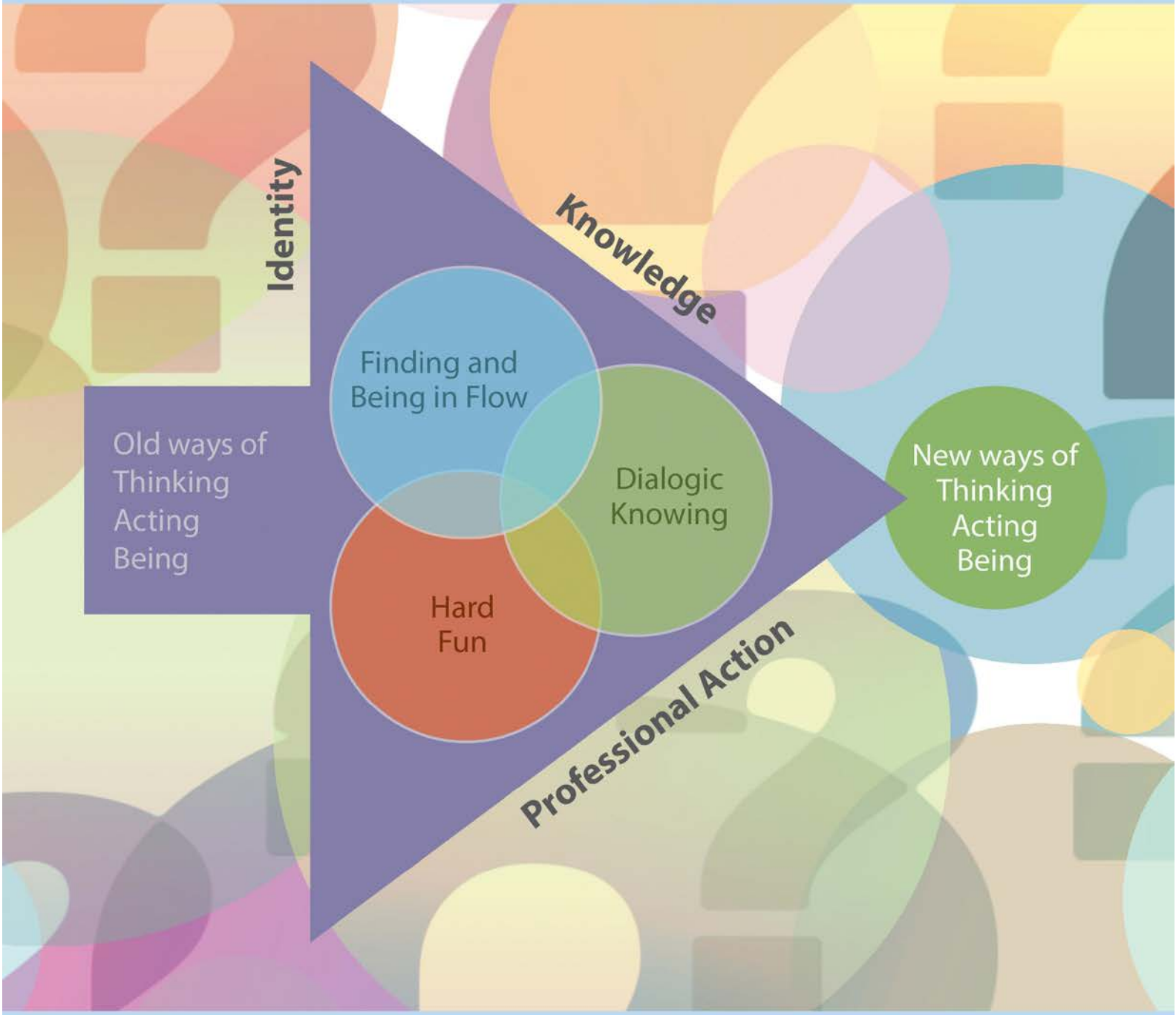
A NEW MODEL OF PROBLEM-BASED LEARNING

Inspiring Concepts, Practice Strategies and Case Studies from Higher Education

Terry Barrett



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Author: Terry Barrett

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Terry Barrett

terry.barrett@ucd.ie

terry.barrett500@hotmail.com

Terry Barrett is an Assistant Professor in Educational Development at University College Dublin. She has over twenty years experience of working with problem-based learning (PBL) as an education developer, programme coordinator, tutor, researcher and research supervisor. She has worked in the design and implementation of PBL initiatives in a range of disciplines including nursing, medicine, physiotherapy, ultrasound, science, computer science, English literature, liberal arts, business, agriculture, community development, education, hospitality, tourism and policing. She has worked as a problem-based learning consultant in Ireland and abroad. She has presented keynote papers on PBL in Ireland, England, Finland and Australia. In addition to problem-based learning her research and teaching interests include curriculum design, creativity, academic writing and mindfulness and compassion in higher education.

