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Contents

Adapting to Change: Facing the Challenges in Developing ESL Students' Communicative Competence Online

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ABSTRACT

Developing students' communicative competence during the pandemic is not an easy task, especially with the abrupt shift to remote learning. This study is intended to explore the challenges faced by English as a Second Language (ESL) instructors in developing students' communicative competence in an online classroom. This study involves three ESL instructors in a university, as well as three students from each instructor's class. The chosen data collection methods were in-depth interviews and stimulated recall for the ESL instructors and focus group discussions for the students. The findings show that among the challenges faced by ESL instructors include the lack of student engagement and socialisation, the fact that the course was designed for physical classes, and the lack of access to high-speed internet. The students also shared their experiences when faced with these issues. It is hoped that ESL teachers, course developers and administrators can understand the issues faced by ESL instructors with remote learning to develop students' communicative competence.

Keywords: Communicative competence, English as a second language, online learning, second language acquisition

INTRODUCTION

Developing communication competence is really important, especially for those learning a language as a second or a foreign language. The concept of communicative competence was developed by Hymes (1972), who defines it as the language learners' ability to use the language appropriately in different communicative situations or contexts. According to Canale and Swain (1980), However, the diverse sociolinguistic backgrounds among academic colleagues and later extended by Canale (1983), the dimensions of communicative competence include grammatical competence, discourse competence, sociolinguistic competence and strategic competence. Language learners with grammatical competence have knowledge of the form and structure of the language, while those with sociolinguistic, discourse and strategic competence have knowledge and ability to use the language appropriately in a variety of contexts.

Communicative competence emphasises appropriateness, not just accuracy, in communicating with others (Savignon, 2018). Communicative competence allows language learners to communicate effectively and accurately without causing misunderstandings and miscommunications (Hymes, 1972). However, for various reasons, second language learners sometimes do not get as many opportunities as

native speakers to learn and practice the skills for developing their communicative competence. Being able to use the target language appropriately is especially difficult for ESL and English as a Foreign Language (EFL) learners because they are not commonly exposed to the language and how it is being used by communicatively competent speakers (Liu, 2008). Therefore, the ESL classroom is their main avenue for gaining knowledge and abilities, especially for the development of this competence, which requires them to be exposed to a variety of contexts.

However, with the recent COVID-19 pandemic, traditional face-to-face classes were brought to a halt, somewhat forcing educators into something that had been significantly applied with distance learning or online classes (Bird et al., 2022). The teaching and learning of English in an online class come with its challenges, which are more in developing learners' speaking skills (Ying et al., 2021), specifically the teaching of skills related to the development of students' communicative competence. Due to the pandemic, the ESL classroom exists virtually, with instructors using computer-mediated communication (CMC), such as video conferencing software and social networking sites, to conduct class and communicate with their students. In terms of the development of communicative competence, this paper discusses the challenges ESL instructors and students face in developing communicative competence in an online classroom.

Developing ESL Students' Communicative Competence in Online Classes

Though using the internet, software and applications, or computer-assisted language learning (CALL) is not unheard of in tertiary level institutions, especially having synchronous classes via video conferencing is not so common for most institutions until recent years with the COVID-19 pandemic. With the abrupt shift from traditional physical classes to online learning, instructors have had to familiarise themselves with synchronous class sessions and personalise learning more towards individual students' needs (Bird et al., 2022). The need for personalised connections with students is especially highlighted in research since it was found that remote learning has affected the teacher-student relationship significantly, as casual interaction between the instructor and the students has been reduced (Atmojo & Nugroho, 2020).

The connection between students and their instructor can also influence their learning, specifically as it may affect student engagement. Lukas and Md Yunus (2021) highlighted that though students seemed initially interested in online learning, ESL instructors found it difficult to keep students engaged in the lesson or motivated to learn. It is only further inflated due to the issues with internet access that students face when attempting to attend online classes. Access to strong internet connections and good devices is not as common among poor families, demotivating students from participating in class and submitting tasks. Hence, it is vital that instructors are aware of their students' needs and current situation, especially

when it can impact their language acquisition. Students need to be able to communicate in the language classroom to develop their communicative competence through practice.

Anugrah (2021) conducted a study involving three English language instructors, exploring the challenges faced by these instructors, along with the way that they overcame these challenges. One of the most prominent challenges that the instructors faced was the lack of classroom interaction. The instructors reported feeling distant from the learners because they sometimes could not see the students' gestures and body language due to the remote learning. They felt this could be the reason for students' lack of engagement. To overcome this issue, the instructors used different online platforms and teaching strategies to engage their students in the lesson. The instructors also deduced that the lack of engagement could be due to the unstable internet connection, but this is an issue that the instructors themselves could not directly solve, so they could only attempt to use different online platforms to accommodate their students' situation.

In their study involving 20 Indonesian English language instructors, Nartiningrum and Nugroho (2021) found that instructors in Indonesia have had to be creative with their use of technology in navigating remote learning due to the sudden COVID-19 pandemic. Lesson plans designed for traditional physical classrooms must be adapted and improvised for online classes. Besides that, it was revealed that the lack of a strong internet connection significantly impacted students' learning, specifically due to the inequality that students might face due to geographical and economic factors. Some English language instructors in this study had to resort to personally visiting students at their homes to provide the notes and tasks to them. Therefore, the researchers concluded that it is vital for a stable internet connection to be made available for students in the whole country to ensure that all students receive the same opportunities to learn.

In another study set in Indonesia, Syafrayani et al. (2022) focused on 45 college students, investigating the challenges they faced and the benefits they gained from learning the English language through online classes. Among the issues they raised were the distractions at home, the information overload from instructors, technical and connectivity issues, as well as limited interaction among classmates and with the instructor. At the same time, the students also cited several benefits they found from remote learning, such as the convenience of having classes at home, which reduced the need for transport or much preparation, and their improved motivation to learn and use the English language due to the virtual environment. In light of the advantages that can be gained from online learning, the researchers recommend that instructors use a variety of online learning platforms to engage students and identify which platform would be most appropriate for their students' internet connection.

Similar to the previous study, Tackie (2022) also found some benefits from online learning. The instructors revealed that online learning had improved how some students communicate in the classroom. Some students who were often disruptive in the traditional physical classroom were less disruptive and would be more willing to communicate with their instructors. Even students who commonly avoided participating in class activities were more involved in lessons. It could be due to the instructors' efforts in using different platforms to communicate with their students, personalised to the different needs of the students. It is important that instructors understand their role as surroundinginterlocutors in a student's life. Though some might view casual conversations as inappropriate in the language classroom, other instructors feel that communicating casually with students can improve their communicative abilities because they view the classroom as a community, and learning can happen through socialisation.

There are many challenges faced by ESL instructors in developing students' communicative competencies, ranging from technical and logistic disruptions to engagement and interactivity issues. Literature has shown that it is vital to identify the challenges to facilitate ESL instructors in managing them. Hence, this study intends to further explore the challenges faced in developing ESL students' communicative competence, specifically in Malaysian English language classrooms.

METHOD

This study has chosen a qualitative approach, with ESL instructors as the main participants, to explore their experiences developing students' communicative competence in the language classroom. Their students were also interviewed to support and further explain the instances and situations described by the ESL instructors to triangulate this data. To ensure that the development of communicative competence would occur in the classroom, the researchers had chosen ESL instructors who were qualified and capable, as verified by the gatekeepers, and those teaching the course that included aspects of communicative competence in the course content.

For this case study, three ESL instructors were chosen for an in-depth interview, and three stimulated recalls were used to gain an understanding of the challenges they faced in developing students' communicative competence online. Stimulated recalls were chosen for this study because they provide the instructors with an opportunity to watch the recording of what they had done in the class so that they can reflect on the specific choices that they had made (Zainil, 2018) in their teaching instructions. As for the students, three students each instructor taught were chosen for focus group discussions. Three focus group discussions were conducted, one group for the students of each instructor. During the focus group discussion, the students were asked about their experience developing their communicative competence in online classes.

In order to conduct the stimulated recall, the researchers watched recordings of the ESL instructors' classes and adapted the existing interview protocol to the occurrences in the classroom, specifically related to the development of communicative competence. The ESL instructors' responses were transcribed and analysed through thematic analysis and constant comparison. Codes found from the data were categorised, and themes were identified. Next, the students were interviewed, and the data from their interviews were triangulated with the data from the ESL instructors' interviews. Categories and themes were adjusted and updated with constant comparison to ensure that the data from the ESL instructors' interviews supported the findings from the students' responses. The findings were then discussed in relation to past studies in the area.

FINDINGS AND DISCUSSION

Based on the data analysis, it was found that among the challenges faced by ESL instructors in developing students' communicative competence in the language classroom are engaging students in the language classroom, lack of socialisation among students, difficulty adapting to abrupt online learning, and lack of access to high speed internet.

Lack of Engagement in the ESL Classroom

The ESL instructors involved in this study found students to be less engaged in the language classroom when they had online classes as opposed to traditional face-toface classes. With remote learning, students are in their own homes, placing them at a distance from their instructors. Due to the environment at home and the online learning environment, which allows students to switch off their cameras and possibly engage in other activities, students might not participate in the language classroom as much. For example, Instructor 3 mentions that students can switch off their cameras whenever they like, and instructors would not even realise whether the students are paying attention to the lesson. Though Instructor 3 admits that having students who are not engaged in the lesson is not uncommon, remote learning seems to cause a lack of engagement in the language classroom.

"…online classes are actually very challenging. I like to call their names so that uh… just to make sure that they are there, during the class. You know… they can just turn off the camera and sign the attendance, but they are not actually in front of the laptop." (Instructor 3, stimulated recall 1)

Similarly, ESL instructors in the study by Lukas and Md Yunus (2021) found that students are only interested in the initial stages and slowly lose the motivation to participate in online classes. This lack of engagement could be because the students were not physically in front of the instructor; rather, they could just switch off the camera and go elsewhere, just as Instructor 3 suggested. Encouraging participation in the second language classroom is already a challenging task, with students' language

learning anxiety and low self-esteem hindering them from communicating in the actual classroom, and this is further heightened due to the class being conducted online. For example, Instructor 2 mentioned that their students are often unwilling to participate in the ESL classroom, and only the same students will respond. The instructor deduced that the lack of responses could be because students are unable to discuss their responses with their classmates, unlike in the physical classroom.

"And then sometimes you ask them, "Okay, I will give you five minutes and then… after this, you can share your answer." Sometimes you'd only get certain feedback from the same students… or all the time from the same students. But the rest just don't want to contribute." (Instructor 2, in-depth interview)

Anugrah (2021) also discussed the need for face-to-face interaction with students to effectively develop their communicative competence. English language instructors in the study expressed their issues with the fact that they could not gauge student engagement because they could not see students' facial expressions and body language as they did not switch on their cameras. ESL instructors can encourage students to keep their cameras on, but it is not something they can enforce in the language classroom, especially since students might experience unstable internet connections.

Ethical Approval and Ethical Considerations

The ethical considerations of this study addressed by obtaining approval from the Ethics Committee for Research Involving Human Subjects (JKEUPM) at Universiti Putra Malaysia (JKEUPM-2020-062). Furthermore, ethical concerns regarding data collection for the study were addressed by stipulating that the collected data would be kept confidential and securely stored for protection against public access. Subsequently, letters of consent were provided to the research participants. Once the above procedures were completed, data collection was allowed to commence, starting with the questionnaire survey. An additional measure of ethical compliance was that the universities, participants, and informants involved in the research were reported anonymously.

