



ORIGINAL RESEARCH PAPER

Health Science

PROBLEM BASED LEARNING: AN OVERVIEW.

KEY WORDS:

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ABSTRACT

In this overview, an analysis is made about the problem based learning curricula (PBL) with an emphasis on the advantages of the PBL in medical education. The principles proposed by reforms in medical education in UK and a close link to PBL curricula is emphasised. The known disadvantages of PBL and implied disadvantages as portrayed by non experts is also analysed. However, the need for such a curricula is emphasised especially when the availability of resources in electronic media is overwhelming. The hybrid model of PBL as an alternate to PBL is discussed. The WSU model is discussed in detail pointing out the role of various participants in the PBL. The block system and its effectiveness at WSU is highlighted backed by some earlier research reports from WSU. The importance of small group tutorials is emphasised as it forms the backbone of the PBL. The role of tutors and the usual problems associated with an ineffective tutor is also spelt out. The role of group chairperson, the scribe and the mentors in solving the students problems is also explained. The WSU model as it is now known and recognised by international experts is an achievement that needs wider publicity and that is the core aim of this overview.

INTRODUCTION:

Problem based learning is the learning that results from the process of working toward the understanding or resolution of the problem (Barrows & Tamblyn, 1980). Problem-based learning, otherwise known as "PBL," has been incorporated into the curriculum at many medical schools around the world (Albanese & Mitchell, 1993). PBL was developed at Mc Master University, 1968 followed by Maastricht (Netherlands) and Newcastle (Australia) in 1978. In the next two decades, PBL was implemented in Harvard (USA), Sherbrooke (Canada), Manchester, Liverpool, (UK) and University of Transkei (South Africa).

The main purpose of this method is to help students acquire new information by providing them with a context to apply their knowledge to clinical problems. It is generally observed that there are three roles for PBL. The first is the acquisition of factual knowledge, the second is the mastery of general principles or concepts that can be transferred to solve similar problems, and third, the acquisition of prior examples that can be used in future problem solving situations of a similar nature (Blumberg & Eckenfels, 1988).

In this context it is pertinent to note that reforms in medical education in UK proposed the following core aspects for the success of a new curriculum. These are to reduce information overload, to innovate teaching practices by replacing traditional 'didactic' teaching methods with PBL, to advocate UG education as a platform for life long learning, to improve student's control over their learning, to focus on self- directed learning, to improve doctors interpersonal skills, to train students to be empathic and relate better to their patients and develop leadership qualities.

PBL is based on two key concepts. Active engagement of the learner and feedback (through group and peer evaluation and self assessment). The success of PBL depends on the development of a relationship between a tutor/facilitator and a small group of students. The role of the facilitator is not to serve as the content expert but as a guide asking questions to make students to be active learners. The role of the facilitator is to integrate science, human behaviour, human populations, and health care delivery.

PBL is based on several theories in cognitive theory. Two prominent ones are that students work on problems perceived as meaningful or relevant and that people try to fill in the gaps when presented with a situation they do not readily understand. Teachers present students with a problem set, then student work-groups analyze the problem, research, discuss, analyze, and produce tentative explanations,

solutions, or recommendations.

However, there are some drawbacks in the PBL' curriculum. First and foremost it is time consuming, which is essentially more detrimental to carrier progress in terms of research and other academic activities like clinical service or administrative contribution. The second recognized problem in PBL is lack of adequate training of facilitators, which is mandatory for the success of the program. The lack of training may be due to lack of resources or in some cases lack of PBL trained experts.

The other known constraints are the inability to give constructive and balanced feedback. This is time consuming and lack of training in assessment to PBL tutors. It takes almost one or two years for the newly recruited staff to get used to the assessment pattern in PBL which is totally different from traditional curriculum. One of the noticeable comments from the students is that both formative and summative assessments are highly subjective. It also emanates from the fact that the inexperienced tutors are usually swayed by the presentation of some students who have proficiency in command of the English language but may lack actual content of the topic discussed. This is a major problem that is encountered by the inexperienced staff and sometimes even senior members of staff are affected by this problem. This can only be solved by adequate exposure of all such staff members to the actual assessments by experienced and well trained PBL tutors for at least two years before they are allowed to do individual assessment. In WSU, there is an effective feedback by the students to the Faculty Quality control unit. This unit is endowed with responsibilities like facilitating independent assessment by students using a computerized evaluation form which is then compiled as a summary of the tutor's skills. This summary is then sent to the staff concerned and a copy forwarded to the Dean for consideration when that particular staff member applies for promotion. This practice was not so popular with some staff and they resisted such practices as they were spending more time in research activities and less time in PBL tutoring. This practice is usually the root cause of the failure of PBL curriculum in many universities across the Globe. Hence this topic needs further discussion.

