pace and possibly globally because the digital space is without geographical boundaries.

Oriola (2014) explained that social media possess certain strength as regards the performance of the surveillance function. They (social media) create a surveillance culture among citizens as many events that may have gone unnoticed are brought to limelight. Ease of usage is a merit of social media because no technical or professional skill is required. Generation of news and information is less cumbersome on social media and this makes information dissemination immediate. The other strengths are high accessibility to means of information dissemination; low cost of usage; interactivity in forms of participation, conversation and sharing; creative opportunities and flexibility in the use of graphics, language, pictures and videos; and absence of institutional influences on news contents (Oriola, 2014). Above all, the limitless size of the social world created by digital communication technology also attests to their powerful surveillance influence. According to Dunbar, Arnaboldi, Conti & Passarella (2015), “the implicit promise of the new technologies was that they would open up a new vista of social world that was intrinsically unlimited in size” (p. 39). Going by the scenario of the present-day world, social media are living up to this promise as digital communication platforms. Ogbuoshi, Oyeleke & Folorunsho (2019) attested to this fact that “social media have democratized, and personalized acquisition, purveyance and distribution of information aided by the powerful networks of internet communication” (p.46).

Despite the potentials of the digital communication media in information dissemination, there are certain limitations associated with their usage at both the levels of the citizenry and converged mainstream media. Social media news contents are of low quality due to the absence of professionalism and institutional guidelines (Foxman, 2013). There is decentralization of the digital communication platforms due to the existence of multiple platforms through which information can be produced, shared and received. News and information shared are prone to manipulation and /or alteration, and no professional skill is required to use social media for news production. Associated with lack of professional skills on

the part of citizen journalists are low quality of contents and low credibility of news materials. Other weaknesses of the digital communication media include lack of good regulatory frameworks to discourage dissemination of unwanted information such as fake news and hate speech, information overload, absence of filtering mechanism, low accuracy of information, large volume of indecent or immoral contents, non-cognizance of, or insensitivity to cultural context of certain societies (Oriola, 2014).

According to Ojomo & Oriola (2016), certain ethical and normative challenges are associated with the use of digital communication technologies as tools of citizen journalism. The ethical issues include inaccuracy of news contents, the indefinite archive of photographic contents on the digital space with the potential of making ethical breaches globally impactful, sacrifice of the principle of editorial independence, the use of hyperlinks in multimedia productions, which may link users to web pages and contents that are offensive and inappropriate, and plagiarism (Oriola & Ojomo, 2016). The normative challenges include conflict between speed and accuracy, preference on entertainment and sensationalism, limited access to and interaction with authoritative news sources by citizen journalists, poor quality of production, low credibility of news materials and the possibility of manipulating contents.

The weaknesses of the digital communication technologies, especially the issues of inaccuracy, manipulation, lack of professionalism and limited presence (if any) of institutional and regulatory frameworks, potentially make the dissemination of unwholesome contents on the digital space easy. Ireton & Posetti (2018), cited in Owens-Ibbie (2019), observe that:

Powerful new technology makes the manipulation and fabrication of content simple, and social networks dramatically amplify falsehood peddled by states, populist politicians and dishonest corporate entities, as they are shared by uncritical publics. The platforms have become fertile ground for computational propaganda ‘trolling’ and troll armies’;

‘sock puppets’ networks and ‘spoofers’
(p. 9).

This suffices to state that the invention, advancements and penetration of digital technologies present the case of the good and the bad as regards communication. One of the manifestations of the issues in digital technological advancements, especially social media, is the menace of hate speech. Hate expression is currently attracting debates in the Nigeria public sphere as in other climes. Scholars, social crusaders, rights groups and different arms and levels of government in consensus that social media have contributed to its spread (Ogbuoshi et. al., 2019).

The Meaning, Characteristics and Effects of Hate Speech

Hate speech is both a legal and technical term the definition of which is elastic, accounting for no universally accepted definition of the concept. The elasticity in its conception is further stretched by differences in cultural contexts of societies of the world to the extent that what accounts for hate expression in one society may not be so considered in another. The word ‘hate’ is defined in Webster’s Universal Dictionary and Thesaurus (2016) as a feeling of intense dislike or contempt for something or somebody. Hatred refers to extreme dislike – overt or covert - of persons or groups on the ground of their racial, ethnic, religious or gender orientation or affiliation (Foxman & Wolf, 2013). This means that hate is psychological: a strong feeling of dislike, contempt or that associated with enmity. The feeling is provoked or aroused by what the hater perceives to be deserving of the victim based on the latter’s orientation or affiliation: gender, ethnic, racial, religious, cultural, ideological or political.

Article 20(2) of the International Covenant on Civil and Political Rights (ICCPR) in its described hate speech as any advocacy of national, racial, or religious hatred that constitutes incitement to discrimination, hostility or violence and provides for prohibition of such expressions. Article 19 of the ICCPR recognises and protects the right to free expression but the United Nations, through its Human Rights Committee, asserts that the right to free expression is not absolute. It sets limits to expression by prohibiting offensive and discriminatory expressions, one of which is hate speech.

According to the US Legal (2016), hate speech refers to any communication carrying no other meaning than the expression of hatred or incitement to hatred against some individuals or groups who are defined in terms of their race, ethnicity, religion, national origin, gender or sexual orientation, especially in circumstances in which the communication provokes violence. The definition considers hate speech beyond the literal meaning of speech and extends it to any communicative expression – verbal, non-verbal, written, graphical, express or implied. Such communication is targeted at persons or groups on the basis of their orientation. The definition also recognizes the possibility of violence resulting from expression of hate. Victims may respond and their responses may lead to conflicts or violence.

Waltman & Ashely (2017) described hate speech as an intentional discourse, the aim of which is to call public attention to social differences in groups and manipulate such differences to the benefits of certain groups but the detriment of others. By implication, expressions of hatred could be on purpose, especially when it persists. Waltman & Ashely (2017) affirmed that hateful communicative activities are usually deliberately aimed at highlighting and exposing social differences against certain persons or groups to the benefits of the persons or groups making the expression. They posted that at the center of such expressions of hatred is manipulation – the act of skillfully or tactfully handling social differences in ways that are unfair to victims of hate speech – for the benefits of the source of such communication. Such benefits may be gender, economic, religious, political, social or cultural.

In furtherance of the global convention on limits to free expression, the ICCPR in Article 19(3) provided that a state may limit the right to free speech through legislation in order to pursue legitimate aim necessary in a democratic society. To this end, countries of the world are domesticating the hate speech laws, part of which are definitions of the concept. In Nigeria, a bill for the prohibition of hate speech, called the Independent National Commission for the Prohibition of Hate Speech Bill, was introduced in the Nigerian Senate on November 5, 2019 by Senator Muhammed Sani Musa.

The bill, which is yet to be passed into law, described hate speech as:

the use, production, publishing, distribution, presentation, or direction of the performance of any visual or written material which is threatening, abusive or insulting or involves the use of such words in order to stir up ethnic hatred or from which ethnic hatred is likely to be stirred up against such person from an ethnic group in Nigeria (Eke, 2020 p. 2).

The definition explicitly encompasses various communicative activities through which hate expression could be made – written or visual materials, production, publishing, distribution, presentation or performance. It however stretches the boundaries of hate expressions to include abusive or insulting communication and suggests only ethnic orientation as the only possible basis for stirring up hatred. The definition broadly encompasses all communicative activities in defining hate speech which previous others did not consider. It however becomes elastic in scope with the inclusion of abusive or insulting communication. Firstly, instance, abusive words may not always amount to hate expression and what amounts to abusive expression may be difficult to determine in the Nigerian socio-cultural context. Secondly, ethnic orientation may not be the only ground for which hate expressions are made. A person or group may be attacked through hate speech on the ground of any social difference or characteristics such as gender, sexual orientation, religious or political affiliation or racial origin. The definition also fails to take into consideration the response of victims of hate speech, which may include but not limited to rights violation, denigration of personality or group, conflict and violence.

From these definitions, certain characteristics of hate expression can be deduced thus:

1. It goes beyond speech to include any of the communicative activities that can express meaning such as writing, publishing, verbal and non-verbal presentations, performances, artistic and other creative works;

2. It expresses (strong) dislike or contempt of persons or groups, provoke hostility, incite hostility or discrimination and promote stigmatisation;
3. It is often intentionally targeted at individuals and groups who can be defined in the society by their social characteristics or differences;
4. It involves manipulation of the defined/known social characteristics/differences of the target persons or groups in a way to portray them in unfair manners;
5. The social characteristics or differences manipulated include gender, race, ethnic origin, religion, sexual orientation, cultural orientation and political affiliation;
6. It is capable of denigrating the persons/groups targeted;
7. There are possibilities of responses from victims as results of the effects of hatred on them and such responses include reprisal hate expression, conflict and violence.

These characteristics indicate the areas covered by hate speech: communicative activities, expression of contempt, intentional targets, manipulation of social characteristics, denigration and responses from victims.

The effects of hate expressions are far-reaching, especially in the fast-paced era of pervasive digital communication. The popularity and wide penetration of social media make the dissemination of hate speech more damaging. Adelakun (2017) observed the damaging and disruptive effects of hate speech on the political system of Nigeria as experienced during 2015 electioneering campaigns in the country. He noted the rise in this menace evident in the use of vitriolic expressions among political actors during campaigns as propagated by mainstream media and shared on various social media. Similarly, Waltman & Haas (2011) observed that hate speech could be detrimental to social and political systems of any society as it can cause intimidation of members of an out-group attacked based on their social and/or political differences.