Through the focus group discussion with the students, they also admitted that they were less participative in the language classroom in remote learning as compared to the traditional physical classes. Students B, E, F, and I mentioned that they felt uncomfortable communicating during the online classes due to background noises, seeing as they were at home and surrounded by other family members. Student G was on campus for the classes, but he also expressed discomfort because he did not feel comfortable participating in the English language classroom, knowing that his/her roommates could hear him. These situations cause ESL students to avoid communicating in the language classroom.

In contrast, Tackie (2022) found English language instructors saying that students who were normally disruptive in their classrooms were less disruptive and more open to discussing their current situation

with the instructor. It could be because the instructors were more flexible with the students and allowed students to contact them outside of class to communicate with them on personal matters. The students felt more comfortable expressing themselves during remote learning as compared to the traditional classroom, possibly due to the accessibility provided through the different platforms that the instructor uses to communicate with the students. Participation in second language classrooms is vital, seeing as students do not get as many opportunities to use the language outside of the language classroom. Being able to practice using the language and being exposed to the language is especially important in developing students' spoken communication (Anugrah, 2021).

As seen in the current and previous studies, the online classroom may pose some issues for students practising the target language. ESL instructors need to play their role in providing students with opportunities to practice the language and a comfortable and positive environment for students to do so. The ESL instructors in this study also highlight the need for instructors to be more open and approachable with students so that they feel comfortable communicating in class, as well as more innovative with the use of different platforms, such as Padlet and Quizizz, which allow students to participate and contribute to the lesson other than through verbal responses.

Lack of Socialisation Among Students

Some instructors feel that online learning could cause a lack of socialisation among students. Socialisation here refers to the experience that students would normally get in physical classrooms, where they can talk to each other about non-academic topics before, during or after the class. With online learning, students lose this experience of physically meeting their classmates and the instructor before and after classes, which the ESL instructors feel affects their motivation and interest to participate in the classroom.

Instructor 2 feels that online classes can sometimes take away from the personal aspect of physical language classrooms, where instructors can talk to students individually to discuss any issues or constraints they might be facing at the time. Remote learning can be very isolating at times, especially with students far from their classmates experiencing similar issues. These issues can result in students being unfocused in class and not learning much despite attending every online class.

"I need to mention every time, "If you have any problem, do let me know, WhatsApp me personally." Because that's the only way that I can get to know what happened to them. So, I told them I would not know what are you experiencing behind the camera, okay.

You have to let me know. You need to keep the communication open, so that's when I detect students, when they have problems, they would not be able to understand… they are committed to the class, attend every time but they don't really understand the topic." (Instructor 2, stimulated recall 1)

As for Instructor 2, her method of handling this issue would be to encourage students to contact her via WhatsApp if they have any issues they would like to discuss. She also mentioned that she would sometimes just switch off her camera after class time to allow students to talk among themselves. Instructor 2 feels that students also need to be given the opportunity to communicate with each other about topics unrelated to class, and remote learning has taken away an avenue of that happening with students being unable to meet physically. In relation to this, Atmojo and Nugroho (2020) also discuss a similar issue with online learning where students feel disconnected from the English language instructor due to remote learning. It especially affects the interactions between the instructor and the students, which supposedly come more naturally in a physical classroom setting.

The researchers feel that the lack of physical interaction can affect the language learning process, especially in developing communication skills. Tackie (2022) views the class as a community for the students to socialise among themselves and with the instructor, and this is disrupted by remote learning, where students are unable to physically gather with their classmates and instructor. Instructors need to be more aware and sensitive to students' well-being and initiate more individualised sessions with students who seem to be facing academic and non-academic related issues.

Instructor 3 also feels that remote learning takes away certain important elements of teaching and learning, especially since students can switch off their cameras during the lesson. ESL instructors need to make connections with students and strengthen the bond between them and their students so that the teaching and learning process can be conducted effectively. When lessons are conducted online, students might not have their cameras on, so instructors are unable to gauge students' engagement as compared to physical classes. Hence, Instructor 3 tries to overcome this by encouraging students to switch on their cameras and discuss any topics unrelated to the course at the beginning of the lesson.

"We are not able to look at their, their facial expressions, their movements and all that because I think being teachers, you need to be more alert because you see the students, their movement, their facial expressions and all that, you'll be able to tell whether they are with you or they are not. So, that is why in every class, I teach, I would make sure that the first 10-15 minutes, I would just talk with them casually. Have a small talk with them, asking them about things other than the course that I teach them" (Instructor 3, stimulated recall 2)

Besides engaging students, this activity at the beginning of the lesson allows ESL instructors to strengthen their bond with the students. It is important because not only do the students get to socialise, they also get to improve their relationship with the instructor and their classmates and their communicative abilities through casual discourse. Bird et al. (2022) also highlight the importance of instructors managing the transition from physical to online classes by communicating more with their students during synchronous classes or with individual students. Remote learning reduces the opportunities for students and instructors to communicate casually, but ESL instructors can play their role by creating avenues for students to interact. It is especially vital in a second language classroom that focuses on developing students' abilities to communicate appropriately in a variety of contexts. Getting students to participate in class discussions or presentations in an academic context would be difficult if they do not feel comfortable practising the English language, even in casual situations.

Based on the focus group discussion with the students, it was revealed that Students G, H, and I felt that the ESL instructor made them feel relaxed in the classroom. The students feel communicating with the instructor because they are allowed to also talk casually about topics unrelated to the course. It strengthens the bond between the instructor and the students, especially because they feel that the instructor is caring and nurturing, making them feel comfortable in the language classroom. In the study by Tackie (2022), the instructors are found to pay special attention to students' mental well-being during the pandemic, showing concern for them so that they would feel less isolated. However, the researchers mentioned that there is no evidence of whether this affected students' learning and development of communication skills.

Difficulty Adapting to Abrupt Online Learning

The course involved in this study was developed and planned for face-to-face classes and not online classes. The pandemic hit the world unexpectedly, and it also lasted for a longer time than expected. Hence, everyone was unprepared to be affected this badly for an extended period. All three ESL instructors expressed their preference for physical classes as opposed to remote learning. They felt that online learning has especially affected language learning, specifically the development of students' spoken communication. Instructor 1 mentioned that he would sometimes ask students to give impromptu speeches in front of the classroom to prepare them for the presentation they would have to give at the end of the semester. However, this activity has lost part of its impact on the online learning situation, where students might not have the same experience when speaking through a video conferencing software as opposed to standing in front of a class full of students.

"…that is one of the methods that I usually do during face-to-face classes. it would be, I would say, it would be more fun, more interactive, hands-on approach … it would be fun rather than…. I mean even in the assessment, when you sit in front of the computer, it's different when they present in front of people." (Instructor 1, stimulated recall 3)

Due to the sudden implementation of online learning, many English language instructors have become uncertain about how best to approach their students, which stems from the lack of experience in conducting classes fully online (Atmojo & Nugroho, 2020). Though online learning has been introduced, and some instructors have dabbled with certain online platforms and websites in their lessons, not many ESL instructors have had the opportunity to completely immerse themselves in an online teaching and learning experience. Instructors need to be ready in terms of technical know-how and preparing the lesson to suit online learning needs. It was revealed that instructors spent more time planning lessons after the implementation of online learning as compared to prior to the pandemic, i.e., from 18% to 33% of their work time (Jones et al., 2022).

The ESL instructors found that they needed to adjust the materials provided by the course coordinators to suit the online learning experience. For instance, Instructor 2 discussed the issue that some instructors faced with the lack of activities that were 10 provided for students. Instructor 2 reflected that it might not be an issue with a lack of activities but that students in physical classes usually take more time to respond to in-class activities because they would perhaps take more time to discuss with their friends and volunteer to contribute their responses. The course materials were developed for physical classes, and in this situation, Instructor 2 feels that ESL instructors need to be flexible and innovative in using different online platforms to support the provided activities. Not only would it allow learners to take their time responding during the activities, but it would also allow instructors to gauge individual students' understanding, especially since the whole class can provide their responses without disrupting the class.

"But if you ask them, to write their answers… you know like using Padlet, or if you want to use Jamboard, or you want to use other approach then maybe it can… I would say take more time … also to ensure that it's going to be interactive and engaging the students, you want to see whether they have understood the task or not." (Instructor 2, stimulated recall 2)

Instructor 3 found that ESL instructors do not necessarily need to introduce new online platforms to their students when trying to accommodate the needs of the lesson, but they can fully utilise the video conferencing software they are using for synchronous online classes. Besides using the chat function so that students can share their ideas and responses in written form, Instructor 3 used the Zoom Breakout Rooms available in the Zoom software to allow students to discuss the topic in smaller groups. This function on Zoom allows the students to discuss in small groups, which improves their engagement and

motivation to communicate in English, but it also allows instructors to join each small group and see how the students are doing.

"Because I'm trying to compare to physical classroom. In the previous semester, whenever I taught this course, I would divide them into small groups and then I would walk around the class. I would go to each group to listen to their discussion… so this breakout room actually applies the same method or the same technique. So you can simply join every group and listen to their discussion. You can talk to them and they would ask you questions. They feel free. Yeah, I think it's a very useful function." (Instructor 3, stimulated recall 2)

In relation to this issue, Lukas and Md Yunus (2021) also discuss that ESL instructors need to be prepared for online learning, especially in terms of technological readiness, to provide students with sufficient opportunities for communicating and learning in the language classroom most effectively. Seeing as courses or lessons might not be planned specifically for online classes, and course developers might not have anticipated such a situation as the pandemic, ESL instructors need up and play their role in the development of students' communicative abilities. Similarly, this is a conundrum faced by English language instructors in Indonesia, where online learning is uncommon, and instructors need to be creative in their lessons to adapt to remote learning conditions (Nartiningrum & Nugroho, 2021). Thus, instructors need to adapt quickly to any situation, such as the pandemic, which would significantly impact the teaching and learning process, as well as be willing to try different approaches and methods with students to overcome any issues that might arise. Only when ESL instructors are able to do so can they appropriately develop students' communicative abilities and lead them towards communicative competence.

Lack of Access to High-speed Internet

Prior to the pandemic, it was uncommon for students to need to be involved in synchronous online learning, even in higher education institutions, at least in Malaysia, where the study was conducted. Hence, issues with internet connection or other technical matters were not often raised. Synchronous online learning requires students and instructors to use video conferencing software with a strong internet connection. Anugrah (2021) reported that the lack of a strong internet connection disrupts the learning process, especially because not only do the instructors need access to high-speed internet, but all the students need to have it for the lesson to be conducted effectively.

Instructor 1 highlights that students who do not have access to high-speed internet might not be able to perform well in their presentation assessment. The instructors have to weigh whether to have the presentations during the synchronous online classes or ask the students to record and play the recordings

in class. Though the use of recordings might be seen as the better option as students' focus and performance might be affected by the issues with their internet connection, it is also not ideal, seeing as the students would not have an audience to interact with and instructors would not be able to assess how they navigate the audience.