One of the major objections to PBL is the self -directed learning skills expected from students. This is not easy for most students, whatever may be their background, both academically and socially. In our experience at WSU, it needs adjustment from the students and requires lot of application by the students. At WSU, the students from rural background usually get adapted to the self- directed learning easily than

the students who come from elite background. This may be surprising to many academicians and may not be easily accepted, but the truth lies in the fact that the motivation plays a major role in this slightly unexpected observation. In the last few years at WSU we have noticed that students with Matric qualification did much better than the graduate students and this may be because the desire to learn is evidently higher in younger students than older students. It may also be due to other factors like competition between peer groups, which is stronger among the matric students than the graduate students. However, in some cases, students with A level passes in GCE, or Masters or doctoral degree holders do much better than matric students. This is again not surprising since they have already been trained in self-directed learning and hence are the beneficiaries of PBL curriculum.

Other known drawbacks are the self evaluation, peer feedback, responding to the guidelines of the facilitator. Many students may face problems in all of the above or in one or two of the above. This can be solved by having private sessions with individual students who face these problems. At WSU, there is a group counseling offered by the senior students to the junior students in resolving this problem and they are known as mentors. This is a highly effective system and the bonding between the seniors and juniors is also achieved with such practice. However, of late, these consultations by senior students have dwindled due to various reasons and hence there is an obvious rise in student failure rate and higher attrition rate and even more number of students with psychiatric problems. The peer pressure and greater stress due to demands from the facilitator are the major contributory factors leading to these psychological problems as identified in the students feedback.

The "paradigm shift": from the role of authority (expert in content) to expert in process. This is noticeable in some Universities where the academicians are used to giving limited lectures in a semester as they spend more time in research and so they find the role of PBL tutor more demanding and so they tend to avoid the PBL curriculum. This is understandable, as these senior staffs have been recognized as authorities in their own field of expertise and suddenly when they are exposed to a totally different role as a facilitator, which is more challenging and hence they tend to shun the PBL curriculum.

As a PBL tutor, it is highly time consuming as the tutors are expected to be more conversant with the tutorial process which comes with practice and there is no set formula to be an effective tutor. In this respect, even students feedback is sometimes misleading as the student's feedback is based on the marks that a particular tutor awards to the students and not on the way the tutor was instilling knowledge by making the tutorial more effective. The majority of the students do benefit and appreciate the contributions by these effective PBL tutors and so there is need for continuous efforts by the Faculty to reward such staff in terms of promotion. This is not unreasonable, since all academic staff members are supposed to spend 40-50% of their work hours in teaching activities and so the promotion should be based on contribution towards undergraduate training and not just PG training and research.

It is essential to PBL that students do not possess sufficient prior knowledge to address the problem. In the initial discussion, students develop a set of questions that need to be addressed. These questions then become the objectives for students' learning. A further aim of PBL is to provide students with resources in self-directed learning skills that will persist throughout their careers (Morrison, 2004). When compared with the conventional curriculum, the PBL method generally increases use of limited resources at medical schools, while debate continues as to its advantage in enhancing learning and test performance (Azer, 2005).

Based on our experience at WSU, we noticed that the attrition rate was quite high before PBL was introduced in our medical school and even after introducing PBL the failure rate was high in the first semester of the 1 yr program. More recent reviews of the literature at the Faculty of Medicine at Melbourne (Azer, 2005); at the University of Oslo (Gude et al., 2005) and in South Africa (Iputo & Kwizera, 2005), recognise the role of PBL at their Facilities for improving student attitudes and performance, using differing outcome measures. Traditional lectures were still endorsed as highly favourable by a majority of students in a few reports (Trappler, 2006).

