"Outcome-based higher education for developing knowledge-based procedures in students"

**Proceedings of the 19th Annual SLAIHEE Conference
on Higher Education in Sri Lanka**

organised by

**Sri Lanka Association for Improving Higher Education Effectiveness
(SLAIHEE)**

supported by Informatics Institute of Technology

Friday, 28 July 2023

9.00 a.m. to 3.00 p.m.

held at

Informatics Institute of Technology (IIT)

DEDICATION

Dedicated to the ever-reminiscent memory of Dr Shrinika Weerakoon

BSc, MSc, MBA(Perth), DBA (Bath, UK), SEDA Accredited Teacher, ASTHE

- an irreplaceable Higher Educational Developer

- a colleague, a friend, a guide, a change agent: who always found time to be there for you

- who epitomised a life that: "what you leave behind is not what is engraved in stone monuments, but what is woven into the lives of others" (Pericles)

and

- in whose memory SLAIHEE has instituted an annual Award:
  "Dr Shrinika Weerakoon Memorial Award for the
  Best Paper in Changing HE student skills"

19th SLAIHEE Higher Education Conference

on

"**Outcome-based Higher Education for developing
knowledge-based procedures in students**"
Friday, 28 July 2023, 9.00 a.m. to 3.00 p.m., held at Informatics Institute of Technology**,**
School of Computing, 10 Trelawney Place, Colombo 04

(the materials of this conference are available at www.slaihee.org)

A WARM WELCOME TO THE CONFERENCE

This is the nineteenth year since SLAIHEE was established as a non-profit voluntary organisation. From its establishment in 2005, SLAIHEE (Sri Lanka Association for Improving Higher Education Effectiveness) has, jointly with a Staff Development Centre (SDC), organised an annual conference, taking pleasure to provide the only opportunity in Sri Lanka for our university staff to document and discuss the learning enhancements that they have been able to achieve through their subject-related teaching. For the first eleven years, the SDC at the University of Colombo was the organisational partner hosting this annual conference. Then, in its 12th year, the SLAIHEE-SDC conference was hosted by the Staff Development Centre, Wayamba University of Sri Lanka and in the 13th year, was hosted by the Open University of Sri Lanka. 14th year, the host became a private HEI, the Sri Lanka Technological Campus with its newly established Centre of Excellence in Teaching, Learning & Innovation (CETLI). The 15th conference was hosted by the Staff Development Centre, Moratuwa University of Sri Lanka. The 16th, 17th and 18th conferences were held online via Zoom due to the COVID-19 pandemic-related restrictions. This year, after the COVID-19 global pandemic, the SLAIHEE Executive Committee decided to hold this conference physically, face-to-face, and was pleased to be supported by the Informatics Institute of Technology (IIT) to hold it at the IIT premises.

This conference has become a Community of Practice and the only national conference in Sri Lanka that focuses exclusively on learning and teaching in the Higher Education (HE) context (SoTL, Scholarship of Teaching and Learning). This year's conference celebrates the nineteenth year of SLAIHEE and 25 years since the first SDC was established in Sri Lanka (at University of Colombo). Such a 25-year history gives us the opportunity to look back and use that experience to question our 'maturity' and where we are, specially with the untimely death of Dr Shrinika Weerakoon who stood, with immense credibility among academics, at the forefront of HE change and improvement in Sri Lanka. She played her role excellently and moved on, much to our disbelief and sorrow. What we will have to say, and do, over the next ten to twenty years is now up to you all and to SLAIHEE. As pioneers in striving to maintain the quality enhancement of HE in Sri Lanka, SLAIHEE has faced and traversed huge challenges and our simple beginnings have enabled us to face these. What challenges the future holds are already palpable, specially with a change in training quality offered at SDC's of our HE institutions.

This year's conference theme, *"Outcome-based Higher Education for developing knowledge-based procedures in students"* (for previous conference themes and proceedings, see: www.slaihee.org) is relevant because the quality of HE teaching, as well as the quality of training programmes for HE teachers, seem to be severely challenged at present. This theme

is a complex theme even while many lecturers, and HE management, mistakenly think that developing skills in students can be done simply and quickly, such as by asking them to stand up and 'give a presentation' (for developing student communication skill), by a single classroom activity (to develop critical thinking), by a couple of group work tasks (for collaboration skill).

While that thinking runs counter to their own 'saying', critiquing that HE graduates lack skills, it really reflects the hard truth that skill building is complex, iterative, and sequential in its practical deployment. It requires students to first have different sets of knowledge, including subject knowledge. Next, students need to have been given the opportunity to learn and to practice repeatedly (based on those knowledge sets), the component steps of the procedure that would develop that pre-identified skill as the student outcome. This practice should also be accompanied by the lecturer giving copious supportive feedback together with a relevant guiding rubric for the student to self-monitor that skill development. Student skill building therefore has to move towards the development of procedures that students can use with students incorporating multiple knowledge elements, intertwined with supervised practice, feedback and effective delivery skills by lecturers. It is a collaborative student-staff classroom exercise, moving away from the often-heard student blame for lack of skills, that staff voice.

While we can identify that such a skills development agenda is complex and know that it is yet to be adopted widely in our HE, it was similarly reflected in the numbers of submitted papers that the Editorial Committee were unable to accept. Therefore, the papers presented in this conference theme are significant in being able to show that, when lecturers receive effective targeted training and support, they will rise to the occasion to develop the much-needed skills in our HE students. Indeed, to meet this training lacuna, SLAIHEE conducted four half-day training workshops leading to this conference and was pleased to see that papers submitted by these workshop attendees had improved to become effective in their skill-outcome teaching approaches, planning designs, delivery methodologies and skills monitoring.

We take great pleasure in welcoming you, and our Keynote speaker, Mrs H M D Sajeewanie D Somaratna, Acting Librarian, University of Colombo. The conference is of particular interest to all those with a concern and commitment to the quality and fate of future Higher Education in Sri Lanka, including; lecturers, managers and administrators in Higher Education, educational and staff developers, and policy makers.

We hope you have an extremely enjoyable experience that will motivate all of us to enhance the quality and usefulness of the higher education experience, mainly to our students.

From SLAIHEE – a big thank you;
- for your participation,

- to the presenters, reporting how they develop knowledge-based procedures in students to enhance students' skills to sustain outcome based higher education while addressing the challenges faced by both HE teachers and students in the 21st Century,

- specially to Mrs H M D Sajeewanie D Somaratna for the Keynote speech,

- to Mr Mohan Fernando, CEO of Informatics Institute of Technology (IIT)

- to IIT staff for assisting us to hold the Conference at their IIT venue

- to all the special invitees, and to the reviewers for their speedy and efficient reviews with helpful feedback.

The Conference Organising Committee;

     Dr Iroja Caldera, University of Colombo

     Professor Suki Ekaratne, IIT

     Professor Sunethra Perera, University of Colombo

     Dr R M P S Bandara, Sri Lanka Institute of Information Technology

     Dr Jinendra Dissanayake, University of Colombo

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     Ms Sapna Kumarapathirage, Informatics Institute of Technology (IIT)

     Ms Ashani Fernando, University of Colombo

The Conference Papers Committee;

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     Professor Sunethra Perera, University of Colombo

     Professor Suki Ekaratne, IIT

This Proceedings Volume was edited by;

Chief Editor: Dr Iroja Caldera, University of Colombo

Associate Editors: Professor Suki Ekaratne, IIT
                    Professor Sunethra Perera, University of Colombo

PROGRAMME

Conference Theme: *Outcome-based Higher Education for developing knowledge-based procedures in students*

08:30 – 08:55   :   **Registration**

<u>Inauguration</u>
09:00 – 09:05   :   Conference Announcement by Prof Sunethra Perera
                    Past President SLAIHEE

09:05 – 09:10   :   Welcome address by Dr Iroja Caldera, President, SLAIHEE

09:10 – 09:20   :   Address by Guest of Honour: Mr Mohan Fernando, CEO of
                      Informatics Institute of Technology (IIT)

09:20 – 09:50   :   Keynote Address by Ms Sajeewanie D Somaratne, Acting Librarian,
                    University of Colombo
09:50 – 09:55   :   Vote of Thanks by Dr Jinendra Dissanayake, President-Elect, SLAIHEE

09:55 – 10:25   :   **Morning Tea** (with Networking)

<u>Paper Presentations</u> **with 'Best Paper' selection [Session 1 & Session 2]**
10:25 – 10:35   :   Remarks by Prof. Suki Ekaratne on;
                    Awardee selection - Dr Shrinika Weerakoon Memorial Award for
                    Best Paper
                    Helping to Improve Conference Participants' Technical Skills
10:35 – 11:50   :   Session 1: Chair- Dr R M P S Bandara

11:55 – 13:10   :   Session 2: Chair- Ms Abarnah Kirupananda

13:10 – 13:15   :   **Feedback Form Completion** (online)

13:15 – 13:50   :   Non-Members: Lunch (in Cafeteria-ground floor, IIT)

13:15 – 13:50   Members: SLAIHEE **AGM** (in Auditorium, IIT), followed by Lunch
                    (AGM = Annual General Meeting: only for SLAIHEE 2023 members)

<u>Mini-Workshop</u> **on "Designing Plans to improve selected student skills"**
    13:50   Group Formation based on Selected Skills
    13:55   Facilitated Group work: Designing Plans
    14:40   Groups Present: Our Designed Plans & when to enact

15:00   **Afternoon tea** *with* **Conference Closure**

SLAIHEE Conference, July 28th 2023 - Session Timetable	
(page #s refer to pages in Conference Proceedings Book)	
Session /venue:	*Session I*
	[Venue: Auditorium, IIT School of Computing]
Session Chairs: Dr R M P S Bandara	
Time	Paper #, page numbers, author(s), *Paper Title*
10.35– 10.50	1.1 – on pp. 1-5 (by) Janice Abeykoon *Improving Students' Independent Learning Skill through Oscillation Teaching*
10.50 – 11.05	1.2 – on pp. 6-10 (by) Ruwaiha Razik *Round-Robin technique to improve impromptu speaking skills in English: student perceptions and observer ratings*
11.05 – 11.20	1.3 – on pp. 11-15 (by) Abarnah Kirupananda *Encouraging development of peer learning skill through in-class activities to enhance student learning experience and interactions*
11.20 – 11.35	1.4 – on pp. 16-20 (by) H A Seneviratne and W M G K Wijerathne *Use of problem-centred learning to develop critical thinking skills among Cyber Security IT students: Student perceptions*
11.35– 11.50	1.5- on pp. 21-25 (by) Shalini Kaduwela *Use of FouRe's method to develop paraphrase building skill in higher education students*
Session II	
Session Chair: Ms. Abarnah Kirupananda	
Time	Paper #, page numbers, author(s), *Paper Title*
11.55 – 12.10	2.1 – on pp. 26-30 (by) Vindya Perera and Nelun de Silva *Self-correction approach to improve students' skills of answering structured essay questions*
12.10 – 12.25	2.2 – on pp. 31-35 (by) B T Liyanaarachchi *Incorporating KWL method in teaching in order to make thinking of students visible in enhancing analytical reasoning*
12.25 – 12.40	2.3 – on pp. 36-40 (by) W R V W Anuradhi and Sunethra Perera *Improving student 4C's skills using student-centred learning activities: student performance and perceptions*
12.40 – 12.55	2.4 –pp. 41-45 (by) U R S R K Senarathne *Ayurveda undergraduates' perceptions on the methodology used to improve their information retrieval skills in the Rasa Shasthra area*
12.55–13.10	2.5 –pp. 46-50 (by) V P N Senadhi *Students' perception on engaging in Fishbowl activity to accomplish 4C's*

Reviewers of papers;

Professor Suki Ekaratne, IIT

Dr Iroja Caldera, University of Colombo

Professor Sunethra Perera, University of Colombo

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Ms Ruwani Mayakaduwa, University of Colombo

Ms Abarnah Kirupananda, Informatics Institute of Technology (IIT Campus)

Ms Sapna Kumarapathirage, Informatics Institute of Technology (IIT Campus)

Ms Ashani Fernando, University of Colombo

The paper submission and peer-review process: papers that appear in this Book of Proceedings are in the form of `Full Papers', made up of sections comprised of Background / Purpose (i.e. Introduction), Methodology, Results, Discussion and Conclusions, References. Each paper has been accepted and printed after having undergone a thorough and rigorous peer-review process. In this process, a Short Abstract had first been submitted together with a Self-assessment Scoring Sheet. These abstracts were reviewed by the "Papers Committee", and relevant authors were invited to submit Full Papers. Each `Full Paper' then underwent a double-refereeing process by two independent reviewers who provided referee reports and supportive feedback to be sent to authors justifying acceptance, improvement or rejection of each submission. A third referee was used whenever the first two referees were in disagreement. The reports of both referees were collated, and the feedback was sent to authors to accept, reject or to do modifications, if any, to the Full Papers as recommended by both referees to meet the 'quality standards'. Authors had the option of not making the changes if they were able to justify why the referee-recommended modifications were not acceptable. Abstracts that were rejected, or not received by the deadline with the recommended modifications, were not 'accepted' and so, do not appear in this Book of Proceedings.

Abstracts / papers plagiarised from others' work, when not acknowledged in the submitted Abstract/paper or have a substantial component of plagiarised material, are in general rejected and followed-up by formally writing to the authors, through their institution heads, as practices that are unacceptable and looked down by the entire academic community worldwide.

All referees and presenters have, in this way, collaboratively contributed to enhancing the quality of Higher Education in our motherland. Even where papers were not accepted, we hope the detailed feedback given would have helped authors to improve their subsequent writing and submissions.