"Another problem is the internet connection, yeah, where it may not be good so that's why I'm contemplating whether I want to have it live or recorded because if the line is not good, people cannot hear them or they know that their line is not good, it can disrupt their flow, style and even the time management." (Instructor 1, stimulated recall 2)

Instructor 2 also addressed the issue with their students, saying that students need to inform the instructor if they have internet connection issues. In order to provide students with the opportunity to learn despite their unstable internet, Instructor 2 offers to provide students with a recording of the lesson. Though synchronous sessions might be the best for a communicative class, Instructor 2 feels it is better to provide a recording rather than leave the student behind in the lesson.

"I would just tell them if you had connection problem, you just WhatsApp me. You need to tell me because I know… I notice they would come… join and leave, join and leave, you know? So, each time I would have to accept them in the Zoom, but it would be good if you can let me know so that at least, if you miss the lesson, you can ask your friends or perhaps I can provide you with recording." (Instructor 2, stimulated recall 1)

Based on the focus group discussion, some students admitted that they faced issues participating in the language classroom due to the lack of strong internet connection they experienced at home. When asked about anything that made them feel uncomfortable communicating in the ESL classroom, Student E revealed that they were affected by the background noise in their house as well as the unstable internet connection. "Sometimes, as I'm in my house… so, the noise, the background noise or my network connection. Most of the time, it would get unstable." (Student E, focus group discussion)

Similarly, Syafrayani, Ginting, Hasnah and Saragih (2022) found that students would often face problems with the software used because of the poor connection, and then they would have to repeat the process of joining the class because they were logged out due to their lack of access to high-speed internet. It would cause more issues for the students because it would especially affect students using their mobile internet quota to connect to the internet. The inequality in internet access is definitely an important issue to be discussed, not just in language learning but in general for the education of youths all over the world. Lukas and Md Yunus (2021) reported that inaccessibility to strong internet connection caused students to be left behind in lessons, which is common in low-income families. Though ESL

instructors may not be able to have such a significant impact in providing better internet connection for all students, they might be able to provide students with different avenues for learning, such as through asynchronous online platforms. Table 1 illustrates the themes and categories that were derived from the data in this study

Table 1. Themes and categories derived from the data

Themes	Categories
Lack of engagement in the ESL classroom	• Students' discomfort in using English due to the physical environment (home & hostel) • Distractions from the physical environment (home & hostel) • Cameras switched off, and microphones muted • Physically separated from classmates and lack opportunities to discuss before responding.
Lack of socialisation among students	• Lack of socialisation affecting motivation and interest • Rapport and good instructor-student relationships are significant factors in learning • Balancing formal and informal communication in online classrooms to make students feel comfortable • The need for small talk before and after classes is often lost in online classrooms
Difficulty adapting to abrupt online learning	• Courses were planned for physical classes, and instructors found it challenging to adapt. • ESL instructors' preference for physical classes affects the teaching and learning • Use of different platforms to create a medium for students to respond and communicate to replicate physical classroom situations
Lack of access to high-speed internet	• Managing issues with online presentations • Video conferencing requires a greater bandwidth • Finding alternatives for sharing materials and information

CONCLUSION

The findings have revealed that remote learning has caused ESL instructors to face several challenges in developing students' communicative competence, such as the lack of student engagement, the lack of socialisation among students, the difficulty of adapting to online classes, and the lack of internet connection. Developing students' communicative competence can be difficult with remote learning, especially when students are not engaged or motivated to participate in class activities. In relation to the issues with engagement, the ESL instructors also noticed that the relationship they would normally have

with students is affected by the lack of socialisation due to remote learning. Besides that, the course they teach was not initially developed for online classes; hence, some of the tasks and materials planned for the class were not applicable. The ESL instructors also found that the lack of a strong internet connection had an impact on students' involvement in class activities.

These challenges have caused challenges in the teaching and learning process, and in some instances, the ESL instructors needed to adapt and improvise their lessons to manage and overcome them. The instructors planned their lessons to cater to their students' needs to ensure the effective development of communicative competence. It is hoped that from these f indings, other ESL instructors can gain a better understanding of the issues of teaching a communicative course online. Perhaps the findings of the study can also inspire others in terms of actions that can be taken to improve their students' online learning experience. The findings of the study reveal that ESL instructors are adaptable and driven in creating a conducive learning environment for their students. Based on the findings, other ESL instructors could see the issues they have faced in others' eyes and the possible solutions to overcome any issues they faced. Being isolated due to the pandemic affected not only students' learning but also ESL instructors' teaching experience. With this study, it is hoped that other ESL instructors would gain some insight and vision in developing students' communicative competence, specifically seeing the impact of the context and environment of the learning, be it online or physical, on students' learning and interaction.

Some issues, such as the lack of access to high-speed internet for many students, especially due to financial and geographical factors, cannot be directly solved by ESL instructors. They can provide different avenues of conveying knowledge to students, but this is definitely an issue that should be given more attention by learning institution administrators. The pandemic caused an abrupt shift in learning from traditional physical classes to online classes, and administrators were unprepared, but this should serve as a learning opportunity for administrators and course developers as well in improving the teaching and learning of communicative competence for any future situations where remote learning might be applied.

Recommendations for Future Research

This particular study focuses on the instructors as the main participants to be investigated, while data from the students play a role in triangulating and supporting the data from the instructors. In the future, studies could be done on the discourse of students to compare how they communicate in physical and online classes. The data could be supported by data from interviews where the students are asked to discuss and explain any similarities or differences between how they communicate online and physical situations to strengthen the study's findings. Having a deeper understanding of the similarities and

differences between how the students communicate and why they occur from the student's point of view would benefit instructors when developing and planning their courses and lessons.

As the instructors in this study have mentioned using certain online platforms, an experimental study could also be conducted to investigate the effectiveness of using certain online platforms for teaching and learning a communicative course. As communicative courses require students to practice the target language significantly, it would be helpful to understand if using specific online platforms would improve students' performance in communicating in English. Other than assessing their performance, the researchers can also do a focus group discussion with some students to understand their experiences using online platforms. The researchers can also interview some students from the control group to discuss their experiences as well.

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Impact of Information Literacy Training on Academic Self-Efficacy and Learning Performance of University Students in a ProblemBased Learning Environment

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ABSTRACT

Problem-based learning (PBL) has emerged as an innovative educational approach and it is increasingly gaining its prominence in the higher education in Malaysia. Past research shows that academic self-efficacy has strong and positive influence on students' motivation and academic achievement. This study aims to examine the influence of information literacy skills training on academic self-efficacy and learning performance of university students in PBL approach in the Physics course. The Solomon Four –group design was used with 78 students in the American Degree Transfer Program of Taylor's University College in Malaysia participated in this study. The study investigated whether causation existed between information literacy skill training and academic selfefficacy as well as between information literacy training and learning performance. The independent variable was the information literacy training. The dependent variables were the mean academic self-efficacy score in a self-reporting and numerically measurable questionnaire developed by Klobas and learning performance scores which constitutes learning satisfaction, learning attitude, and learning score. A between group Factorial ANOVA and one-way ANOVA showed that the treatment of information literacy skills did have an impact on academic self-efficacy and learning performance. The findings showed that there was a cause-and-effect relationship between information literacy training and improvement in academic self-efficacy and learning performance of university students in PBL environment. This study confirmed that information literacy skill training may help raise the academic self-efficacy and learning performance of university students, which is essential to the learning process in PBL.

Keywords: Information literacy skills, problem-based learning, IL competency standard, academic self-efficacy, experimental design, higher education

INTRODUCTION

A shift of educational paradigm from traditional teaching approach to a problem-based learning (PBL) approach has been observed in most of the universities, university colleges and colleges in Malaysia in the past decade. An example is the successful implementation of PBL in the Medical and Dental Faculties of University Malaya (Salimah, 2003; Mohd Arriffin et al., 2004). PBL is a curriculum development and instructional system that simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem solvers confronted with an ill-structured problem that mirrors real-world problems (Finkle and Torp, 1995).

Wales and Harmon, 1998). It has been documented that the role of current IL actually forms the basis for lifelong learning (ACRL Task Force, 2000). A PBL environment has an important role to play in developing a student's ability to learn how to learn. A PBL environment is a student-centred environment which organizes the curriculum around an ill-structured, "real world" problems or scenarios, purported to empower learners by encouraging them to take a deep approach to their own learning. This approach enables students to become more confident and self-directed in their learning. The key philosophy of PBL is "student empowerment", where the concept of PBL is team-oriented with students empowered to identify their learning needs. This philosophy facilitates personal engagement in learning process and reinforces the student's ability to learn how to learn (Boud, 1991; Ryan, 1993). Harvey (2004) described empowerment as the development of knowledge, skills, and abilities in the student to enable them to control and develop their own learning. Students studying under PBL approach may be able to gain a competitive edge with key characteristics of knowledge worker, such as academically skilled, methodologically competent, team worker, creative and information literate. Information literacy is a means of individual empowerment within today's information society (ALA, 1998). According to Hewer (1999), empowerment provides students and facilitators with the necessary skills to find and use information they need for study and leisure, and equips them with transferable skills they can use for all sorts of information retrieval and tasks, enabling them to cope with the information age.

Despite the recognition of the important concept of student empowerment and IL as means of individual empowerment, there is still little research exploring the learning and understanding in PBL environment from this perspective. The findings of this study showed that IL skills training has an impact on improvement of academic self-efficacy and learning performance which serve as a measure of learning outcomes directly or indirectly in PBL environment.

The Problem

PBL educators strongly believe that PBL approach empowers students by encouraging them to take a deep approach to learning and to become more confident and self-directed in their learning (Spronken-Smith, 2006). They also recognise that university students who learn in PBL environments have the ability to learn how to learn in order to prepare themselves for their future professions (Dunlap, 2005). PBL educators see that students have the information technology skills to use search engines, while students believe that they already possess information skills with their increased exposure and wider access to search engine technology and technology skills (Macklin, 2002). However, according to Majka (2001), such students are actually functionally information illiterate. With the overconfidence in information skills, PBL students are only able to fulfil simple information needs, searching information to answer simple question that exhibits only surface learning. They are unable to explore deeper

concepts or determine if they have really reduced uncertainty successfully. PBL educators may have over estimated the competence and capabilities of university students in IL skills because they are unaware of the subtle difference between information technology skills and IL skills (Fosmire, 2002). They failed to empower university students by giving them the necessary tools they need during problem solving, to perform excellently and maintain quality in accomplishing their learning tasks. They have omitted the importance of IL skills which helps students to acquire an empowering set of "navigational" skills. This set of skills includes the ability to determine what information is needed, how to access this information effectively, efficiently at the same time evaluate the needed information and its sources critically while incorporate the selected information into his or her knowledge base and value system.

Overconfidence of the information technology skills as perceived by university students themselves and the omission of PBL educators in embedding IL skill training in PBL will limit students' ability to successfully participate in team work so as to explore their full potential in deep learning. Failing to provide proper IL skill training will limit university students' confidence in information seeking, which will in turn demoralise their learning satisfaction and attitude, and eventually limit their learning performance and affect their success and survival in PBL environment.

PURPOSE OF THE STUDY

The purpose of this study is to provide findings on the impact of IL skill treatment on dependent variables of learning in the PBL environment, namely academic self-efficacy and learning performance. The null hypotheses of this study state that:

H01: Information literacy skill treatment has no statistically significant impact on the improvement of academic self-efficacy of university students in a problem-based learning environment.