The US Legal (2016) calls attention to violence because of hate speech. This corroborates Waltman & Haas (2011) who stated that users and sponsors of hate expression usually intimidate target groups with the aim of promoting violence against them. In the real

sense, violence is one possible response of victims of hate speech, resulting from hostility or discrimination against them. Oriola (2019) further enunciates that hate speech is sometimes used to recruit members into certain groups. This is achieved when social differences are manipulated through teaching and orientation in a way to mentally and psychologically construct a collective form of belief system in people's memories. The various security crises Nigeria is facing – Boko Haram, banditry, herders-farmers' clashes, kidnapping – can be linked to the use of hate expressions against the Nigerian state and people by elements who recruit able-bodied youths into sects to foment violence. Thus, violence becomes the end result of the ideological manipulation of the groups achieved through teachings and orientation.

Similarly, Ogbuoshi et. al. (2019) identified the widening of social distance among groups and ethnic nationalities as an effect of hate speech in Nigeria. They explain that hate expressions have exacerbated crisis in Nigeria with the attendant negative implications on nation building. They establish a connection among hate speech, ethnicity and the security crises of the country, stating that "hate speech is often the gateway to discrimination, harassment and violence as well as a precursor to serious harmful criminal acts" (Ogbuoshi et al, 2019, p. 50). Implied from this is that hate speech dampens the spirits of love and unity in a multi-ethnic society like Nigeria. It has serious consequences on national integration as social, cultural and political groups and ethnic nationalities highlight their differences for divisive purposes rather than see the strengths in their differences. Thus, it is no gainsaying that the fabrics of national unity in Nigeria that is being threatened in recent times can be attributed partly to dissemination of hate expressions. Social media as digital communication avenues have been more instrumental than any other media platform in fueling this menace.

Legal and Regulatory Frameworks in Flattening the Hate Speech Curve in Nigeria

The pervasiveness of digital communication media (especially social media) and the integration of digital media into mainstream media operations have perhaps led to the rise in the curve of hate speech in Nigeria. As a multi-ethnic and culturally sensitive society, Nigeria has a political history of promoting ethnocentric agenda in place of national unity in the struggle for supremacy that characterized her polity immediately after independence. The mainstream media, which were united in the struggle for independence against British colonialism, became tools in the hands of political leaders for propagating ethno-political sentiments (Daramola, 2006). Such sentiments are akin to what is described as hate speech today because of the manipulation of social and cultural difference for the (political) benefits of certain ethnic group(s) but to the detriment of others – contained in the definition of Waltman & Ashely (2017) - and even national unity.

The global communication landscape has become more widened as a result of the internet and its numerous innovative technologies to the extent that digital communication has broken geographical barriers among countries of the world. The digital revolution that characterizes the world has made dissemination of hate expressions through social networks to have more far-reaching and damaging effects on persons and groups. According to Ogbuoshi et. al. (2019), the exacerbation of hate speech through social media is evidence of one of the destructive tendencies of the digital media to humanity, though expression of hatred has existed for long. In order to curb the menace of hate speech, countries of the world have domesticated the United Nations Convention on human rights as it relates to setting limits to freedom of expression, taking a cue from Article 20(2) of the ICCPR.

Findings and Discussion

Nigeria, in the present democratic dispensation, has also been making legal and regulatory efforts to curb the spread of hate expressions. In 2015, the Cybercrime (Prohibition, Prevention, etc.) Act 2015 was passed and signed into law in Nigeria. The Act is

aimed to prohibit, prevent, detect, prosecute and punish cybercrime offenders in Nigeria; protect critical national information infrastructure; promote cyber security; protect computer systems and networks; and protect intellectual property and privacy rights (Cybercrimes Prohibition, Prevention, Etc. Act, 2015). Section 26 of the Act contains provisions against racist and xenophobic offences, which prohibit distribution of racist or xenophobic materials through a computer system; publicly insulting persons through the computer system or network on the basis of their race, colour, decent, ethnicity, nationality or religion. The Act stipulates that any person that commits such offences (related to hate speech) is liable on conviction to imprisonment of a maximum of 5 years or an option of fine of a maximum of N10,000 or both the fine and imprisonment. Though the Act does not expressly state or define hate speech, its provisions in Section 26(2), especially the description of racist or xenophobic material, include ingredients that characterize hate expressions on computer systems and networks, making it an appropriate law to check hate expressions through digital (social) media.

The recent legal effort in checking hate speech was the sponsorship of the Independent National Commission for the Prohibition of Hate Speeches Bill popularly referred to as hate speech bill by Senator Muhammed Musa Sani. The bill was introduced in the Senate of the Federal Republic of Nigeria on November 5, 2019 and its passage remains inconclusive because of the controversies it has generated since its introduction. Eke (2020) observed that the bill “remains one of the most controversial Bills to be passed by the legislative arm of government in Nigeria” (p. 1). The bill was aimed at ensuring national unity by “outlawing unfair discrimination, hate speeches and the establishment of an Independent National Commission for the prohibition of hate speeches” (Eke, 2020 p. 1). As soon as the bill passed the first reading, it became a subject of public outcry because many considered its passage as an attempt by the government to violate the fundamental right of citizens to freedom of expression guaranteed in the Section 39 (1) of the Constitution of the Federal republic of Nigeria 1999, as amended. More controversial is the prescription of the capital punishment for offenders of hate expressions, generating serious agitations for the discontinuance of the process of passing the bill. Various

stakeholders such as lawyers, human rights activists, media scholars, media practitioners, social crusaders, civil society groups, bloggers and ordinary citizens have queried the morality of the bill as well as the death penalty prescribed as punishment for offenders.

Section 4 of the bill deals with hate speech which:

prohibits the use, production, publishing, distribution, presentation, or direction of the performance of any visual or written material which is threatening, abusive or insulting or involves the use of such words in order to stir up ethnic hatred or from which ethnic hatred is likely to be stirred up against such person from an ethnic group in Nigeria” (Federal Republic of Nigeria National Assembly, 2019).

The section prescribes life imprisonment as a punishment for offenders of hate speech and death by hanging for offenders who disseminate hate speech that led to the death of victims. It is noteworthy that the bill expands the scope to of hate speech to encompass visual and written materials, and prohibit the use, production, distribution, presentation, or direction of performance of such materials.

However, extending hate speech to include abusive and insulting words is to go beyond the limits. Nigeria is a multi-ethnic society and the cultural context of the use of language differs from one ethnic group to another. What could amount to abuse or insult in some cultures may not be considered so in others. The present world is a globalized cultural environment in which culture is dynamic to the extent of embracing some aspects of foreign cultural practices, including language use. Also, democracy thrives on free speech, which could include criticisms that could be termed abusive. The passage of such a law may thus be used by political leaders to suppress dissenting and critical voices, especially if such voices are not from the ethnic group of the targeted leaders.

Nigeria is yet to evolve an enduring spirit of national unity as ethno-centric agenda is usually highlighted over nationalism. Also, there are high levels of intolerance, leadership distrust, cultural

sensitivity and low level of political maturity in the country. There is thus the tendency for the proposed law to be used to target certain ethnic groups who are opposing to the views and ideologies of others, especially when a group is in leadership. Sunday (2019) observed that the bill was a war on people's voices, freedom and rights as it may be used to mute lawyers, journalists, other government critics and opposition to the status quo, describing it as a route to totalitarianism. Life imprisonment or death penalty prescribed as punishment for offenders could amount to killing a fly with a sledgehammer – one of the major concerns that led to public outcry against the bill. More heinous crimes such as corruption, banditry and terrorism have not been dealt with so seriously, suggesting some ulterior motives in the proposed legislation. Above all, setting up a Commission on the prohibition of hate speech is needless and wasteful because there are law courts in the country competent enough to handle such cases.

On the regulatory divide, the Minister of Information and Culture, Lai Mohammed, on Tuesday, the 4th of August 2020 unveiled the Reviewed (6th edition) National Broadcasting Code. Part of the Reviewed Broadcasting Code is the increase in the fine for hate speech from N500,000 to N5 million. The review was necessitated by a Presidential directive for an inquiry into the regulatory role of the National Broadcasting Commission and operations of broadcast stations before, during and after the 2019 general elections (Oyero, 2020a). The Minister added that the N500,000 fine was easy to pay and as such, the provision regarding hate speech was being violated at will. The first casualty of the reviewed code was Nigeria Info 99.3 FM purported to have been fined N5 million for allegedly breaching the code by transmitting a comment made by a former Deputy Governor of the Central Bank of Nigeria, Dr Obadiah Mailafia. In an interview he granted on the station's programme, 'Morning Cross Fire' aired on August 10, 2020 between 8.30am and 9.00am, Mailafia stated that he got revelations from repentant commanders of Boko Haram that one of the Northern Governors was the commander of the sect which was the same with bandits (Oyero, 2020b).

The development has generated another round of controversies about the hate speech debate. In the ensuing controversy, a human

rights lawyer, Inibehe Effiong has sued the Minister of Information and Culture, Lai Muhammed, the Federal Government, and the National Broadcasting Commission for arbitrarily amending the broadcast Code and hiking the fine for hate speech from N500,000 to N5 million. Also, the Socio-Economic Rights and Accountability Project (SERAP) – a non-governmental rights group in Nigeria – has sent an open letter to President Muhammadu Buhari to as a matter of urgency instruct the Minister of Information and Culture, Lai Muhammed and the National Broadcasting Commission to withdraw the Reviewed Broadcasting Code and Memo because it was illegal (Akinkuotu, 2020).

