Faculty and Graduate Student PBL Experiences

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Abstract

This paper examines similarities and differences in faculty and student perceptions to PBL training. Faculty at a newly formed university participated in a four day PBL workshop. A cohort of MSc. Petroleum Engineering students were PBL trained. Results from the pre/post test using a 15 item dichotomous opinionnaire revealed that there was an overall decrease in the number who felt that PBL was inappropriate for some disciplines, sufficient content was not taught and PBL assessment was a complicated activity. Twenty percent of participants felt more confident after training. Training eroded common myths. Students embraced change more easily than faculty. Implications for teaching and learning in the classroom are discussed. Further PBL research may be used to improve teaching and learning in the classroom.

Keywords: Problem-Based Learning, faculty, students, teaching, learning.

Introduction

The use of Problem-Based Learning (PBL) as a teaching/learning tool for training persons, particularly students is well documented in the modern literature (Albanese and Mitchell, 1993; Dochy, Segers, Van den Bossche, and Gijbels, 2003; Vernon and Blake, 1993; Gagné, Yekovich and Yekovich, 1993; Engel, 1997; Poikela and Poikela, 1997 and Segers, 1997). PBL training described in the foregoing accounts was focused on students. This present paper seeks to examine the similarities and differences of perceptions of faculty and students towards PBL training with a view to improving teaching and learning in the classroom. Faculty and students came from a newly formed university. This researcher trained faculty to use PBL as one of the preferred pedagogical delivery modes. This researcher also trained graduate students to experience PBL in curriculum delivery. Comparing the perceptions of faculty and students could uncover best practices for future

PBL training that could maximize output and minimize expenditure. To this end, this present

paper reports on the similarities and differences in PBL perceptions of faculty and students

with a view to improving teaching and learning in the classroom.

Background

As a fairly young educational institution, with a preferred non hierarchical, flat

topped organizational structure that facilitates interdisciplinarity across the board, the

university was designed to meet the existing needs of a growing population in an oil and

natural gas rich country. The university chose PBL among its preferred methods of delivery

in all of its program offerings.

Literature Review

Since in the days of Plato memoires were found of experiences detailing students

taking an integral part in the learning process as they actively engaged in whatever was

taking place. More recently, as early as the 20th century, PBL was supported by numerous

well known researchers like Dewey (1910, 1944); Piaget (1954); Bruner (1959, 1961);

Rogers (1969) and Ausubel, Novak and Hanesian (1978). Dewey, Piaget and Bruner among

other well known educators advocated that learning took place as students participated in the

process by interacting intimately with materials and method.

To this end PBL has been used in psychology (Reynolds, 1997); medical training

(Barrows, 1996), engineering (Cawley, 1989) and architecture (Donaldson, 1989; Maitland,

1991) to mention a few. Defined in a variety of ways, PBL uses authentic or real-life

problems/scenarios/situations to allow users opportunity for investigation, self-directed

study, collaborative analysis, solution, synthesis and evaluation. To get the most out of the

experiences, participants often work in small or reasonably sized break-out groups (about

five to six). The facilitator serves in a multiplicity of roles as resource person, coach, referee,

adjudicator, counselor, friend and fellow learning partner. Basically, there is a non traditional

relationship that is meant to foster meaningful exchange of ideas in a non threatening

atmosphere that encourages inclusion and accelerates learning. While Barrows and Tamblyn

(1980:18) defined PBL *as 'the learning that results from the process of working toward the*

understanding or resolution of a problem', Evenson and Hmelo (2000) viewed PBL as an

approach to instruction that uses concrete problems to provide scaffolding for learning and

teaching.

Whatever perspective is taken, this type of course delivery is particularly relevant in

an era of globalisation where the demands of today's world require all persons, from bottom

up, to play an integral role in any organization. Poikela and Poikela (1997) among others

like Yekovich (1993) and Segers (1997) consider the solution of complex problems as being

mandatory for students. Further, because PBL offers a congenial atmosphere in which

collaborative problem solving may be done it is reasonable to expect that both faculty and

students could stand to benefit from exposure to such experiences.

In particular, Mergendoller, Maxwell and Bellisimo (2006) in their study compared

the effectiveness of PBL and traditional instructional approaches in developing high-school

students' macroeconomics knowledge. They examined the effectiveness of PBL using

students of different abilities in the areas of verbal ability, interest in economics, preference

for group work, and problem-solving efficacy. At the 5 % level of significance, they found

that overall PBL proved to be a more effective instructional approach for teaching

macroeconomics than the traditional lecture/discussion method. The researchers also found

that average and below average verbal ability students, those who were more interested in

learning economics, and those who were most and least confident in their ability to solve

problems benefited more from PBL than traditional instruction.

Even among students with special needs, Belland, Ertmer and Simons (2006) found

that PBL was effective. Their data arose from the perceptions of middle-school students with

mild, moderate, and severe disabilities and also the perceptions of the teachers of those

students about the value of participating in a PBL unit. Using observation data and artifacts

to triangulate interview comments with actual interview data analysed by the use of the

constant comparative method (Glaser and Strauss, 1967) the researchers found that students

manifested strong engagement. Those with less severe disabilities '*developed compassion for*

students with more severe disabilities.' It is interesting that the PBL unit used for this

particular study focused on '*the physical accessibility of a low-SES, rural community where*

the students' school was located'.

By a similar token, Dunlap (2006), found that the use of the rich environments for

active learning (REAL) instructional model actually increased students' self-efficacy. The 12

doctoral students under study subsequently published an online journal. As a result of their

PBL training they felt comfortable working collaboratively and sharing their research and

publications with the professional community. They were not afraid to identify themselves

as '*contributing members of the community of practice'*. Ordinarily, faculty exposed to

traditional methods of teaching and learning may lack confidence to display their expertise in

a professional manner especially in public forums. Needless to say, effective leaders need to

know that they are capable of leading in organizational and professional settings.