Improving students' independent learning skill through oscillation teaching

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Abstract

Independent learning, though essential to apply knowledge, is avoided by most students, in turn affecting their performance negatively. This drift-away, from independent learning, also lessens the enthusiasm in learning the subject. While analysing past performance of a module, it was observed that students lacked knowledge in applying concepts and logic. With the focus of inculcating independent learning amongst students that would reduce the gap in successfully applying the concepts and logic, I used teaching of content, interleaved with focussed student activities ('oscillation teaching'). Students (n=55) following a Requirement Modelling course in their first year were grouped in 4's and sat in groups throughout the designed learning activities. Oscillation teaching replaced the traditional lecture and tutorial. First, the relevant concept was taught. Then, students were requested to discuss and attempt tasks in groups with supervision, followed by a take-home activity to do independently prior to the next session. Student numbers engaging in groups and attempting individual activities were recorded. The quality of answers was evaluated using an analytic rubric and resulting course marks were compared with the previous year. Student feedback was gathered on the method of teaching. During the two in-class activities, student engagement within groups for activity 1 and 2 were observed as 78% and 80% respectively. Analysis of the take-home activity showed that 74% had attempted the activity compared to 48% last year and an average mark of 63.9 was obtained. The average course mark increased to 62.03 (from 52.93, last year). Further, the post- session student feedback revealed that the intervention had a positive impact on independent learning. The study showed that the use of oscillation teaching had supported the students to apply the concepts and logic better while encouraging them to learn independently. Thus, the study confirmed the positive impact of oscillation teaching in helping to improve students' skills in applying concepts independently.

Background

Independent learning is referred to as a method or learning process where learners have ownership and control of their learning (Livingston, 2012). Independent learning, which is an important aspect to develop life-long learners is currently avoided by many students. This improper practice of the students has caused a negative impact to their performance, while reducing the enthusiasm to learn the subject. When analysing the past performance of the Requirements Analysis course delivered in the first year of BSc (Hons) Business Information Systems programme, I identified that 21% of the students had failed the course and the course average stood at 52.93. While further analysing the reason behind the failure rate and low course average, I identified that the students were facing a challenge in applying the concepts and logic discussed during the class. In search for solutions for this problem, I

reflected on my method of teaching. I had used the traditional method of delivery which comprised of a lecture and a tutorial session. I taught the theory during the lecture and gave them activities to work on independently during the tutorial session. I observed that the students were struggling to apply the concepts they learnt while working on the activities given. This struggle of the students motivated me to research on a different method to teach this course.

As a solution to this problem 'interleaved practice' was introduced. Interleaved practice focuses on Implementing a schedule of practice that mixes different kinds of problems, or a schedule of study that mixes different kinds of material, within a single study session (Dunlosky *et al.,* 2013). Interleaved practice could be implemented in different ways depending on the focus of the study. When teaching a concept through interleaving, students are given the opportunity to practice with the material before moving on to another concept (Interleaving: A Teacher's Guide, 2021). This repetitive practice also referred to as oscillation teaching provides multiple opportunities for students to reach outcomes based on the material. Interleaving could be practiced for subjects that require a "deep understanding".

Further, identifying solutions to the problem, lesson breaks (Biggs & Tang, 2011) were used to ensure that students stay active while learning. Moving on to encourage students to learn independently, small group learning (Biggs & Tang, 2011) was used during the class. This method encourages the student to reflect on their independent learning while comparing the way others learn, thus learning continues outside the class as well. The delivery of the course followed the process of Tell-Show- Do (with/without supervision). Analytical rubrics have been used in the process of evaluating and grading students. The effectiveness of the change was judged by obtaining formative feedback (Hattie, 2009)

The objective of this study was to assess the effect of Interleaved practice ('oscillation teaching') to improve the skill of student independent learning which supports to apply the concepts and logic better, in turn improving their overall course performance.

Methodology

The study was conducted for 55 students following the Requirement Modelling course in their first year. Initially, the students were informed of the new method of teaching via the LMS (Blackboard) announcements. The students were grouped into groups of four members and a seating allocation was given. The students were requested to keep their mobile phones in a space provided in front of the class to ensure that they do not get disturbed and give their fullest attention to the work done in class. The lecture material was updated with interleaved content and a session plan was drafted including the task done by the lecturer, task done by the students and lesson breaks. With this setting I commenced my new method of teaching.

Focusing on the process of Tell-Show-Do (with/without supervision), I first taught the students part of the concepts of the week's lecture. Then I discussed an example and worked with them so that they identified how to apply the concept. Next, I gave them an activity to be done in their groups. The students were requested to discuss in their groups, and attempt to apply the concept with the support of their peers under my supervision.

Small group teaching was used during class to provide peer support while learning and to

make students feel more confident to learn independently. Further, this method also supports the students to continue learning out of class and creates a support structure for the weaker students. I repeated this process of teaching during the session and gradually increased the time given for student activities to practice what they have learned as shown in figure 1. The student tasks included, two concept application activities and a few lesson break activities given in table 1. Finally, the students were given a take home activity to be done independently prior to the next session.
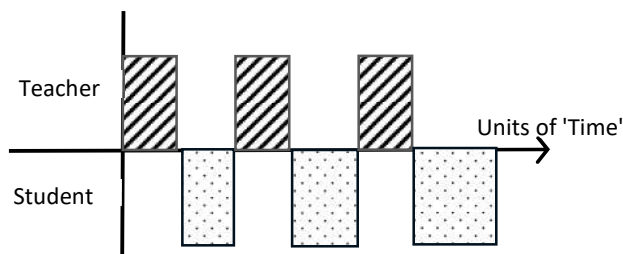

Figure 1. Time allocation for teacher and student

Table 1. Student Activities

Activity	Activity type
1	Discuss
2	Concept application activity 1
3	Read - own notes
4	Discuss
5	Concept application activity 2

Student numbers engaging in groups and attempting the take home activity was recorded to assess the effect of interleaved practice for independent learning. Further, the quality of answers of the take home activity was assessed using an analytical rubric which is given as Table 2. A google form was used to gather student feedback to assess the new method of teaching.

Table 2. Analytical rubric used to assess take home activity

Criteria	Poor (0-1 marks)	Satisfactory (2-3 marks)	Good (4-5 marks)
Identification of User requirements	Poor identification of UR not relevant	Good identification of UR. Relevance to the case can improve	Excellent identification of UR. Relevant to the case
Identification of System requirement	Poor identification of SR not relevant	Good identification of SR. Relevance to the UR can improve	Excellent identification of SR. Very relevant to the UR
Writing Style	Incorrect style of writing	Style of writing is average with grammatical errors	Exact style of writing followed with good grammar
Correct formatting	Correct formatting not followed	Correct style of formatting with incorrect numbering	Correct style of formatting with correct numbering

Results

The student engagement within the groups were assessed based on their participation for the discussions and contribution for the concept application activities. The student engagement rate for the first concept application activity was recorded as 78% while 80% was recorded for the second activity. While analysing these results along with the number of students who had attempted the individual take home activity it was identified that the engagement during the group activity had an impact on the number of attempts of the take home activity which is illustrated in figure 2. Analysis of the take home activity showed that 74% of the students had attempted the activity which is higher than the 48% last year.
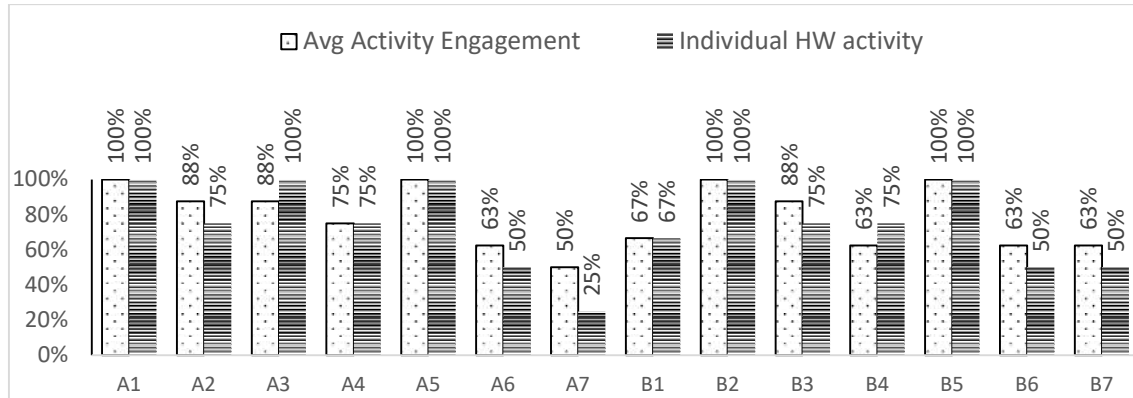

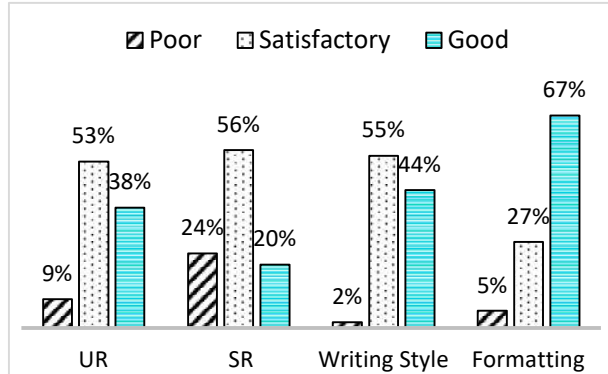Figure 2. Impact of engagement towards independent activity

Figure 3. Marks distribution of the take home activity

Further analysing the take home activity, it was noted that the students had obtained an average mark of 63.9 for the task given. Analyzing the mark distribution (figure 3) it was evident that only 6 students obtained an average less than 40 which is 11% of the class. The mean of the course increased from 52.93 of last year to 62.03 this year which shows an improvement in the overall course results.

The post-session feedback obtained from the students on the method of teaching showed that the students, had applied the concepts better with the new method of teaching and this was evident in the feedback provided as stated in figure 4.
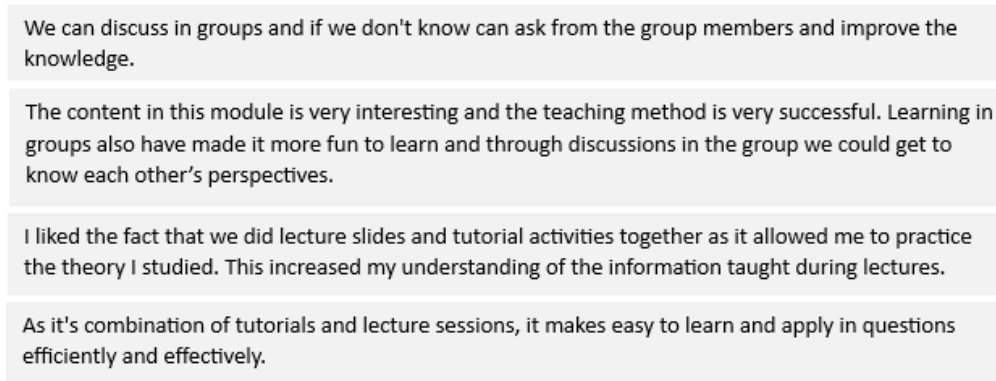
> We can discuss in groups and if we don't know can ask from the group members and improve the knowledge.

> The content in this module is very interesting and the teaching method is very successful. Learning in groups also have made it more fun to learn and through discussions in the group we could get to know each other's perspectives.

> I liked the fact that we did lecture slides and tutorial activities together as it allowed me to practice the theory I studied. This increased my understanding of the information taught during lectures.

> As it's combination of tutorials and lecture sessions, it makes easy to learn and apply in questions efficiently and effectively.

Figure 4. Post session feedback

Discussion and Conclusion

The findings of the study revealed that the students were able to apply the concepts better when activities were interleaved replacing the traditional lecture and tutorial session. The opening provided to learn in groups and practice in class created a better learning opportunity amongst students, thus encouraging them to learn independently. Furthermore, restrictions of mobile phones during class became a new habit which broke the barriers to student engagement. The introduction of small group teaching created a support structure for the students to learn out of class. The expectation from students to learn independently without support and guidance is a challenge. Therefore, it is important that adequate time to practice with supervision is given to students prior to expecting them to learn independently. Thus, a change to the teaching method should be brought about providing the opportunity for students to practice in class. This in turn would encourage the students to improve their skill in independent learning as, in this learning example, they have applied the concepts clearly. This study confirms that interleaved practice (oscillation teaching) has positively impacted and improved students' skill of independent learning.

References

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Round-Robin technique to improve impromptu speaking skills in English: student perceptions and observer ratings

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Lack of English language proficiency is a bottleneck that challenges graduate employability. Although students are given opportunities to speak in the classes, not every student speaks up. The continuous assessments practiced in the management discipline usually involves an oral presentation in English language. However, these presentations are pre-prepared and scripted. Hence, a once a semester presentation does not contribute to improve the impromptu speaking skills of students. Therefore, a regular space for students to speak during the class time was introduced, where it was compulsory for each student to speak for 20 seconds using the Round-Robin technique. Round-Robin activity was introduced to 3rd year students (n=27) studying Employee Resourcing (HRM3314). It required each student in the class to speak for 20 seconds. Each successive speaker was required to start speaking from the word uttered by the previous speaker at the 20th second at which point an indication was signalled. This activity was practiced in 12 sessions on regular basis. The subject of the speech commenced with self-introduction and scaffolded to discuss complex topics related to the subject. An assistant lecturer observed the sessions and marked the progress of each student based on a rubric. An individual feedback chart was given to each student at the end of the semester depicting the progress they made. Observer ratings and student perceptions confirmed positive outcomes. According to the independent observer's rating, 83% of the students made good progress, while 17% achieved satisfactory improvement. 95% of the students informed this activity helped them to improve their confidence to speak in English in public while 89% of the students reported they felt more comfortable in impromptu speech. 93% of the students endorsed that this activity should be continually practiced as a regular classroom activity. Results confirmed that Round-Robin technique facilitated combatting speaking apprehension and improving impromptu speaking skills of undergraduates in English language.