Regulating the dissemination of hate speech through the mainstream media is necessary, in view of the negative effects of the menace, though no such offence as hate speech is known to the Constitution of the Federal Republic of Nigeria. Also, the National Broadcasting Commission (NBC) Act of 1999 empowers the NBC to regulate and control the broadcast industry in Nigeria. However, the Act does not empower the NBC to place fines for offences committed by broadcast stations. Meanwhile, the Act provides for sources of funds for the Commission which are license fees, grants to the Commission by Federal or State Governments, gifts, loans, grants-in aid, testamentary disposition and other assets that may accrue to the Commission from time to time (NBC Act, 1999). There is no provision for fines or penalties as a source of funding the NBC in the Act, neither is the NBC empowered to place fines on erring broadcast stations. Also, it should be noted that while the Act empowers the NBC to monitor broadcasting for harmful emission and illegal broadcasting (Section 2 (1m)), it is equally her duty to guarantee and ensure the liberty and protection of the broadcast industry with due respect to the law. Thus, placing such (heavy) fines on broadcast stations runs contrary to its powers as stated in the law. Therefore, the NBC should not be the accuser, prosecutor, judge and executor in a case of hate speech. Rather, it should refer cases of infraction to the law courts for prosecution. More importantly, the stipulated penalty relates to the broadcast media and this leads to the ambiguity of whether or not what amounts to hate speech in the broadcast media differs from the offence in the print media

Conclusions

The dissemination of hate expressions needs to be checked through legislation and regulation in digital communication. The pervasiveness of social media makes the effects of hate speech more damaging and far-reaching now than ever. Also, the absence of institutional control of social media makes their usage an all-comers affair, leading to the dissemination of all manners of unwholesome contents on the digital communication space. However, the legal framework for checking hate speech in Nigeria is replete with ambiguity due to multiple laws that seek to address the issue. Two separate bills were introduced in the Senate of the Federal Republic of Nigeria in 2019 – one on hate speech and another on social media – while The Cybercrime Act of 2015 is still in force, part of which deals with racist and xenophobic expressions on computer systems and networks. The recently introduced Reviewed Broadcasting Code is in itself questionable as it puts to question the intention of the NBC as well as her legitimacy to accuse, prosecute, judge and execute in cases of hate speech. The absence of a clear-cut Constitutional provision for hate speech in the country suggests that nothing can be built on nothing in respect of its legislation.

There is a need to clearly define and situate what amounts to hate speech in Nigeria's extant laws, particularly the Constitution, without which the consideration of an offence as hate speech may be elastic and open to manipulation by those in political power against opposing groups. There is a need for a holistic legislation on hate speech derived from the Constitution. Regulatory agencies such as the NBC could then derive their codes from such extant laws. There should be conscious efforts at strengthening the country's institutions in order to promote socially responsible and ethical practices. The media institution should undergo ethical consciousness and embrace social responsibility that takes cognisance of Nigeria's multi-ethnic and culturally sensitive composition. The National Orientation Agency should step up its campaign against hate speech as part of efforts to revive the country's values among the citizenry.

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Perceived Research Publication Pressure on Academics: An Exploratory Study at The Open University of Sri Lanka

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Abstract

Research is vital for development of any discipline. Academics in universities are also expected to engage in research in their discipline or other areas of interest and publish them in reputed journals. In most of the universities worldwide, the quantity of research publications has become the main criterion for recruitment, promotion, grants, and other incentives for academics. Many academics in Sri Lankan universities too experience pressure to publish and the pressure comes from different sources. Hence, the need to conduct research on publication experience of academics of The Open University of Sri Lanka (OUSL) was felt necessary. The objectives of this research were to identify the level of publication pressure experienced by a sample of academics at OUSL and to find out the factors that influence their research performance. This study used a survey research design. The revised

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Publication Pressure Questionnaire (PPQr) by Haven, Bouter, Smulders & Tjldink (2019) with an additional open-ended question was used as the data collection instrument. The findings showed that the academics in the sample experience research publication pressure to a considerable extent. The findings of this exploratory study will be used to adapt the questionnaire to suit the Sri Lankan University context, especially the Open and Distance teaching context.

Keywords: *Publication pressure, Research experience, Academics' stress, Open and Distance Teaching, Research publication*

Introduction

There is no argument that research is important for development of any discipline. Research output plays a key role in quality assurance criteria of universities and in the promotional and recruitment criteria of university academics. Academics in universities and higher education institutes worldwide engage in research in their discipline or other areas of interest and attempt to publish them in reputed journals. However, getting published in international peer-reviewed journals is not an easy process and nearly forty years ago, Bradley (1981) reported that 76% percent of university academics encountered pressure to conform to the expectations of the reviewers and the rejection rate was very high. It is also common practice that the publication process takes at least two years. However, in most of the universities and other HEIs in the world, the quantity of research publications has become the main criterion for promotion, grants, and other incentives for academics. According to Haven, Bouter, Smulders, & Tjldink (2019) this exercises pressure on academics to publish, and they define this 'perceived publication pressure' as 'the subjective pressure resulting from the feeling that one has to publish' (p.1). Some researchers argue that high publication pressure may cause 'detrimental effects ... on the scientific enterprise and on individual researchers' and this may affect the quality of research leading to 'scientific misconduct, fraud, and plagiarism' (Haven, de Goede, Tjldink, & Oort, 2019). Research publications play a major role in

the criteria used for recruitment, promotion, and incentivization of academics in the Sri Lankan university system. Anecdotal evidence from fellow academics also shows that they too experience pressure to publish and the pressure comes from different sources. Hence, the need to conduct research on publication experience of academics of OUSL was felt necessary. The objectives of this research were to identify the level of publication pressure experienced by a sample of academics at OUSL and to find out the factors that influence their research performance. The findings will also be used to adapt the questionnaire to suit the Sri Lankan University context, especially the Open and Distance teaching context.

Theoretical Framework

The present study was guided by the Theory of Reasoned Action and the Theory of Planned Behavior. According to the Theory of Reasoned Action (TRA) by Ajzen & Fishbein (1980), individuals' intention to perform a behavior is guided by their own attitudes about that behavior, and subjective norms i.e., perceived social pressures from people whom they want to please. The Theory of Planned Behavior (TPB) is an extension of the Theory of Reasoned Action (TRA) (Ajzen & Fishbein 1980) and this theory is useful in understanding how changes happen in people's behavior. Both TRA and TPB are based on the hypothesis that people evaluate information available to them and make logical, reasoned decisions on their behavior. The performance of a behavior is influenced by the value an individual give to it, the ease with which it could be performed, the views of significant others and the individual's perception that the behavior is within that individual's control.

According to the Theory of Planned Behavior, people's intentions to engage in something are determined by three variables: personal attitudes towards a particular behavior, subjective norms (one's perceptions of other's views about that behavior), and perceived behavioral control (the extent to which a person thinks she or he can control a particular behavior). Ajzen (2005) stresses that having the intention of the action per se will have no positive effect unless

the person has control of all the other factors that contribute to the final behavior. Figure 1 shows the relationship among the factors explained by the Theory of Planned Behavior.

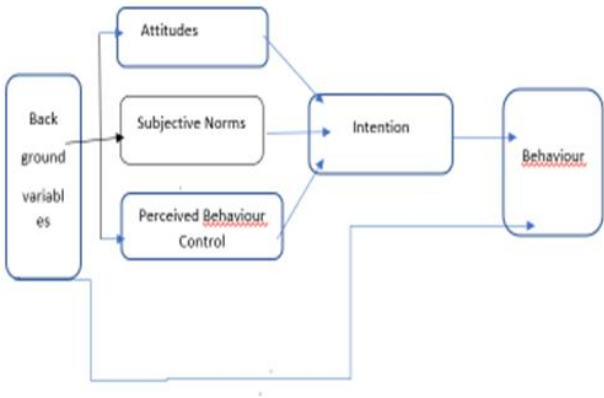


Figure 1. The Theory of Planned Behavior adapted from Ajzen (2005).

Review of literature

Previous studies have looked at publication pressure on academics from several perspectives. Some researchers have studied the role of language in publication. While some claim that proficiency in English affects publishing (Cho, 2009; Hanauer, & Englander, 2011), others argue that there are non-linguistic factors such as experience, seniority, one's professional network, availability of funding, and access to resources that hinder academic publishing (Canagarajah, 2002; Hyland, 2016; Soler, 2019). Some research focuses on publication pressure from a socio-political perspective, and they claim that the importance given to bibliometric research parameters when granting scholarships, academic appointments, and research funding result in pressure (Bedeian, Van Fleet, & Hyman, 2009; Bird, 2006). Rowlands & Wright (2019) studied academics' and administrators' awareness of bibliometric indicators used for research assessment in a Danish university.

Using Bourdieu's theory, they argue that most of the senior researchers who are in high positions resist the hunting for points, and they pay less attention to bibliometric indicators. In contrast, Rowlands & Wright (2019) found that early career researchers in their sample showed interest in knowing more about bibliometric indicators which have considerable effects on their publishing practices. Tijdkink, Verbeke, & Smulders (2014) found that publication pressure was significantly linked to scientific misconduct, and this was common among Flemish young biomedical scientists in their study. Haven, de Goede, Tijdkink, & Oort (2019) also stressed that publication pressure leads to fraud and misconduct.