In 2003, an attempt was made to integrate lectures and seminars into PBL at WSU. The diversity of PBL models were categorised as, full, near-full, partial or hybrid (Kwan & Tam, 2009). The hybrid models can be classified into 4 types, namely type I which is the conventional curriculum (2-3 PBL problems per year), type II & III which are essentially lecture based curricula, but type II incorporates PBL tutorials for supplementary knowledge, while type III uses PBL problems for a lecture. Type IV is the typical PBL, which is effectively followed in McMaster. However, hybrid PBL, may lead to dysfunctional PBL (Lim, 2012).

A dysfunctional PBL curricula, is usually the result of too many resource sessions which discourages independent study. This is probably due to the lack of PBL experts. This is more detrimental in student learning process. Other known factors identified are lack of medical education expertise or ineffective curriculum reviews and inadequate staff developmental programs (Lim, 2012). One major factor that leads to dysfunctional PBL is ineffective case-scenarios which are not open-ended. This may look trivial but only experienced tutor would appreciate the role of case scenarios in an effective PBL curriculum.

Inadequate preparation time on the part of both staff and students is a known factor that leads to dysfunctional PBL and this has to be avoided as much as possible. This is becoming a major concern of late, due to frequent student's strikes, which leads to ineffective PBL. It is to be noted that adequate time interval is given between sessions and to provide convincing supportive leadership to make the PBL curricula work. Hence, it was concluded that poor teaching is bad, but poor PBL is worse (Kwan & Tam, 2009).

One of the major advantage of PBL over traditional curricula is its unique emphasis on horizontal multi-disciplinary integration as well as self-directed learning (SDL) and most importantly emphasis on acquisition of knowledge which is problem based rather than discipline based (Bokey et al., 2014). However, some serious concerns were raised against PBL mainly by the clinicians as they were found to be disconnected and disenfranchised with PBL as the expert clinical bed side teaching suffered and student content with practice progression was diluted (Bokey et al., 2014).

At WSU, PBL has been successfully implemented since 1989, as it is evident that after the implementation of PBL, student drop out has dropped from 23% to 10.3%. It was also noted that in the traditional curricula, only 55% of the students were able to complete the MBChB in six year, while 67% of the students in PBL curricula were able to complete the same course in six years (Iputo & Kwizera, 2005). It was also reported that the failure rate was unusually higher in I year as compared to other years and this attributed to the lecture based I semester in I year while in the II semester it was PBL based (Umapathy et al., 2011).

Type III hybrid model, is essentially followed in the I year, at WSU, since the I year students were exposed to two different kinds of learning, namely lecture based learning during the 1st semester and Problem Based Learning (PBL) in the 2nd semester of their 1st year. Lecture based learning comprises of

lectures being given to students, lecture notes given as hard copies or electronically to students by lecturers. In the second semester, typical and effective PBL is followed with strict adherence to the principles of PBL where emphasis is given to an active type of learning where the students are more involved in the learning process. Both tutorial process and assessment followed in the second semester of I yr at WSU focuses on student's ability to learn concepts and to improve their reasoning process.

This effectiveness is achieved by small group tutorials, where not more than 8-9 students are allocated to each group. The tutors are invariably subject specialist but need not necessarily be a clinician. Typically in the second semester, two blocks were covered namely cell block and GIT block.

The selection of tutors for each group is based on the following criteria. They need to have some years of graduate teaching experience, and has expertise in conducting small group tutorials. All tutors had to undergo a mentoring session where the expert tutors would mentor the newly appointed staff for a period of 1-2 years before they are allocated individual tutorial group. One meaningful observation is that it is not necessary to be a clinician in order to acquire competence in tutoring or handling cases of this nature. Non-expert mentors were either junior faculty members or clinicians lacking consistent experience in teaching (Davis, 1992).

PBL is, however, more expensive than conventional curricula, especially in larger medical schools (Donner & Bickley, 1990). In the early literature reviews, PBL graduates tended to rate their basic science background weaker than their conventional curriculum counterparts. These results suggest that PBL may not develop in students an effective cognitive foundation (Albanese, 2000). Mc Master students identified a lack of definition of core material as a weakness in student-directed PBL (Woodward & Ferrier, 1993). Neame & Powers (1993), stated that "It is impractical to suggest that an unstructured, undergraduate medical course be designed in which the onus is entirely upon the student to define and undertake his own program of studies." What these authors recommended was a gradual progression towards independent learning, via a graded reduction of imposed structure.