She was joint co-ordinator of the Enquiry and Problem-based learning Project and is currently the Programme Director for the accredited programmes in University Teaching and Learning at University College Dublin. She facilitates a scholarship of teaching writing group and academic writers' retreats.

Terry was a founding member of the All Ireland Society for Higher Education (AISHE) and is the co-chair of Facilitate (The Irish Enquiry and Problem-based learning network) and a SEDA (Staff and Education Development) Fellow.

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The PBL students I have facilitated have inspired me as to the potential of PBL for dialogic knowing, creativity and hard fun and I am grateful for that.

Dedication

May this book contribute to providing challenging, collaborative and creative learning environments for students across the globe and across a range of disciplines.

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Enhancers of Hard Fun in PBL

Introduction

PBL Practitioners' Vignettes

"I want the students to think for themselves"

Jane Ostrander, Ph.D., Director, Experiential Learning Center, Truckee Meadows Community College, Reno, Nevada, U.S.A

Jane in her response to this chapter discusses her students developing thinking skills, courage, creativity and career self-efficacy through the hard fun of PBL.

"Students were highly engaged and much more interested in the topic (toxicology) compared to the traditional delivery format. They welcomed the freedom and opportunity for creativity- something they don't often experience in a science degree. Overall grades improved in addition to students developing many softer skills such as group work, writing and communication skills. Increasing social interaction and creating a more inclusive environment for international and mature students was another goal achieved."

Carmel Hensey, Ph.D., Senior Lecturer,School of Biomolecular and Biomedical Science, University College Dublin.

Carmel provides a case study of a PBL problem that was both hard work and fun.

Problem-based learning (PBL) is hard work for students. PBL involves a high level of activity on their part and engagement in new levels of critical and creative thinking. The focus of this chapter is the potential of *learning in PBL to be hard and fun at the same time*. Practice strategies that enhance this hard fun are presented.

Chapter overview

This chapter will help you to:

- Think in new ways about learning in PBL
- Adapt the concept of hard fun to your own contexts
- Apply and adapt practical enhancers for facilitating hard fun in your PBL initiatives
- Get ideas from case studies of learning as hard fun
- Design PBL compatible assessments
- Widen your repertoire of assessment methods
- Use questions, triggers and further resources for developing hard fun in your PBL initiatives

One of the important resources we have for facilitating hard fun for our students is our understanding of our own experiences of hard fun. To tap into these experiences, take a moment to stop and reflect on your experiences of hard fun. You might like to use these questions as writing prompts. You can use it as a freewriting exercise. Write in full sentences, keep the writing flowing, don't edit it, let a stream of writing emerge. Please write for 10 minutes.

Stop and Reflect

Think of a specific event/task that was hard and fun at the same time

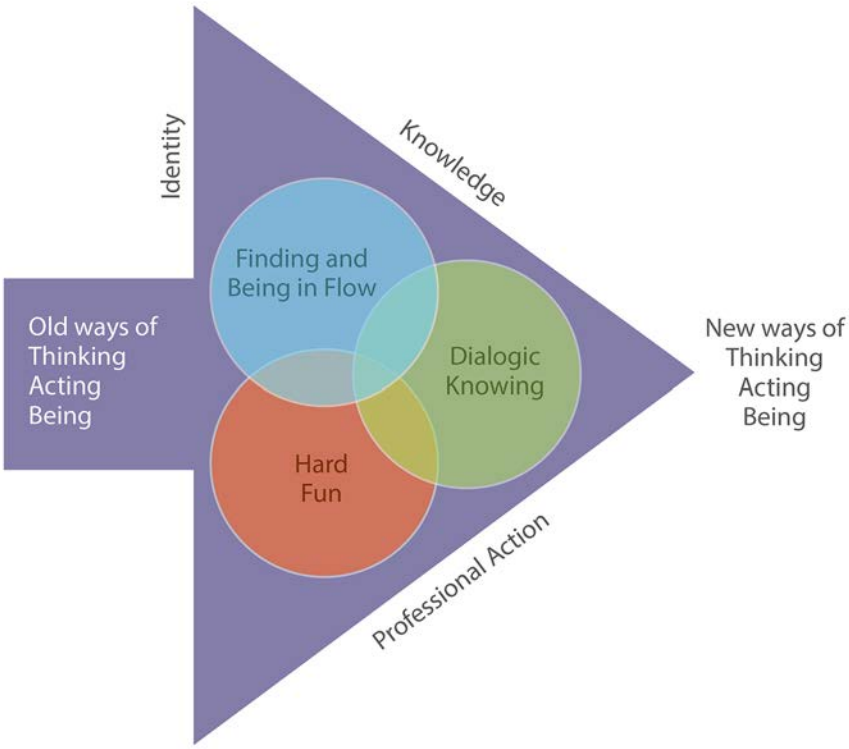
- What was the event/task?
- What did it feel like?
- What made it hard?
- What made it fun?
- What made it hard fun?
- What did you achieve?
- How do you currently encourage your students to experience learning as hard fun?
- Would you like your students to experience hard fun more often in the problem-based learning process?