Ho2: Information literacy skill treatment has no statistically significant impact on learning performance of university students in a problembased learning environment.

Ho2a: Information literacy skill treatment has no statistically significant impact on learning satisfaction of university students in a problembased learning environment.

Ho2b: Information literacy skill treatment has no statistically significant impact on learning attitude of university students in a problem-based learning environment.

Ho2c: Information literacy skill treatment has no statistically significant impact on learning scores of university students in a problem-based learning environment.

LITERATURE REVIEW

Rankin (1999) articulated that IL skills are essential to the learning process, and problem solving process in PBL parallel to IL competency standards set for higher education. Research showed that shifting to

independent learning in PBL has made IL skills critical to students' survival and success (Wales and Harmon, 1998). PBL entailed an increased use of libraries and wide variety of information sources (Limberg, 1999). However, studies conducted among university students showed that majority of the students showed a very low level of competency in the use of library and displayed poor information seeking patterns (Zondi, 1992), many experienced problems in locating library information material (Kamanda, 1999). Wurman (2001) pointed out that without IL skills, people are condemned to lack of information, dependence upon others for access to knowledge and information, and even experience an acute level of information anxiety. Mayer (1992) articulated that although IL competency influence the learning performance through the acquisition of knowledge and skills, without self-efficacy, the performance may not even be attempted.

Self-efficacy is the confidence in one's ability to behave in such a way as to produce a desirable outcome (Bandura, 1977). Bandura (1997, p.3) speculated that it is "the belief in one's capabilities to organize and execute courses of action required to produce given attainments". In academic context, academic self-efficacy is the "self-evaluation of one's ability and chances for success in the academic environment" (Robbins et al., 2004, p. 267). Researchers found that academic self-efficacy is a strong predictor of academic performance in college students (Robbins et al., 2004; Pajares, 1996; Chemers et al., 2001). As students' academic expectations and self-efficacy increased, they were more likely to "show higher performance". In PBL research community, researchers recognize the importance of IL skills to the successful implementation of PBL (Breen and Fallon, 2005), but little research has been done.

Given the evidence that academic self-efficacy is closely linked to academic achievement and performance, it warrants a research to study the impact of IL skills training on the improvement of academic self-efficacy of university students in PBL environment.

Unlike the traditional lecture-based approach which assesses learning outcomes based on examination to measure the acquisition of content knowledge, PBL presents some unique challenges for assessment. Due to the fact that PBL is primarily focused on learning how to learn and less on mastery of a particular body of knowledge, traditional methods of course assessment may not be very effective (Major, 2002). Thus, alternative assessment strategies seem necessary as a better measure of knowledge acquisition from PBL. There are alternative assessment strategies such as authentic assessment which uses tasks developed from realistic activities in the professional world (Nightingale et al., 1996) can help bridge the gap between instruction and assessment. Authentic assessment task is defined as complex simulations, case studies, or multi-faceted projects in assessing a range of knowledge, skills and attitudes in the assessment task (Nightingale et al., 1996). Luh et al. (2007) have shown that student' attitudes are factors

which significantly influence student performance in PBL courses.

Giving students the opportunity to evaluate and reflect on their own learning is a key element in PBL. This will also allow the facilitator to help students in assessing their own performance in solving a problem. The self-evaluation of students can be recorded through the learning satisfaction form. An effective assessment tool must be designed to assess the learning outcome from performing the learning task. Waters (1996) has suggested two options for the assessment: 1) prepare objective questions that test the student's comprehension of the learning tasks given, and 2) create a problem statement to the solution of which requires the student to demonstrate the desired depth of understanding of the learning outcomes. The learning performance in this study thus consists of subjective indicators such as learning satisfaction and attitudes as well as 124 objective indicators such as learning scores, including objective tests and presentation of solutions to learning tasks.

MATERIALS AND METHODS

Sampling

A total of 78 undergraduate students who registered for the Fall-2009 Physics course in the American Degree Transfer Program at Taylor's University College (Malaysia) participated in this study. The list of these students was obtained from the registrar office at Taylor's University College. These participants were randomly assigned to four groups, namely E1 , E2 , C1 , and C2 during the experiment. All these groups were comparative enough in terms of number and resources. Moreover, the pretest analysis showed no significant difference in the dependent measures.

Research Design

This study utilized Solomon Four–group quasiexperimental design (Solomon, 1949; McGahee, 2009) by setting up two experimental groups and two control groups for the experiment. The design is rigorous and robust enough to eliminate variations that might arise from individual experiences to contaminate the validity of the study (Koul, 1992; Kothari, 2003). Participants were randomly assigned to experimental groups and control groups. The participants were asked to write their name on an identical sticker, fold the sticker along the middle line and put the sticker into a hat. Four students were nominated as representatives to draw the stickers from the hat in turns. The first representative drew a sticker from the hat and stuck it on the list of E1 group. The second representative drew another sticker and stuck it on the list of C1 group. The same was followed by the third and fourth representatives. This process was repeated until all the stickers were drawn to create four probabilistically equal groups in order to increase the internal validity of the study.

A carefully crafted ill-structured problem was given to all participants. They were allocated 20 minutes to study the problem. One of the experimental groups and control groups (E1 & C1) were given 20 minutes to fill up the pretest questionnaire that measured their academic self-efficacy and learning

satisfaction after reading the PBL problem. The other two groups were subdivided into smaller groups of five members before the PBL activities. The pretest instrument was a questionnaire comprising 10 items of learning satisfaction and 27 items of academic self-efficacy. The experimental groups then attended a two-hour IL skill training conducted by the facilitator in collaboration with a librarian before carrying out PBL activities and information seeking activity. The control groups (C1 & C2) began the normal process of PBL activities and information seeking activity. All participants were post-tested on their academic self-efficacy and learning satisfaction about the learning task at the end of the PBL process after they submitted their report or solution.

The set up of the Solomon four-group design in this research is as shown in Table 1: The reasons of using Solomon Four-Group design in this study were:

1. Even though non-random sampling was used to draw the sample, a quasiexperimental study was still possible with the purposive sampling (Gall et al., 1996). This purposive sample can be randomly assigned to two experimental groups and two control groups.
2. The ability to control for instrument reactivity. Instrument reactivity refers to situations where pre-test cues subjects about the treatment and enables them to guess the expectation. In Solomon Four-Group design, half of the participants from both the treatment and control groups were pretested while the other half were not. Thus, it was able to control and test instrument reactivity. 3. Ability to assess the presence of pre-test sensitisation. 4. Allowing more confidence in inferring causal relationships as it has higher degree of internal validity.
5. Extraneous temporal effect was avoided as the treatment for the two experimental groups was given at the same time, with the collaboration of the facilitator and the librarian.
6. Most of the threats to internal validity were eliminated.

Treatment

The independent variable of this study was the treatment which aimed to improve the academic self-efficacy and learning performance of the university students by raising their IL skills. The treatment was a two-hour IL skill training programme conducted by the facilitator in collaboration with the librarian in two separate

TABLE 1 Solomon four-group design

Group	Pretest	Treatment	Posttest
1. R Experimental (E_1)	O_1	X	O_2
2. R Control (C_1)	O_3		O_4
3. R Experimental (E_2)		X	O_5
4. R Control (C_2)			O_6

X :	Treatment of IL skill training.
O_1, O_3 :	Measurement of dependent variables before IL skill training.
O_2, O_4, O_5 and O_6 :	Measurement of dependent variables after performing the learning task.

phases. The first phase was a 40-minute lecture of IL knowledge conducted by the facilitator, while the second was 80-minute hands-on IL skill training conducted by the librarian in the library training room. The content of the lecture included the five standards of IL for higher education, the importance of these standards and how to relate and apply the five standards as they participated in PBL. The skills taught are: 1. to determine the nature and extent of the information needed, 2. to access needed information effectively and efficiently, 3. to evaluate information and its sources critically and incorporate selected information into knowledge base and value system,

4. to use information effectively to accomplish a specific purpose individually or as a member of a group, and

5. to understand the economic, legal, and social issues surrounding the use of information and to access and use information ethically and legally.

The librarian conducted a mini-PBL session in the second phase by giving four learning tasks related to a bibliography project that required the participants to work in small groups. The tasks were:

1. to make a list of information sources,

2. to describe the need of citing information sources in a bibliography,

3. to identify the element included when citing a book or websites, and

4. to identify a list of criteria that could be used to critically assess an information source. These tasks involve the three elements of IL instruction outlined by Nahl and Jakobovits (1993) – critical thinking or information evaluation skills, information use skills, and learning to learn or enjoying the benefits of information success.

A summary of the four groups with and without the pretest as well as with and without the treatment is tabulated in Table 2.

Instruments

The independent variable of this study was the treatment of IL skills. The experimental groups were trained in a two-hour IL skill program by the facilitator in collaboration with the librarian. The dependent variables were the academic self-efficacy scores and learning performance scores on the self-reporting and numerically measurable questionnaire measured in 11-point scale for academic self-efficacy and 5-point Likert scale for subjective measure of learning performance which constitute learning satisfaction and learning attitude respectively. The questionnaire was administered in a pretest and posttest format to

one experimental and one control group, and posttest only for others. By precluding the other two groups from pretesting allowed the researcher to determine if the actual act of pretesting influenced the results. If the difference between the posttest

TABLE 2 . A summary of the four groups of participants during the experiment

Treatment condition / Pretest condition	ILS training	No ILS training
Pretest	E_1	C_1
No Pretest	E_2	C_2

Notes: Group E1 : Experimental group, with ILS Training and Pretest; Group C1 : Control group, No ILS Training but with Pretest; Group E2 : Experimental group, with ILS Training but No Pretest; Group C2 : Control group, No ILS Training and No Pretest.

results of E2 and C2 was different from the E1 and C1 , then the researcher can assume that the pretest has had some effect upon the results. The questionnaire was used to ascertain the cause and effect relationship between IL skill training and academic self-efficacy as well as between IL skill training and learning performance. The academic self-efficacy questionnaire comprises a series of element developed by Klobas et al. (2007). Learning performance was expressed as a function of learning satisfaction, learning attitude, and learning scores (see Fig. 1).

Learning satisfaction was measured by a 10-item self-report rated by a scale from 1 being “strongly disagree” to 5 being “strongly agree”. This instrument was adapted from the usefulness instrument developed and tested by Davis (1989). Learning attitude was measured during the whole PBL activities on a scale from 1 being “unsatisfactory” to 5 being “exceptionally satisfactory”. The learning assessment was based on a test that consists of 15 multiple-choice questions on the course unit conducted in PBL, and the quality of the solution to the PBL task.

RESULTS AND DISCUSSION

Testing of Hypothesis 1

Information literacy training and academic self-efficacy

The mean score of academic self-efficacy was computed by dividing the total score of the 27 items on academic self-efficacy divided by 27. The mean post-test scores of the academic self-efficacy of the four groups were compared and analysed using 2 (pre-test/ no pre-test) x 2 (treatment / no treatment) between-group factorial ANOVA. In this analysis, 2 factors were each applied in two levels. The first factor was the condition of pretesting and the two levels were pre-test and no pre-test. The second factor was the treatment of IL training and the two levels were IL training and no IL training. Table 3 shows the

results of this analysis. From the results in Table 3, it was axiomatic that there was no significant interaction (F 1,74 =2.24, p = 0.139) between the two main effects.