The advantage of small student PBL groups appears to work by creating tightly knit student groups who steer, direct, and delegate learning tasks that evolve over many sessions. In contrast, in some models, expert mentors who actively focused the learning tasks and used their group process skills to function both as group facilitators and leaders offset the advantage of small groups (Trappler, 2006).

PBL is best suited for those with motivation to learn, irrespective of their earlier school background as majority of our students come from a background not conducive to learning in terms of facilities and social benefits. There are suggestions expressed by Albanese & Mitchell (1993) in implementing comprehensive curricula with rapid conversions to PBL. Before launching into a PBL dominated curriculum, faculty should appropriate skill training to prospective PBL mentors to allow them to function comfortably using this teaching format.

A compromise curricula that amalgamates the benefits of both conventional and PBL components is the way to go (Trappler, 2006). However, with the early dominance of conventional teaching and the introduction of PBL, in increasing complexity, commensurate with student development and faculty resources may indeed be an ideal policy in implementing PBL. This is in agreement with our earlier observation (Umaphathy., 2017).

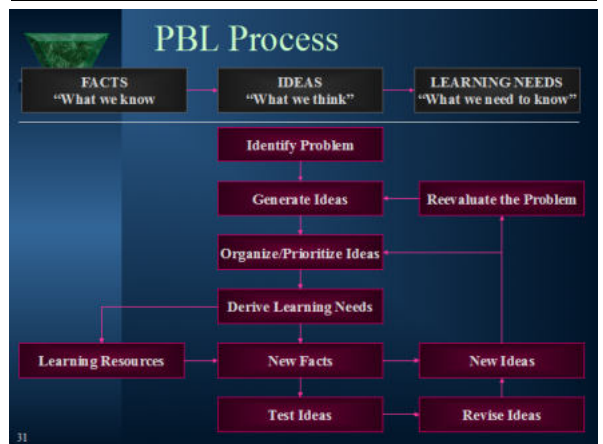
In the next section, the possible steps of implementing PBL under the following items.

1. A comparison between traditional curriculum and PBL.
2. PBL process in a nutshell.
3. The WSU model.
4. PBL grouping.
5. PBL weekly cycle.
6. Role of facilitator, the chairperson, the scribe and group members.
7. The seven steps of PBL.
8. WSU model: Three phases.
9. Drawbacks of traditional curriculum.
10. Advantages and pitfalls of PBL.
11. Tips for surviving PBL.

Comparison Traditional vs PBL

- Traditional curriculum
- Lecture based.
- Theory and practice not covered.
- Achievement almost similar if not less
- Lesser clinical problem-solving skills.
- Less preference
- Less problem-centered approach.
- Content not adequately covered.

- PBL curriculum
- Making reasoned decisions ;
- Reasoning critically and creatively;
- Adopting a holistic approach;
- Appreciating the other person's point of view;
- Good collaboration
- Identifying strengths and weaknesses and
- Undertaking adequate remediation (SDL).



The WSU model:

PBL Grouping

- General principles: Teaching in small groups of 8-10 students and not more.
- Allocation at the beginning of each block and the group is not allowed to change for the whole duration.
- In pre-clinical years: SIX BLOCKS:
- 2 blocks in I yr II semester: Cell block & Nutrition & Gastro-intestinal block
- 4 blocks in II yr: Musculo-skeletal block, Neurosciences, Cardio-respiratory block, and Renal & Reproduction block.
- Both group members and tutors are shuffled every block.
- Main idea is to benefit from the variations in tutoring skills.

PBL weekly cycle

- Monday: New case introduced. 8-10 am: Pages are given one by one, mainly the first two pages which should have only patient's complaints, both present and past history of the patient regarding his general health.
- It is important that the case scenario is open ended. This promotes student's ability to think on his own and tutors are advised to exercise patience and allow every student

to express his opinion, however trivial it may be. Time limit is to be set for each page and so the tutor reminds the group about the time restriction.