Background

English language proficiency is a key enabler for employment and career advancement across the Commonwealth. Lack of English proficiency among graduates in Sri Lanka is a key bottleneck that hinders securing job opportunities, particularly in the private sector. Further, scholars have recognised that lack of oral skills in English language is more pronounced among Sri Lankan graduates, which is a key contributing factor to the soaring level of unemployment among Sri Lankan graduates (Wijewardena et al., 2014). This issue remains a perpetual problem, despite adopting English as the medium of instruction in majority of the courses taught at national universities in the country. This phenomenon signals the necessity and importance of taking measures to develop the soft skill of oral proficiency in English among undergraduates as a key priority.

Leong and Ahmadi (2017) inform that speaking skills is the most difficult aspect of learning a new language. Scholars also highlight that speaking skills in English is overlooked by school and universities, as they pay more attention towards grammar and sentence structure (Leong & Ahmadi, 2017; Sahardin et al., 2019). Speaking skills can be broadly categorised into two: prepared and impromptu. While prepared speaking skills help an individual to communicate on a pre-prepared theme or a topic, impromptu speaking skills are spontaneous. Day to day communication in work and non-work situations are mostly impromptu, which emphasises that schools and universities should give high priority to improve impromptu speaking skills in English. However, when the opportunity is given to the students to speak up in the classes, particularly during the question and answer sessions, not every student takes the chance to speak up. Scholars highlight that fear of making mistakes, criticisms, and shyness are the main reasons that prevent students speaking up in English in classes (Leong & Ahmadi, 2017; Sahardin et al., 2019). The continuous assessments practiced in the management discipline usually involves an oral presentation in which each student is expected to present. However, these presentations are pre-prepared and scripted. Hence, a once a semester presentation does not help in improving the speaking skills of the students. Therefore, a regular speaking space where every student speaks is essential to improve the impromptu speaking skills of the students. The Round-Robin technique was first introduced by Spencer Kagen in 1994 (Sahardin et al., 2019). This mechanism is adopted by Toastmasters movement in Sri Lanka in their regular sessions, and the researcher learnt about this technique through this movement. Round-Robin technique was developed in a classroom setting where each student took the turn to follow the same structure of speaking. Kagen (2003) informs that declaring a speaking structure equalises every student in the group while fostering cooperative learning. He also emphasises that enabling speaking activities in the classroom without a structure and interaction rules creates space for few students to dominate, which hinders the creation of a safe environment for students.

Methodology

In order to improve the improving speaking skills and combat speaking apprehension, a regular space for students to speak during the class time was introduced, where it was compulsory for each student to speak for 20 seconds using the Round-Robin technique. The Round-Robin activity was practiced in lieu of a lecture break for the students who followed the class HRM3311 – Employee Resourcing in the Bachelor of Business Management Human Resource Management Special Degree programme offered by the Faculty of Management and Finance, University of Colombo. The class consisted of 27 3rd year students. The activity structure required each student in the class to speak for 20 seconds. Each successive speaker was expected to start speaking with the last word uttered by the previous speaker at the end of the 20th second. The time indication was signalled with the ring of a bell. This structured activity was practiced in 12 sessions on regular basis. The subject of the impromptu speech commenced with self-introduction and scaffolded to discuss complex topics related to the lesson and the subject as depicted in Table 1.

In the first session, a number indicating the seating sequence was given to each student, and they were asked to sit in the order of the numbers in all the sessions in order to facilitate progress monitoring by the independent observer. An assistant lecturer observed the session and marked the progress of each student based on a rubric presented in Table 2. Each student was given an individual progress chart at the end of the semester on the progress they made in the activity. The scoring rubric was also shared with the students to understand their scoring.

Table 1. Themes of the Round-Robin session (Week 1 – 12)

Week Number	Theme of the Round-Robin session
Week 1	Self-introduction
Week 2 & 3	Any topic comfortable to the student
Week 4 & 5	Story chain
Week 6 & 7	Lesson in discussion
Week 8 & 9	Lesson discussed in the previous week
Week 10& 11	New developments in the subject
Week 12	Link the subject to a different subject taught in the same semester

Table 2. Rubric used to track participant progress

Criteria	Good – 3	Satisfactory – 2	Needs Improvement – 1
Time taken to speak up in the session	Started speaking at the ring of the bell with no delays.	Took nearly 15 seconds to start speaking	Took more than 15 seconds to start speaking.
Ability to start speaking with the last word uttered by the previous speaker	Started with the last word of the previous speaker.	Used the last work to form the sentence but did not start with the last word.	Did not use the last word of previous speaker in the speech at all.
Ability to link the speech to the theme	The entire speech is in relation to the theme.	There is some reference to the theme.	The speech was not in relation theme.
Utilization of total time allotted to speak	Fully utilized the 30 seconds allotted.	Utilized half time allotted – I e spoke for 15 seconds.	Spoke for less than 15 seconds.
Overall enthusiasm in taking part in the Round-Robin session	Demonstrated a high level of enthusiasm with high level of engagement.	Demonstrated some enthusiasm.	Was not enthusiastic at all.

Results

According to the independent observer's scorings, 83% of the students made good progress, while 17% achieved satisfactory improvement. The progress chart of a student who was present in all 12 sessions (Student code 19) is presented in Figure 1 below. In   terms   of student's perceptions, 95% of the students informed this activity helped them to improve their confidence to speak up in English. 89% of the students reported they felt more comfortable in impromptu speaking in English. 93% of the students endorsed that this activity should be continually practiced as a regular classroom activity.
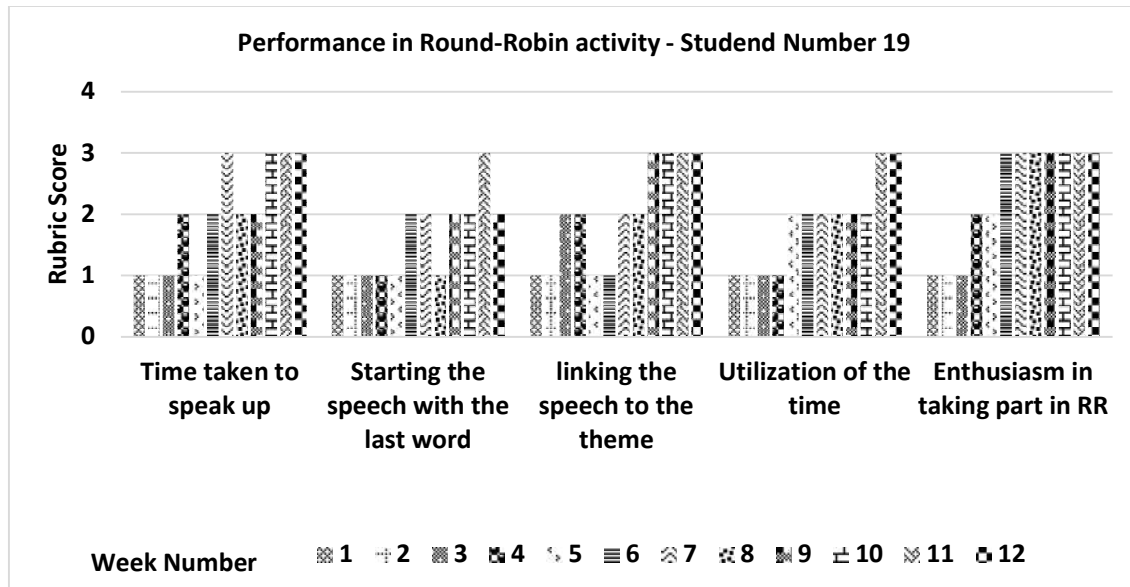

Figure 1. The progress chart of student # 19 throughout the 12 sessions

Discussion and Conclusion

The results revealed that the Round-Robin technique improved the impromptu speaking skills in English of undergraduates, which helped them to build their confidence to express and share their ideas with their peers. These findings complement with the findings of a study by Sahardin et al. (2019) who introduced Round-Robin technique to junior high school students in Indonesia. The student feedback confirmed that Round-Robin activity should be adopted as a regular classroom activity.

The objective of the present intervention was to improve the impromptu speaking skills of the undergraduates in English. Future interventions could also capture the accuracy of the language use and grammar in speaking. Such an endeavour needs a standardised rubric that captures elements of the accuracy of the language use. Alternatively, the Round-Robin activity could be adopted in successive courses in the programme, where the initial course could focus on improving impromptu speaking skills and the successive course could focus on improving the grammar and the technicalities of the language. Practicing Round-Robin technique in more than one course and/ or in more than one semester will provide more structured opportunities for students to improve their English language skills over a longer period of time.

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Acknowledgment

Encouraging development of peer learning skill through in-class activities to enhance student learning experience and interactions

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Abstract

Peer to peer learning is where the students learn from each other in addition to what is taught by the teacher. It has been proved by research that this method is efficient, and it enables students to take ownership, increase self-confidence and help learn from experience, knowledge and skills of others. When the students join the university, they have very few friends. They always try to network with only the people they knew previously. Also, it was noticed that they worked in silos and rarely got involved in peer learning. As I noticed that the students are reluctant to talk with others in class during the year 1 Business Computing module for business school students, I planned to introduce activities in class that will promote peer learning. There were 78 students enrolled for this module. I decided to do this in a scaffolded manner so that they will be able to adapt to this new concept. During the third week of the lecture, I used Jigsaw method for students to learn concepts related to data. Then during the 5th week I got the students to teach the class on Data Visualisation. Observations were made before and after the intervention to measure the effectiveness. At the end of these intervention feedback was collected from 78 students and response was neutral. 51% of the class has indicated that this intervention has helped them while 49% of the students have found it difficult when the peers did not cooperate with the learning activities. As peer learning should be promoted among students, I believe it is necessary we identify the correct technique and implement this in class for students to practice. We should start with less 'risky' activities and gradually move to more 'risky' activities. By continuously practicing this in class, we can make this to develop into a habit in students.

Background

Peer learning is an essential skill that needs to be instilled in students. It helps students to work effectively and efficiently in teams which in turn will help them to be successful in their careers. Peer learning also helps the students to take ownership and to become more responsible learners. This not only makes them to be responsible themselves but also responsible for others learning too. By teaching peers, learners also enhance their knowledge and skills (Boud et al., 2016). Further, research also have proven that this method helps students to overcome challenges in learning, reduces the failure rate in class and also improves the attendance of the students in class (Tullis & Goldstone, 2020). It also helps students to learn to collaboratively work with their peers, provides them an opportunity to learn to give and receive feedback, and may facilitate creating a community of learners. We also must be mindful that peer learning is not a complete replacement for a teacher in a classroom. It is only a method that can be used to enhance students' skills facilitated by the

lecturer (Maria, 2023).

In today's world students not only need to excel in reading, writing and arithmetic but they also need to be excellent collaborators, communicators, critical thinkers, and creative individuals. Hence facilitating peer learning through in class activities will also help them to become effective communicators and good collaborators (Erdoğan, 2019). The employers in 21st century is also looking for more of employees who are good in collaboration, communication, critical thinking and creativity. Enhancing these skills will make them more industry ready (Keane, 2012).

One problem I noticed in my classes is that most of the time students are working independently unless there is a group coursework. Most of the first year students do not know their peers in the class. Due to this, they struggle to work together when an assessment is given. It takes a long time for them to get to know each other. Furthermore, they rely always on the lecturer to learn the concepts and hardly shares their knowledge with peers. There was less opportunity given for them too to practice collaborative learning in class.

As I wanted to instill peer learning in my students and make it a habit, I researched strategies to improve peer interactions in class. I realized that this must be part of the module teaching and learning process to ensure that the students practice this. As the result of the research done, jigsaw activity and group presentations were interesting and feasible to be done during the classroom sessions. Jigsaw activity trains the students to independently work to achieve a common goal.

Methodology

This is an action research which was carried out to encourage the students to collaborate with their peers and enrich their learning experience. This intervention was done with the 1st year students for the module Business Computing. This class had 78 registered students. The student group consisted of two different degree programmes namely BSc Business Information Systems and BSc Business Data Analytics. I planned two key activities as jigsaw activity and group presentation to be done during the semester. Apart from this, time to time I also used think-pair-share to encourage them to work with peers. During the 2nd week lecture, I introduced them few basic concepts on data analytics and time to time I got them to discuss it with their neighbours.

During the third week of the semester there was a topic on introducing attribute types and attribute values in data analytics. I collected the student list using a google form where I captured their name, student number and the degree programme. I divided the class into ten different groups with 8 members in each group. I ensured each group had members from both degree programmes. At the end of the 2nd week lecture, I introduced them the importance of peer learning and what benefits are there for them using this technique to ensure that they actively involved in the activities. The group list was published two days before the session with the instruction for them to be seated with their groups for the next lecture. On the session day the students were seated with their group members. Initially I explained to them some basic concepts and then started the activity. I introduced them to the jigsaw activity along with the home group and expert group concepts. All the students

with a similar number were then grouped and given a topic to research and learn.

They were given ten minutes for this activity. Then they returned to the home groups and explained that to their peers. Even though I allocated only 10 minutes to explain it to peers, it took closer to 20 minutes. Once the activity was completed, I taught them the remaining concepts.