The illuminative Concept of Hard Fun

What is hard fun? The concept of learning as hard fun, following Papert (1996), encapsulates the idea that emerged from the research study (Barrett 2008), that is, that learning was both “hard” and “fun” at the same time. For Papert (1996), the meaning of this concept is that learning is fun *because* it is hard. I use the concept in a more limited sense, that learning is simultaneously fun *and* hard. In this research study, while PBL was fun, enjoyable and creative for the PBL students at the same time it was hard, challenging and stretching for them.

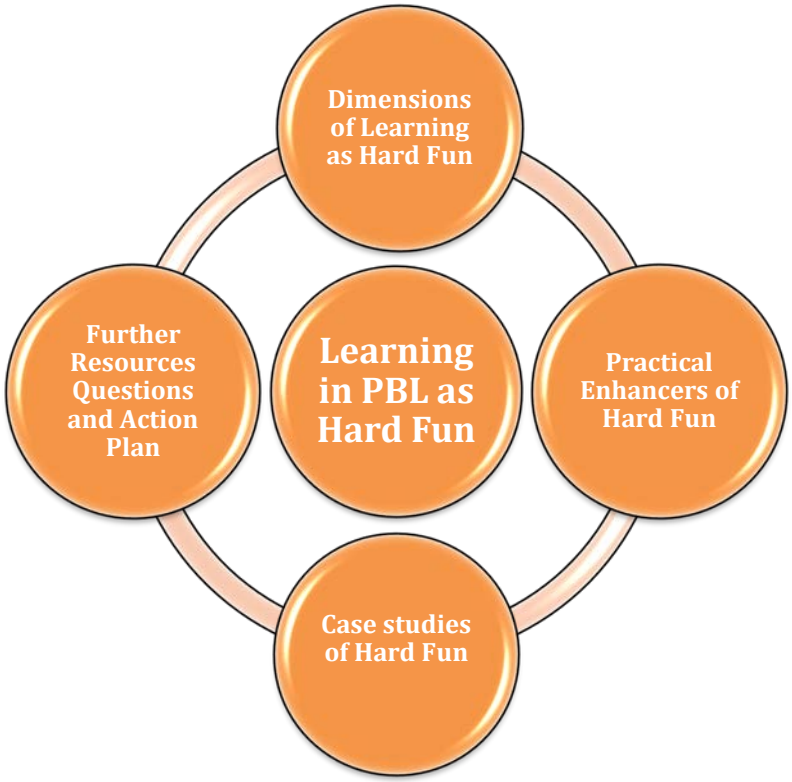
In chapter two the concept of the problem as a provoker of a liminal space was elaborated. The problem provokes betwixt and between spaces, between old states and new states. PBL problems provoke liminal spaces between 1) current levels of knowing and new levels of knowing, 2) habitual forms of professional action and forms of professional action new to the learner and 3) satisfaction with current identities and a desire to explore other possible identities. PBL students move within and beyond the liminal spaces prompted by the problem in different ways. This chapter focuses on one of those ways of learning and growing in a liminal space, that is, students experiencing learning as hard fun.