What can we say are some major similarities and differences between faculty and students prior to PBL engagement? By and large, faculty would have been exposed to peer assessment by virtue of their training at the graduate level where they would have had numerous colloquia with peers. Many would have peer reviewed journal articles and books. As part of their professional development, faculty would engage each other in conversations that oftentimes take the form of a PBL experience. On an ongoing basis, faculty tends to interface and obtain opinions from colleagues regarding decisions to be made about students. Additionally, faculty engage in ongoing research that requires collaboration and problem solving strategies that have application in the academic world as well as the commercial environment (Gibbs, 1995:3).

Students, perhaps to a lesser extent, would have engaged in peer assessment informally or formally. Students together decide on opinions about faculty and arrive at consensus in very much the same manner as faculty. Barfield (2003:354) believes that '*interactive peer-based methods promote student creativity, critical thinking and experiential learning'*. Additionally, work quality, content acquisition, reasoning and thinking processes and collaborating for effective outcomes offer value added effect on student growth and the group's performance (Lambros, 2004).

Further, student gains at the K-12 level have been noted in the literature by Ertmer and Simmons (2006). In their work with teachers they found that implementation challenges pertained to the creation of a collaborative and interdependent culture, the adjustment to non traditional roles and the scaffolding of student learning and performance. They recommended initial and ongoing support for teachers in developing '*flexible thinkers* and *successful problem solvers'*. Since much of the current research has focused on what students get out of

PBL training and not so much what faculty gains are this present paper seeks to fill that gap in the current literature. Specifically, this paper focuses on exploring the similarities and differences in the perceptions of faculty and students to enhance best practices in teaching and learning in the classroom and to inform future research. Accordingly the following four research questions were formulated.

Research questions

(1) What similarities can we find between the perceptions of faculty and students to their Problem-Based Learning experiences?

(2) What differences can we find between the perceptions of faculty and students to their Problem-Based Learning experiences?

(3) How can we leverage these similarities and differences to improve teaching and learning in the classroom?

(4) How can we leverage these similarities and differences to inform future research?

The Study

Faculty were invited to participate in a four day PBL training workshop just prior to the commencement of the new academic year. The response was so overwhelming that two venues had to be designated for the training exercise. Approximately equal numbers of faculty members were trained at two campuses. PBL interaction for participants commenced at 8: 30 am and culminated at 4: 30 pm, with a one hour lunch break and two 15 minute tea breaks (one in the morning period and the other in the afternoon period) each day.

A few weeks following the faculty training this researcher conducted a one day PBL experience for a focus group of graduate students from the same institution pursuing the MSc. Petroleum Engineering Degree. Those faculty members who normally interacted with

the students were also invited to their PBL training session. PBL interaction commenced at

8: 30 am and culminated at 4: 30 pm, with a one hour lunch break and two 15 minute tea

breaks (one in the morning period and the other in the afternoon period). After rearranging

furniture to suit intended purpose, this researcher conducted the PBL session in the students'

normal classroom.

Participants

Participants for this present study were faculty and graduate students from the same

university. Faculty had taught for varying number of years ranging from five to over 25.

Several of them had industrial experience. Faculty taught in numerous programs across the

university like energy and offshore technologies, manufacturing and c-ideas, process and

utilities, information and communications technology, food production, national engineering

technician diploma (NETD) programs, pre university programs (PUP), environmental health

and safety engineering, environmental studies and education. A multidisciplinary approach is

practised.

Some students also worked in industry prior to program enrollment. All students

entered their program with at least a second class honours classification at a baccalaureate

degree. There were a few students who had come straight out of an accelerated program with

limited work experience. Because faculty came from a number of geographically dispersed

campuses across the country their team building exercises were more intense than those for

the students. Students had already worked in groups with each other for several weeks prior

to their formal PBL experience.

Method

Participants for this present study (faculty and students) were exposed to similar situations throughout the duration of their training. They signed an attendance register indicating both their times of arrival and departure. This activity infused accountability and integrity from the commencement of the exercise. Participants engaged in a 'find-your-neighbour-friendship hunt' that encouraged team building. In this activity participants obtained signatures of persons who responded positively to the selected get-to-know-you statements. Several participants received prizes shortly after the get-to-know-you session for obtaining the highest number of authentic signatures. This action served as a form of motivation and underscored the fact that all activities played an important role in the PBL process. Participants worked in small break-out groups of five to six members. This facilitated meaningful communication, active listening and the honing of a variety of skills. All participants engaged themselves in sustained silent reading when required.

Research Design

A mixed methods approach (qualitative and quantitative methods) favored the collection of maximum information to address the four research questions posed. This researcher used a number of self-designed assessment instruments (available upon request). This researcher used several validity and reliability checks to ascertain that the instruments were suitable for use. Pilot testing ensured that items were simple to understand and straight forward. Several items were modified for clarity and simplicity following the pilot tests. Statements like *'I am presently confident about PBL'* vs. *'I have little knowledge of PBL' and 'Sufficient content is not taught using PBL'* vs. *'Students need prior content knowledge'* served to enhance the internal consistency of the instruments. Whilst the focus on faculty

PBL training involved the how-to, the emphasis on student PBL training focused on the actual PBL experience itself while learning content. In both cases, this researcher circulated an uncaptioned sheet of possible qualities honed through PBL for discussion. Participants received awards for adding new information to that existing document.

For the present study, the research design was a pre/post test design using an opinionnaire (Table 1). Face, content and construct validity were examined in addition to internal consistency (Cronbach alpha = .79). The latter indicated that the correlation between the items were reasonable, bearing in mind that alpha can be artificially inflated by making scales comprising changes in wording within a set of items. Participants responded to 15 dichotomous statements soliciting their feelings/attitudes about PBL before and after the training session. They shared their perceptions on teaching and any other information in the spaces provided without fear of vicitimisation or reprisal. A ten item evaluation instrument allowed participants to share their perceptions. This researcher examined face, content and construct validity and internal consistency (Cronbach alpha = .71). Finally, interviews with participants provided additional information to supplement the quantitative data obtained.

Method: The PBL Experience

Faculty

As mentioned earlier, training faculty in PBL differed in many ways from demonstrating to students how PBL works in a classroom setting. Faculty comprised a heterogeneous group coming from different programs involving a variety of disciplines like communication, mathematics, physics, chemistry, languages, engineering, home economics and information technology. Many had never met each other prior to the PBL workshop.