During the 5th week, the students had to learn data visualization techniques. I decided to do this activity also as a peer learning activity. The students were again divided into 15 groups with 5 members in a group with three groups having 6 members. Each group was given a chart type one week prior to the session. The chart type was emailed along with a motivational message to the batch, indicating the benefit of doing this activity. It was made mandatory that every member in the group should present to avoid any free riders. Each group was given 5 minutes for the presentation and two minutes for question and answer time. To save time, all the students were asked to email any visual aids prior to the session. The visual aid was then projected as the content from the lecturer's laptop to ensure there is less switching time between the groups. This helped a to save time considerably. On the day of the session the teams were called in a random order to present and then another group (which was picked by me) had to give constructive feedback for the group which presented. This helped to keep the students attentive to the presentation and for them to learn the art of giving constructive feedback respecting their peers. They also rated their peers through a google form [https://forms.gle/HWo4kvTezKtNjpTT6]. At the end of each session feedback was collected from the students using google forms [https://forms.gle/jnWEMseJgoCNfpuQ6/] [https://forms.gle/H9k81eumFG9Tj5qu6].

Results

At the end of both interventions, feedback was collected from the entire class. Table 1 below shows the summary of the feedback received for two important questions in the feedback form. It is evident that initially there was resistance from the students and later they have been positive about this intervention. In this 1 indicated very bad and 5 indicated very good.

Table 3. Feedback summary for two important questions

Intervention	Criteria / Scale	1	2	3	4	5
Jigsaw	Was the Jigsaw session of self- learning with the support of your peers helpful in promoting better understanding as compared to the lecturer teaching?	14.6	25	20.8	33.3	6.3
	Jigsaw activity - Was teaching and being taught by peers helpful?	10.4	27.1	25	22.9	14.6
Group Presentation	Was the Presentation session of self -learning with the support of your peers helpful in promoting better understanding as compared to the lecturer teaching?	2.2	13.3	24.4	48.9	11.1
	Group Presentation - Was teaching and being taught by peers helpful?	4.4	11.1	26.7	48.9	8.9

1 – Strongly disagree and 5 strongly agree

After the 1st and 2nd activities, it was asked if the student would like to use this method more often. As shown in figure 1 and 2, at the initial stage only 43.8% were positive about this and later after the 2nd activities this number increased to 51.1%.
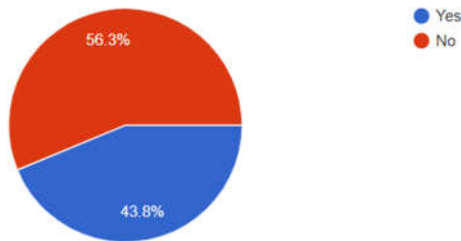

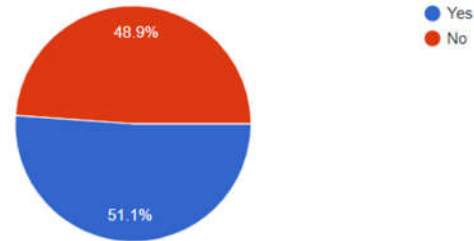*Figure 5 Jigsaw Activity*   *Figure 6 Group Presentation*

The students also have commented that these activities have given them a chance to work with their peers and to get to know them as well. While it had been a fun filled learning experience for few, some also have felt it boring especially when the group members did not explain well. Based on the evaluation provided by the peers, best three teams were selected and appreciated during the class.

Discussion and Conclusion

These chosen activities helped to meet the outcome of promoting peer learning among the students. It is important that the activities should be carefully planned and should be introduced in a scaffolded method. Also,it is very important that we start this with some less complicated topics as it will help the students to identify and apply the concepts easily on their own and boost their confidence level. Introducing some gamified approaches such as awarding points for activities and maintaining leader boards will help a lot to encourage the students to actively involve in the activities.

By reflecting on the implementation, results, and feedback, I identified a few changes to be made in future implementation of the same method. Student preferred to choose the groups on their own as there were instances where some members never contributed. Completely agreeing with this suggestion might not give the effective output where we wanted them to also get to know each other through this activity. However, we could do the grouping by asking them to choose 3 members and we can assign 2 members. When the grouping was done using the students submitted data, there were some students who missed adding their names. This impacted on starting the activity on time as they had to be assigned to a group. Using the list obtained from official mode such as from the registry will help to reduce this issue too.

This intervention not only promotes interaction among peers and help them learn from each other, but also improve the 21st century skills mainly communication and collaboration. When these activities are practiced from the 1st semester of university life and if it is practiced

continuously, we are building this skill to become a habit that the student will practice lifelong.

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Use of problem centred learning to develop critical thinking skills among Cyber Security IT students: student perceptions

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Abstract

This pre-post study examines Problem Centred Learning (PCL) effectiveness in enhancing critical thinking skills of IT students(n=45) in Department of Multimedia and Web Technology, Faculty of Information Technology, University of Vocational Technology who enrolled to follow the 2nd year course on Cyber Security. It was observed that traditional lecture-based instruction hampered critical thinking due to passive learning. PCL was introduced at the latter part of the Cyber Security course. Students worked in groups to solve real-world scenarios given by the teacher using brainstorming, discussions, and case analysis. Additionally, qualitative data were collected through student feedback on their perceptions and experiences with PCL. The Halpern Critical Thinking Assessment (HCTA) measured students' skills before and after PCL intervention and the mean differences were compared following paired t test. HCTA analysis involved standard 20 scenarios with open-ended and multiple-choice questions to assess analysis, inference, evaluation, and self-regulation abilities. The results show an increase in mean scores across all five subscales of the Halpern Critical Thinking Assessment (Analysis, Inference, Evaluation, Explanation, and Self-regulation) after participating in Cyber Security PCL activity. The paired-samples t-test considering overall mean difference scores from pre-test to post-test on the five subscales of the Halpern Critical Thinking Assessment showed a significant improvement in critical thinking skills after participating in the Cybersecurity PCL ($t(44) = -10.67$, $p < .001$, mean difference = 2.8, SD = 0.24). Qualitative data supported these findings, indicating that students (n=45) perceived PCL as effective for developing critical thinking skills through real-world scenarios and collaborative work. Suggestions for enhancement included providing clearer guidelines and structured feedback from instructors. In conclusion, this study highlights the effectiveness of PCL in enhancing critical thinking skills among IT students who enrolled in 2nd year course in Cyber Security in Department of Multimedia and Web Technology, Faculty of Information Technology, University of Vocational Technology. This study offers empirical evidence supporting the notion that the integration of active learning strategies, such as problem-centred learning (PCL), within higher education settings, can effectively foster the cultivation of critical thinking skills among students.

Purpose

New technologies bring challenges that require creative and critical thinking skills to address them effectively. Developing these skills is crucial for addressing non-routine problems in the modern world (Ulger, 2018). The significance of critical thinking in Cyber Security education is highlighted, emphasizing its role as a crucial cognitive skill necessary for proficient problem-solving and effective decision-making in this specific field of study (Coursera, 2023; Bhuyan et al., 2020). However, traditional lecture-based instruction often fails to foster critical thinking skills due to its passive nature, hindering students' ability to actively engage with the subject matter (Yuberti *et al.* 2019). The importance of learners possessing critical thinking skills, problem-solving abilities, communication and collaboration skills, as well as creativity and innovation highlighted in previous literature (Toheri et al., 2020). It has been found that Problem-Centered Learning (PCL) can enhance critical and creative thinking skills in various academic disciplines (Pollard 2003; Ranasinghe & Dharmasena, 2018; Sothy et al., 2022*).* PCL is an active teaching strategy that empowers students to gain problem-solving skills by taking charge of their own learning. This study aims to investigate the effectiveness of problem-centered learning (PCL) in enhancing critical thinking skills among IT students in the field of Cyber Security education. Additionally, the study seeks to gather evidence to gain insights into students' perspectives and experiences with PCL.

The Halpern Critical Thinking Assessment (HCTA) is a validated and reliable tool for assessing critical thinking skills across various populations and academic measures (Halpern, 2013). It evaluates multiple dimensions of critical thinking, such as analysis, inference, evaluation, explanation, and self-regulation. The assessment employs a combination of open-ended and multiple-choice questions to assess individuals' logical reasoning, problem-solving, and decision-making abilities. The HCTA is commonly utilized in educational and research settings to evaluate the effectiveness of interventions and educational programs aimed at enhancing critical thinking skills (Butler, 2012).

Methodology

The study involved 45 IT students in Department of Multimedia and Web Technology, Faculty of Information Technology, University of Vocational Technology who enrolled for the 2nd year course on Cyber Security. The participants were selected based on their willingness to participate in the study. A pre-post study design was employed to assess the impact of PCL on the development of critical thinking skills. The Halpern Critical Thinking Assessment was used to measure students' skills before and after the intervention.

The PCL intervention was implemented during the latter phase of the Cyber Security course, spanning duration of 5 weeks with three-hour per week sessions. Students were organized into 9 groups, having 5 members each and are presented with 09 real-world scenarios one for each group, that aligned with the theory being taught. Student groups were given study and discussion time of three weeks and presented their findings on fourth week, and finalize findings with feedback by fifth week. The teacher served as the facilitator for all the class

groups, for defining the problem scenario, establishing learning goals and outcomes, guiding the inquiry process, and providing feedback and reflection to support students in refining their thinking, enhancing their skills, and establishing connections between theory and practice. Furthermore, the teacher verbally encouraged students on how to apply critical thinking skills to analyse the problems, generate potential solutions, evaluate alternatives, and self-regulate their learning process.

Quantitative data were collected through the administration of the Halpern Critical Thinking Assessment (HCTA) before and after the PCL intervention. The Halpern Critical Thinking Assessment tool comprised 20 standard scenarios with open-ended and multiple-choice questions. Based on how students answer these questions determines the critical thinking ability based on Analysis, Inference, Evaluation, Explanation, and Self-regulation skills. Qualitative data were collected through student feedback forms, focusing on their perceptions and experiences with PCL.

Results

The analysis of the Halpern Critical Thinking Assessment scores revealed a significant increase in mean scores across all five subscales (Analysis, Inference, Evaluation, Explanation, and Self-regulation) after participating in the Cybersecurity PCL intervention. The results are shown in Table1. The overall mean difference in scores from pre-test to post-test on the five subscales of the Halpern Critical Thinking Assessment is calculated by taking the average difference in scores across the five subscales.

Table 1: Mean values of pre and post-test on five subscales and overall mean and Standard Deviation (SD) values

Subscale	Mean pre-test	Mean post-test	Avg. difference in scores	Overall mean difference	Overall SD
Analysis	15.67	18.44	2.77 **	2.80	0.24
Inference	12.11	14.89	2.78 **		
Evaluation	15.44	18.44	3.00 **		
Explanation	11.67	14.67	3.00 **		
Self-regulation	11.33	13.78	2.45 **		

** Significant at 1% level

The paired-samples t-test showed a significant improvement in critical thinking skills after participating in the Cyber security PCL (t (44) = -10.67, p < 0.001). This indicates that the PCL approach effectively enhanced students' critical thinking abilities.

The qualitative data collected through student feedback forms provided valuable insights into their perceptions and experiences with PCL activity. The analysis of the qualitative data revealed that students (n=45) generally perceived PCL as an effective approach for developing critical thinking skills. Majority of them (n=40) highlighted the benefits of engaging with real-world scenarios and collaborating with their peers. The majority of students stated that the interactive nature of PCL activities had allowed them to actively participate in problem-solving (n=35) and decision-making processes while promoting deeper understanding and critical

analysis of the subject matter. However, some students (n=10) suggested that clearer guidelines and structured feedback from instructors would further enhance their learning experience.

Discussion and Conclusion

The findings of this study provide strong evidence for the effectiveness of PCL in enhancing critical thinking skills among IT students in Cyber Security education. The significant improvement observed in both quantitative and qualitative data supports the notion that PCL promotes active learning, problem-solving, and collaboration, which are essential components of critical thinking. By engaging students in real-world scenarios, PCL enables them to apply their knowledge and skills to practical situations, fostering higher-order thinking and analysis. The positive student perceptions further highlight the value of PCL in creating interactive learning environment with student engagement in learning activities.

The results align with previous research that has demonstrated the benefits of PCL in various educational contexts. (Ghazivakili et al., 2014; Ranasinghe & Dharmasena, 2018 ;Toheri,2020; Zairul, 2020). The application of PCL in Cyber Security education fills a crucial gap in traditional lecture-based instruction, allowing students to develop the critical thinking skills necessary to address the complex challenges of the field. The findings of this study contribute to the growing body of literature on active learning strategies and their impact on the development of critical thinking skills.

In conclusion, this study highlights the effectiveness of PCL in enhancing critical thinking skills among IT students who enrolled for 2nd year course in Cyber Security. The results indicate a significant improvement in critical thinking abilities observed from the increase in scores across all subscales of the Halpern Critical Thinking Assessment. The qualitative data further support these findings, with students recognising the benefits of PCL in promoting active learning and collaboration. The study highlights the importance of incorporating active learning strategies, such as PCL, into higher education to foster the development of critical thinking skills among students.

Based on the findings of this study, several recommendations can be made to enhance the implementation of PCL in Cyber Security education. Clearer guidelines and structured feedback from instructors should be provided to facilitate the learning process and ensure that students are effectively guided throughout their problem-solving activities. Further research can explore the long-term impact of PCL on the retention and transfer of critical thinking skills in the field of Cyber Security. Additionally, studies can investigate the integration of technology and online platforms to facilitate collaborative PCL experiences in virtual learning environments.