It was therefore concluded that no pre-test sensitisation was present. The analysis of the treatment effect on the post-test scores (F1,74 = 10.499, p=0.002) revealed a statistically significant result. This implied that the treatment had an effect and this effect existed without any prerequisite. Information literacy skill training has significantly improved academic self-efficacy of university students despite the presence of the pre-test. Thus, Ho1 was rejected in favour of the alternative hypothesis. It follows that IL skill treatment has a statistically significant impact on the improvement of academic self-efficacy of university students in a PBL environment.

Testing of Hypothesis 2

Information literacy skill training and learning satisfaction

Learning satisfaction score was computed as the total scores of the 10 items of learning

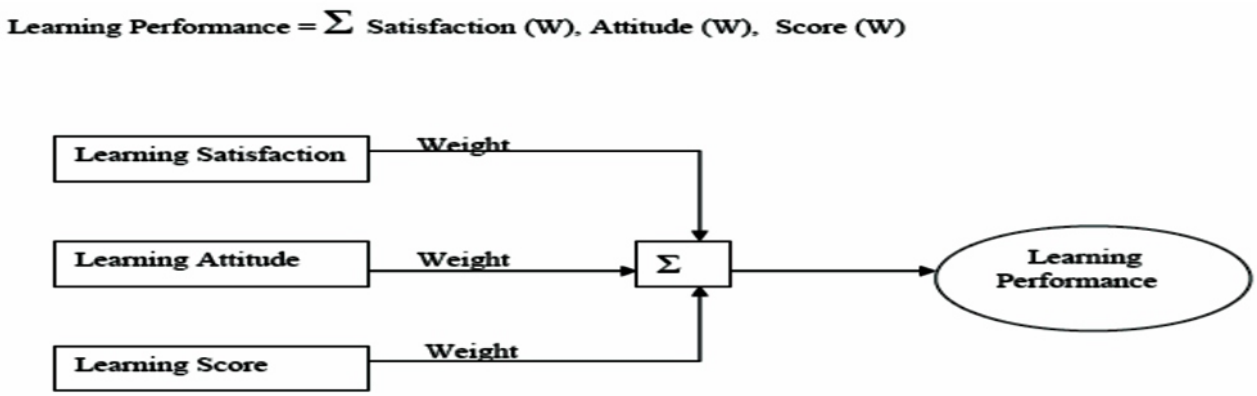

Fig. 1: Expression of Learning Performance (Loh, 2010, p. 35)

TABLE 3 Factorial ANOVA on academic self-efficacy post-test scores of all four groups

Descriptive Statistics

Dependent Variable: ACADEMIC SELF_EFFICACY

experimental group	pretest identifier	Mean	Std. Deviation	N
Experimental group	pretest	7.9923	1.1156	20
	no pretest	7.3502	.6451	19
	Total	7.6795	.9618	39
control group	pretest	6.9939	1.1814	19
	no pretest	6.9827	.6407	20
	Total	6.9882	.9308	39
Total	pretest	7.5059	1.2406	39
	no pretest	7.1617	.6611	39
	Total	7.3338	1.0026	78

Tests of Between-Subjects Effects

Dependent Variable: ACADEMIC SELF_EFFICACY

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13.338[a]	3	4.446	5.136	.003
Intercept	4187.850	1	4187.850	4837.677	.000
TREATMEN	9.089	1	9.089	10.499	.002
PRETEST	2.080	1	2.080	2.402	.125
TREATMEN * PRETEST	1.939	1	1.939	2.240	.139
Error	64.060	74	.866		
Total	4272.629	78			
Corrected Total	77.398	77			

a. R Squared = .172 (Adjusted R Squared = .139)

satisfaction. The post-test learning satisfaction scores of the four groups were compared and analysed using 2 (pre-test/no pre-test) x 2 (treatment/no treatment) between-group factorial ANOVA. Table 4 shows the results of this analysis. There was no significant interaction ($F1,74 = 1.855$, $p = 0.177$) between the two main effects. It can be concluded that no evidence of pre-test sensitisation was present. An analysis on the treatment effect of the posttest scores ($F1,74 = 3.011$, $p=0.087$) indicated that no statistically significant result was obtained. An ANCOVA with the pre-test scores used as the covariant was performed to determine the effect of treatment on the post-test scores of Groups E1 and C1 .

The result from the ANCOVA ($F1, 37 = 6.682$, $p=0.014$) indicated that a statistically significant result was obtained. This indicated that the treatment had an effect on the learning satisfaction regardless of the presence or absence of the pre-test. Thus, no further analysis was needed and the null hypothesis Ho2a was rejected in favour of its alternative hypothesis. It follows that IL skill treatment had a statistically significant impact on the learning satisfaction of university students in a PBL environment. Information literacy skill training and learning attitude

Learning attitude was computed as the total scores from the 8 items on learning attitude. Since there was no pre-test administered for the learning attitude, one-way ANOVA was conducted on the learning attitude in all four groups of subjects. The ANOVA results showed that there were at least two groups of subjects who showed significant difference in the mean scores of learning attitude, with the result $F(3, 74) = 15.882$, $p = 0.00$. A further examination of the Turkey Post Hoc test indicated that subjects

TABLE 4 Factorial ANOVA on learning satisfaction post-test scores of all four groups

Dependent Variable: learning satisfaction for post test

experimental group	pretest identifier	Mean	Std. Deviation	N
Experimental group	pretest	41.6500	2.3232	20
	no pretest	39.2632	2.9029	19
	Total	40.4872	2.8550	39
control group	pretest	39.0526	3.5351	19
	no pretest	38.9500	5.3062	20
	Total	39.0000	4.4721	39
Total	pretest	40.3846	3.2169	39
	no pretest	39.1026	4.2538	39
	Total	39.7436	3.8017	78

Dependent Variable: learning satisfaction for post test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	98.740[a]	3	32.913	2.402	.074
Intercept	123033.419	1	123033.419	8977.605	.000
TREATMEN	41.270	1	41.270	3.011	.087
PRETEST	30.193	1	30.193	2.203	.142
TREATMEN * PRETEST	25.419	1	25.419	1.855	.177
Error	1014.132	74	13.704		
Total	124318.000	78			
Corrected Total	1112.872	77			

a. R Squared = .089 (Adjusted R Squared = .052)

TABLE 5 ANCOVA on learning satisfaction for Groups E1 and C

Dependent Variables	Source	MS	df	F	p
Learning Satisfaction	Treatment	58.14	1	6.68	0.014
	Error	8.70	36		

in the experimental groups showed higher scores in learning attitude than those in control groups, while no significant difference was found in learning attitude of subjects between control groups ($p = 0.889$) as well as subjects between experiment groups ($p = 0.970$) (see Table 6). Hence, hypothesis Ho2b was rejected in favour of its alternative hypothesis. It follows that IL skill treatment had a statistically significant impact on the learning attitude of university students in a PBL environment.

Information literacy skill training and learning score

The learning score of the students was derived from the mark assigned to each student based on the total scores in multiple-choice test questions on the topics covered in PBL and the solution to the learning task. As there was no pre-test for the learning score, one-way ANOVA was performed on learning scores

in all groups of subjects. Results of the ANOVA revealed that at least two groups of subjects showed significant difference in the learning score mean (F(3, 74)

TABLE 6 One-way ANOVA for learning attitude post-test scores

ANOVA

Learning attitude

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	163.280	3	54.427	15.882	.000
Within Groups	253.592	74	3.427		
Total	416.872	77			

Learning attitude

Tukey HSD[a,b]

group identifier	N	Subset for alpha = .05	
		1	2
control group with posttest only	20	28.1000	
Control group with pretest posttest	19	28.5263	
experimental group with pretest posttest	20		31.0500
experimental group with posttest only	19		31.3158
Sig.		.889	.970

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 19.487.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

= 4.788, p = 0.004). A further examination of the Turkey Post Hoc test indicated that subjects in experimental groups showed higher learning scores than those in the control groups, while there was no significant difference in learning scores of subjects between control groups (p = 0.778) as well as subjects between experiment groups (p = 0.073) (see Table 7). Hence, hypothesis Ho2c was rejected in favour of its alternative hypothesis. It follows that IL skill treatment has a statistically significant impact on learning scores of university students in PBL environment.

Information literacy skills training and learning performance

Since all the subsidiary null hypotheses were rejected in favour of alternative hypotheses, it was reasonable to predict that the IL skill training has an impact on learning performance of university students.

A one-way ANOVA was employed to further analyse the learning performance of the four groups of students. The results were shown in Table 8. The one-way ANOVA analysis showed that at least two groups of subjects showed significant difference in the mean score of learning performance (F(3, 74) = 8.227, p = 0.000). A further examination of the Turkey Post Hoc test indicated that subjects in the

experimental groups showed higher scores in the learning performance than subjects in the control groups, while there was no significant difference in the learning scores of subjects between the control groups (p = 0.895) as well as subjects between the experiment groups (p = 0.855) (see Table 8). Hence, hypothesis Ho2 was rejected in favour of it alternative hypothesis.

The statistical analysis revealed that there was evidence suggesting that IL skill treatment had a statistically significant impact on learning performance of university students in a PBL environment. A 2 (pre-test/no pre-test) x 2 (treatment/ no treatment) between-group factorial ANOVA was also performed on the learning performance

TABLE 7 One-way ANOVA for the learning score

ANOVA

LEARNING SCORE

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	817.643	3	272.548	4.788	.004
Within Groups	4212.011	74	56.919		
Total	5029.654	77			

LEARNING SCORE

Tukey HSD[a,b]

group identifier	N	Subset for alpha = .05	
		1	2
Control group with pretest posttest	19	77.1053	
control group with posttest only	20	79.4000	79.4000
experimental group with pretest posttest	20		83.5000
experimental group with posttest only	19		85.3684
Sig.		.778	.073

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 19.487.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

TABLE 8 Results of one-way ANOVA for learning performance

ANOVA

LEARNING PERFORMANCE

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1670.771	3	556.924	8.227	.000
Within Groups	5009.201	74	67.692		
Total	6679.972	77			

Homogeneous Subsets

LEARNING PERFORMANCE

	group identifier	N	Subset for alpha = .05	
			1	2
Tukey HSD[a,b]	Control group with pretest posttest	19	109.5368	
	control group with posttest only	20	111.3950	
	experimental group with pretest posttest	20		118.5050
	experimental group with posttest only	19		120.6105
	Sig.		.895	.855

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 19.487.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

post-test scores of all four groups. Table 9 shows the results of this analysis. From the results in Table 9, it was evident that no significant interaction existed ($F_{1,74} = 0.004$, $p = 0.947$) between the main effects. It can be concluded that no pre-test sensitisation was present. An analysis on the treatment effect of post-test scores ($F_{1,74} = 23.797$, $p = 0.00$) revealed a statistically significant result. This implied that the treatment had an effect that existed without any prerequisite. The IL skill training thus significantly improved the learning performance of university students. Thus, as anticipated, Ho2 was rejected in favour of its alternative hypothesis which was consistent with the results obtained from the one-way ANOVA.