This researcher presented faculty with a non curriculum based PBL problem that involved Jim as a faculty member who attended seven from a total of 24 PBL sessions for the duration of a four day PBL workshop. Jim reported that *he had to conduct interviews for in coming students, submit grades, prepare for classes and attend to urgent personal matters.* Certification for workshop was denied. Jim insisted that he should be certified, *claiming that he has a 'feel' for PBL, he has all the handouts, he was kept updated and that the group was aware of his situation.* Faculty was expected to arbitrate on the matter.

The specific non curriculum based PBL problem regarding Jim was purposeful. The aim was to have participants introduced to PBL through a PBL strategy rather than a lecture mode. The primary learning objective focused on getting participants involved in the decision making process and empowering them to succeed. Like all PBL problems it was ill-structured; had incomplete information; addressed learning objectives; was grounded in the experiences of participants; had clearly stated requirements and was set in a real world context. Additionally, the problem required decision making or judgement; had the ability to engage participants in meaningful activities; forced them to identify and seek out required information and was complex enough to promote group effort in its solution. Finally the PBL problem also motivated them to learn, posed open-ended issues that generated discussion and was challenging and creative.

Faculty training focused on the PBL process by allowing faculty to work in small break-out groups on an initial problem that pictured a young university who adopted PBL as its primary learning methodology. There were factions loyal to the instructivist approach and others loyal to the constructivist approach. A few were willing to try PBL despite the fact that they perceived it inappropriate for their disciplines. Under the heading '*Changing*

Mindsets', as PBL enthusiasts, faculty presented their cases to the academic staff of the

young university. The remainder of the faculty training centred on exploring the benefits of

PBL, mentoring or coaching, constructing the PBL problem and developing a PBL unit. A

simple checklist ensured that the main features of a PBL problem were included. Finally, this

researcher did a PowerPoint slide presentation entitled '*PBL as self interest'* highlighting

how PBL develops the individual in a variety of ways.

Students

Students comprised a homogenous group who had spent several weeks together

bonding prior to this PBL experience. This researcher also presented students with a non

curriculum based PBL problem in which Joe was an enthusiastic MSc. Petroleum

Engineering student who attended only three hours out of a total of eight hours at a one day

PBL orientation workshop. Joe reported that *he had to attend to urgent business, submit an*

outstanding homework assignment, prepare for other classes and attend to pressing personal

matters. Despite his partial participation Joe claimed that he should receive course marks for

the workshop. He claimed that he *has a 'feel' for PBL, that he would get all the handouts*

from friends and that the group was aware of his situation. Group members were asked to

arbitrate. This exercise set the tone for the PBL training because participants soon realized

that they were involved in the decision making process and to a very large extent they

determined their own fate.

After this initial exercise students received a one-pager of their relevant learning

objectives and a PBL problem that incorporated numerous areas from their attached MSc.

Petroleum Engineering curriculum. Students went away with a homework assignment

requiring approximately 12 pages for a report in the SPE technical paper format. The same

Petroleum Engineering problem discussed during PBL training was the stimulus for that report. Some prompts like '*The problem is----------------, The situation is------------, The circumstances related to the problem are-----------, You know----------------, You need to know------------, You are going to------------------------, Action plan is----------------------, Resources are ------------, Persons identified for specific actions are --------.*' allowed for a step-by-step guide to facilitate the PBL process.

Participants completed a tabulation of agreed solutions and appropriate evaluations aimed at selecting the most viable solution(s). Break-out groups presented their findings to an audience comprising the remaining participants who evaluated their presentations. This researcher incorporated reflection and suggestions for improvement into the evaluation exercise.

This researcher also circulated relevant PBL literature to provide additional information. As required, participants did self-directed study. Participants completed the identical opinionnaires before and after their training exercise. This researcher batched the completed instruments under the headings 'BEFORE' and 'AFTER'. Participants completed a one page researcher designed evaluation instrument that requested information about three areas of the PBL training that were well done. They rated 10 statements about the entire PBL experience on a 10 point Likert scale where 1 = Strongly Disagree and 10 = Strongly Agree, with 5 = Neutral. They also identified three areas that needed improvement and completed an open ended section for general comments and recommendations. Finally, participants completed a form requesting information about the day's proceedings: '*Three things I grasped', 'Three things I need help with'* and '*Three things I will do differently*'. This

exercise encouraged introspection and reflection and sought to recapitulate the main learning

issues of the entire PBL experience.

Results

Faculty

This researcher provided a flip chart for break- out groups to display their findings

after arriving at consensus. Three subgroups were identified from the PBL arbitration

problem. Two subgroups appeared to be at both ends of what may be regarded as a

continuum, where leniency and strictness were at both ends. The third subgroup represented

a balance between leniency and strictness. At the strictness end of the continuum,

participants were unwilling to have their colleague Jim excused for his actions. Here are

some salient quotations obtained from written comments and interviews done:

> *'...He should not be certified because he has not internalized the*
> *process of PBL...'*
> *'...What contribution did Jim make to the group?...'*
> *'...Is the 'feel' for PBL a criterion for certification or for participating or carrying*
> *   out PBL in your curriculum area?...'*
> *...'What's the relevance of Jim's excuses?...'*
> *'...PBL dates were known before...'*
> *'...Nature of PBL required his presence in a group...'*
> *'...Ask Jim to reflect on whether he is willing to suspend attendance expectations for*
> *his students in a similar way...'*
> *'...Jim should not be certified because he missed out on a range of skills that could*
> *not have been learnt in an isolated environment, e.g. teamwork, communication,*
> *cooperation, patience, ...'*
> *...'There is a point during the workshop when everything actually comes together.*
> *It's that 'ah ha' moment. . It is absolutely necessary for Jim to be there for all or at*
> *least most sessions...'*

The other subgroup at the leniency end of the continuum felt that some form of

consideration should be given to Jim since there were numerous individual differences that

may have accounted for his perception of his situation. That particular group empathized

with Jim. Empathy sentiments echoed were:

> *'...Jim must be congratulated for his service to the institution...'*
> *'...Arbitration is a strong word...perhaps presenting the intent of finding the appropriate outcomes...'*
> *'...Criteria for certification should be given on the first day...'*

The third subgroup that provided a balanced view presented a two sided argument

that included the perceptions of the two previous groups:

> *'...Let Jim suggest how his rating should be done...'*
> *'...better planning is necessary and recognition of his efforts should be noted...*
> *'...We felt that there was a breakdown in communication between administration and the course facilitators...Poor Jim even though he may not be "trained" he was the victim of trying to be in two places at the same time...'*
> *'...Jim should be at another PBL session...'*

Most faculty responded to all statements (no response column, Table1). Percentages

recorded are meant to give the reader a sense of similarities and differences in perception of

faculty and students to PBL training. At most, 12.85% did not respond to any given

statement. Table 1 shows that faculty perceptions changed on all statements presented except

for *'I am not willing to embrace PBL'*. After PBL training more faculty disagreed that PBL

was just a fad (Before: 91.30%; After: 96.75%). PBL training appeared to influence faculty

perceptions regarding its suitability for first year students (Before: 76.55%; After 81.70%).

After PBL training 54.95% of faculty reported being confident about PBL compared to

36.00% prior to the training; an increase of 18.95%. Eighty one percent (81%) of faculty felt

that their attitude towards PBL could determine their success.

<Insert Table 1 here.>

In response to the statement, *'I consider assessment in PBL to be a complicated activity'*, whilst 67.90% of faculty disagreed prior to the PBL experience, half (50%) of the students did so. Additionally, whilst 89.45% of faculty disagreed after the PBL experience, 75% of students expressed similar sentiments. Among faculty, 31.15% felt that PBL was too time consuming after the PBL experience but among students no one expressed a similar view (Table 1).

As mention earlier percentages provided were meant to give the reader a simple comparative sense of similarities and differences in perception of faculty and students to PBL training. In general, there was an overall decrease in the number of faculty who felt that PBL was inappropriate for some disciplines (Before: 59.80%, After: 76.20%). With respect to the teaching of sufficient content using PBL, 69.450% of faculty disagreed prior to the PBL experience. However, after the PBL experience 82.3% of faculty disagreed. The percentage changes recorded provide the reader with a sense of the magnitude of change in respondents' perception as a result of PBL training.

The mood, attitudes and general feelings of the participants could be identified by noting the following comments:

> *'... This has been an eye opener for me...little did I think that PBL could be so effective a teaching tool...I have learned to listen better...'*

While some faculty and students were exalting the value of interactions others were more protective and cautious as gauged from the following responses:

> *'...I need to wait and see how this would all play out in my classrooms with so many students and so little space and resources...'*

Concerning the benefits of PBL in terms of personal development, the following quotes

speak for themselves:

> *:* *'I was most impressed by the PowerPoint presentation highlighting how PBL can serve me as an individual…so it's not just about improving learning outcomes as much as it is about changing the whole person…'*

> *'…the comradry I feel now makes me believe that there is hope for current education system…I am a better listener now…'*

Faculty welcomed timely responses that intercepted possible misconceptions. This

researcher briefed all facilitators not to allow any erroneous material to go by without timely

correction and reinforcement using examples, non examples, anecdotal accounts, personal

experiences and group encounters. Verbatim remarks from faculty and students were as

follows:

> *'…I appreciated how the facilitators took care of misconceptions quickly before the wrong ideas were disseminated…'*

Several participants wondered about how the assessment process would affect them

personally despite their satisfaction with timely feedback. Not being used to so many

different forms of assessment their concerns were not unfounded. For the workshop, this

researcher used a number of self-designed assessment instruments *e.g.* self, peer, group,

facilitator assessment. Participants' concerns about the validity, reliability and weighting of

those assessment instruments are revealed in the following quotes:

> *'…I'm having the feeling that assessment in PBL could be quite bothersome… What with all those instruments!...I don't know…'*

> *'… this sounds like I would have sleepless nights trying to grade work and be fair to all students…'*

> *'…I could see students deliberately agreeing to give each other high scores without taking the time to analyse the work of their peers…'*

'...Look on the bright side ...we were not satisfied with what we had....we decided to embrace change...so let's be open-minded and give it a fair chance...Time is needed for internalizing all the concepts...I am willing to wait before casting aspersions of defeat...'

Faculty acknowledged the overall benefits of the PBL exercise. Their comments portray their satisfaction:

'...This was a blessing...I am thrilled to be a part of this innovation...'

'...To think that PBL was around for such a long time and we were stuck in the traditional mode is unbelievable... Good gracious me!...It is refreshing to be a part of this institution...

'... It's good to know that my views are respected and best of all administration takes it into consideration in the planning process...'

'...When I first heard about PBL I envisaged a lot of opposition but it is good to see faculty embracing the novel ideas and being willing to be a part of transformation...'

'...Truly I have developed self confidence...I feel so empowered...I never thought I could accept criticism and feel so comfortable about it and actually learn from it...'

'...This coming together of faculty is unprecedented...simply getting to meet others and learn about what they are doing is refreshing...To think that we would be using PBL in all disciplines is delightful...'

'...I have learned so much...communication, critical thinking, mediation, editing skills, teamwork, endurance, patience... I could go on and on and on...It was awesome! ...I'll recommend this to everyone...'

Sixty four percent (64%) of faculty responded to the evaluation instrument. With an average score of 7, faculty reported that the PBL workshop prepared them mentally for learning more; the activities stimulated discussion; the PowerPoint slides helped them to focus on the important ideas and the break-out groups allowed them to experience PBL.