Taking a psychological perspective, Haven, Bouter, Smulders, & Tijdkink (2019) conducted a study to assess the level of publication pressure among academics of different ranks and disciplines using a Publication Pressure Questionnaire (PPQr). This PPQr is a revised version of the Publication Pressure Questionnaire developed by Tijdkink, Smulders, Vergouwen, de Vet, & Knol (2014). The questionnaire consists of three subscales, namely, Stress subscale, Attitude subscale, and Resources subscale. The findings showed that researchers experience publication pressure irrespective of their discipline. Most of the academics at postdoc or assistant professor level experienced publication stress and they had a negative attitude towards the publication climate while the more established academics perceived less publication pressure. Out of the three subscales in the PPQr questionnaire, attitude subscale had the highest score for irrespective of the academic rank or discipline, stress subscale came next, while the resources subscale had the lowest score. The literature review shows that there is a scarcity of studies on publication pressure of academics. There are no studies conducted on this topic in Sri Lanka to the researcher's knowledge.

Objectives of the Study

The main objectives of the study were to identify the level of publication pressure experienced by a sample of academics at

OUSL and to find out the barriers that affect their research performance as perceived by these academics.

Research Questions

1. What is the level of publication pressure experienced by a sample of academics at OUSL?
2. What are the perceived barriers that affect their research performance?

Methodology

The study adopted a survey research design. This is an exploratory study which was conducted to collect data on research publication experience of academics at OUSL. The revised Publication Pressure Questionnaire (PPQr) by Haven, Bouter, Smulders, & Tijdink (2019) was used as the data collection instrument. The PPQr is a validated questionnaire which measures stress, attitude, and resources as three dimensions of publication pressure. The questionnaire was slightly amended by the researcher to improve clarity and to collect more data. For example, an open-ended question was added to get additional information. Permission to revise and use the PPQr questionnaire was requested from the researchers mentioned above and written permission was obtained. The questionnaire consisted of 19 items and these were categorized under the above-mentioned subscales. Items 1-6 were related to Publication Stress, 7-12 were related to Attitude towards publication and the items 13-19 were on Resources related to publishing. The responses were on a 5-point Likert Scale from Totally agree (5) to Totally disagree (1). See Appendix for the Adapted Publication Pressure Questionnaire used in the present study. The publication stress subscale had 6 items (Cronbach's $\alpha = .804$) which attempt to discover the stress level experienced by academics. The publication attitude subscale consisted of 6 items that reflect academics' attitudes towards publication (Cronbach's $\alpha = .777$) and the publication resources subscale also had 6 items (Cronbach's $\alpha = .754$) that are related to factors that can help in preventing the publication pressure.

The survey questionnaire was converted to a Google form and was sent to 175 academics representing all six faculties at OUSL. It can be considered a random sample as all the email addresses of academics in a mail list generated for circulating a common mail by the university were used for administering the questionnaire. Three reminders were sent 14 days apart. There were 41 complete responses, and this paper discusses the findings based on the closed and open-ended questions in the questionnaire. The details of the respondents are given in Table 1.

Table 1. Respondents according to their Gender, Age, Qualifications, Experience, and Academic Position

Gender	N	%
Male	15	36.6%
Female	26	63.4%
Age	N	%
24-39	09	22%
40-55	21	51.2%
56-65	11	26.8%
Qualifications	N	%
PhD	27	65.9%
MPhil	04	9.8%
MA/MSc	10	24.4%
Experience at OUSL	N	%
Less than 5 years	6	14.6%
6-12 years	13	31.7%
13-19 years	08	19.5%
20 years and above	15	36.6%
Academic position	N	%
Senior Professor	04	10%
Professor	03	7%
Senior Lecturer	30	73%
Lecturer	04	10%

Results

Out of the 175 academics in the sample, 41 responded to the

questionnaire and the response rate was 24%. The informants' background information is given in Table 1. The low response rate could be attributed to online administration of the questionnaire, lack of time, or absence of a positive research culture in the university. The questionnaire consisted of 18 statements. Eight statements which had negative connotations were reverse coded before analysis.

The study revealed that OUSL academics in the sample face publication pressure in all three areas, namely, Stress, Attitudes, and Resources. Out of these 3 subscales in the questionnaire, Stress subscale scored the highest ($M = 2.62$, $SD = 0.87$) while Attitude subscale scored second ($M = 2.57$, $SD = 0.77$) and the Resources subscale scored the lowest ($M = 2.05$, $SD = 0.66$).

Table 2. Publication Stress Subscale

Statement	Mean	SD
1. I experience stress at the thought of my colleagues' assessment of my publications output.	2.17	0.76
2. I feel forced to spend time on my publications outside office hours.	3.09	0.82
3. I cannot find sufficient time to work on my publications.	3.07	0.92
4. I have no peace of mind when working on my publications.	2.41	0.76
5. I can combine working on my publications with my other tasks.	2.39	0.76
6. At home, I do not feel stressed about my publications.	2.39	0.72

As shown in Table 2, these academics experience stress mainly due to lack of sufficient time to engage in their research publication. The answers to the open-ended questions also revealed that most of the academics suffer from publication stress. The main reason given was time constraints as they attempt to balance a heavy load of academic and administrative duties.

At OUSL, the large amount of administrative work academics

must do compromises the commitment to teaching and even more, to conducting research. (R11)

Due to shortage of staff and the high teaching and academic administration work, it is difficult to find time slots to do a study as well as write a paper. (R20)

Table 3. Publication Attitude Subscale

Statement	Mean	SD
1. The current publication climate puts pressure on relationships with fellow-researchers.	2.39	0.76
2. I suspect that publication pressure leads some colleagues (whether intentionally or not) to cut corners. (find easy/fast ways)	2.95	0.66
3. In my opinion, the pressure to publish scientific articles has become too high.	2.95	0.79
4. My colleagues judge me mainly on the basis of my publications.	2.26	0.54
5. Colleagues maintain their administrative and teaching skills well, despite publication pressure.	2.41	0.79
6. Publication pressure harms other academic work.	2.46	0.73

The findings showed that the attitudes of academics towards publication climate are not very positive. As shown in Table 2, the academics experience pressure when they are unable to publish research articles in indexed journals as required by the circulars for funding, promotions, and incentives. However, the academics themselves believe that there are both positive and negative effects of this publication pressure.

An academic should not be judged primarily on publications. Pressure to publish affects other academic work of the academic. However, the pressure to publish also has positive

effects. (R 5)

There were senior academics who were of the opinion that the publication demands attached to incentives lead to low quality research and violation of research publication ethics.

Application for annual research allowance and Annual SER has made academics to publish a paper somehow. In one hand this has motivated academics to engage in research, however, it has increased publishing of low quality research too (majority). (R 23)

Pressure to publish has sometimes compromised the important aspect of publishing ethics. Recognition for research output by Awards (which is a good move) has driven some researchers to submit any number of papers to the same conference in a given year. (R 21)

Researchers tend to deviate from ethical practices when publishing research articles e.g., students' projects - supervisors publish the work as first authors, researchers tend to carry out very superficial research and get those published by paying money. (R 30)

A senior academic claimed that positive attitudes among academics towards collaborative research may increase the quality and quantity of research publications. He emphasized the importance of knowledge sharing and working towards common goals for enhancing research publication opportunities.

Table 4. Publication Resources Subscale

Statement	Mean	SD
1. When working on a publication, I feel supported by my co-authors.	2.17	0.48
2. When I encounter difficulties when working on a publication, I can discuss these with my colleagues.	2.09	0.53
3. I have freedom to decide about the topics of my publications.	1.58	0.53
4. When working on a publication, many decisions about the content of the paper are outside my control.	2.09	0.75
5. I cannot cope with all aspects of publishing my papers.	2.48	0.73
6. I feel confident in the interaction with co-authors, reviewers and editors.	1.85	0.52

Table 4 depicts the level of pressure experienced by these academics with regards to publication resources. These academics experience pressure as they are unable to cope with the demands of the publication process. The open-ended questions provided qualitative data which revealed the nuances in the research publishing experience of academics. Some informants attempted to explain the reasons behind their choice of a response to a particular statement. One informant expressed that her responses to some statements in the questionnaire could have been different if she were in another work environment. This was mainly about statement 2 in the Publication Resources Subscale. According to this informant, she could have discussed her difficulties in research with her colleagues if she were in a different institution. Regarding statement 3, an informant stated that she chooses the content to suit the requirements of a particular publisher.

In addition to the areas that cause publication pressure given in the questionnaire, some informants mentioned other aspects that are problematic to them. Such issues included inadequate proficiency in academic writing skills and lack of awareness of the research publication process.

Although I am confident in my writing skill, I like to develop it more. Also it would be better if we get good guidance regarding the choice of suitable and accredited journal for publications.
(R8)

The Resources Subscale did not include statements related to physical resources. However, the responses to open-ended question revealed that these informants experience pressure from lack of adequate resources such as laboratory equipment, printing facilities, access to research articles, and funding for research publication.