The Solomon four-group design used in this research met all the conditions for a causeand-effect study. Firstly, this experimental study established a relationship. Secondly, a proper time order was observed, whereby the independent variable was manipulated and then the outcome was observed. Finally, it ruled out alternative explanations because random assignment equates the groups on all extraneous variables at the start of the experiment. Thus, the findings inferred that there was a causeand-effect relationship (causation) between IL skill training and the two dependent variables, and there was a cause-and-effect relationship (causation) between IL skill training and learning performance, and between IL skill

training and the two dependent variables, and there was a cause-and-effect relationship (causation) between IL skill training and learning performance, and between IL skill training and academic self-efficacy of university students in a PBL environment.

CONCLUSION

The results have demonstrated that IL skill training in a PBL environment by the facilitator in collaboration with the librarian was effective in improving students' academic self-efficacy and learning performance. The inferential statistics.

TABLE 9 Factorial ANOVA on learning performance post-test scores of all four groups

Descriptive Statistics

Dependent Variable: sum of PBL learning satisfaction, learning attitude and score

experimental group	pretest identifier	Mean	Std. Deviation	N
Experimental group	pretest	118.5050	7.4568	20
	no pretest	120.6105	7.3995	19
	Total	119.5308	7.4077	39
control group	pretest	109.5368	9.4244	19
	no pretest	111.3950	8.4867	20
	Total	110.4897	8.8865	39
Total	pretest	114.1359	9.5130	39
	no pretest	115.8846	9.1500	39
	Total	115.0103	9.3141	78

Tests of Between-Subjects Effects

Dependent Variable: sum of PBL learning satisfaction, learning attitude and score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1670.771[a]	3	556.924	8.227	.000
Intercept	1031084.113	1	1031084.113	15232.015	.000
TREATMEN	1610.841	1	1610.841	23.797	.000
PRETEST	76.540	1	76.540	1.131	.291
TREATMEN * PRETEST	.298	1	.298	.004	.947
Error	5009.201	74	67.692		
Total	1038413.980	78			
Corrected Total	6679.972	77			

a. R Squared = .250 (Adjusted R Squared = .220)

revealed that differences in the mean scores of academic self-efficacy and learning performance of students in the treatment group and those in the control groups were statistically significant. With the increase in academic self-efficacy in PBL, students may increase their confidence to accomplish their learning tasks and perform better while learning in the PBL environment. This will catalyse their ability to successfully participate in team work and foster their deep learning and empowerment. The collaboration with librarians to conduct IL skill training is essential in the successful implementation of PBL. Further research is recommended to expand this study to university students from other majors

such as business, humanity, laws, arts, or with post graduate students. Students with different majors and maturity may respond differently to an intervention.

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Transdisciplinary Leadership: Dealing with Wicked Problems, A Case Study from Australia

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ABSTRACT

While addressing social problems, and planning in general, the notion of "wicked problems" (coined by Rittel and Webber, 1973) is also applicable to complex organisational and social change issues that are currently challenging business and community leaders. The relentless drive for solutions, coupled with the desire to 'get it right' the first time, is straining the traditional or rational approaches to problem solving and leadership. In an effort to address the above, concepts such as cross-disciplinary, inter-disciplinary, and multi-disciplinary teams or thinking have been developed and deployed. However, these have fallen short of expectations. The concept of transdisciplinary leadership is drawn from systems thinking transdisciplinarity. Using action research and case study methodology, transdisciplinary leadership has evolved through a range of "complex wicked problems". It also draws from in-depth interviews with a number of business and community leaders in Australia and USA who have successfully addressed "wicked problems". This paper suggests that developing leadership strategies based on transdisciplinary thinking can benefit leaders tasked with dealing with wicked problems. A transdisciplinary approach offers a more effective approach to building knowledge, consensus, making sense of the complexity of issues at stake and ultimately delivering results with wider support and agreement.

Keywords: Leadership, organizational change, problem solving, systems thinking, transdisciplinarity

INTRODUCTION

The media highlights daily the performance of national and global leaders as they are confronted by increasingly complex challenges, as the milieu within which leaders operate continues to undergo radical change. However, leadership research has, over the past 50 plus years, continued its focus on the relationships between tasks, roles, functions, contexts, and behaviours (Bass, 1990; Yukul, 1994; Zaccaro and Klimoski, 2001). An underpinning assumption is that leaders will adapt their leadership practices in response to the change in their milieu. Mounting evidence from decades of organisational, national and global crises would suggest that leaders do not readily or easily adapt their practices as they are confronted by these increasingly complex leadership challenges.

A philosophical question raised over 20 years ago during an early career discussion on leadership, was whether leadership is an "Art, Science or Practice". Clearly, there is no simple answer to this question. Of importance to the debate was the syntax of "practice"; that is "to practice" as a profession, or to "practice" as a musician or sportsperson, that is to expand, improve and enhance one's skills, knowledge,

and performance in different contexts.

The challenge is that many leaders appear not to "practice" to improve their leadership performance, rather, they continued, holding onto a past paradigm of leadership thinking, despite being faced with overwhelming evidence of a radically changing milieu. This paper is written with my reference to my involvement as a participant, facilitator, and leader across a wide range of Australian and international projects, such as:

• Developing the approach for a major policy research project Future of Work 2020 (Fayed and Pearce, 2008),

• Developing the strategy framework and shared vision across stakeholders for new specialist health business unit for a multinational bank,

• Facilitating and team coaching multinational finance organisation's strategy: Carbon Neutral 2010, and

• Facilitating a think tank on Military Health Ethics (Pearce and Saul, 2006).

All these have clearly highlighted the fact that the dominant "why and how" of leadership thinking and practice has essentially remained unchanged over the past sixty years.

This is best demonstrated by the current systems of supporting and marketing leadership theories or concepts to the broader population. Researchers are asked to capture "what is leadership" based on existing leadership theories, and observation of a comparatively small population. Successful leaders of the day are identified and also asked to distil their thinking on leadership. This is then marketed through books, publications and courses to a wider audience. However leaders, when confronted by new complex challenges, are asked how they view these challenges and "how they think about the leadership strategies required to respond to these challenges" suggest that mainstream thinking on leadership is not helpful.

Hambrick and Fukutomi (1991) support observation in their study of a Chief Executive Officer's (CEO) tenure, where they suggest that a CEO exists within a current paradigm and that this is impacted by two elements, schema and repertoire. Schema is "pre existing knowledge systems a person brings to a job" (p.721). These systems are the personal givens, the conscious and unconscious preconceptions, beliefs, inferences, and expectations. They are derived from family experiences, culture, business experiences and networks, formal and informal education, and causal observation. Research indicates that a leader's values and belief systems have the strongest influence (Bass, 1990; Beck and Cowan, 1996; Montor et al., 1998; Yukl, 1994). Schema forms the perceptual and interpretive apparatus from which a manager or executive operates. This is the Art of Leadership.

This is balanced by a person's repertoire. Repertoire is the supply of skills, devices or expedients

possessed by a person at any given time that is a person's "tool kit" (Hambrick and Fukutomi, 1991, p.721). This is the Science of Leadership. However, it is limited by the completeness or balance of the elements of the Science that a person considers either useful or not. Even though an element may be considered useful, a person may dismiss using it due to reasons such as lack of confidence or clarity of understanding. In some cases an element may be included within a repertoire however it may be totally avoided. So self-insight and related confidence will determine which elements of repertoire will be selected, used, improved, and new elements sought. This leads to the skills becoming the "tangible" ability of a person to apply their repertoire within a given context.

Clearly the interrelationship of these two elements, schema and repertoire, influences the practice of leadership, and feedback from the practice informs these elements. Any shortcoming in leadership paradigm thinking will critically limit a leader's ability to make sense of and identify with new, complex and at times unique challenges being presented in the current dynamic environment of the 21st century.
The aim of this paper is to add a perspective to leadership practice, specifically dealing with complex challenges, while being informed by the art (personal nuances, aesthetic judgement, and interpretations) and the science (theories, models, and concepts drawn from different disciplines) of leadership. Specifically the focus is on leaders tasked with the strategic responsibility of leading complex challenges such as radical change, sustainability or building strategic capability and capacity (see Collins and Porras, 1994; Denison et al., 1995; Finkelstein and Hambrick, 1996; Jaques and Clement, 1994; Wheatly, 1992; Zaccaro and Klimoski, 2001).

WICKED PROBLEMS: 21ST CENTURY LEADERS' CHALLENGES

Leadership has been a multi-discipline and multi-paradigm field of study for some decades. Bass (1990) and Van Seters and Field (1990) present detailed evidence of this evolutionary development. Senge (1990) questioned traditional leadership theories and their approaches based on the assumption of "people's powerlessness, their lack of personal vision and inability to master the forces of change" (p.340). Yukl (1999) notes the limitations of many early leadership studies by using a two factor relationship such as task versus orientation or autocratic verus participative or transformational versus transactional. Yukl (1999) importantly argues that this approach is an over simplification of what is in essence a complex function, the processes involved in an effective leadership practice.
Additionally this extensive body of work on leadership in essence focuses on the elements of the organisation and so achievements at the functional element of a business or organisation. This is totally in line with the Newtonian reductionist principles applied to business, strategy and leadership. It is not intended as a criticism of the works, rather an observation that each represents the research paradigms and strategies of the period in which they were the focus and undertaken. Unfortunately these do not

provide insight into dealing with wicked problems.

Drucker (1968), Schön (1971), Ackoff (1981), Nohria and Berkley (1994) and Stacey (1996) are representatives of the discussion on the need for management to the develop thinking and means, to better manage and cope with increasing discontinuities or complexity.

One early landmark work that continues to hold relevance to understanding the challenges of leading, via their discussion of planning in environments of complexity, is Rittel and Weber (1973) and their notion of "wicked and tame" problems.

Rittel and Weber (1973) identified ten distinguishing properties of wicked problems. Of these, the problem has no definition, it is in essence unique, and as such has no single solution. The "right solution" may be not only misleading but also meaningless. It is important to highlight that these problems are complex, not complicated. These terms are often interchanged. Complicated problems have an identifiable structure, which can be understood given time and expansive knowledge of all the interrelating disciplines that make up the parts. They represent a large-scale collection of many simple or tame problems; however, because of the nature of scale, they are not reducible to a simple problem.

The structure, if any, is generally externally imposed and with a focus on one element of the total problem.

Whereas complex problems have no clear structure and in essence are difficult to understand. This structure is emergent, and can only be achieved given appropriate open interaction between the actors and elements of the total system. "There seems to be a growing realization that a weak strut in the professional's support system lies at the juncture where goalformulation, problem-definition and equity issues meet." (Rittel and Weber, 1973, p.156).

A summary comparison of complicated and complex problems is in Table 1.