Qualitative results came from the open ended comments about three specific areas that were particularly well handled and three specific areas for improvement along with any

other suggestions or comments and recommendations about the experience. Some specific

areas of commendation were as follows:

 '…group discussions…; '…good preparation of facilitators…; '…PBL planning unit; problem construction; '…quality of presentation…; '…moderation of questions and answers…, …improve my self-awareness…'

Some specific areas for improvement noted were as follows:

   '…assessment; less forms to be filled…; '…more time spent on writing PBL curriculum; '…continuous practice…'

In general, faculty reported gaining knowledge from the PBL experience; the

activities stimulated discussion. Activities included some games, impromptu reports, prize

giving, celebrating each other, self assessment and peer assessment. Faculty also reported

that the break-out groups allowed them to experience PBL. Break-out groups gathered to

discuss various concepts, work on mini projects and report their findings to the whole group.

Faculty confirmed that and the facilitators assisted them in experiencing PBL in practice by

not providing ready-made answers to questions and using exploratory type strategies to arrive

at solutions. With an average score of 8, faculty reported that the information in the binder

summarized the main points and they gained knowledge from the PBL experience. A few

faculty indicated that they would recommend the PBL experience to someone else,

Graduate Students

The PBL arbitration problem presented to students also showed the emergence of

three subgroups of individuals. Here too, two subgroups appeared to be at both ends of what

may be regarded as a continuum, where lenience and strictness are at both ends. The third

subgroup represented a balance between lenience and strictness. At the strictness end of the

continuum, students were unwilling to have their colleague excused for his actions. Here are

some salient quotations obtained:

> '…*What does Joe have to do that we go not have to do?...*'
> '...*Well, Joe needs to organize himself and do what is important to him....*'
> '... *Joe is free to make his own choices but he must be prepared to face the*
> *consequences of his choices...*'

The student subgroup at the lower end of the continuum felt that some form of

consideration should be given to Joe since there were numerous individual differences that

may have accounted for his perception of his situation. Empathy sentiments echoed were:

> '...*I could well understand being in a situation like that ...*'
> '...*Here is an opportunity to display the human qualities ...*'
> '..*Place yourself in Joe's situation and you could well see the kinds of challenges he*
> *has to face ...*'

The third subgroup of students presented a two sided argument that basically

included the perceptions of the lenient and strict groups:

> '...*let's have a balance here...Look at the first column...then look at the second*
> *column....*'
> '...*I have had situations pretty much like these before ...*'
> '...*Let the final word of consensus be the guide for arbitration....*'

It must be noted that this group presented first so it cannot be said that their findings were

taken from those of the other two subgroups. This subgroup opted to leave the final decision

to a panel of experts for consensus.

Ninety four percent (94%) of students responded to the evaluation instrument.

Student perceptions did not change on issues like PBL being considered a fad, PBL being

unsuitable for first year students, the need for prior content knowledge of the subject and

attitude towards PBL determining their success. After PBL training students claimed that the

PBL experience did not make a difference in their view about PBL being a fad (Before: 93.75%; After: 93.75%). By contrast, PBL experience did not appear to influence student perceptions about its suitability for first year students. In fact, all students disagreed that PBL was unsuitable for first years (Before: 100%; After: 100%). After PBL training 87.5% of students reported being confident about PBL compared to 62.5% prior to the training; an increase of 25%. Seventy five per cent (75%) of students felt that their attitude towards PBL could determine their success. In general, there was an overall decrease in the number of faculty who felt that PBL was inappropriate for some disciplines (Before: 68.75%; After: 81.25%). Approximately, 56.2 % of students disagreed that sufficient content was taught using PBL prior to the PBL experience. After the PBL experience 81.25% of students disagreed (Table 1). Here too, percentages reported are meant to give the reader a sense of similarities and differences in perception of faculty and students to PBL training.

The mood, attitudes and general feelings of the participants could be identified by noting the comment:

'…*I am appreciative of the fact that I can listen and learn from others and moreso be exposed to new and diverse perspectives on natural reserves in the Petroleum Industry…*'

While some participants were exalting the value of interactions some students were more protective and cautious as gauged from the following response, *'…I know I must work with others in the workplace but until then I do not mind going it alone as long as I can…'* Concerning the benefits of PBL in terms of personal development, the following student quotes speak for themselves:

'…I tend to be introverted…This is s good opportunity to get out of myself and engage with others especially when the main facilitator realised that I needed to be placed elsewhere for my own benefit…'

'…Now in this group I believe I can make a worthwhile contribution because I am surrounded by the top achievers…I have learned to listen now…'

Students also welcomed timely responses that intercepted possible misconceptions as

exemplified by the comment:

'…It was good for me to have instant feedback as it prevented me from going ahead with misconceptions especially when it came to certain ideas about the formula in use…'

Students too wondered about how the assessment process would affect them. Some

comments in this regard were:

'…I do wonder what kind of grade I will get eventually with this style of learning…the atmosphere appears so congenial and everyone seems so friendly and cooperative that it is extremely difficult to gauge what kind of final grade I will earn…'

'…How would the various instruments be weighted to give me a final grade?...'
'…What would happen if all group members conspired to defraud the system by cheating for each other?...'

'…'I guess the experts know what they are doing because they have the PBL experience and they have worked with several groups in different environments and in different countries…'

Like faculty, students too acknowledged the overall benefits of the PBL exercise when they

said:

'…I have learned a lot from actively listening to my colleagues as they share their experiences with passion…It makes you realize how much you have been missing by merely attending a lecture session and have a professor tell you as it is without allowing you to personally grow, develop and self actualise…'

'… I realize that the tasks ensure interdependence and face-to-face interaction of participants whilst at the same time demanding individual accountability… '

'...There is a process as well as a product approach....you have to go through the entire process to appreciate what's happening but you also need to have a well thought-out group presentation at the end of it all...'

'...At last I have a voice ...I can be heard instead of being silenced without being given a chance ...'

'...Initially I was apprehensive about certain group members and how I thought they may dominate the group but my apprehension was short-lived as folks toned down and gave others a chance to express themselves without interruption...'

'...Without a doubt I was motivated to think outside the box...to think critically...to think in terms of utilitarian good rather than being insular...'