Table 5. Descriptive Statistics of Participants' Publication Pressure Stratified by Gender and Academic Rank

	N	Publication Stress M(SD)	Publication Attitude M(SD)	Publication Resources M(SD)	Overall Publication Pressure M (SD)
Male	15	2.57(0.88)	2.54 (0.77)	2.02 (0.67)	2.38 (0.82)
Female	26	2.56 (0.87)	2.57 (0.76)	2.04 (0.66)	2.40 (0.81)
Senior Professor/ Professor	07	2.57(0.89)	2.52 (0.77)	2.01 (0.68)	2.37 (0.83)
Senior Lecturer I/II	30	2.59 (0.87)	2.57 (0.76)	2.05 (0.66)	2.40 (0.81)
Lecturer/ Lecturer (Prob.)	04	2.61 (0.87)	2.57 (0.72)	2.12 (0.76)	2.43 (0.82)
Total	41	2.62 (0.87)	2.57 (0.77)	2.05 (0.66)	2.40 (0.81)

As shown in Table 5, the data were analyzed according to gender and academic rank. The results showed that female academics in the sample experience slightly higher overall publication pressure than the male counterparts. The highest mean was found to be in

Publication Attitude while Publication Stress came second and the Resources the last. The male academics had the highest mean for Publication Stress with Publication Attitude coming next and the Resources with the lowest mean. When analyzed for academic rank, the results showed that the overall publication pressure was the highest with Lecturer/Lecturer (Probationary) category and it was the lowest with Senior Professor/Professor category. All three academic ranks experienced the highest pressure in the Publication Stress Subscale while the next highest was in Publication Attitude. Publication Resources caused more pressure on Lecturer/ Lecturer probationary ranks than that on higher ranks.

Discussion

The study used a validated questionnaire on publication pressure (PPQR) designed by Haven, Bouter, Smulders, & Tjldink (2019) slightly adapted to suit the present context. It also included an open-ended question which collected qualitative data. The findings showed that academics at OUSL experience publication pressure in all three areas. The highest pressure was seen in the Publication Stress subscale ($M=2.62$). The Publication Attitude was the next highest cause of publication pressure on academics ($M= 2.57$) while the Resources subscale had the lowest with a Mean of 2.05. These results differ from what Haven, Bouter, Smulders, & Tjldink (2019) found in their study in Amsterdam. In their study, the Publication Attitude Subscale had the highest mean ($M= 3.59$) with Publication Stress ($M= 3.22$) coming next, and the Resources subscale ($M= 2.21$) was the last. They found that there was a negative attitude towards the publication climate in the country across academic ranks and disciplinary fields. In the present study, OUSL academics were found to be experiencing Publication Stress mostly due to time constraints. Inability to find adequate time to work on their publications and the pressure to work on publications outside working hours were the factors that caused higher stress than the others in the Stress subscale for OUSL academics. In the Attitudes subscale, temptation to engage in low quality research or research misconduct and the issues related to publishing in scientific journals create negative attitudes towards research. In the study by

Haven, de Goede, Tjldink, & Oort (2019), however, high negative attitude ($M = 3.93$) was created when the academics' performance was merely judged based on their research publications.

The study revealed that there are gender differences in perceived publication pressure of the informants with females experiencing more pressure than the males. Those who were in higher academic ranks experienced less pressure than those in lower ranks. Haven, Bouter, Smulders, & Tjldink (2019) also found similar results about gender but their results in the academic rank differed from the findings of the present study. In their study the postdocs and assistant professors (second rank) perceived the highest publication stress and negative attitudes while OUSL academics in the third rank experienced the highest stress and negative attitudes. The Resources caused higher pressure to academics in lower ranks than to those in higher ranks in both studies.

The open-ended question was useful in identifying additional information on OUSL academics' views about publication demands and in answering the second research question: What are the perceived barriers that affect their research performance? Many academics feel that they are burdened with administrative duties which affect their teaching and research. While some academics think the pressure to publish has positive effects, there are others who believe that pressure to publish has 'compromised the important aspect of publishing ethics'. As pointed out by some of the senior academics, incentives tied to research output such as research allowance and research awards may lead to low-quality and unreliable research. Ajzen & Fishbein (1980), individuals' intention to perform a behavior is guided by their own attitudes about that behavior, and subjective norms i.e., perceived social pressures from people whom they want to please.

The academics expressed the view that an academic's contribution to the university or to society should not be judged merely on her/his research output as there are academics whose main concern is to provide comprehensive support to students through teaching, assessing, counseling, and designing course material. While acknowledging the importance in research in academia, they

believe that equal weighting should be given to other services offered by academics as well in criteria for evaluation of academics. They suggest that positive attitudes towards collaborative research, sharing knowledge about research, working towards common goals would increase both quality and quantity of research publications.

The qualitative data also indicated the importance of creating a healthy climate for research by providing adequate physical resources and funding for academics to engage in research without pressure.

Conclusions

The findings revealed that the academics at OUSL experience pressure due to several factors related to publication stress, publication attitude, and publication resources. These findings cannot be generalized since the responses are from only 41 academics of OUSL. However, the study revealed valuable information regarding publishing experience of the sample. The responses to the open-ended question can be used to revise the PPQR questionnaire. The revised questionnaire could be administered to a larger sample followed by interviews to gain a better understanding of the publication experience of the academics in a university which practices Open and Distance learning mode and which gives priority to teaching (only??). This exploratory study revealed that the academics in the sample experience publication pressure and it has both positive and negative effects on academics. The study showed the need to strengthen the resources and facilities necessary for research and the need for creating a research-friendly culture which will enhance the intrinsic motivation of the academics. Their positive attitudes towards research need to be encouraged (Ajzen & Fishbein, 1980). Creating an environment conducive to research, raising awareness of publishing opportunities, encouraging collaborative research, and recognizing contributions to university other than research for incentives, may motivate academics to engage in good quality research.

Limitations and suggestions for future research

The present study also has some limitations that need to be addressed in future studies. The study had a fairly low completion rate (24%) which may be an indication of lack of interest in research, absence of a research culture and time constraints due to academic and administrative workload. The study investigated the psychological aspects of publication pressure and the future studies may study the political and social aspects that lead to publication pressure among academics. Interviews with at least a sub-sample of academics would reveal the nuances in publication pressure experienced by academics. Future studies may also study the publication pressure experienced by academics in other conventional universities as well.

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Appendix

Publication Pressure Questionnaire (PPQr) (Adapted)

(‘Totally agree’ = 5, ‘Totally disagree’ = 1)

Publication Stress Subscale

1. I experience stress at the thought of my colleagues' assessment of my publications output.
2. I feel forced to spend time on my publications outside office hours.
3. I cannot find sufficient time to work on my publications.
4. I have no peace of mind when working on my publications.
5. I can combine working on my publications with my other tasks.
6. At home, I do not feel stressed about my publications.

Publication Attitude Subscale

7. The current publication climate puts pressure on relationships with fellow-researchers.
8. I suspect that publication pressure leads some colleagues (whether intentionally or not) to cut corners. (Find easy/fast ways)
9. In my opinion, the pressure to publish scientific articles has become too high.
10. My colleagues judge me mainly on the basis of my publications.
11. Colleagues maintain their administrative and teaching skills well, despite publication pressure.
12. Publication pressure harms other academic work.

Publication Resources Subscale

13. When working on a publication, I feel supported by my co-authors.
14. When I encounter difficulties when working on a publication, I can discuss these with my colleagues.
15. I have freedom to decide about the topics of my publications.
16. When working on a publication, many decisions about the content of the paper are outside my control.
17. I cannot cope with all aspects of publishing my papers.
18. I feel confident in the interaction with co-authors, reviewers and editors.

An Assessment of ICT Competence Among Academic Staff in Kwara State Colleges of Education, Nigeria: Implications for Management

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Abstract

Globally, information and communication technology (ICT) is seen as an indispensable part of the contemporary world. In fact, culture and society have to be adjusted to meet the challenges of the information age. ICT is a force that has changed many aspects of education system. It is on this premise that this study examined the ICT competence among academic staff of colleges of education in Kwara State, Nigeria. Survey research design was adopted in this study. The population consists of all academic staff in government owned colleges of education in Kwara State. An instrument titled ICT Competence among Academic Staff of College of Education Questionnaire (ICASCOEDQ) was used to

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collect data from a sample size of 152 academic staff using simple random sampling technique. The collected data were analyzed using descriptive statistics (percentages). From the results, it was revealed that academic staff are competent in word processing, Microsoft power point, e-payment and mobile phone browsing; electronic mail (e- mail) and social networking. It was also evident that inadequate funding, internet connectivity/low internet bandwidth, inadequacy of ICT facilities at workplace and low ICT literacy by staff are the biggest challenges to the ICT competence among academic staff. It was also revealed that better interactivity and connectivity, ability to type, process and store work for later use, facilities for easy information retrieval and timely and quicker information processing are some of benefits gained by the effective usage of ICT by academic staff. It was recommended that the government and school management should encourage academic staff to participate in ICT training programs. Acquisition of ICT skills from such training programs would help to improve their level of ICT competence and this would lead to high productivity.

Keywords: *ICT competence, Academic staff, Colleges of education, Nigeria*

Introduction

Information and communication technology (ICT) is an indispensable part of the contemporary world. In fact, culture and society have to be adjusted to meet the challenges of the information age. ICT is a force that has changed many aspects of people's ways of life. ICT is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer, and network hardware and software, satellite systems and so on, as well as the- various services and applications associated with them, such as videoconferencing and distance learning (Mondal & Mete, 2012). ICT involves a process of creating, processing, storage, retrieval and dissemination of information and data using computers and telecommunications. ICT also refers to electronic technologies used for accessing, processing, gathering, manipulating and presenting or communicating information as well as to other

electronic devices such as computer, radio, television, digital camera, telephone (AbdulKareem & Isiaka, 2009; Akpan, 2008; Yusuf & Balogun, 2011).