A challenge confronting leaders of large organisations is that managers in general tend to build complication into business structures and operations. As the natural rate of change increases so does the complexity of the issues confronting the leader. Performance demands to present appropriate, relevant, and immediate solutions merely increases the leaders dilemmas. Schön (1971) and Stacey (1996) also highlight the glaring fact that as complexity increases,

TABLE 1 Characteristics of complicated and complex problems

Complicated problems	Complex problems
Have defined form or structure	Do not have well defined form or structure
Structures determine relationships	Structures and relationships are dynamic and interactive
Have clear dimensions and variables for which we have current knowledge	Dimensions and variables are not known due to lack of clarity of the problem
Have a high degree of certainty	Have uncertainty and ambiguity
Assume a static environment	Occur in dynamic environments
Understanding is based on convergent rational linear cause – effect thinking	Understanding requires divergent holistic systemic thinking
Have many "right" alternative solutions that can be determined through reduction and analysis and rationally linked	Have many possible solutions, none of ultimately right and they emerge through a process of divergent thinking and synthesis

predictability decreases, with the result that solutions and systems generate unknown and unintended consequences, and newer, more complex problems. The complexity of these socalled problems generates additional issues such as how to build consensus on agreed outcomes across different groups or stakeholders with the continual expression of we must get "it" (the solution) right. This notion of "rightness" raises the interpretation of what is ethical or fair, for each stakeholder group, further compounding the issue.

Supporting this practice for rightness is the observation by Shapiro (1988), who is perhaps the first person to suggest "clumsy institutions" in his argument that when institutions, or their leaders, are presented with complex problems they are also presented with opposing definitions and interpretations of the wicked problem and associated solutions. It is the expectation of having to choose one definition and solution that leads to this notion of clumsiness.

Ghoshal (2005) presents a landmark paper, in what has been a publicly muted debate, on the role bad management theory has played over the past fifty years. I would extend this to include leadership theory. It also provides insights into the notion of clumsiness with his critique on the influence of bad management theories, through the "pretence of knowledge" and "ideology penetrating disciplines" as leading to "excessive truth-claims based on partial analysis and unbalanced assumptions" which has been influencing the practice of mangers (pp. 76-77).

While Ghoshal was reflecting on the high profile demise of Enron, the continuing Global Financial Crisis perhaps amplifies his case a thousand fold. The role of "positivism" cannot be understated, as Ghoshal (2005) citing Milton Friedman perhaps best captures the management and leadership dilemma we currently find ourselves in:

Don't worry if the assumptions of our theories do not reflect reality; what matters is that these theories can accurately predict the outcomes. The theories are valid because of their explanatory and predictive power, irrespective of how absurd the assumptions may look from the perspective of common sense. (p. 80) Following on from the above view, is the underpinning assumption that leaders engaged in solving wicked problems are, and will continue, to be evaluated on their performance. That is their ability to present a solution. The solution's "rightness" appears to be driven by the underpinning views of the world held by the different stakeholder groups, their timeframe, agendas, and apparent lack of due consideration of the downstream impacts these solutions will or may have.

The role of performance management is based on rational decision making thinking. It assumes a single linear predictive path of cause and effect. This rational predictive logic dictates that interventions are possible, trade-offs made and solutions with their results known.

Adding to the leader's dilemma is the use of vertical organisational structures and divisions that operate on single disciplinary thinking and often with a notion of controlling an element of the complex challenge that is within their specified domain. The clumsiness of rational cause and effect thinking with vertical organisational divisional structures influences leader behaviour and with short term market demands, requires leaders to present "the solution", so further blinding a leader's ability to see that they are increasingly being confronted by complex problems and that there are other possibilities or views of the world.

So what has influenced leaders thinking, and how have "bad management theories" evolved to dominate our understanding and thinking. The exchange between Ferraro et al. (2005) and Bazerman's (2005) coupled with Ghoshal (2005) provides great insight into how and why leaders of organisations have been influenced, over the past two or so decades, into seeking rapid short term solutions at the expense of a more balanced exploration of the issues. Clearly leaders cannot merely rely on theories and thinking that led to this situation as providing solutions to this wicked problem.

One initial observation of leaders engaged in wicked problems, was whether they resorted to attempting to control the solution by using a single line of thinking and action, or engages in understanding the problem through knowledge building and collaboration processes before acting. Clearly there is a time constraint; however, even in periods of near crisis, what I will term "effective complex challenge leaders" continued to use the latter approach.

So while wicked problems or complex challenges suggests a holistic approach to viewing an issue, management and leadership education and development presents a segmented reductionist approach,

through individual subjects, theories and models as a trade off – one or the other. I am reminded here of my early training as a navigator and the debate between round earth and flat earth paradigms. We actually live with both; it depends on what we are doing as to which paradigm we draw from, global travel, building a bridge or a short trip across town. Why then do we persist with the notion that one paradigm is better or "in date" as compared to another?

This paper represents the emergence of a new paradigm, one that in Kuhn's (1962) terms is the blending of past multi-paradigms and has evolved into a new research and paradigm for leadership practice.

METHODOLOGY

The failures of cross-disciplinary and multidisciplinary teams to address wicked problems led to the notion of transdisciplinary. The concept of Transdisciplinary Leadership evolved from a twenty-year longitudinal case study of personal experience of leading and facilitating complex change projects within a range of different industry, business and social settings as well as semi structured interviews with noted business and community leaders.

Action research and a single case study using multiple sources of evidence was used to investigate the phenomenon of leaders dealing with complex challenges in actual life settings and within a comparatively real time (Yin, 2003). Patton (2002) notes a single case study is suitable where the case represents a critical test of existing theory or where the case is a rare, unique test of existing theory or serves a revelatory purpose.

Multiple sources of data representing significant projects over the twenty-year period were collated to support the study's validity and reliability (Yin, 2003, p.21). Data collected included notes and reports from a sample of thirteen significant projects that involved unique complex changes. I was engaged in all these projects as leader, consultant or facilitator. Examples of these projects include: being the lead internal staff officer for placing women at sea in the operational command of the Royal Australian Navy, for radical technological change for a book and news printing organisations, for project teams restructure and cultural diversity program for a multinational aeronautical manufacturer.

In addition, I led a team in developing a framework of Military Health Ethics in response to allegations of health professionals being involved in the torture of prisoners of war and co-facilitator, and also was the team coach for a multinational finance organisation's strategy, Carbon Neutral 2010.

In addition to these projects, I conducted a number of in-depth and on-going semi-structured interviews with business and community leaders. This data collection and analysis process enabled for sense making, testing, and feedback of emerging ideas and finally the Transdisciplinary Leadership concept. Table 2 presents a summary of the research process.

TRANSDISCIPLINARY LEADERSHIP: AN EVOLVING THEME

The idea of transdisciplinary first emerged in early 2005 while working on the think tank for military health ethics. After reflection on a previous concept "macro leadership" failed to adequately address issues within projects where potential outcomes were either, watered down by tradeoffs between different actors unable to understand each other's position, or projects that failed, because belief structures failed to see alternatives. Involvement with the practice of forming multidisciplinary, cross-disciplinary or inter-disciplinary project or problem solving groups also failed in different ways to address the issue at hand.

Checkland (1981) noted the need for transdisciplinary concepts to unify knowledge so that it is applicable to areas that cut across traditional academic boundaries. He does note that interdisciplinary teams would not solve this issue. Drawing from the environmental movement who have engaged in transdisciplinary thinking, Funtowicz and Ravetz (1991) note the

TABLE 2 Data collection and method

Level of analysis	Unit of analysis	Sources	Criteria for interpretation
Macro – the complex problem	Researcher	Primary: documentation both archival and current Secondary: reflective notes and on-going testing and engagement of concept	Researcher's methods of enquiry, sense making and continuing motivation for further engagement with wicked or complex challenges
Meso	Client organisations	Primary: Observation and engagement with client groups Secondary: client internal reports and verbal feedback	Client culture, response to change and feedback
Individual	Business unit leaders, team members and identified leaders	Primary: semi-structured interviews and some questionnaires Secondary: observation and third party documents	Espoused views of the complex challenge bring confronted, mental models and views being expressed, feedback on change process

limitations of reductionist and mechanistic thinking and assumptions about the way this thinking presents relationships. They also note the normative effect of societal values and how they affect stakeholder inputs at one end and how there is an expectation that science will deliver certainty. The challenge we are confronted with is that we seek "science" to solve or explain all problems, however, as indicated by the notion of "wicked problems", not all problems can be solved by science, as they are not all caused by science, rather they are problems produced by the side effects of created systems and subsystems.

The International Center for Transdisciplinary Research, from their Moral Project (1987), describes transdiscplinarity as:

Transdisciplinarity is not concerned with the simple transfer of a model from one branch of knowledge to another, but rather with the study of isomorphisms between the different domains of knowledge. To put it another way, transdisciplinarity takes into account the consequences of a flow of information circulating between the various branches of knowledge, permitting the emergence of unity amidst the diversity and diversity through the unity. Its objective is to lay bare the nature and characteristics of this flow of information and its principal task is the elaboration of a new language, a new logic, and new concepts to permit the emergence of a real dialogue between the specialists in the different domains of knowledge. (www)

Transdiscplinarity as a concept would appear to be still emerging and evolving.

TRANSDISCIPLINARY LEADERSHIP STRATEGIES: SENSEMAKING, EMERGENCE, FACILITATING

Unravelling the leadership required to deal with complex challenges is much like the "Blind men of Indostan" (Blind Men and the Elephant; John Godfrey Saxem, 1878), each vested actor or stakeholder gropes for truth and reality, each being right in that what they are describing, each being logical or plausible. However, attempts to improve, or provide a solution or resolve an issue, in isolation is flawed in that none actually sees or understands the entire system; the elephant. Solutions may be effective for their own areas, however the consequences to other areas of the system are unknown and not considered. People are rewarded for work that has the potential to destroy the system (see the cases of US finance organisations related to Global Financial Crisis, NAB trading losses, Bearing Bank, Enron, Toyota and Ford Vehicle Recalls and Ajax Fasteners Australia).

Transdisciplinary Leadership identified a framework of leadership strategies to guide a leader's practice. These strategies engage a fluid process of divergent to convergent thinking and action. The critical leadership challenge is recognising when to switch between these thinking and acting practices.

The underpinning success factor for this approach is that leaders and their associated stakeholder networks have a degree of clarity and agreement on what they aspire to be and, just as importantly, what they desire not to be.

Fig. 1 represents the Transdisciplinary Leadership strategy cycle. The preliminary identification and understanding of the complex challenge presents the starting point for a leader to determine the leadership strategies needed to build a systemic understanding of the challenge from the position of different actors or stakeholders. The ability to engage stakeholders is influenced by the capacity and

capability of the different stakeholders and their existing mental models.