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Use of FouRe's method to develop paraphrase building skill in higher education students

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Students in the Foundation level lack paraphrasing skills. Their paraphrased material is mostly similar to the original as they fail to follow accurate paraphrasing steps. Thus, their marks for critical evaluation decline, due to incorrect paraphrasing. Also, they risk plagiarism as the paraphrased material is similar to the original. The clear reason is, students only change a few original words using synonyms, and do not rearrange/reorganise the sentences to suit their own writing style. It is assumed that paraphrasing steps make the task complicated and unexciting for students creating a lack of interest in doing it successfully. Therefore, the study explored whether teaching FouRe's and some collaborating activities could make students' paraphrasing attempts successful while ensuring that practising all the paraphrasing steps is important. FouRe's (four simple steps: Reword/Rearrange/Realize/Recheck) was used to explain the paraphrasing steps, 54 students studying the EAP module were asked to reword selected phrases in two popular English songs and a group paraphrasing game were involved, followed by an individual paraphrasing task. Students' feedback on FouRe's and activities, observable behaviour on students' engagement during activities, rubrics to assess students' completed tasks assisted to evaluate the intervention. Students' positive feedback indicated that FouRe's was interesting, and the subsequent activities were stimulating. After FouRe's was introduced, the individual activity completed by students showed improvement in marks compared to previous semester/s. 81% of students achieved 10/12 or above for their individual task compared to 60% in previous semester/s. Group paraphrasing exercises were moderately successful since they were completed by students as initial tasks, with lesser experience. However, working on selected song phrases while listening to their most favourite songs was entertaining and group involvements were energetic. The study can conclude that FouRe's and interactive activities were successful and can be implemented for developing paraphrasing skills.

Purpose

Proficient academic writing is a university expectation. Higher Education (HE) institutions deliver English for Academic Purposes (EAP) courses as HE students need academic skills to present their work to an academic community. This allows undergraduates to develop their thinking on the subject material and to rephrase the given ideas in their own words. EAP courses aim to train undergraduates for that process particularly well with paraphrasing skills.

Paraphrasing refers to a restatement of a text, passage, or work giving the meaning in another form (Merriam-Webster.com, 2023). LiteraryTerms.net (2017) mentions that it is also a restatement or rewording of a paragraph or text, to borrow, clarify, or expand on information

without plagiarizing and thus is an important tool to use when writing research papers, essays, and pieces of journalism (Paraphrase: Definition and Examples/ LiteraryTerms.net, 2017). It is an important skill as it allows the writer to produce the original author's writing in a new form, adapted to the writer's style of idea expression., encouraging the writer to avoid using 'direct quotes' too much.

Paraphrasing involves analysing the original text entirely, rephrasing the key words/phrases and reorganising the phrases/sentences, producing the writer's own rendition to the original source. Therefore, mastering in paraphrasing skills concerns a multiplicity of subskills and the EAP students are expected to practise them in their EAP courses.

A case study by (Na & Mai, 2016) projects that learners' language related difficulties; inadequate comprehension of the source text and lack of knowledge in vocabulary as main challenges faced by Vietnamese English learners in paraphrasing texts. Thadphoothon (2019) highlighted similar findings on students' paraphrasing skills: syntactic, lexical and comprehension skills making paraphrasing skills difficult.

On this background, students in the Foundation level in a selected HE institute, with completed Ordinary Level examinations find it challenging to involve all the steps in paraphrasing. The students manage to replace words/phrases in the original source with synonyms but fail to reorganise the phrases/sentences in the original source (Na & Mai, 2016). This results in producing a paraphrase that is closely like the original and does not project the student's comprehension and interpretation of the original. If a student only alters a few words/phrases it becomes an illegitimate paraphrase. Hence, the students' critical evaluation skills are criticised along with their comprehension of the material, leading them to score lower than anticipated. Furthermore, due to inability to paraphrase successfully, leaners may produce texts with instances of plagiarism (Choi and Lee, 2012). Based on this persistent nature, it was essential to develop an encouraging method for students to get involved in paraphrasing exercises as the process in paraphrasing itself seemed to be complex and difficult for the students' level.

Therefore, the study intended to seek a more effective and an enthusiastic approach for Foundation students to practise paraphrasing skills. Consequently, this process followed to answer if four simple steps; FouRe's (Reword/Rearrange/Realize/Recheck) discussed in several study related websites would be an effective technique to practise paraphrasing skills. The study aimed to explore if involving FouRe's and several engaging exercises would lead to improved results in the students' paraphrasing experience.

Methodology

The class consisted of 54 students studying the EAP module. The paraphrasing concept was introduced with its purpose, use and importance with the help of PowerPoint slides. Accurate examples of paraphrased material were discussed at the same time while highlighting the key requirements of an acceptable paraphrase. Then, the following steps (FouRe's) were explained to the students to produce an accurate paraphrase.

Step 1 – Reword: During this step, the passage should be read a few times to identify where specific words/phrases need to be rephrased. Then, synonyms should be developed in order

to replace those words/phrases. Step 2 – Rearrange: Involves moving words, phrases and sentences around to convey the same general idea across to the reader without using the exact wording and the organization of the original author. Step 3 – Realize: Recognizing that some parts of the original text cannot be changed, such as statistics or data. Step 4 – Recheck: Checking the paraphrased material to ensure that it is meaningful, and facts and information are not misinterpreted. The explanation on above steps was followed by below activities.

Activity 1 – Working with song lyrics: figurative expressions.

Being the first time that these students were learning about paraphrasing, a basic activity of paraphrasing few phrases from two popular English songs was conducted. "Roar" by Katy Perry and "Shut up and dance" by Walk The Moon are common among teenagers. First the songs were video played on the classroom digital screen. Initially, the students were told that they need to pay attention to the expressions in the songs that are also figurative language expressions in English. Following on this explanation, first the students were allowed to enjoy each song after which they received the printed song lyrics with certain expressions underlined. In groups of 3-4 members, students were asked to write underlined expressions in their own words. As the song included the phrases in figurative language, it was important to translate them into the students' own language to receive the actual meaning given in the song. To see how successfully the students paraphrased the figurative expressions, their answers were graded based on the following rubric:

Table 4. Rubric for figurative expressions

	Good – 3	Fair – 2	Poor – 1
Rewording	All the phrases are in the students' words.	Most of the phrases are in the students' words.	The use of students' words is very minimal.
Meaning	All answers give the accurate meaning.	Most of the answers give the accurate meaning.	Only a few answers give the accurate meaning.

Activity 2 – Group paraphrasing game

Each group of 4-5 students received several simple paragraphs to paraphrase by following FouRe's steps. Once the groups had completed paraphrasing all the given paragraphs, each group was asked to exchange their work with another group. The groups were presented with both the newly paraphrased work and copies of the original work, and the new group matched the paraphrased versions of the work with the original work.

Activity 3 – Individual paraphrasing task

Students were given a paragraph to paraphrase individually. The paraphrased material was

graded according to the rubric below:

Table 5. Rubric for individual task

	Good - 3	Fair – 2	Poor - 1
Accuracy of information	All information is correct and represents what the original contained.	Almost all the key pieces of information are correct.	Some information was correct. There were places that it is evident the student did not fully understand what they had read.
Content clarity and organisation	All the information is clear. The words/sentences/phrases have been reorganised.	The information is clearly written. Only some of the words/sentences/phrases have been reorganised.	It is difficult to perceive the meaning of what is written. None of the information is reorganised.
Rewording	All the sentences are in the student's words.	Most of the sentences are in the student's words.	The use of student's words is very minimal.
Sentence structure	All sentences are grammatically correct, show good sentence structure and correct spelling.	Most sentences show correct grammar and structure.	Only some sentences show correct grammar and structure.

Followed by the series of activities, students were asked to provide some written feedback on the paraphrasing lesson: the steps and activities.

Results

After the explanation on FouRe's, students were thrilled when they were told that they were going to practice paraphrasing while listening to songs. Paraphrasing figurative expressions in the two songs was a simple activity set out for students to perceive the sense behind the paraphrasing concept before they engaged in actual exercises. The students enjoyed listening to the songs while watching the videos and in fact, some students sang along with the songs and asked for more songs. As for the figurative expressions exercise, 23 out of 30 groups had scored 4 or above out of 6 marks. It was observed that the exercise was stimulating, making it a comfort zone for students. Students at this level are mostly teenagers, and the two selected songs were popular among them. The activity was simple, and they enthusiastically engaged in it for the same reason. In their feedback, the students mentioned that the task was engaging, interactive, helpful, exposed themselves to know hidden meanings behind expressions, interesting, fun, educational, a different way of learning, exciting, attentive, unique, creative, and productive.

During Activity 2, students' engagement was positive again, it being group work. They worked in collaboration and positively interacted with each other to generate a successful paraphrase. These paraphrases were averagely successful, but the matching exercise was enjoyable for students. Activity 2 was conducted as a stimulation before working on an individual paraphrase so that students could get exposed to as many different paraphrases as

possible. Exchanging the work enabled them to learn paraphrasing techniques from others' paraphrased material too. The students had mentioned that the task was interesting, encouraging to work with others, challenging but FouRe's made it simpler and helped them to understand the concept to a great extent.

In Activity 3, students' individual paraphrasing exercise, 44 students (80%) scored 10 or above out of 12 marks. This is an improvement from previous semesters as generally 60% of students in a class succeed in producing an accurate paraphrase. The students' written feedback revealed that FouRe's, activity 1 and 2 were helpful for assessments, comprehensive, fun-filled, perfect, excellent, exciting, relaxing, more interesting than previous activities done in class and needed similar activities for future lessons.

Discussion and conclusions

FouRe's and the series of exercises were thrilling and had created positive feelings in students about paraphrasing, leading them to work on it more successfully in the final exercise, as current students had improved by 20% more than the students in the previous semester. Findings of the study underline that FouRe's and subsequent activities are reliable in getting HE students to practice and improve paraphrasing skills. However, a pre-activity with the previous method of teaching paraphrasing could have been conducted to see the students' progress as FouRe's was introduced subsequently, which can be considered an improvement in future.

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Self-correction approach to improve students' skills of answering structured essay questions

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Abstract

At the Microbiology final assessment (proper examination) held in 2022, seven out of 75 students were unsuccessful. All of them scored very low marks for the structured essay question (SEQ) component of the theory examination. As a strategy to improve their answering of SEQs and prepare them for the subsequent examination, they were given the opportunity to self-correct their answers for SEQs of the proper examination. Students (n=7) were given their answer scripts of the proper examination and were asked to mark their answers using the model answer and the marking rubric used by the teachers to mark the same questions. Thereafter, a face-to-face discussion was held individually with each student to clarify their doubts. Following the activity anonymous written feedback was requested. After conducting the subsequent examination, marks obtained by students for SEQs in the proper examination and the subsequent examination were compared by paired t-test using Microsoft Excel version 2019. Students informed that it was a good experience (n=7) to see their own paper and mark their own answers. All the students stated that the activity showed them the points where they lost marks. 'Valuable', 'effective', 'helpful' and 'useful' were the terms they used to describe the session. The mean scores of SEQs in proper and subsequent examination were 33% (95% CI, 8 -24) and 44% (95% CI, 10-34) respectively. The standard deviations were 9 and 10 respectively. There was a significant difference between the scores of SEQs in proper and subsequent examinations (p-value, 0.02). Self-correction made students aware of their errors. Although it might not be the sole contributory factor, the self-correction exercise given to them had a significant effect on improving their skills in answering SEQs in the subsequent examination. Additional studies are required to identify the effects of self-correction on students' performance in SEQs in the assessments.

Purpose

Students require some means of knowing the accuracy of their own judgements and be able to calibrate their judgements in the light of evidence. With such calibration they will be able to identify the areas in which they need to improve and improve their capacity over time (Boud et al., 2015). Self-assessing including self-correction is one such way that enhances the ability of students to identify their strengths and weaknesses and areas to improve in their own performance. This process helps learners to self-reflect on their own performance for further improvements. By self-correction technique students can reflect on and evaluate the quality of their work and their learning, know goals or criteria expected from them and assess their work for strengths and faults, and update it (Andrade and Du, 2007). However, for this process to be effective, the self- correction activities need to be monitored by the teachers providing feedback. Learners need to know the criteria and standards to which their

performance are being compared to. However, the opportunities for the students to get feedback to criteria-based comparisons of their own work and the tutor's judgements, to calibrate their own judgements are very little (Boud et al., 2015).

The written paper of the Microbiology final assessment included 6 structured essay questions (SEQ) which are corrected by the teachers according to a marking rubric developed to a model answer. At the Microbiology final assessment (proper examination) held in 2022, seven out of 75 students were unsuccessful in passing the final assessment. All the seven students scored very low marks for the written SEQ component. As a strategy to improve their answering of SEQs and prepare them for the upcoming subsequent examination, they were given the opportunity to self-correct their answers for SEQs of the proper examination. This study was aimed to identify the effectivity of self-correction to improve students' skills of answering SEQs.

Methodology

All the students (n=7) who were unsuccessful in the proper examination participated in the activity. Students were given their answer scripts of the proper examination and were asked to mark their answers using the model answer and the marking rubric used by the teachers to mark the same questions. After the activity a face-to-face discussion was held individually with each student to provide feedback on their performance and clarify if they had any doubts. Following the process anonymous, written feedback was requested from each of the student (Student 1 - Student 7) on the self-correction activity. After conducting the subsequent examination (that was conducted in 6 weeks after the self-correction activity), marks obtained by each student (n=7) for SEQs in the proper examination and the subsequent examination were compared by paired t-test using Microsoft excel version 2019.