Academic staff in higher institution plays a crucial role in the development, adoption and implementation of any educational curriculum or innovation. This role becomes even more needed in the adoption and integration of ICT into the education programme of a country. It has been discovered that knowledge of ICT usage improves human capacity in every field of human endeavor, including business transaction, industrial operations, educational programmes and activities and life in general. Teachers are important to any society. The roles they play in the education process are central to basic education generally, and particularly in Developing Countries. A daunting challenge facing the education system is the lack of competent teachers who are literate and proficient in the use of computer application, computer packages and information technology (Yusuf, Afolabi & Loto, 2013). Academic staffs are often referred to agents of change, and if they become literate and competence in the use of modern technology, they would bring about a lot of positive attitudes towards the use of information technologies. In colleges of education, where academic staff are under pressure to carry out their work efficiently and effectively amidst knowledge-based technology and globalization, the use of ICT becomes imperative. Teachers who succeed in making use of ICT in their work processes do not only contribute to improved learning outcomes in their students, but also benefit personally from enhanced work productivity (Adavebiele, 2016, Victor & Figo, 2015; Yusuf et al. 2020).

Academic staff of colleges of education have various tasks to accomplish and these range from teaching, research and publications, marking of tests and examinations, supervising students' research activities, supporting students through advisory roles, attending conferences, providing community services etc. In other words, for them to be effective and efficient, they need to acquire an appreciable level of ICT competence. ICT competence as used in this study refers to the ability of a college

of education teachers to make use of the various ICT tools such as e-mail, facsimile, internet, world wide web, intranets, extranets, online databases and other networking technologies in the performance of their job. Their ability to do what is defined as desired or to be effective in producing the desired result. It encompasses teacher efficiency and effectiveness. Effective and efficient teacher is one who is accurate, attempts to solve job-related problems, avoid waste of resources and ensures quality output. Educators' ICT competence can help in this direction. This corroborates with Radloff (2001) who stated that ICT increases the skills and status of teachers for job performance. Premised on this background, the study assessed the ICT competence among academic staff in Kwara State Colleges of Education, Nigeria.

Problem Statement

In this era of globalization, job efficiency of academic staff in higher institutions cannot be divorced from the level of ICT competence which is necessary for quality academic output. Unfortunately, in Nigeria, some higher institutions' academic staffs still do not recognize the opportunities that ICT presents for improving the efficiency and effectiveness of their job. Some of them lack knowledge that would aid the application of ICT skills in lesson planning, mastery of subject matter, instructional delivery, research and record management (Abdulrahman et al. 2020). The need for ICT in educational system has become more relevant. This is because, ICT can provide a convenient technique for designing and developing a course of instructions and can expose the academics to varieties of information that will equip them to face the task ahead. ICT literacy skill among academic staff has been viewed as a prerequisite in adoption and integration of ICT in the school system. Specifically, it has however been observed that in state colleges of education in Nigeria, ICT usage among academic staff in the teaching and learning situation is still very minimal (Archibong, Ogbiji & Anijaobi-Idem, 2010). This is in line with the study of Akpan (2014) who reported that previous researches on the availability and utilization of ICT resources for teaching and research by academic staff in higher institutions of learning has been found to be low despite. This

informed the researchers' decision to investigate if this prevailing situation could be attributed to academic staff competence in ICT.

Review of Literature

From conceptual point of view, ICT comprises electronic devices such as computer, radio, television, telephone, satellite, and the Internet. ICT refers to forms of technologies that are used to transmit, store, create, share or exchange information (Abdulrahman et al. 2020; Johnson, 2007). Moore & Kearsely (2005) defined ICT as an innovative approach for delivering computer mediated, well-designed, learner-centered and interactive learning environments to anyone, anyplace, anytime by utilizing the internet technologies concerned with instructional design principles. Idowu & Esere (2013) describe ICT as electronic mode of knowledge sharing and transmission, which may not necessarily involve physical contact between teacher and student.

Research to date has shown the importance of ICT in education system. For instance, Kpolovie & Awusaku (2016) investigated the lecturers' perceived attitude on the adoption of ICT and found that lecturers embraced ICT as an indispensable tool that is needed for them to succeed in teaching students in classroom. The study concluded that ICT is an integrated framework of computers, software applications that is needed to be adopted by lecturers for efficiency and effectiveness in education. The study conducted by Fagbanmi & Ogunjobi (2009) on the availability and use of ICT among staffs of research institutes in Nigeria and found that ICT plays an important role in shaping the skills and knowledge of staffs with the adoption of technology. The study concluded that ICT is an umbrella term that includes all technologies encompassing medium for recording information such as magnetic disk, tape, optical disks (CD/DVD) flash and paper record, technology for the broadcasting, information, radio, television and technology for communicating through voice and sound or image microphone camera, loudspeaker, telephone to cellular phones. It also includes a wide variety of computing hardware, desktop computers, laptops, storage devices etc. Research conducted by Idowu & Esere (2013) affirmed that

lecturers in higher institutions remain the main actors in the development of both the individual and the society at large. Specifically, they remain the most essentials and critical element in a student's achievement with the adoption of technology in ensuring effective delivery of the contents of curriculum. It was concluded that if ICT is fully adopted, it will serve as great hub upon which educational development has been hinged because lecturers represent the hope of any society and there is need to equip him for the job through exposure to the ICT knowledge, skills and abilities relevant to his noble assignment.

Furthermore, ICT has the potential to accelerate, enrich and deepen skills, motivate and engage students learning, helps to relate school experience to work practice, helps to create economic viability for tomorrow's workers; contributes to the total development of the institution; strengthens teaching and learning and provides opportunities for connection between the school and the world (Toyo, 2017). Mondal & Mete (2012) found that the importance and significance of education cannot be overstressed because it is the process through which the cultural values of a people, knowledge, understanding skills and abilities are transmitted among its populace in order to prepare them for further membership and participation in the maintenance, growth and development of the society. Education takes care of the total development of the individual personality and the society of which all individuals are a part. Hence, no worthwhile development and progress can take place in any society unless the citizens are well educated and are fully equipped with modern technology knowledge as a tool for solving the diverse and complex problems facing that society, thereby bringing about meaningful change and positive progress in that society. The study noted that nothing meaningful and convincing can be achieved through education without the use of technology by the teachers who need it to ensure that the goals and objectives of education is achieved. Gama (2008) established that the value of ICT is endless. ICTs not only give the opportunity to have easy access to information from various sources, but also facilitate resource sharing between and among various organizations apart from improving the status of the institution. The significance of ICTs usage among academic

staff of Nigerian colleges of education cannot be overemphasized.

Theoretically, this study is anchored on some assumptions based on two models of technology, which include Technological Pedagogical Content Knowledge (TPACK) and Technology Acceptance Model (TAM). First, TPACK framework is built upon Shulman's idea of Pedagogical Content Knowledge to describe how teachers' understanding of educational technologies and PCK interrelate with each other to come up with an effective teaching with the use of technology (Ammade et al., 2020; Hossain et al., 2019). TPACK framework is the intricate interaction between and among the primary forms of knowledge: (i) content (CK); (ii) pedagogy (PK) and; (ii) technology (TK). Conversely, framework's focus does not only limit on these bases; its emphasis goes more into the different brands of knowledge that lie at the intersections between three primary forms: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPACK) (Aydin & Gürol, 2019). Also, the Technology Acceptance Model (TAM), which was propounded by Fred Davis in 1986, was developed together with the efforts of Richard Bagozzi, is said to be a development of Aizen and Fishbein's Theory of Reasoned Action (TRA). TAM is based on various factors that determine technology acceptance and information technology usage behavior. The TAM introduced the concepts of Perceived Ease of Use and Perceived Usefulness which are the essential determinants of technology acceptance and user behavior (Aslan & Zhu, 2016).

Research Questions

1. What is the ICT competence level of academic staff in Kwara State Colleges of Education, Nigeria?
2. What are the challenges related to ICT competence faced by the academic staff in Kwara State Colleges of Education, Nigeria?
3. What are the benefits of ICT competence to the academic staff in Kwara State Colleges of Education, Nigeria?