Figure 5.1 Students learning in a liminal space through experiencing hard fun



Firstly, this chapter will begin by analysing the different dimensions of how the students talked about learning as hard fun (Barrett 2008). The students were lecturers working on problems about problem-based learning. Extracts from the dialogue of the Skelligs team and the Glendalough team will be discussed. The teams and the students were given pseudonyms. Secondly, specific practical enhancers for facilitating learning as hard fun that you can adapt for your own context will be elaborated. Thirdly, as part of this discussion case study examples of PBL provoking learning as hard fun are presented. Fourthly, further resources and questions will be provided to assist you in developing your action plan for promoting learning as hard fun.

Figure 5.2 Chapter Five overview



Since an earlier presentation about learning in PBL as hard fun (Barrett 2009) I have further developed my understanding of hard fun conceptually and I have elaborated nine practical enhancers for facilitating hard fun.

Students' talk about learning as hard fun

I illustrate my view of learning in PBL as hard fun by an extract from the dialogue where some students were talking about their learning from their work on the "Help!" problem (Barrett 2008). This "Help!" problem required the teams to create a presentation to Heads of School about the PBL process.

Help!

The Centre for Teaching and Learning in Higher Education will be facilitating a two-day workshop on Problem-based Learning for Heads of School. You have been asked to do a presentation of your experience of the PBL process. Your presentation is on the second day and is for two hours. You are free to work in any media.

The Skelligs team gave a shadow acting presentation in response to this problem. In the following extract, the students were talking about their ways of learning and the impression that they would like to leave with the Heads of School. It was part of a discussion following their presentation. It is very striking to hear PBL students talking about their learning as hard fun. Listen to their words.

Hanora: ….. And working it through, tackling it and breaking it down into units (*hand moves up and down and across from left to right*) and addressing them. And as Heads of Schools they are wanting to have something unique in comparison to other schools. Maybe that is what they want, they want something unique. Em I would love to leave them with the fact that we were so creative, and the amount students, we put it all together without anybody's help, no lecturers.
Maura: It was such an enjoyable experience as well. It was actually fun.

Hanora talked about problem-based learning involving breaking the problem down into units, working on these units and then synthesising the learning themselves without help. She was talking about the learning being active hard work and it is noteworthy that she said "no lecturers". Although these PBL students were lecturers she was clearly talking about their role as problem-based learners "who put it all together without anybody's help." Maura talked about the learning being "fun", but at the same time, involving hard work, which she qualified with the word "actually." The word "actually" has three meanings all of which I interpret are implied in this context. The first meaning of actually is factually and Maura was saying that learning was in fact fun. The second meaning of the word "actually" is surprisingly; Maura was saying that surprisingly, and in opposition to some expectations she had, that the learning in PBL was "fun". The third meaning of actually is to add emphasis. Maura adds emphasis to the sentence by placing the word "actually" before fun. The learning experience was "enjoyable" and hard at the same time. The conception of learning in terms of hard fun is based on the language-in-use, the tone of the students' voices and the students' repeated expressions of learning in PBL as "fun" and "hard" in the course of this module.

In the concept of hard fun the two elements of hard and fun are complementary halves that make up a mutual whole. The Yin-Yang sculpture is an effective visual metaphor for this.

Figure 5.3 Yin-Yang Sculpture, Photograph by A. Hert of Yin-Yang Brunnen von Otto Wesendonck Bronze Sculptor, Wikimedia Commons

Reninger (2013) summarises the meaning of this ancient Chinese symbol.

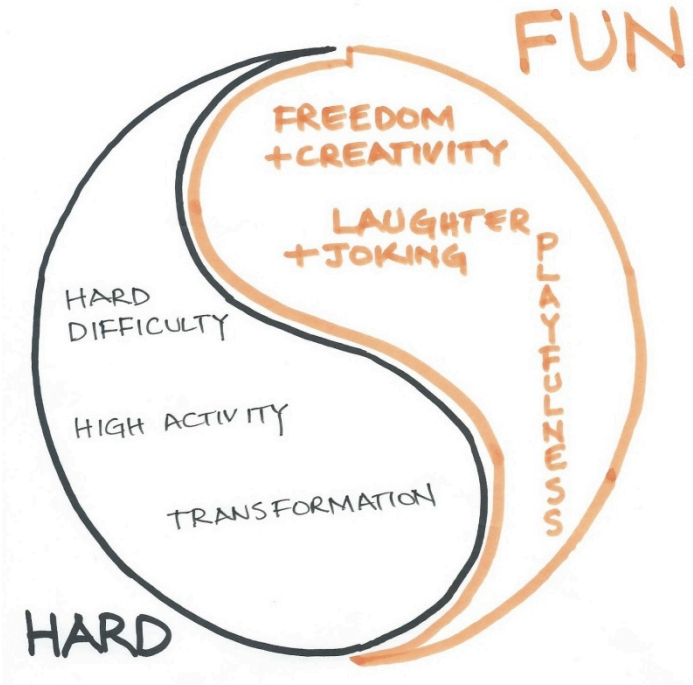
> The curves and circles of the Yin-Yang symbol imply a kaleidoscope-like movement. This implied movement represents the ways in which Yin and Yang are mutually-arising, interdependent, and continuously transforming, one into the other. One could not exist without the other, for each contains the essence of the other.