Results

Students, in their feedback, informed that it was a good experience to see their own paper and mark their own answers, as the following excerpts show;
"We identified our mistakes and how to answer questions correctly. It was a good experience to see our own paper" (Student 4)

'Valuable', 'effective', 'helpful' and 'useful' were the terms they used to describe the session All the participants stated that the activity helped them to prepare for the subsequent assessment, as the following excerpt shows;
"It is very helpful to get prepared for our repeat exam" (Student 3)

All of them stated that they identified the areas where they had performed poorly and lost marks, as the following excerpts show;
"It is a valuable session to know where I have lost marks" (Student 1)
" I haven't got any idea of what are my weak points before this" (Student 2)
" At the session I understood my missed points" (Student 3)
" I was able to identify my weak points" (Student 5)

In the subsequent examination, all students (n=7) scored higher marks for the SEQs than in the proper examination (Table 1).

Table 1. SEQ marks (scores) of each student in the proper and subsequent examinations

Student	SEQ marks in the proper examination	SEQ marks in the subsequent examination
Student 1	33.4	38.0
Student 2	27.5	60.0
Student 3	27.0	40.7
Student 4	40.5	42.7
Student 5	19.0	26.7
Student 6	43.3	50.0
Student 7	41.5	52.7

The mean scores of SEQs in proper and subsequent examination were 33% (95% CI, 8 -24) and 44% (95% CI, 10-34) respectively, the standard deviations were 9 and 10 respectively. There was a significant difference between the scores of SEQs in proper and subsequent examinations (p value, 0.02).

Discussion and Conclusion

Our study focused on the unsuccessful students in microbiology final assessment at the Faculty of Medicine, Sabaragamuwa University of Sri Lanka. The purpose of this study was to identify the effectiveness of self-correction to improve students' skills of answering SEQs. We explored student's perceptions of self-correction of the SEQs to improve their skills in writing answers to SEQs. While the studies in the literature encourage self-assessment methods like self-correction to improve learners' performances (Boud et al., 2018), to our knowledge, this kind of strategy is not much used in practice in the educational context in Sri Lanka. Our results showed that all the students perceived this strategy positively. Hence, the students found self-correction exercises useful and helped them to study for the subsequent examination. This is in line with previous research that showed self-assessment can improve intrinsic motivation (McMillan and Hearn, 2008) and students mainly experience these activities positively (Nieminen and Tuohilampi, 2020).

Although in our study all the students' perceptions on the activity were positive, studies in the literature show high variation in how the students value doing self-assessment exercises. This includes students stating that it is a meaningless experience and students feeling uncomfortable assessing their own work (Asikainen et al., 2014; Willey & Gardner, 2010).

Perhaps the reason that we did not observe such variations in the perceptions of our students might be that we included only a few students with similar levels of performance in the study.

In the study, the scores in the subsequent examination held after the activity and the statistical analysis showed a significant improvement of students' performance in SEQs, which implies that the activity had a positive influence on the student performance. Similar findings have been reported in several other studies in the literature (Yanti et al., 2022, Cahyono & Amrina 2016). Research about self-correction techniques have shown that it results in good progress in reducing errors and increasing students' writing quality (Yanti et al., 2022*)*. Studies showed that self-correction benefited students' writing skills and self-awareness, which resulted in the development of critical self-assessment of their performance and responsibility for their own learning (Yanti et al., 2022, Cahyono & Rosyida 2016, Ramirez and Gullen, 2018). Although self-correction might not be the sole factor contributing to the improvement of students' performance in SEQs in our study, as the scores analysed in proper and subsequent examinations were from the same students and as in both the examinations the SEQs were prepared to cover similar intended learning outcomes, the influence of this external factors may have been minimal.

In conclusion, the self-correction exercise given had a significant effect on improving student' skills of answering SEQs in the subsequent examination. However, additional studies are required to identify the effects of self-correction on students' performance in SEQs in the assessments.

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Incorporating KWL method in teaching in order to make thinking of students visible in enhancing analytical reasoning

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Abstract

Over the decades students' poor performance in Advanced Level (A/L) mathematics has adversely impacted new students' selection of the mathematics subject for A/L. Among the possible reasons behind the poor achievements, lack of analytical reasoning has resulted in rote learning among majority of the students. However, the skill of relational thinking can be improved in students through facilitating a consistent and a systematic practice. It is important to visualize students' concept schemas to analyze and identify how analytical reasoning functions in their minds. Incorporating self-evaluative techniques such as KWL (**K**now, **W**ant to know, **L**earned) method will effectively assist in forming the habit of analytical reasoning in students in their problem solving process. In this direction, a group of 30 A/L mathematics students was given a strategically developed questionnaire consisting of three main questions covering the three KWL domains. In stimulating the students to analytically reason out their phased approach in the problem-solving process, the KWL method significantly ($p < 0.05$) increased their performance in problem-solving in mathematics. The method is successful in encouraging the students to explore their existing knowledge needed to solve the problem at hand with a response rate of 100% for the first question under domain "K". The response rate of 67% for the second question under domain "*W*", indicates, if the student failed to solve the task completely, this method will also assist the student to self - investigate what more knowledge is required in order to fulfill the task. Moreover, there is a significant tendency (87%) among students to successfully solve the problem when they already identify what knowledge is needed to be applied in solving the problem. KWL method is a successful self-evaluative guide for students to investigate the gap between their existing knowledge and required knowledge in solving problems. Both the teachers as well as students can be benefitted through the incorporation of this method in teaching. By making the KWL method popular in the curriculum, a significant improvement in students' performance at national level examinations can be expected.

Background

Students' poor performance at General Certificate of Education (GCE) Advanced Level examination in mathematics has adversely impacted several levels of the education system. Students' incapability towards analytical thinking in learning mathematics has affected the poor results at examinations, especially for a subject area like mathematics where a higher

level of abstract thinking is essential. Fortunately, it is possible for us to inculcate the practice of relational thinking among students through systematic practices. Visible thinking helps documenting one's effective thinking patterns for later reflection. By helping students to externalize their thinking through *speaking, writing, drawing etc.,* teachers can accurately assess the student's mastery of course outcomes. The level of the abstract thinking required in learning mathematics gradually increases over time. *" Students awareness of thinking strategies dramatically increases at all grade levels"* (Ritchhart et al, 2008). The incorporation of a self-regulatory learning technique such as KWL (Know, Want to Know, Learned) method (Lyman, 1981) effectively activates the student's prior knowledge, generation of ideas and curiosity, and prepares students for deeper inquiry (Ritchhart et al, 2008). Although literature emphasizes the efficiency of applying the KWL method in mathematics at lower grades, it is worthy to explore the effectiveness of the method in teaching A/L mathematics students, especially in instances where such methods have not been applied, as in Sri Lanka. Therefore, in this research I have analysed how effectively student's analytical reasoning can be enhanced through the incorporation of KWL method in teaching which would also make the thinking of students visible.

Methodology

Sixty A/L mathematics students' performances to a question on *Quadratic equations* were scored and recorded in a continuous based assessment at school. Due to the poor performance observed at the evaluation, students were made aware of the three basic steps in Know–Want to know–Learned method. Students were encouraged to practice the steps in this method whenever they tried to solve problems during the usual school hours. After implementing this method for a period of two weeks, their ability to apply the aforementioned method was evaluated. The same group of 60 students was given a carefully constructed questionnaire consisting three main questions covering the lesson "Quadratic functions" taught under the A/L curriculum. The first question covered **K** (know) and second question covered **W** (Want to know) and the third question covered **L** (learned) in KWL method. A problem on quadratic functions was given to be solved in 3 phases. In the first question the student was required to answer in words what he thinks is required (what lessons or what portions of the lessons) to solve the problem. In the second question, the student was required to answer what else or what more (what lessons or what portions of the lessons) he thinks that he needs to know in order to solve this problem. In the third phase, the student was asked to solve the problem stepwise justifying his answer, up to the knowledge he has. The student responses were scored based on rubrics in Table 1, and 2 below. As in Rubric Table 1, a score of 1 was allocated to the student according to the existence of each concept under each domain. A score of 0 indicates the nonexistence of a concept. As stated in Rubric Table 2, a score of 5 marks was given to the student for accurately applying each concept under the 3rd domain. The scores obtained for continuous based assessment as well as scores obtained for the third domain (problem-solving) by each of the sixty students was recorded. The significance of the difference between the mean values of the previous scores and scores obtained after implementing KWL method was statistically analysed using a paired t test.

Table 6. Rubric for 1st and 2nd questions

Domain	Exist-1/non exist - 0
Know	
Minimum of a quadratic functions	
Graphical knowledge on functions	
Completing square method/roots	
Discriminant	
Minimum of function to be Positive(inequality)	
Want to know	
Minimum of a quadratic functions	
Graphical knowledge on functions	
Completing square method/roots	
Discriminant	
Minimum of function to be Positive(inequality)	
Learned	
Minimum of a quadratic functions	
Graphical knowledge on functions	
Completing square method/roots	
Discriminant	
Minimum of function to be Positive(inequality)	

Table 7. Rubric for two possible solving methods -3rd question (using roots of a function/ using minimum of a function)

Pre requisites or concepts required to solve the problem	Marks allocated	Marks obtained
Roots of a quadratic function/Minimum of a quadratic functions	05	
Graphical knowledge on functions	05	
Formula for obtaining roots of a quadratic function/Completing Square method	05	
Discriminant of a function/Minimum of function to be Positive(inequality)	05	

Results

Table 8. Paired Two Sample t-Test for the means of students marks before and after implementing the KWL method in teaching.

Mean		SD		
Before	After	Before	After	t -value
6.333	14.167	5.074	10.262	5.997

The results emphasize that there is a significant difference between the two mean scores of students before and after incorporating the KWL method in teaching. Stimulating the students to analytically reason out their phased approach in the problem solving process this KWL method has significantly ($p < 0.05$) increased their performance according to the t test

results.

Table 4. Response percentage to each Question (under each domain)

Number of students answered 1st Question (Domain Know)	Number of students answered 2nd Question (Domain Want to Know)	Number of students completed 3rd part successfully after answering 1st and 2nd questions (Domain Learnt)
30/30	20/30	13/15
100%	67.70%	87%

This method has succeeded in encouraging the students to explore their existing knowledge needed to solve the problem at hand with a response rate of 100% for first question under domain "*Know*". On the other hand, if failed to solve the task completely, this method would also assist the student to self - investigate what more knowledge he requires to fulfill the task with a response rate of 67% for second question under the domain "*Want to know*". Moreover, there is a significant tendency (87%) among students to successfully solve the problem when they already identify what knowledge is needed to be applied in solving the problem. Through the observations during lessons conducted at the class, it was clearly evident that irrespective of students who perform better at mathematics (with high scores), all the class members actively participated in answering at least the first question as all were given an equal opportunity to reflect on their thinking.

Discussion and Conclusion

The method has succeeded in motivating the students to explore and recall their existing knowledge needed to solve the problem at hand. On the other hand, even if the student failed to solve the task completely, this method will still assist the student to self - investigate what more knowledge is required to pursue in order to fulfill the task. Moreover, there is a significant tendency among students to successfully solve the problem when they already identify what knowledge is required to be applied in solving the problem. Still there was minor chance for some students who have performed poorly in solving the problem even though he already knew what knowledge he possessed. The reasons for this problem are open for future research. This method facilitates students who previously believed they lacked a voiceo r that their ideas were not valued, including students with learning disabilities, to participate more actively and confidently in problem solving (Ritchhart et al., 2006). Although, it is important to encourage students to practice answering first and second questions before solving any problem at the beginning, gradually the students will fill these domains imaginatively in their heads in lesser time period. It is inevitable that this method helps students to come up with the most efficient answer with lesser number of steps empowering their critical thinking abilities. This method also prompts students to share whatever tentative ideas they hold allowing teachers to identify the thinking patterns, misconceptions or missing conceptions that should be addressed later in teaching (Langer & Piper, 1987). In future the same set of questions can be expanded to verify whether the students completed the task of solving the problem in the third domain merely due to practice or due to possessing the necessary concepts. Hence, the KWL method is a successful self-evaluative guide for students to investigate the gap between their own existing knowledge and essential knowledge in

solving problems, so that they will head towards filling this gap in future. Both the teachers as well as students can be benefitted through the incorporation of this method in teaching. By making the KWL method popular in the curriculum, a significant improvement in students' performance at national level exams can be expected.

Acknowledgements

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Improving student 4C's skills using student-centred learning activities: student performance and perceptions

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Abstract

Twenty-first-century skills, 4C's - critical thinking, creativity, communication and collaboration are important for preparing HE students as lifelong learners. Students who follow DMG 4179: Demography for Urban Planning and Policy, are expected to learn theoretical and technical aspects related to urban demographic dynamics and apply the knowledge and skills to solve practical urban issues. In the previous year, student-centred learning (SCL) activities which aimed to help improve students' critical thinking and communication skills were assessed using take-home assignments and presentations. However, it was observed that students were reluctant to engage in discussions and comments on peers' work due to lack of skills in collaboration and creativity. Therefore, this year we introduced six SCL activities to facilitate students to learn 21st-century learning skills (4C's skills). All the lessons were planned and learning activities were integrated with assessments following Bloom's revised taxonomy. The class size consisted of 38 students (N=38) and students were grouped into six. The first two activities, focused on critical thinking and communication skills and were assessed using take-home assignments and presentations. Other four activities included field excursion, group discussions and poster presentations which focused on improving student collaboration and creativity skills. Two Rubrics were used to assess learning outcomes, rubric-1, for student performance in critical thinking and communication while rubric-2, for collaboration and creativity skills. Student perceptions and performance were evaluated using student feedback, and the marks obtained for each activity by student respectively. The analysis revealed that the percentage of students who obtained marks more than B+ has increased gradually from activity one to six. First to fourth activity, the number of students scored more than B+ was 20%, 39.3%, 79.3%, and 93.8% respectively and activity five to six almost all the students scored more than B+. The average mark scored by the final examination was 67.16, and 60.53% of students scored more than the average mark. Each activity followed the steps of a sequence from LOTs to HOTs. Over 90% of students agreed that they had gained all 4C's skills through the SCL activities done during the course. SCL activities along with formative assessment can be used to gradually develop students 'skills within the learning process.