Research Methodology

The population of the study consists of one hundred and seventy-eight (178) both males and females academic staff in Kwara State College of Education, Ilorin; Kwara State College of Education, Oro; and Kwara State College of Education, Lafiagi. In order to avoid being restricted to sampling academic staff in some departments and leaving others out, the researchers adopted quota and simple random sampling techniques so as to enable the researchers to purposively administer the research instrument and have a good mix of academic staff in diverse discipline in the study. Out of the total number of academic staff selected for the study, one hundred and eight (108) were males while seventy (70) were female's staff. In terms of rank, the sample comprised seventy-six (76) senior lecturers (Chief and Principal Lecturers) and one hundred and two (102) junior lecturers (Lecturer I, Lecturer II, Lecturer III and Assistant Lecturer). An instrument tagged 'ICT Competence among Academic Staff of College of Education Questionnaire (ICASCOEDQ) was adapted from the work of Edewor, Imhonopi & Urim (2014). The questionnaire was divided into 2 sections. Section A sought demographic information on gender, rank and job description. Section B contained a total of 34 questionnaire items and was divided into 3 sub-sections. Specifically, Section B sub-section i contains 12 questionnaire items which sought information on ICT competence level among academic staff. Section B sub-section ii and iii contain 12 and 10 questionnaire items respectively. The 12 items in section B (sub-section i) measured in a 4-point Likert-scale ranging from 'Not competent to 'Very competent' and 12 and 10 items in section B sub-section ii and iii measured in a 4 point Likert-scale ranging from strongly agreed to strongly disagreed. The questionnaire was made very brief and concise. The drafted questionnaire items were first presented to the research expert for necessary corrections. The face validation for items in the research instrument was carried out by 1 academic staff that is in the measurement and evaluation discipline. The internal consistency of the research instrument established through the test- retest method using 50 academic staff that were not part of the study sample. This yielded a correlation co-efficient of 0.86 for the entire instrument. This was done in line with Odekunle (2013) who remarked that

validation of research instrument must be done before administration. Hence, the instrument was considered adequate and significant to the objective of this study. The collected data were analyzed using descriptive statistics (percentages). On the decision rule, as for research question 1, items whose percentage scores are 50% and above indicated that they were either competent or very competent and less than 50% was considered to be either not competent or low competent. However, as for research questions 2 and 3 items whose percentage scores are 50% and above and less than 50% were used as bases for agreed and disagreed respectively. The research instrument was administered to a total of one hundred and seventy-eight (178) academic staff in all the three state colleges of education using cross-section method of data collection with the assistance of two trained research assistants. Out of 178 administered questionnaires, only one hundred and fifty-two (152) were successfully completed and returned, giving a return rate of 85.4%. Data collected were analyzed using descriptive technique of data analysis.

Findings and Discussion

Research Question 1. *What is the ICT competence of academic staff in Kwara State Colleges of Education, Nigeria?*

Table 1. ICT competence among academic staff

Item	Not Competen t Frequency (%)	Low Competen t Frequency (%)	Competen t Frequency (%)	Very Competen t Frequency (%)
Word processing,	32 (21.1)	19 (12.4)	68 (44.7)	33 (21.8)
Microsoft excel and corel draw	61 (40.1)	28 (18.5)	44 (28.9)	19 (12.5)
Data analysis	81 (53.3)	08 (5.3)	38 (25.0)	25 (16.4)
Microsoft powerpoint	19 (12.5)	22 (14.5)	45 (29.6)	66 (43.4)

presentation				
E- library	72 (47.3)	30 (19.8)	28 (18.4)	22 (14.5)
E- payments	17 (11.2)	22 (14.5)	67 (44.1)	46 (30.2)
E-learning	52 (34.2)	33 (21.7)	47 (30. 9)	20 (13.2)
(online				
courses)				
Notes	65 (42.8)	37 (24.3)	20 (13.2)	30 (19.7)
online/				
giving				
assignments				
Video	68 (44.7)	25 (16.4)	49 (32.2)	10 (6.7)
conferencin				
g and e-				
conferencin				
g				
Mobile				
phone	18 (11.8)	22 (14.5)	71 (46.7)	41 (27.0)
browsing,				
electronic				
Mail (e-				
mail) and				
social				
networking				
E-books, e-				
journals, e-	46 (30.3)	40 (26.3)	39 (25.7)	27 (17.7)
references				
materials, e-				
news, e-				
magazines				
Networking	63 (41.4)	22 (14.5)	47 (30.9)	20 (13.2)
and internet				

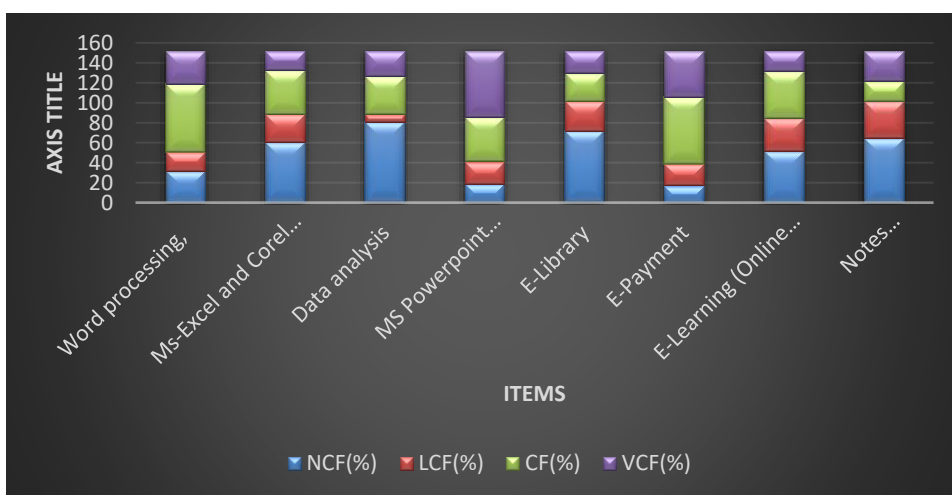


Figure 1. Graphical Analysis on ICT Competence of Academic Staff of Colleges of Education

The results in Table 1 and Figure 1 revealed that academic staff of Kwara state colleges of education were either competent or very competent (combined) in Word processing, Microsoft Power point presentation, e-payments and Mobile phone browsing, Electronic Mail (e- mail) and Social Networking with 101 (66.5%), 111 (73.0%), 113 (74.3%), 112 (73.7%) respectively, as against less than 50% bench mark for “Not Competent” and “Low Competent”. On the other hand, the results indicated that they were either not competent or low competent (combined) in Microsoft excel and Corel Draw, Data analysis, E-library, E-learning, Notes online/ giving assignments, Video conferencing and E-conferencing, E-books, E-journals, E-references materials, E-news, E-magazines and Networking and Internet with 63 (41.4%), 63 (41.4%), 50 (32.9%), 67 (44.1%), 50 (32.9%), 59 (48.6%), 66 (43.4%) and 67 (44.1%) respectively, as against 50% and above bench mark for “Competent” and “Very Competent”. Given this result, it can be said that the competency level of academic staff in ICT is extremely low. The present finding is in line with that of Akpan (2014) who reported that teacher ICT competence in Nigeria is below expectation and access to ICT resources like the internet and computer is mostly limited in campuses of various higher institutions. The finding of this study also corroborates with the

research finding of Omenyi, Agu & Odimegwu (2007) who reported that teachers’ perception of their increased job efficiency was associated with the level of ICT competence possessed by the teachers. The implication of these findings is that the academic staff ICT competence in higher institutions of learning could greatly impact upon their job efficiency. The current finding is also in line with the TAM which explained that there are factors that determine technology acceptance and information technology usage behavior among users. Specifically, the concepts of perceived ease of use and perceived usefulness are key essential factors of technology acceptance (Aslan & Zhu, 2016). The study is in agreement with the TPACK model, which described how teachers’ understanding of technologies in education interrelates with each other to ensure efficiency and effectiveness in the use of technology (Aydin & Gürol, 2019).

Research Question 2. What are the challenges related to ICT competence faced by the academic staff in Kwara State Colleges of Education, Nigeria?

Table 2. Challenges to ICT competence among academic Staff

Item	Strongly Agreed Frequency (%)	Agreed Frequency (%)	Disagreed Frequency (%)	Strongly Disagreed Frequency (%)
Poor funding	60 (39.4)	66 (43.5)	20 (13.2)	06 (3.9)
Lack of prioritization of investments by management and sponsorship by the school management.	32 (21.1)	63 (41.4)	37 (24.3)	20 (13.2)
Proximity to ICT facilities and Inability to acquire personal ICT	24 (15.8)	59 (38.8)	48 (31.6)	21 (13.8)

facilities.				
Inadequacy of ICT facilities at workplace.	58 (38.2)	42 (27.6)	28 (18.4)	24 (15.8)
Low ICT literacy by staff and ICT phobia.	46 (30.1)	49 (32.2)	28 (18.5)	29 (19.1)
Lack of interest and No patience to learn (poor learning interest).	05 (1.2)	32 (21.1)	65 (42.8)	50 (32.9)
Poor opportunity for training	40 (26.3)	48 (31.6)	35 (23.0)	29 (19.1)
Insufficient time due workload	63 (41.4)	22 (14.5)	47 (30.9)	20 (13.2)
Personal office not secure to install ICT facilities	19 (12.5)	22 (14.5)	45 (29.6)	66 (43.4)
Insufficient time for practice	36 (23.7)	45 (29.6)	37 (24.4)	34 (22.3)
Poor Internet connectivity/low internet bandwidth	62 (40.8)	47 (30.9)	23 (15.2)	20 (13.2)
Erratic power supply/Spotty power supply	50 (32.9)	35 (23.2)	37 (24.3)	30 (19.7)