The Yin-Yang sculpture, as a metaphor draws our attention to how apparently opposite and separate elements i.e hard and fun, are in fact interdependent and interconnected.

The map of the concept of hard fun

A discourse analysis of the dialogue revealed there were three complementary dimensions of the fun: laughter and joking, freedom and creativity and playfulness. The students' talk also revealed that the hardness of learning had three dimensions: high activity, hard difficulty and the transformation of changing beliefs and values. The following figure is a map of the concept of hard fun and an advanced organiser for the discourse analysis of this chapter.

Figure 5.4 The Map of the Concept of Hard Fun: The Dimensions of Fun and Hardness



The Fun of Hard Fun

The three dimensions of fun, namely laughter, and joking, freedom and creativity, and playfulness will be discussed in turn. Extracts from the students' dialogue from the research study illustrate the dimensions.

Fun as Laughter and Joking

Laughter can serve many functions including expressions of nervousness, release of tension and joking with others. An important part of fun is laughter and joking. In the student talk, there was much laughter that expressed joking with fellow students and "craic" (the word Irish people use for an explosive, energetic boisterous type of fun).

One of the problems the students were given was entitled "Help!" which involved students preparing a presentation about the PBL process for Heads of School. The following extract is from a poem that the Glendalough team wrote as part of their presentation for the "Help!" problem, Julie was joking about herself and her learning and everyone was enjoying the laughter.

Julie: (*Stands up to read verse*)
I used to believe with all my might and height *(laughter*) [she is short!]
I could shelter students from the mess of real life
and then I learned some more. *(laughter*)
(*Tears up written verse and sits down*)

At the participant validation session Julie, from the Glendalough team, said that PBL was "fun", "relaxed" and that "you could slag people off". "Slag" is an Irish slang expression meaning to joke with someone about her/himself.

Fun as Freedom and Creativity

Freedom and creativity was the second dimension of fun that the students talked about. The Skelligs team talked about the assessment of learning in terms of "Assessment of learning: Terrifying lack of freedom versus enjoyable freedom". The students talked about freedom, creativity and laughter in presenting their learning through shadow acting, which they also described as a lot of hard work. They chose to do the entire presentation for the "Help!" problem through shadowacting. As noted in the previous chapter, the students had four characters behind the screen and the fifth character was a

person holding a puppet. In addition, there were two narrators. One narrator told the story of the PBL team as it progressed from scene to scene while the other linked what was happening in the shadow acting to PBL theory and research. This shadow acting was a genre that was new to some of them and this change in genre was reflective of a change in the way they were interacting with one another in an assessment of learning space. After the presentation, there was a discussion about why they had decided to take this particular approach to the problem and presentation. The following is an extract from that presentation:

Maura: In terms of our own learning…mm…some of us who had never engaged in that type of learning before, you know, so, or active before, so it was important for the team as well that there were people in the group that had a lot of experience of this kind of presentation. So it stretched the boundaries a wee bit for some of us.
Hanora: How many of us have been on a course and we would have had the freedom to do something so creative, so when the idea came up even though some of us were quite nervous about doing it, but we said let's give it a try and see how it works.
Beatrice: And Hanora is now running away with the circus *(laughter*)….

The students talked about the freedom and creativity that was part of their learning experience in PBL. The stretching of "the boundaries" was two-sided; it gave the students the freedom to be "creative" but also made some students "quite nervous." Freedom is a prerequisite of creativity; both factors are essential elements of fun.

Jackson (2006:3) argues that the problem of developing students' creativity in higher education is:

> a sense of dissatisfaction with a higher education world that seems, at best, to take creativity for granted, rather than a world that celebrates the contribution creativity makes to academic achievement and personal well-being.

Problem-based learning has the potential of providing learning spaces where creativity for academic and personal development can be socially constructed, confirmed and celebrated together in PBL tutorials. Hanora, who was a lecturer in nursing, was responsible for the props and stage design and

enjoyed exploring her creativity so much that Beatrice joked about her "running away with the circus."