Purpose

Twenty-first-century skills, 4C's - critical thinking, creativity, communication and collaboration are important for developing knowledge-based procedures in students and these are recognized as essential skills not only for classroom learning but also for preparing students for the future workforce and lifelong learning. Therefore, it is necessary that students develop skills that generate confidence for them to proceed from Lower Order Thinking (LOTs) to Higher Order Thinking Skills (HOTs) as in Bloom's taxonomy (Bloom, 1956 cited in Anderson and Krathwohl et al, 2001). Student-centred learning (SCL) activities are vital to enhance student skills while letting students take responsibility of their own learning. Previous

researchers highlight that 21st-century teaching and learning requires teachers to recognize them as facilitators by ensuring the learning process in students with flexibility, inquiry, collaboration and creativity (Masriani et al., 2021). The students who follow DMG 4179: Demography for Urban Planning and Policy, are expected to learn theoretical and technical aspects related to urban demographic dynamics and apply the knowledge and skills to solve practical urban issues. In the previous year, student-centred learning (SCL) activities for the course included take-home assignments and presentations, which aimed to improve students' critical thinking and communication skills. However, it was noted that students were reluctant to engage in discussions and comments on peers' work due to lack of skills in collaboration and creativity. Therefore, this year we introduced six SCL activities to facilitate students to learn 4C's skills. Several research show that when students develop their initial skills, facilitating for SCL activities such as group learning, student-engaged discussions presentations, fieldwork, and peer learning provides an important opportunity to students for enhancing their critical thinking, communication skills and self-image (Biggs and Tang, 2011; Gibbs, 1988; Rossin & Hyland, 2003), Therefore, we assessed how these SCL activities can facilitate student learning in 4C's skills.

Methodology

All the lessons were planned and six SCL activities were integrated with assessments following Bloom's revised taxonomy (Anderson and Krathwohl., et al, 2001; Navaratnam, 2019). The class size consisted of 38 students. Six student groups (4 groups each 6 students and 2 groups each 7 students) were formed to do the SCL activities and were guided to achieve learning outcomes as given in Table 1. Each activity was designed considering Bloom's revised taxonomy with the purpose of enhancing students' skills from LOTS to HOTS. Students were made aware of expected learning outcomes, SCL activities and the methods of assessment as well as two rubrics that were used to assess at the beginning of the course. Rubric-1, given in Table 1, was used to assess student performance in critical thinking and communication skills while rubric-2, for collaboration and creativity skills(appendices 1, 2).The first two activities were aimed at developing critical thinking and communication skills. The other four activities were used to improve collaboration and creativity skills through field excursions, group discussions, and poster presentations. For instance, for the first activity, student groups were asked to collect the list of definitions used to identify urban areas by different countries in the world (factual knowledge). Then they were asked to compare definitions between countries (conceptual knowledge), thereafter they were asked to identify methods or procedures used in defining urban areas in selected countries using subject-specific techniques (procedural knowledge) and finally, student groups submitted take-home assignments based on the findings, and presentations were done on the same. After all presentations, each group was asked to comment on others' work as well as self-reflect on their own work (self-knowledge or metacognitive knowledge). Likewise, students were guided to do all other SCL activities listed in Table 1. Each activity followed steps of a sequence from LOTs to HOTs by linking with formative assessments. Student perceptions and performance were evaluated using student feedback(https://forms.gle/r19FrePDsYjXhJF47) and the marks obtained for each activity.

Table 1. Intended learning outcomes (ILOs), SCL activities and 4C's development of the course

Activity No.	ILO	TLA	4C's development
Activity-1	Identify issues related to definitions of urban areas	Take-home assignment	Critical thinking
Activity-2	Examine urban population trends and patterns in different regions	Presentation	Communication
Activity-3	Analyse urban population dynamics in Sri Lanka	Reading –based group discussion	Collaboration
Activity-4	Evaluate urban population policies in Sri Lanka	Group discussion	Collaboration
Activity-5	Apply the theoretical knowledge to address urban issues by participating in field excursions in the urban resettlement area	Field excursions- report/ presentation	Collaboration Creativity
Activity-6	Create suitable models for a smart city in order to address urban issues and challenges	Model development / creation and poster presentations	Collaboration Creativity

Results

The analysis of student grades obtained for each SCL activity based on rubric 1 and 2 (please see appendices 1 & 2) revealed that the percentage of students who obtained marks more than B+ has increased gradually from activity one to six. From the first to fourth activity, the number of students who scored more than B+ was 20.0%, 39.3%, 79.3%, and 93.8% respectively and activity five to six almost all the students scored more than B+. Student perceptions on SCL activities and 4C's development are shown in Table 2.

Table 2. Student perceptions on SCL activities and 4C's development (N=33)

Student perceptions	Student feedback (self-rated) %						
	Mean	SD	Strongly disagree	Disagree	Mode-rate	Agree	Strongly agree
I was able to find out urban definitions and their limitations.	4.27	0.52	0.00	0.00	3.00	66.70	30.30
I was able to give reasons related to low urbanisation in Sri Lanka.	4.39	0.50	0.00	0.00	0.00	60.60	39.40
I was able to collaborate with peers to complete suggested readings.	4.00	0.56	0.00	0.00	15.20	69.70	15.10
I was able to analyze and discuss urban issues with peers and make presentations.	4.18	0.58	0.00	0.00	9.10	63.60	27.30
I was able to evaluate the causes of urban issues with practical experience.	4.27	0.57	0.00	0.00	6.10	60.60	33.30
I was able to develop and present a sustainable urban development model.	4.18	0.58	0.00	0.00	9.10	63.60	27.30

The average mark scored at the final examination by students was 67.16, and 60.53% of students scored more than the average mark. Based on written student feedback given by 33 students out of 38, on each activity, students have shown positive attitudes on SCL activity and its impact on 4C's skills development. More than 90 per cent of students felt that all six SCL activities they engaged in the course helped them to develop their skills such as critical thinking, communication skills, presentation skills, and analytical skills, as well as collaborative and creativity-related skills to a certain extent (Table 2). It is suggested to implement SCL activity-based approach to other courses to develop 4C's skills among undergraduates.

Discussion and Conclusion

The above findings suggest that SCL –based activities along with formative assessment can be used to facilitate developing 4C's skills among undergraduates as such activities can help the student to move in the skill ladder from LOTs to HOTs and gradually develop students' skills within the learning process. Findings further suggest that the student-engaged SCL approach can improve positive perceptions regarding skills development among students, thereby improving their confidence. Results of this study cannot be generalized due to the small sample size and need to be extended with further study. Nevertheless, it is recommended to introduce similar SCL activities for other courses where student numbers are small (less than 50) as methods of 4C's skill acquisition for undergraduates. In addition, designing SCL activities for all courses in a degree programme following the stages of Bloom's revised taxonomy, can further facilitate the enhancement of 21st-century learning skills among students which makes them easier to contribute to society as life -long learners.

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Appendix 1: Rubric to assess critical thinking and communication skills

Activity #	Very poor (less than 45% marks)	Poor (45-54% marks)	Moderate (55-64% marks)	Good (65 – 74% marks)	Very Good (75 and over% marks)
Activity 01	Unable to identify definitions and issues	Able to identify definitions and issues poorly	Somewhat identify definitions and issues	Able to identify definitions and issues	Able to identify definitions and issues adequately
Activity 02	Unable to examine urban population trends and patterns	Able to examine urban population trends and patterns poorly	Somewhat able to examine urban population trends and patterns	Able to examine urban population trends and patterns	Able to examine urban population trends and patterns adequately

Appendix 2: Rubric to assess collaboration and creativity

Activity #	Very poor (less than 45% marks)	Poor (45-54% marks)	Moderate (55-64% marks)	Good (65 – 74% marks)	Very Good (75 and over% marks)
Activity 03	Unable to analyze urban population dynamics in Sri Lanka	Poorly analyze urban population dynamics in Sri Lanka	Somewhat able to analyze urban population dynamics in Sri Lanka	Able to analyze urban population dynamics in Sri Lanka	Able to analyze urban population dynamics in Sri Lanka adequately
Activity 04	Unable to evaluate urban population policies in Sri Lanka	Poorly evaluate urban population policies in Sri Lanka	Somewhat able to evaluate urban population policies in Sri Lanka	Able to evaluate urban population policies in Sri Lanka	Able to evaluate urban population policies in Sri Lanka adequately
Activity 05	Unable to apply the theoretical knowledge by participating in field excursions in the resettlement area	Poorly apply the theoretical knowledge by participating in field excursions in the resettlement area	Somewhat able to apply the theoretical knowledge by participating in field excursions in the resettlement area	Able to apply the theoretical knowledge by participating in field excursions in the resettlement area	Able to apply the theoretical knowledge by participating in field excursions in the resettlement area adequately
Activity 06	Unable to create a suitable model for a smart city in order to address urban issues and challenges	Poorly create a suitable model for a smart city in order to address urban issues and challenges	Somewhat able to create a suitable model for a smart city in order to address urban issues and challenges	Able to create a suitable model for a smart city in order to address urban issues and challenges	Able to create a suitable model for a smart city in order to address urban issues and challenges adequately

Ayurveda undergraduates' perceptions on the methodology used to improve their information retrieval skills in the Rasa Shasthra area

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Abstract

Rasa Shastra (Ancient Alchemy) is a pharmaceutical Ayurveda subject related to drugs containing metals and minerals which have special benefits such as quick action and longevity. However, students find it challenging and feel less confident in some subject areas due to the difficulty of remembering and recalling factual matter, though needed to be applied in medicinal preparations. It was reflected by the previously evaluated feedback after the lecture series on the selected topic of second professional undergraduates (n= 98). To improve the student's skills in information retrieval/recall, the nine-hour lecture series was redesigned for the next parallel batch, with five new teaching-learning activity steps made up of "Naming" raw materials (used in medical preparations) followed by "Showing" pictures and photographs, and then, Classroom "Recall" with spaced retrieval practicing. These were accompanied by increased staff-student classroom interactions and motivation by elaborating examples on how this knowledge would be usefully applied in their future careers. Perceptions on the new teaching were obtained from students who attended the last lecture (n=104) using a feedback questionnaire having a rubric to evaluate students' confidence in reaching the Intended Learning Outcomes (ILOs) and on the redesigned teaching method. More than 92% of students showed high confidence in identifying, distinguishing, recalling, and applying the subject content. More than 98% were satisfied with the teaching methodology which had been used. Furthermore, students completed a 10-minute Observational Spot Practical test to assess LO's achievement. Students who attended all lectures were filtered as group 'A' (n=51) and students who were absent from at least one lecture were included in group 'B' (n= 53). In Group A', 96% performed better to reach a higher mark in the spot test, compared to 53% in Group B. These results show that students' information retrieval skills in Rasa Shastra can be improved with a step-wise procedure of training to recall along with staff-student interactions and motivation as teaching strategies. Further training can contribute to developing independent student learning.

Background

There are two types of Ayurveda medicines such as pure herbal products and mineral or metallic-containing medicines. The latter type of mainly mercurial, metallic, animal-originated, and toxic plant substances converts into rejuvenating medicines under the subject of Rasa Sastra (Savrikar & Ravishankar, 2011). During the limited period of undergraduate study, considerable knowledge and skills have to be learnt, with students having to learn by heart. Also, students have to identify and differentiate some materials and should be able to recall their chemical compositions, purification methods, and therapeutic index.

A teacher-centered passive learning method (Baghoussi, 2021) was used for teaching the selected lessons to the previous parallel batch, where the continuous assessment test scores for the same showed that the theoretical and practical competence of the students with regard to achieving the ILO's in the subject was low. In addition, their comments on feedback on teaching methodology also were not satisfactory as expected. Therefore, the teaching methodology was redesigned to constructively align TLA's towards reaching the LO's.

Methodology

Second professional BAMS students (n=159) were considered for this teaching methodology change. Eight minerals and their elaboration containing the topic "Upa Rasa" have been selected as the lesson content (Anagadi, 2015). The physical learning environment was a traditional classroom and a nine-hour lecture series was used on a one-hour daily basis. Student attendance per day was variable from 90 to 110, and the students who participated in the last lecture (n=104) were used for feedback. All these individuals were evaluated through a feedback form having five Likert scale questions to measure the students' confidence level of learning and five questions to test whether the expected teaching method was effective. Furthermore, they faced a 10-minute Observational Spot Practical Examination (OSPE). Selected test materials were placed on the table and questions were asked from the placed question paper as per the assessment task. Marks were allocated within the range of 0 to five per each spot. All 104 students (*i.e.*, those who came for the last lecture) answered each spot within a 02-minute rotation so that the duration for 5 spots was 10 minutes for a student. After analyzing the attendance sheet, the collected student answer sheets were divided into two groups. Students who participated in all nine lectures were considered as Group A (n=51) and the other students (n=53) were taken as Group B for comparison.

The ILOs (Ozola, 2014) of the lesson and Assessment Task were clearly informed to the students at the starting point of the lecture. Accordingly, students were expected to remember the information, Identify, and distinguish the mentioned raw materials and apply the purification methods in the medicinal preparation process as outcomes to develop the related cognitive domain levels of Bloom's taxonomy (Ahmed, 2021). Student feedback was collected on how they learned and what they felt in the classroom. Observational spot Examination (OSPE) was the summative assessment task on what they learned (Dolin et al., 2018). Visual presentation, Classroom "Recall" with spaced retrieval practicing, Lecture discussion, Student motivation, and being with students' sides were the five redesigned teaching-learning Activities (TLAs). (Dunlosky et al., 2013). These were constructively aligned (Biggs, 2014) to reach the Intended Learning Outcome (ILO) such as recall. The visual presentation used to teach was prepared by using smart art. Comparative pictures and photos

were used to familiarize the teaching content to students. The practical process was explained with real photographs. The colorful and clear presentation was presented via a projector in an attractive way with the teacher staying not on a stage but moving among the students. Recall of the taught content was practiced with 15-minute spacing and randomly selected different individuals were given a chance to summarize the lesson. Students were directed towards the ILO by motivational speaking during the lecture.