- Tutor skills are being tested here as some students may not be controlled easily. The tutor's interpersonal skills are at stake here and so be strict and do not give in.
- The group should be able to identify a few learning issues based on the scenario and tutor's may give some clues if they are of the opinion that it will help the students in the learning but do not interfere in the thinking process as this is key to PBL principles.
- It is emphasized that the tutor only facilitates and not lectures. Even experienced tutors talk a lot during sessions. This has to be avoided as this is detrimental to the process.
- Wednesday: 8-10 am: Presentation of Learning Issues by the students based on the case. It is noted that the students should have a group meeting the day before presentation and come prepared to the tutorials.
- This is crucial to the tutorial process since further processing of the case depends on the students understanding of the case and the relevant basic sciences topics especially in anatomy and histology.
- The tutor is required to come prepared with the learning issues as they need to identify those students who are either not well prepared or inadequately prepared.
- After the presentation of learning issues, the next 2-3 pages are given one by one comprising of laboratory findings, diagnosis, management & followed by the discussion page.
- During the session, more learning issues are identified relevant to the case focusing on finer details like physiological mechanisms leading to the complaints and the underlying biochemical principles. This session is likely to reveal the problem areas faced by the students which is to be addressed in the resource sessions.
- Thursday: Both anatomy and physiology resource sessions are given. It may be in the form of lectures or seminars in physiology and anatomy dissections and histology practical sessions to reinforce the student's understanding of the basic sciences.
- Friday: 8-10 am: Detailed presentation of learning issues. This may be quite tricky as the students may just repeat what was covered in the previous day resource session, but this is not to be discouraged as this is crucial to the learning process. This is contrary to some tutors perception that this practice as the students do not learn on their own and simply encourages the didactic lectures. This is a point of contention which is still being probed by using various research tools.
- The discussion that follows the presentation of learning issues is to be encouraged as this opens up the students ability to identify various issues. Other topics are to be discussed like community medicine, behavioural sciences and clinical issues. Such an integration is the backbone of PBL.
- Finally each student should present the case summary individually. Tutors should encourage independent thinking and not allow other students to interfere.
- Finally a general feedback from students and tutor on the case as a whole and whether it was useful in generating adequate learning issues.
- Friday: 10-11 am. Tutor's meeting: This is unique to WSU as the Tutors meet with student group leaders in the presence of Faculty representative from the Teaching and Learning Unit. The students are supposed to comment on students participation in their group and tutor's contribution and the whole process in general. This is noted by the Faculty representative and passes it on to relevant authorities for necessary action.

Role of Facilitator.

- Usually a doctor or professional with a link to health care.
- To facilitate group discussions,

- To create a healthy environment to contribute to discussions (no dominance by any member)
- Provide feedback and monitor the group's progress.
- Not to provide easy answers and do not provide learning objectives for the case: students should derive it.
- IF YOU DO IT IS DETRIMENTAL TO THE PROCESS.
- Facilitator is as much a member of the group and so do not lead the discussion: IF YOU DO STUDENTS MAY RAISE THEIR CONCERNS.
- Openness and honesty: vital part of group dynamics and failure to raise issues can lead to discord and poor group dynamics.

JOB description of the facilitator

- Punctuality and regular attendance: Make prior arrangements if absent
- Promote student interaction as a group
- Guides the groups learning
- Motivates the students to learn
- Monitor the progress of each student in the group
- Monitors attendance
- Provides feedback to management/weekly tutorial meeting
- Helps students to identify learning resources
- Provides support both for academic or welfare problems: MENTOR

The scribe:

- The scribe writes an account of the group discussion on the board.
- The scribe has to keep a good record of all the discussions:
- Personal information of the patient, Complaints, System identification, Structures or organs involved, History taking: Presenting history, Past medical history, Family history & Psycho-social history.
- The scribe is to be rotated for each case.
- In addition to noting down the groups views, must also contribute.
- Posts the learning objectives on the board.
- Avoid writing down everything that is said
- Do not be afraid to tell the group to slow down.

The chairperson

- Rotated weekly: for each case a new chair is selected/elected.
- Agreeing the process for the group: Tasks to be done, time keeping, conducting proper discussion
- Introduces the trigger material for discussion of each topic
- Invites participation: encourage the quieter members to contribute
- Leads the group in all activities.
- Elaborates and reformulates discussion
- Identification of learning issues in accordance to the groups mandate
- Oversees the time keeping
- Evaluate the session, weekly reports to be presented in the tutors meeting.