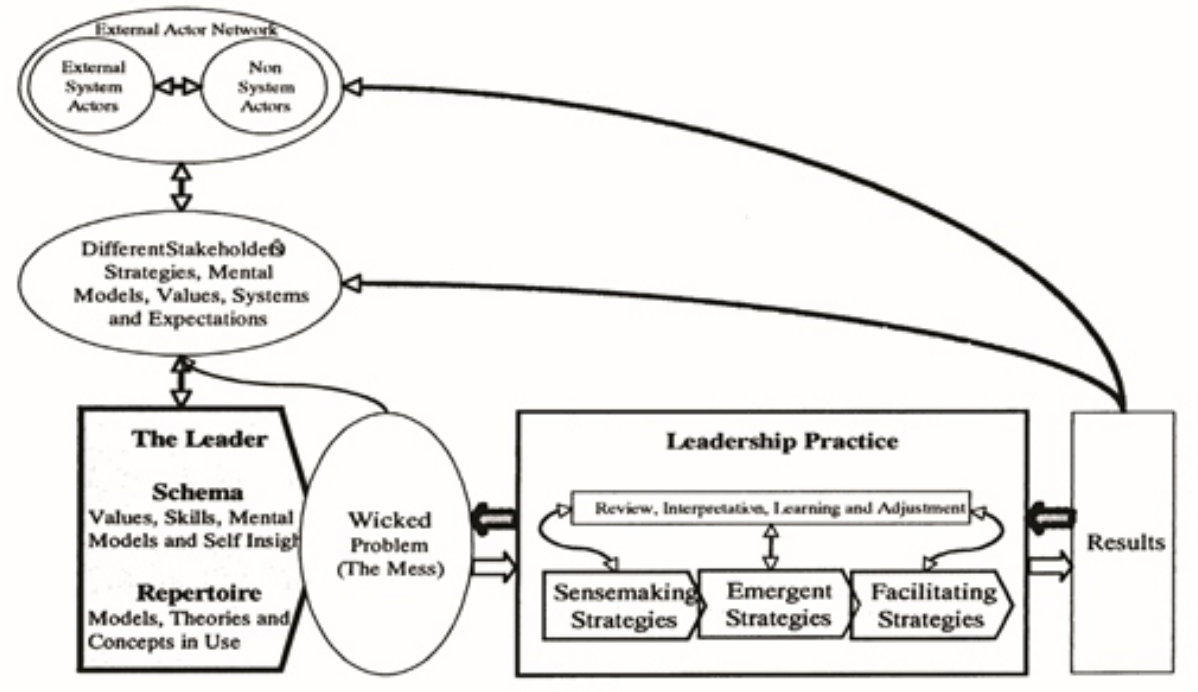

Fig. 1: Transdisciplinary Leadership Strategy Cycle

The Transdisciplinary Leadership approach is best described, as taking the complex challenge to a meta-level, a level that exists above the separation of the stakeholder disciplines. Leaders develop transdisciplinary leadership strategies through the use of a number of tools and techniques with the objective to cross the boundaries or borders created by single disciplines to produce understanding, insights and perhaps new knowledge relevant to the complex challenge and issues at hand.

Sense-making Strategies: Divergent Thinking

Sense-making is a paradigm, involving how to reduce ambiguity, to socially determine understanding and meaning of the wicked problem at hand. As indicated by Weick (1995) the strategy is about understanding how the different stakeholder groups construct meaning as data is converted into usable information and then knowledge.

How a leader engages with the total system is critical. This requires extensive periods of challenging all stakeholders to engage in "divergent thinking processes". This can be exceptionally challenging, if not virtually impossible, for disciplines skilled and rewarded for almost instant convergent solutions thinking. It focuses on open-ended future oriented questioning aimed at exploring, inquiring, examining, explaining, and enticing as diverse as possible views on the issues at hand that make up the wicked problem.

Sense-making has a number of objectives, however, these must be linked to the organisation's overarching strategic aspiration, or more simply put "to what purpose can we use this knowledge?" Essential elements within this process include:

- Understanding the nature of the wicked problem and associated issues from different perspectives.
- Understanding how the system is currently attempting to respond to the wicked problem.
- Understanding how the wicked problem arose based on the thinking or mental models in use within the system.
- As best as possible present clarity of sense of the issues as they impact on all stakeholders.
- Clarity of the current systems strategic capabilities to address the wicked problem.
- Maintain the tension created by the paradoxes present within the challenge.

A key element here is ensuring that leaders need to understand how meaning is ascribed and interpreted by different disciplines to wicked problem. Misunderstanding, confusion, and misinterpretation often occurs within organisations, cross-disciplinary teams or multistakeholder groups, when disciplinary jargon, acronyms, or unique meanings of terms are used.

This requires extensive open conversations and workshops, mostly facilitated, to ensure clarity of message, understanding of the issues and most importantly trust to develop the next stage. This demands an astute understanding by the leader of their personal capabilities and the capabilities leaders require from others to complement the leader's strengths to understand the problem and issues at hand. It is imperative that the leadership team and their critical stakeholders have significant levels of trust and agreement of future strategic aspirations. Failure to achieve this will ensure failure in any endeavours. It is also essential that the leadership team remain open to all ideas and suggestions; that is their thinking remains divergent.

To date this has been a facilitated process.

Tool and techniques used in this process include:

- Featuring tools such as scenario development
- Strategic arena mapping
- Story telling
- Strategic conversations
- Semi structured interviews
- Open space workshops
- Appreciative inquiry
- Soft systems methodology

This is highly time-consuming for leaders. Experience suggests depending on the type of challenge being confronted and levels of trust between key stakeholders that these strategies will require between 50 to 80 percent of a leaders time actively engaging with stakeholders in different forums.

The most successful strategies have involved developing snap shot scenarios of possible futures supported by strategic arena maps and using these during one-on-one interview meetings with key leaders from each stakeholder group. This allows for a full discourse, building an understanding of the stakeholders' current mental model and aspirations, as well as establishing their initial position on your aspirations. It is the initial step in building trust.

As key leaders within different stakeholder groups are engaged, they need to become part of the broader leadership team so that the final leadership team has the greatest potential to make sense and build knowledge. This in reality is an ongoing strategy, as different leaders will be required at different stages to address the wicked problem.

This has proven to be the most critical phase, a phase that literally defines success or failure in responding to the problem in a meaningful way. One critical element has been the leader's ability to recognise and approach groups who are non-stakeholder actors, but have the power to derail positions taken by vested stakeholders. These can include activist groups, disenfranchised customers, competitor industry groups or even overseas groups. Early engagement with these non-stakeholder actors has proven successful in building and sustaining long term relationships and trust, which have paid unexpected benefits over the course of each relationship. For example in developing the issues paper and planning for the think tank for military health ethics we engaged via one on one interviews for the first time, all elements of the Australian Defence Force, different veterans units, department of Veterans Affairs, different health specialist groups, NGOs such as Red Cross and Médecins Sans Frontières and key participants from Canada, UK and NZ who had experienced past military ethical problems. This led to clarity of actions needed by all stakeholders and built critical relationships where they had previously not existed.

These sense-making strategies perhaps identify the success or failure of successive actions. It must be an engaged and shared process.

Emergent Strategies

Whereas sense-making strategies focus on divergent thinking to build shared understanding and awareness, emergent strategies focus on an awareness of the new learning and understanding that is generated from the interactions of the different stakeholders. As described by Gladwell (2000), there is a time, a tipping point, where significant knowledge and understanding of the system has been built to explore possible solutions. This occurs when the initial leadership team engages a critical mass of

stakeholders to build a new logic. This ideally should be a spontaneous positive event. However, experience demonstrates that some people go through periods of perturbation as they struggle with paradigms or mental models that do not provide the answers or understanding. This is perhaps best identified by the work of Clare W. Graves (Beck and Cowan, 1996) and his identification of the cycle through which people travel, where previous mental models or value thinking systems no longer present working solutions to the problems encountered.

The power of the leader at this stage is to recognise the emergence of new knowledge and understanding happens through sensemaking interactions between stakeholders and actors over time. To date this has only been achieved during workshops, think tanks, round table meetings after significant research and engagement or open space processes. Tool and techniques used in this process include:

- Mind mapping / Pattern recognition
- Synthesis
- Feedback systems to test new knowledge and understanding (workshops, focus groups, workplace café meetings)
- Stacey (1996) What / How matrix

Facilitating Strategies

Facilitating results represents the convergence or agreement on action required to address the complex challenge as it is currently understood. Implementation is clearly the task of many, however, the role for transdisciplinary leaders is to maintain a strategic oversight of the systems and how the solutions are progressing. This is linked with ensuring the systems and organisational environment are conducive for success.

Leaders have the responsibility and accountability for the systems that in essence, control the organisation's operations. The dynamic nature of wicked problems and hence solutions often means that possible or plausible solutions in one operating context will not be plausible in another. The critical role of transdisciplinary leadership is to understand the often-subtle differences in context across organisations and their stakeholders and effectively adjust the systems as required. The leadership approach required here is one of innovation and experimentation. It is one of moving the resources to respond to the problem. Unlike environments that foster risk aversion or low risk where outcomes are expected within a predetermined set of boundaries, here outcomes will be more generic. The leadership approach and strategies are perhaps similar to testing or experimentation, especially if the problem is unique and therefore never seen, or experienced, by the leadership team. Critical here are the establishment of:

- meaningful metrics and modelling systems that provide as close as possible to real time feedback

information; • an "early warning system", one designed to pick up early indications of impending issues; and

• Systemic capability to change direction quickly or engage additional resources as required.

In part, this is the establishment of learning systems across the network, and also building a capacity and capability to deal with ambiguity and uncertainty. A further benefit of this approach is understanding how this approach has worked and building success stories to share across the network.

INSIGHTS FROM TRANSDISCIPLINARY LEADERSHIP APPROACH

The Transdisciplinary Leadership framework has been used in response to a number of complex organisational and social challenges, examples as noted above. It continues to be used and refined. The insights gained from this process to date include:

• Within the overall decision cycle time, greater emphasis and time is spent on divergent, sense-making activities. Early engagement with stakeholders has proven increased quality in decisions with greater buy in from all stakeholder groups. The process has achieved positive initial results in three to six months on complex problems that had been in a protracted state for some years;

• Non organisational actors can disrupt the process if not identified and engaged early;

• The need for clarity and understanding of stakeholder network relationships is critical;

• Building trust across the stakeholder network is critical, especially where significant mistrust exists especially over long time periods; and

• Where current capacity and capability to respond to the wicked problem is lacking, capacity and capability development time must be factored into the response. It is important to collaborate with strategic stakeholders who may include direct competitors.

FURTHER RESEARCH

Transdisciplinary leadership process has identified a number of additional areas for further research. These include:

• Application of systems thinking and complex problem awareness to leader development,

• Continued application of systems thinking within general leadership research,

• Engagement of transdisciplinary thinking in professions and disciplines that regularly interact with complex challenges,

• Understanding different tools and techniques to effectively engage leaders in complex problems.

CONCLUSION

This journey has been a voyage of discovery across a wide range of disciplines to gain an understanding of the views held by leaders and researchers of wicked problems confronting their discipline. It is

interesting that the notion of wicked problems has transgressed across a number of disciplines and that they resonate with similar leadership issues. This paper is an attempt to distil these leadership issues and present a summary of leadership strategies based on experience in using transdisciplinary leadership approaches.

What is clear is that no one person can satisfactorily manage the process of confronting significant challenges alone. Transdisciplinary leaders need to have around them others who complement their abilities, provide diversity in thinking and discipline experience, and they can trust. It is claimed to be lonely at the top, but no one can remain effective as a leader if isolated from any source of support. Transdisciplinary leaders create strong networks and sounding boards as sources of sensemaking and knowledge as they explore different perspectives on wicked problems.

Complex and wicked problems need a collaborative approach to understand the systemic issues. Failure to do so means leaders operating in isolation will continue to present solutions that are biased and lead to extremes. The more this happens the more polarised people within any system will become.

Transdisciplinary leadership is a leadership paradigm focused on leadership practice that engages leaders to consider the dynamic nature of the system within which they are engaging. It is a framework of continuous learning:

What we have learned Is like a handful of earth What we have yet to learn Is like the whole world. (Hindu prophet Avvaiyar)

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