Using the constant comparative method (Glaser and Strauss, 1967) mentioned earlier,

qualitative results arising from the open ended comments about three specific areas that were

particularly well handled and three specific areas for improvement along with any other

suggestions or comments and recommendations about the experience revealed the following

themes:

'...encouraging group participation', '...the presentation of the entire experience...', '...rewards for motivation...', '...everyone being given a chance...', '...enthusiasm of main facilitator...', '...delivery..., '...organization...', '...getting the class involved...', 'assessment...', '...problem solving...', '...open mindedness...', '...team work...' and '...exchanging ideas...' '...more computer facilities present in the classroom during the PBL experience...'

 Table 2 compares quantitatively perceptions of randomly selected respondents.

<Insert Table 2 here.>

Students reported knowledge gains from the PBL experience. They affirmed that the

activities stimulated discussion, the break-out groups allowed them to experience PBL and

the facilitators assisted them in experiencing PBL in practice. With an average score of 8,

students reported that the PBL experience prepared them mentally for learning more; the facilitators assisted them in experiencing PBL in practice and they gained knowledge from the PBL experience. Like several faculty, many students wished we had extended the PBL experience longer. All students indicated that they would recommend the PBL experience to someone else. Students made no additional suggestions and comments except that the PBL experience was excellent. They indicated this in bold print on the evaluation form, perhaps indicative of their strong feelings.

Discussion and Conclusion

This present paper attempted to provide readers with the perceptions of faculty and students at the same educational institution regarding PBL training. This researcher postulated that the similarities and differences in their perceptions could inform future PBL practice. With this in mind, the research sought to examine the similarities and differences in perceptions and determine how those similarities and differences observed could be leveraged to improve teaching and learning in the classroom.

It is reasonable that any new educational institution subscribing to a publicly declared and fully articulated pedagogic style like PBL would inevitably be presented with a number of initial challenges. Whilst some faculty and students may be excited about something 'new', others may be resistant to change and could be obstructive to progress. In between both extremes there would be those who have no fixed perceptions but may be willing to try PBL provided enough motivation is offered from those attempting to introduce the change.

Invariably, there would be a myriad of perceptions, questions, doubts, apprehensions and concerns in the minds of both faculty and students. Having a study of this nature, the first

of its kind at a newly formed educational institution, is historic. It serves to reveal powerful

insights into PBL training from the perspectives of both faculty and students. Having come

from a traditional mode, some faculty and students viewed PBL as something worth the try.

However, with no benchmarks readily available, the results of this present study need to be

interpreted contextually and guardedly.

An invitation for a PBL workshop that subsequently had to be conducted at two

venues testifies to the fact that overall faculty was eager and willing to be an integral part of

transformation. Ninety one percent (91%) of invited faculty attended the PBL training

sessions. Coming from a number of different educational institutions, with no formal PBL

training and having to redefine relationships both faculty and students the atmosphere could

have been uncooperative. This present study assumes that the perceptions expressed are

representative of the population and could be interpreted with some measure of respect. It is

assumed that fear of upward mobility, tenure and other issues in a newly formed institution

did not motivate participants to respond positively. In the case of faculty, the facilitators

originated from their ranks and so perceptions of a 'local' flavour could have affected the

respondents' reactions.

In the case of the graduate students, they may have felt constrained to combine forces

in order to appear *'good'* for a person external to their normal class. Perhaps, their

perceptions may result from their own personal beliefs regarding PBL. The primary

facilitator was a representative of a centre well known and highly acclaimed for its expertise

in assessment. For both faculty and students, some degree of 'Halo Effect' may have

influenced their normal behaviour and so affect the results obtained. Additionally, the fact

that several faculty and graduate students had industrial experience could have positively affected their interest in PBL.

It must be noted that a comparison of faculty's and students' perceptions may not be exactly accurate. For instance, whilst students had already bonded as a group for more than a month prior to the PBL session, several faculty met for the first time in a setting of this nature. Accordingly, it is assumed that the team building exercises for faculty and students were appropriately proportioned. Clearly, it is difficult to actually measure, with any degree of accuracy, how well trained faculty would react under normal classroom conditions. Whilst results in this present paper may appear promising it may well be that in actual practice several participants may not be as cooperative under normal circumstances. Johnson, Johnson, Holubec and Roy (1984) see the teacher as a group member sharing in the work and the play, being attentive to the needs of individuals of the group, the health of the group itself and being mutually responsible for fostering a cooperative spirit in the classroom. An assumption is this present study is that faculty and students reflect the aforementioned model.

A point worthy of mention here is that faculty, by nature of their discipline may tend to be more reflective than students. Says, Schön (1987), the development of an increased level of professional and personal awareness of self in relation to others is the ability to reflect on one's practice. He contends it is the hallmark of professional practice. Faculty over the years of experience may have practised reflection moreso than students. It may well be that a four day PBL workshop compared to a one day PBL experience could make a tremendous difference in respondents' perceptions. Accordingly, results from this present study must be interpreted in the light of these aforementioned observations.

The results summarized in Tables 1, 2 speak to an overall satisfaction on the part of both faculty and students with PBL training. Descriptive statistics were recorded so that readers would have a comparative sense of perceptions of faculty and students. Faculty were trained to use PBL as a primary but not exclusive methodology of choice for classroom interaction regardless of discipline. The students participated in a demonstration of what learning in the PBL mode was like. Accordingly, faculty members were exposed to a variety of methods for consensus building, problem construction and PBL unit design. Students actually experienced what working with a predesigned PBL problem in a setting promoting the virtues of PBL would be like. Faculty members were therefore sensitized to the emotion and cognitive expressions of students and were encouraged to develop skills in responding in what is described by Schön (1987) as the '*indeterminate zones of practice*'. Those are the unique situations in which rote application of previous knowledge or skills is inadequate. Those are the situations where decisions regarding what is appropriate would have to be made almost instinctively.

PBL training for both faculty and students emphasized multi tasking. Participants acted in the roles of mentor, coach, learner, confidant, friend, counselor, arbitrator, mediator, assistant fellow learner, advisor, visionary, think tank, entrepreneur, innovator, technologist, listener, communicator, motivator, decision maker, negotiator, editor, presenter, disciplinarian, advisor, and tutor. The results in Tables 1 and 2 reveal the changing perceptions before and after the PBL experience. More importantly, participants' reports indicate the measure of success of the PBL training. A detailed examination of each faculty members' and students' opinionnaire before and after the PBL experience revealed the critical changes in fundamental perceptions regarding commonly held myths about PBL. For

instance, before the PBL experience some respondents who felt that PBL was just a fad

changed their perceptions after the PBL experience. This is significant because it appears

that PBL training changed respondents' conceptual beliefs.