Results

Formative Assessment for ILOs

The first five questions of the feedback form were formatively focused on the student's confidence level toward ILOs. The first two questions were on the ability to recall and describe the information they learned and 92% of students agreed that they had developed confidence on recalling and describing. The third question was specific regarding the chemical composition and 93% of students stated they had developed the ability to remember the formulae. Students' self-assurance regarding recognizing and distinguishing capacities of the learned material was evaluated by the 4th query and the data revealed that more than 91 % of students had felt they had developed their identifying and distinguishing ability. While observing the skill of practical utility, 93% of the students have shown strong confidence in their applicability of the theory at a practical level **(**Figure 1).
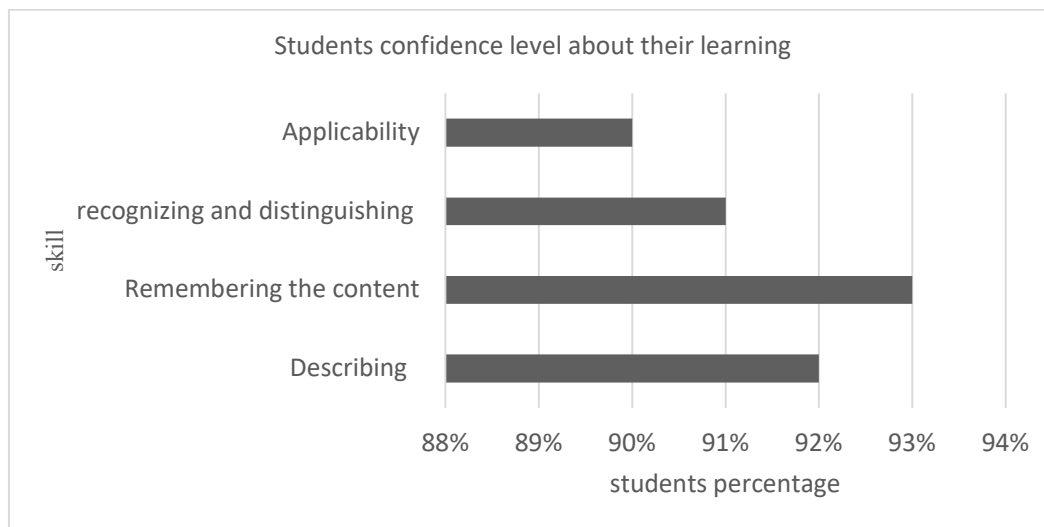

Figure 1. Students' confidence level on learning as per the feedback

When analysing the overall results of feedback, it was shown that more than 92% of students had high confidence (strongly agree or agree) in identifying, distinguishing, recalling, and applying the subject content.

Summative Assessment of ILOs

Marks obtained from the OSPE/ Observational Spot Practical Examination were gathered into a data sheet (Table 1). A maximum of five marks were allocated to each question and the students who earned four or more marks per query from Group A and Group B were compared. According to the marks, 96% of students of Group A had scored four or more marks while only 53% of students from Group B were able to have achieved the same mark.

Table 1. Marks obtained for OSPE

Spot Number	The developed skill that was tested	Student number who earned more than 04 Marks per question (out of a maximum of 5 marks)	
		Group A (n=51)	Group B (n=53)
1	Students could practically distinguish similar	48	39
2	materials and identify the materials of *Upa Rasa* (2 sets of questions)	49	33
3	Could recall and write the Chemical	50	24
4	composition (2 sets of questions)	48	24
5	Could recall and write the process of purification (01 spot)	50	23
	Mean Value	49.2	28.2
	Percentage (%)	96.3	53.2

Formative Assessment for TLA

Students' satisfaction level with Teaching Learning Activities is shown in Table 2.

Table 2. Students' feedback on TLAs that were used

	Rubrics on TLA (n=104)	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Agree & strongly agree	Percentage Satisfaction (%)
1	The presentation used by the lecturer is clear	101	1	2	0	0	102	98
2	Lecturer Recall the subject content every 15 min.	99	4	1	0	0	103	99
3.	I was encouraged by the lecture's motivation	94	4	3	1	2	98	94
4	I could answer the lecturer at least one time	74	9	0	6	5	83	79
5	The lecture stayed not only on the stage	0	0	0	0	0	104	100

As per the data, 98 % of the students agreed or strongly agreed on the clarity of the presentation. The agreement of 99% of students is evidence for the effective implementation

of Classroom recall activity. While evaluating the perception regarding motivation, 94% of the students were at a satisfactory level. According to the data, 79 % of the student could participate in interactive teaching and learning processes and it implies that the teacher discussion method had been successfully implemented. Another teaching technique used was lecturing while not on the stage but staying among the students and 100 % of students agreed with the suitability of this aspect.

Discussion and Conclusion

The research study showed that the proper aligning of the redesigned teaching-learning activities (TLAs) with Intended learning outcomes (ILOs) was successful in improving the information retrieval skills of undergraduates in the Ayurveda Rasa Shastra area as fulfilled assessment tasks (ATs). It shows that the strategically constructed teaching-learning alignment is an effective way of overcoming barriers in the teaching and learning process.

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Students' perception on engaging in Fishbowl activity to accomplish 4Cs
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Abstract

Critical thinking, creativity, communication, and collaboration (4C's) are identified as 21st Century learning skills in students. It has been observed that students who follow DMG 3256: Migration and Urbanisation prefer to do individual activities rather than team-based activities due to a lack of skills in communication and collaboration. These students had engaged in online learning for over two years due to the COVID-19 pandemic. Therefore, they were not used to working in groups and lacked opportunities to learn in a classroom setting. The main purpose of this study was to examine whether student engagement in a fishbowl activity through group work could enhance learning skills in the 4C's. Bloom's Taxonomy, the 3P Model and Miller's pyramid of assessment were used to design a group activity. The class size consisted of 38 students, and they were divided into four groups (2 groups with 9 students and 2 groups with 10 students). A fishbowl activity was implemented over two weeks and linked to the continuous assessment. The first week, the session topic on urbanisation and ethnic segregation was explained to the entire class and each group was assigned a sub-topic related to the main topic. Reading materials related to each topic were uploaded to the LMS and student groups were asked to read the literature and come to the next class. In the second week, the student groups were asked to share their ideas on the given topics using the fishbowl method. First, they were asked to discuss and share their ideas with peers and second, each group was asked to prepare a presentation to present their ideas and their communication and teamwork skills were evaluated through presentations. The outcome of the activity was assessed using peer feedback, student feedback, and teacher observations. Student perceptions of the activity revealed that this activity helped them to enhance their subject knowledge (84%), while also enhancing their skills in working with teams (45%). About half of students indicated that they were able to acquire critical thinking and communication skills (53% and 55% respectively). The findings suggest that fishbowl activities can be used to facilitate the initiation of 4C's learning skills of undergraduates, particularly in the post-pandemic learning environment.

Purpose/ background

The fishbowl is a teaching and learning method that can be used to enhance student learning skills such as critical thinking, creativity, communication and collaboration in a group setting. Arivananthan (2015) argues that fishbowl activity help students communicate with others while enhancing their skills in organizing presentations and participation in group discussions (Arivananthan, 2015). It is also evident that by engaging in a fishbowl activity, students can share experiences with others in an open learning environment. Hannafin et al. (1999) argued that open learning environments (OLEs) tend to be especially important in promoting divergent thinking and in situations where multiple perspectives are valued rather than a single 'correct' perspective. In addition, it promotes the sharing of each other's opinions in an active learning environment (Prince, 2004). Most studies have indicated that active learning

improves the learning skills of students with high performance (Crouch & Mazur 2001). The main purpose of this study was to examine whether student engagement in a fishbowl activity as an active learning method in a group setting could facilitate enhancing their learning skills in relation to the 4C's. The outcome of fishbowl activity can be assessed as part of continuous assessment. Fry et al. (2009) stated that it is the responsibility of the lecturer to ensure the design of curricula, the methodology of teaching and the allocation of assessments to facilitate the learning skills development of students, especially critical thinking, creativity, synthesis, etc. Shepard (2000) argues that assessment practices in higher education measure students' acquisition of knowledge and skills by providing information to improve learning and teaching. Further, Scouller (1998) claims that assessment methods are associated with students' learning approaches, and therefore, teachers should carefully choose ordinary and alternative assessment tools to enhance students' learning (Sambell & McDowell 1998; Sluijsmans et al., 1999). A fishbowl activity was used to address the less active participation of students, as they had been used to participating in online lectures for about two years due to the COVID-19 pandemic.

Methodology

It was decided to introduce a fishbowl activity for third-year students who follow DMG 3256-'Migration and Urbanisation' course unit, and the activity was implemented in an on-site classroom setting. It was designed using three teaching and assessment models, namely, the 3P model of teaching and learning (Biggs, 1999); Miller's Pyramid method developed in 1990 (Ramani and Leinster, 2008); and Bloom's Taxonomy (Bloom, 1956). The activity was designed under three stepwise process including reading activity, fishbowl activity and presentations. The class size consisted of 38, and they were grouped in to four (2 groups with 9 students and 2 groups with 10 students). A fishbowl activity was implemented over two weeks and was linked with the continuous assessment. The first week, the session topic on urbanisation and ethnic segregation was explained to the entire class and each group was assigned a sub-topic related to the main topic. Reading materials related to each topic were uploaded to the LMS and student groups were asked to read the literature and come for the next class. On the second week, the student groups were asked to share their ideas on the given topics using the fishbowl method. First, they were asked to divide the given sub-topics to among group members, and discuss and share their ideas with peers in the same group. Second, each group was asked to prepare a presentation to present their findings and their communication skills and teamwork skills were assessed through presentations. Student perceptions and peer observation were obtained through student and peer feedback forms.

Results

Students showed positive perceptions on the fishbowl activity that they engaged in groups. Table 1 shows student perceptions on their skills enhancement through the activity. The majority of students agreed that the activity helped them to exercise in acquiring knowledge and skills through engagement in readings and discussions, making presentations, presenting creative ideas and urbanisation practising time management. Students perceptions of the activity further revealed that this activity helped them to enhance their subject knowledge (84%), while also enhancing their skills in working with teams (45%). About half of students

indicated that they were able to acquire critical thinking and communication skills (53% and 55% respectively. Student performance on learning was assessed based on the presentations. Each member of the group presented the section that he or she was responsible for, and student performance showed that 60% of students scored more than 75 marks.

Table 1. Student perception on their skills enhancement through fishbowl activity

Key areas of skill enhancement	Descriptive Statistics			Student feedback (%)				
As a result of the Activity	Number	Mean	SD	Strongly disagree (%)	Disagree (%)	Somewhat agree (%)	Agree (%)	Strongly agree(%)
Made a genuine effort to build up unity in the team/ enhanced my collaborative skills	38	4.29	0.84	-	7.9	-	44.7	44.7
Promoted creativity when designing the presentation	38	4.53	0.51	-	-	-	47.4	52.6
Enhanced my reading skills and acquired subject knowledge	38	4.84	0.37	-	-	-	15.8	84.2
Encouraged time management	38	4.63	0.48	-	-	-	36.8	63.2
Stimulated my critical thinking	38	4.61	0.49	-	-	-	39.5	60.5
Developed my communication skills	38	4.55	0.50	-	-	-	44.7	55.3
Enhanced my analytical skills	38	4.61	0.49	-	-	-	39.5	60.5

After completing the activity, students mentioned that they enjoyed the activity and were able to complete the continuous assessment component smoothly and under less stress. Also, this activity helped students to work in a student-centred learning environment.

By reflecting on the stages of the activity and students' active participation during the classroom activity, I was able to observe several improvements in student learning skills related 4C's as shown in Table 2.

Table 2. The teacher's reflection on the fishbowl activity at different stages

Stage	Steps of the activity	Teacher's observation/reflection
Step 1	Use of reading materials on urban ethnic segregation	• Students read the materials given and discussed in groups • Active participation was observed
Step 2	Engaging in the Fishbowl activity	*2 students from each group were invited to the inner circle and asked to share ideas* • Active participation of group was observed • Group discussed ideas with peer groups • Students were able to gain leaning experience by listening to others

Table 2(continued). The teacher's reflection on the fishbowl activity at different stages

Stage	Steps of the activity	Teacher's observation/reflection
Step 3	Student presentations	Students were able to analyse information gathered on the topic- 'urban ethnic segregation' • Group members selected sub-topic • Each member was responsible for the specific aspects of the sub-topic chosen • Teamwork observed At presentations, all group members actively contributed for the discussion as the activity has integrated with assessment

In addition, peer observation on the fishbowl activity, highlighted that it helped students to enhance their presentation skills while demonstrating their potential in other skills development.

Discussion and Conclusion

It is evident that student engagement in the fishbowl activity helps to initiate development of their skills related to 4C's. This study further suggests that students' engagement in student centred learning activities like fishbowl can enhance student's individual as well as collaborative learning skills. The results further suggest that the process or 3 steps involved in this activity help students to move from lower order thinking (LOTs) to higher order thinking (HOTs) at some extent. However, this kind of activities can be recommended for small group teaching.

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