Group members: role: major factor in the success of PBL

- Success of the group depends on the hard work and full participation of all group members.
- All group members must respect the roles of the scribe, the chair and assist them.
- The groups success depends on shared responsibility of all members.
- Try and avoid dominating the group or keeping quiet.
- Do not be shy to contribute ideas, during brainstorming session: Examples: making hypothesis, identifying learning issues.
- All ideas are equally valid.
- Be patient with the adaptation process: IT MAY TAKE SOME TIME TO SETTLE IN FULLY TO GROUP WORK AND

SELF DIRECTED LEARNING.

The seven steps of PBL

- Read out the problem and identify/clarify words unknown to you.
- Define the problem or problems.
- Generate hypothesis based on the problem
- Arrange according to priority of the hypothesis.
- Define learning objectives needed to test the validity of your explanations
- Members of the group : study on their own using all sources of information available.
- Share the results of your private study with the rest of the group.

WSU model: MBChB: Based on three Phases.

- Normal structure and function: basic sciences
- Abnormal structure and function: Para clinical sciences
- Clinical practice: Clinical disciplines.
- Themes: integrated throughout the curriculum reflecting scientific and socioeconomic aspects of medicine.
- I yr: PBL triggers outcomes relating to the normal form and function of human body.
- II yr: more clinically oriented.
- Spiral curriculum: Topics are frequently revisited to enable students to reinforce
- PBL is supplemented with plenaries, resource sessions, clinical skills training and clinical placements.
- PBL is NOT a stand alone tool but a whole curriculum concept designed to structure learning effectively and realistically in relation to clinical realities.

Drawbacks of traditional curriculum

- Creates an artificial divide between basic sciences and clinical medicine.
- Wastage of time in acquiring knowledge that is eventually forgotten or sometimes irrelevant since it is not linked to clinical scenario.
- Acquisition and retention of information : no relevance to clinical scenario: may be boring and discourages students from learning.
- Strong emphasis on certain disciplines makes students loose focus on the relevance of the topic to the actual clinical scenario,
- NOT STUDENT CENTERED AND SO MAKES STUDENTS FEEL OVERWHELMED AND DISENGAGED.

PBL advantages.

- Relevance: Topics covered has relevance to the case studies.
- Identification of Core: The students direct their learning to core issues.
- Generic competencies: Develop broader skills such as communication, problem solving and team working.
- Student centered: Students take responsibility for their learning. Active approach to learning rather than endorsing passive and forced learning.
- Motivation: Enjoyable by both staff and students.
- Deep approach to learning: During the PBL process students interact with the learning material more freely.
- PBL is developed on existing knowledge.
- Prototype learning: Students learn better when they are ready to learn.

Common Problems with PBL.

- TIME CONSUMING: Lot of time is spent just drawing up objectives and then having to search out resources.
- SETTLING IN CAN BE DIFFICULT: From traditional to PBL: It takes longer than one expects.
- COPING WITH UNCERTAINTY: Mainly on the right kind of learning resources, sufficient depth, understand properly the concepts??
- WORKLOADS & WEEKENDS: Volume of work is higher: May be even weekends are used for learning. Proper time

management and identifying the proper learning outcomes is a way out.

Common pitfalls encountered in PBL.

- Blaming the course structure, PBL or the group: common complaints when the group is not working well.
- Not understanding how PBL works:
- Bypassing some steps in PBL: Read through the problem and identify the topics to study as the students and the group become complacent. Always go through all the 7 steps.
- Being NOT critical about the information given: Evaluate all informations given whether in text book or by others.
- Confusing consensus with critical appraisal: More rigorous discussion
- Splitting main learning tasks: Always prepare all learning issues and not divide it among group members.
- Not doing enough: Students need to be motivated to carry out the necessary self directed learning and come prepared for all sessions.

CONCLUSION

Tips for surviving PBL.

- Learn to share not compete. Study together and learn from each other.
- Resist the temptation to solve the case. Emphasis is on identification of the knowledge to solve the case and not actually solving it.
- Be reflective. A healthy group dynamic is the most important tool.
- Do the work that you are tasked to do. Do not fall behind.
- Do not mind if the other groups are doing things differently.
- Be brave and do not be intimidated if you feel that people know more than you. Accept if you do not know and ask others.
- Do the block evaluations properly, do not be in a rush.
- Enhance cooperative learning skills by sharing others views: a mix of different ethnic and cultural experiences is a great way to learn
- Try and interact with other group members socially as well.

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