After PBL training those who formerly thought that sufficient content was not taught

realized that more than sufficient content was taught. They also found that numerous

unintended learning issues were addressed. This fundamental realization has far reaching

consequences in terms of the utility of PBL as a viable pedagogical tool. In like manner,

participants who felt that, given the course demands, PBL would be too time consuming

realized that they were empowered to transform the already existing course into a PBL

format and organize their time strategically. In that regard, participants realized that prior

content knowledge of the subject was not necessary for PBL as they had indicated in the pre

test. It was no small wonder that a comparison of individual perceptions from their pre and

post test results showed that confidence soared after the PBL experience compared with what

is was like before PBL training. This was reflected in attitudes that the participants described

as '*being able to determine their success'*.

The elimination of the traditional shroud of secrecy accompanied with the design and

development of assessment instruments was an unintended outcome of the PBL experience.

Both faculty and students realized that assessments could be done in a variety of ways

consistent with the learning objectives. Participants had the opportunity to engage in the

process of arriving at consensus and using assessment instruments with confidence.

Additionally, they were empowered to remodel existing assessment instruments to match

their immediate needs. Critiquing no longer appeared treacherous but was welcomed by

participants. Each break-out group evaluated the presentations made by all other groups. This activity empowered participants even further.

A reward system served as a powerful means of modifying behavior in desired directions. Acceptable behaviors were immediately rewarded with tangible small tokens of appreciation. It was clear that this form of extrinsic motivation meant much to both faculty and students. They became aware of the multifaceted nature of PBL. This researcher further reinforced acceptable behavior by recognizing participants' feelings and highlighting expected qualities *e.g.* tolerance, discipline, endurance, *etc*. in a timely manner. Rewards were also given to participants who added to the spreadsheet additional qualities.

Selected quotations scattered throughout this report reflect the overall satisfaction of both faculty and students with the PBL exercise. The comments also demonstrate the similarities and differences in their perceptions. Participants realized that an accurately kept attendance register was a powerful form of assessment that could determine attitudes, mannerisms and general beliefs. Faculty and students also recognised the significant role of active class participation in all activities.

Both faculty and students were enthusiastic about experiencing the PBL process. Participants shared how much they personally benefited from the hands-on, interactive experiences. They also shared how they were revived and motivated to move on with their careers and research agendas. The non curriculum based PBL problem allowed participants to feel empowered. They were able to set their own pace and decide their own ground rules. The activity allowed them to take early ownership of the process and participate fully in all activities even those that initially appeared unrelated to PBL. For instance, activities like looking out for each other, being 'brother's keeper', preferring others, enjoying fellowship,

offering impromptu speeches, distributing and receiving gifts, willingly sharing thoughts about issues, being accountable to others and actively listening to others assumed new significance.

Both faculty and students appreciated the importance of homework as a form of reinforcement of concepts. Faculty had the opportunity to review their own curriculum and remodel it to facilitate PBL. For students, the linking of the PBL classroom experience with an appropriate homework assignment served to further reinforce the importance of punctuality, class attendance, class attentiveness and active class participation.

Both faculty and students were randomly allocated to break-out groups that changed in composition during the course of the PBL experience. This action forced faculty and students to appreciate the need to get along with each other regardless of culture, class or other traditional divides. Peer assessment became an important tool in the process as both faculty and students assessed their peers using agreed upon criteria. They used a six point Likert scale ranging from 0 = urgently needing attention to 5 = outstanding. The scale descriptors avoided condemnation by focusing on the individual's actions rather than his personality. Self assessment facilitated objective appraisal and promoted introspection, honesty, integrity and accountability.

Both faculty and students were able to openly express themselves in a welcoming, non threatening manner to an appreciative audience. This encouraged further group participation. Many participants said they appreciated that they could be heard. They claimed that the anxiety about *'being right or wrong'* became a non issue. This researcher witnessed non savvy computer users exploring new ground and learning many skills. Several

participants who were not proficient in Microsoft Word and Microsoft PowerPoint availed themselves of the opportunity to learn with supportive colleagues.

How may these differences and similarities in the perceptions of faculty and students to PBL training be effectively used to improve teaching and learning in the classroom? Best practices identified could be useful in improving professional development. Skills development opportunities could be made available on a regular basis using PBL. Minimal instructional support staff would be needed. This would allow staff to do other important activities for the institution. A sustained community of life long learners is envisioned as the institution builds capacity. The continued human interaction and articulation of values fundamental to PBL would serve to enhance meaningful relationships between faculty and students. A coordinated approach to teaching and learning would serve to improve achievement and advance research. The use of state-of-the-art technologies in blended learning could be informed by those differences and similarities in the perceptions of faculty and students. Innovations developed by students could feed into faculty research and *vice versa.* This would create the synergy needed for future institutional development. The level of engagement required during PBL could open opportunities for faculty and students to develop problem based learning materials and useful simulations to improve the quality of offerings at their institution.

Additionally, differences and similarities in the perceptions of faculty and students to PBL training could be an advocacy platform for creative and effective use of indigenous materials. Articulation of the strategies used could assist others in PBL facilitation. For example, in seeking to understand the goals and strategies of an expert facilitator in support of collaborative learning, Hmelo and Barrows (2006) examined how specific strategies were

used to support the PBL goals of '*helping students construct causal explanations, reason effectively, and become self-directed learners while maintaining a student-centered learning process'*. The researchers examined two PBL group meetings using interaction analysis with video data and stimulated recall. They posited that articulation of these strategies is important in assisting others learn the art of PBL facilitation.