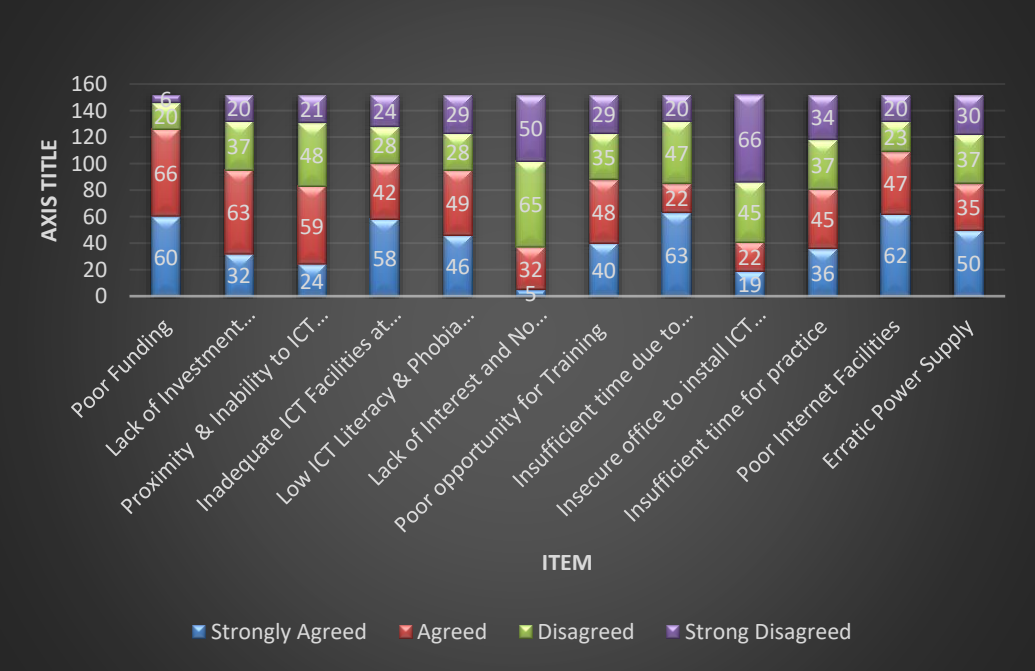


Figure 2. Graphical analysis on challenges related to ICT competence among academic Staff

The results in Table 2 and Figure 2 shows the challenges to ICT competence among academic staff in Kwara state colleges of education, Nigeria. It is evident that poor funding, poor internet connectivity/low internet bandwidth, inadequacy of ICT facilities at workplace, lack of prioritization of investments by management and sponsorship by the school management and low ICT literacy by staff and ICT phobia are the most challenges to the ICT competence among academic staff in Kwara state college of education as agreed by the respondents with 126 (82.9%), 109 (71.7%), 100 (65.8%), 95 (62.5%) and 95 (62.3%) respectively. Other challenges with high frequencies are poor opportunity for training, erratic power supply/spotty power supply, insufficient time due workload, proximity to ICT facilities and inability to acquire personal ICT facilities and insufficient time for practice as stated by 88 (57.9%), 85 (56.1%), 85 (55.9%), 83 (54.6%) and 81 (53.3%) of the staff respectively. However, personal office not secure to install ICT facilities and lack of interest and no patience to learn were not seen as to pose as challenges with 41 (27.0%)

and 37 (22.3%) respectively. This implies that so many challenges are influencing the ICT competence among academic staff in Kwara State Colleges of Education. This is in line with Edewor, Imhonopi & Urim (2014) who identified various challenges that are associated with the use of ICT which include epileptic power supply, inadequate availability of ICT facilities among others. The finding of the current study corroborates with the work of Toyo (2017) who found that there are factors contributing to low adoption of ICT in higher institutions. They include inadequate ICT gadgets and lack of training. Akpan (2014) found that the effective adoption and utilization of ICT in higher institutions of learning is thwarted by a combination of factors.

Research Question 3. What are the benefits of ICT competence to the academic staff in Kwara State Colleges of Education, Nigeria?

Table 3. Benefits to ICT competence among academic Staff

Item	Strongly Agreed Frequency (%)	Agreed Frequency (%)	Disagreed Frequency (%)	Strongly Disagreed Frequency (%)
Ability to type, process and store work for later use	95 (62.5)	27 (17.8)	18 (11.8)	12 (7.9)
Better interactivity and connectivity	96 (63.2)	56 (36.8)	-	-
Timely and quicker information processing	70 (46.1)	38 (25.0)	-	44 (28.9)
Facilitates easy information retrieval	42 (27.6)	80 (52.6)	20 (13.2)	10 (6.6)
Collaborative research	30 (19.8)	49 (32.2)	40 (26.3)	33 (21.7)
Digitization of school processes	39 (25.7)	43 (28.3)	40 (26.3)	30 (19.7)
Enhanced information	53 (34.9)	37 (24.3)	22 (14.5)	40 (26.3)

dissemination				
processes				
Automated	32 (21.1)	38 (25.0)	40 (26.3)	37 (24.4)
records				
management				
Improved	31 (20.4)	56 (36.8)	19 (12.5)	46 (30.3)
communication				
Easy accessibility	26 (17.1)	66 (43.4)	24 (15.8)	36 (23.7)

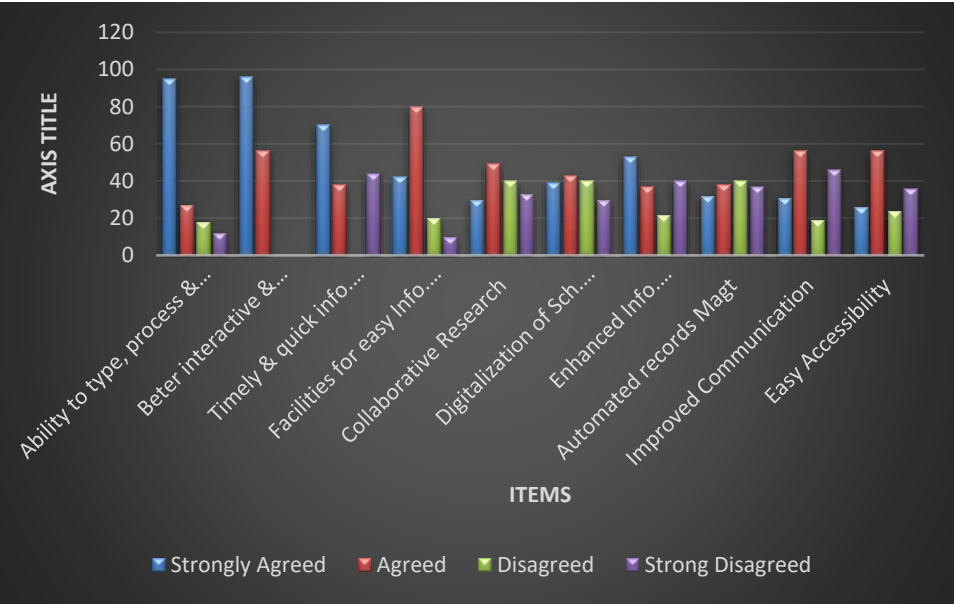


Figure 3. Graphical analysis on benefits of ICT competence for academic Staff

The results displayed in Table 3 and figure 3 discloses the benefits to ICT competence among academic staff of Kwara State Colleges of education, Nigeria. Some of the major benefits include better interactivity and connectivity, ability to type, process and store work for later use, facilitates easy information retrieval and timely and quicker information processing as agreed by 152 (100%), 122 (80.3%), 122 (80.3%) and 108 (71.1%) of the respondents. Other benefits include easy accessibility, enhanced information dissemination processes, improved communication and automated records management, digitization of school processes and collaborative research as agreed by 92 (60.5%), 90 (59.2%),

87 (57.2%), 82 (54.0%) and 79 (52.0%) of the respondents respectively. However, it is obvious that automated records management was not seen as one of the benefits to ICT competence in Kwara state colleges of education as recorded by low responses from the respondents. Thus, this analysis is in line with Edewor, Imhonopi & Urim (2014) who highlighted various benefits of ICT facilities in tertiary institutions to include digitization of school processes amongst others. This study also agreed with that of Toyo (2017) who stated ability to type, process and store work for later use, and digitization of school processes amongst others as some of the most benefit of ICT to teachers in higher institutions of learning.

Conclusions

Based on the findings of the study, it can be said that academic staffs of Kwara state colleges of education, Nigeria were extremely competent in word processing, Microsoft power point, e-payments and mobile phone browsing, electronic mail (e- mail) and social networking. There are many challenges to ICT usage by the academic staff of Kwara state colleges of education. They include inadequate funding and internet connectivity/low internet bandwidth and inadequacy of ICT facilities at workplace lack amongst others. The benefits of ICT competence among academic staff in the Kwara State college of education, can be best seen in the ability to type, process and store work for later use, facilities for easy information retrieval and timely and quicker information processing amongst others. Having had an insight on the assessment of ICT competence among academic staff in Kwara State Colleges of education, the research findings show that that the benefits to ICT usage in any tertiary institution cannot be overemphasized. The researchers therefore concludes that every higher institution of learning especially colleges of education should utilize every source possible to combat the challenges responsible for poor or low ICT competence among academic staff.

Implications For Management

1. Funds should be provided by the government on a regular basis to the management of Colleges of Education in order to invest on ICTs.
2. Government and college management should encourage academic staff to participate in ICT training programs. Acquisition of ICT skills from such training programs would help to improve their level of ICT competence and this would lead to high productivity.
3. The management of Kwara state College of Education should ensure that academic staff offices are provided with ICT facilities and also connected to the internet. This would enable the lecturers to access and download information or materials quickly and easily for lecture preparation, teaching, research and other allied duties.
4. Government's interventionist agencies such as Tertiary Education Trust Fund (TETFUND), Petroleum Technology Development Fund (PTDF) should focus their intervention more on the provision of ICT facilities for colleges of education in Nigeria.
5. Other stakeholders in education (e.g. banks, oil companies) should assist colleges of education in terms of adequate provision ICT facilities.

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Cover Page: Authors should include a cover page including a concise and informative title and the name/s of the author/s with affiliation/s, address/es, contact number/s and e-mail address/es of each author. (Authors' names should not appear elsewhere in the article).

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Tables and Figures: All Tables and Figures must be placed in the correct location within the article. These should be numbered separately using Arabic numerals, in the order in which they are

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