Further support about the utility of similarities and differences of perceptions of faculty and students to PBL training in improving pedagogical practices in the classroom came from Lehman, George, Buchanan and Rush (2006). Their four year professional development project was designed to assist teachers in integrating problem-centered science methods in their classrooms. In a collaborative student centred environment the researchers found that the project promoted positive teacher perceptions and encouraged student-centred classroom approaches. The present study adds to previous work done in this field since its findings may be used to enhance best practices in PBL implementation that could ensure that all stakeholders maximize their gains. Teachers from other disciplines may replicate this study without extensive additional explanation because of the simplicity and straightforwardness of the methods used. Further, no additional institutional resources are required thus making replication even more attractive.

One main observation made in this present research regarding the differences on listening and speaking behaviours of faculty and students was supported by the research of Remedios, Clarke and Hawthorne (2008). In their two year ethnographic study with Asian students operating in a Western context, they found that speaking was placed ahead of listening in the collaborative process. The researchers developed what they referred to as a Collaborative Listening/Speaking (CLS) framework that provided structure for facilitators to

scaffold the novice learners' collaborative skills. Perhaps, research on this instrument in the context of this present study might be worthwhile.

More comparative research on PBL training could be useful to determine what works best for each group. Perhaps the most significant future research might focus on dispelling commonly held myths about PBL. Some of these myths include insufficient content being taught, unsuitability of PBL for first year students and the difference PBL makes in teaching and learning. It is hoped that PBL training for both faculty and students would receive added impetus as a result of this present research.

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Table 1
Comparison of faculty and student responses to opinionnaire

		Before Agree		Before Disagree		Before No response		After Agree		After Disagree		After No response	
		F	S	F	S	F	S	F	S	F	S	F	S
1	I consider PBL to be just a fad.	5.79	6.25	91.30	93.75	2.90	0.00	1.62	6.25	96.75	93.75	1.62	0.00
2	I think PBL does not allow for individual learning.	1.28	0.00	91.60	93.75	7.07	6.25	0.00	12.50	100.00	87.50	0.00	0.00
3	I have little knowledge of PBL.	52.70	75.00	40.55	25.00	6.77	0.00	11.30	6.25	88.70	87.50	0.00	6.25
4	PBL facilitates reflection necessary for reinforcement of concepts.	77.50	87.50	9.63	6.25	12.85	6.25	81.35	75.00	15.75	25.00	2.90	0.00
5	PBL is inappropriate for some disciplines.	29.90	31.25	59.80	68.75	10.30	0.00	22.50	18.75	76.20	81.25	1.28	0.00
6	I believe PBL is unsuitable for first year students.	13.17	0.00	76.55	100.00	10.30	0.00	16.70	0.00	81.70	100.00	1.62	0.00
7	Students need prior content knowledge.	51.10	56.25	41.85	43.75	7.07	0.00	33.15	56.25	66.85	43.75	0.00	0.00
8	Sufficient content is not taught using PBL.	22.50	37.50	69.45	56.25	8.02	6.25	16.10	18.75	82.30	81.25	1.62	0.00
9	I think PBL is too time consuming.	20.60	25.00	69.45	68.75	9.99	6.25	31.15	0.00	60.75	100.00	8.05	0.00
10	Given the course demands, using PBL will be too demanding for me.	20.60	0.00	69.45	87.50	9.99	12.50	21.25	6.25	70.10	93.75	8.69	0.00
11	I am not willing to embrace PBL.	4.51	0.00	87.75	93.75	7.73	6.25	4.51	6.25	93.85	93.75	1.62	0.00
12	I do not think PBL will make a difference to teaching and learning.	0.00	6.25	92.90	93.75	7.07	0.00	2.90	0.00	97.10	100.00	0.00	0.00
13	I consider assessment in PBL to be a complicated activity.	20.87	43.75	67.90	50.00	11.24	6.25	9.32	25.00	89.45	75.00	1.28	0.00
14	I am presently confident about PBL.	36.00	62.50	51.10	31.25	12.85	6.25	54.95	87.50	43.75	6.25	1.28	6.25
15	My attitude towards PBL could determine my success.	80.05	75.00	8.69	12.50	11.24	12.50	81.00	75.00	17.40	12.50	1.62	12.50

Note.: F= Faculty, S= Student.

Table 2
Comparison of faculty and student responses to overall PBL evaluation instrument

Serial #		1	1	2	2	3	3	4	4	5	5	6	6	7	7				
#	**STATEMENT**	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F AV	S AV	F SD	S SD
	Identity #	82	6	33	7	6	9	47	10	79	12	28	13	75	14				
1	The PBL workshop prepared me mentally for learning more.	1	8	5	9	9	8	7	6	8	10	10	10	8	5	7	8	3.02	1.91
2	The activities stimulated discussion.	1	0	7	8	7	8	9	8	9	10	10	10	8	10	7	9	2.98	0.00
3	The PowerPoint slides helped me to focus on the important ideas.	2	3	4	7	8	5	8	7	8	10	10	10	7	5	7	7	2.75	2.63
4	The information contained in the presentations was delivered clearly.	1	5	5	8	8	7	2	8	7	10	9	10	7	5	6	8	3.05	2.07
5	The break-out groups allowed me to *experience* PBL.	2	8	8	9	9	7	9	8	6	10	9	10	8	5	7	8	2.56	1.77
6	The presenters held my interest.	4	8	4	6	7	8	8	5	4	9	8	8	1	5	5	7	2.61	1.63
7	The presentations were easy for me to follow.	2	3	8	8	6	8	6	7	6	10	8	7	5	5	6	7	2.04	2.27
8	The facilitators assisted me in experiencing PBL in practice.	1	9	7	9	7	8	7	7	7	10	10	10	1	5	6	8	3.40	1.80
9	The information in my binder summarized the main points.	3	8	8	7	8	8	8	7	8	10	10	10	8	0	8	7	2.15	3.39
10	I gained knowledge from this PBL workshop.	2	9	8	9	8	7	8	7	8	10	10	10	9	8	8	8	2.57	1.27
	TOTAL	19	71	64	80	77	74	72	70	71	99	94	95	62	53	66	77	23.07	15.74

Note.: F= Faculty, S= Student.