Teaching in higher education is about facilitating student learning. It is also a performance that requires that attention be given to scene setting and props. The word "creativity" is often repeated in the strategic plans of universities and other higher education institutions. The key argument for treating:

> creativity in students learning more seriously is that creativity lies at the heart of learning and performing in any subject-based context and the highest level of both are often the most creative acts of all. Our problem then becomes one of co-creating this understanding within different disciplinary academic communities (Jackson, 2006: 3-4).

The students in the Skelligs team contrasted their experience of assessment of learning in PBL as enjoyable freedom, with some previous experiences of assessment of learning that were characterised as terrifying and lacking in freedom:

Maura: How many times do you have the opportunity to be assessed and actually enjoy it, without being terrified….(*laughing)……*
Ann: You mean you were not terrified? *(laughter)*
Hanora: The screen helped, you know if you don't like acting or anything like that, you are totally hidden away, there was an element of protection and security as well.

Freedom as defined in the following analysis incorporates inner and outer dimensions:

> In the first place the freedom that I am talking about is essentially an inner element, something that exists in the living person quite aside from any of the outward choices of alternatives that we often think of as constituting freedom…The second point in defining this experience of freedom is that it exists not as a contradiction of the picture of the psychological universe as a sequence of cause and effect, but as a complement to such a universe. Freedom rightly understood is a fulfilment by the person of the ordered sequence of her life. The free person moves out voluntarily, freely responsibly to play her significant part in the world whose determined opportunities move through her spontaneous choices and will (Rogers and Freiberg 1994:30).

The students experienced " freedom" in both dimensions; an inner existential freedom, and an outward expression of freedom, as choices between alternatives. Problem-based learning has the potential to create a space which offers significant levels of freedom to learn, a free zone where students can brainstorm their ideas, reason through the problem, determine their own learning issues and action plans in the context of multiple alternatives. Problem-based learning can provide two of the key ways of building this freedom, as outlined by Rogers and Freiberg (1994), namely, the building of problems perceived as real and providing resources for learning for the students.

This freedom to learn space was one in which the students had real possibilities to move beyond their current levels of learning, creativity and professional practice and provided the fertile ground for stretching "the boundaries" as one student put it. Harland (2003:268) highlighted the fruits of the freedom that PBL can offer, as he described PBL experiences in zoology:

> …the freedom we gave students to work within this environment sustained new levels of energy, excitement and commitment. Barnett describes an educational ideal of 'critical being'… with learners engaged in critical thought, self-reflection and action. To achieve this, learners must invest something of themselves in this engagement and this investment appeared to be sustained throughout the PBL curriculum.

Part of the freedom that Harland's students experienced stemmed from the fact that they were given complete freedom to work in any media they wanted. In my study, I witnessed this experience at the end of the module where the students talked about this freedom in positive terms. However, at earlier stages of the module, the students talked about the freedom in negative terms, for example, they sometimes spoke of the freedom of the PBL process in terms of confusion that was not O.K., which is documented in the previous chapter.

At the participant validation session, where students were presented with the my analysis, Maura talked about the freedom they experienced as "liberating". Betty made links between this theme of freedom and Stake's (2002) keynote

paper entitled “The Unbearable Lightness of Education ”. She explained that this paper was an analogy with “The Unbearable Lightness of Being ”[Kandura 1984]. She said: “Do we want our students to be heavy with the curriculum we have set or light with their own curriculum, own agenda. This links with words like freedom and enjoyment.” Betty then referred to how Stake talked about the lightness of how his granddaughter, who was three, learned. I joined in the conversation making links between Stake’s description and Brendan Kennelly’s (1990) *Poem from a three- year old.* I talked about how in Kennelly’s poem, the three year old is learning through asking a series of questions, in a creative, playful way. The little girl comes down to the kitchen with her father and sees a vase of flowers withering. Here is the poem:

Poem from a three -year old
By Brendan Kennelly

And will the flowers die?
And will the people die?
And every day do you grow old, do I
Grow old, no I’m not old, do
Flowers grow old, do
Flowers grow old?
Old things-do you throw them out?
Do you throw old people out?
And how you know a flower that’s old?
The petals fall from flowers,
And do the petals fall from people too?
Every day more petals fall until the
Floor where I would like to play I
Want to play is covered with old
Flowers and people all the same
Together lying there with the petals fallen
On the dirty floor I want to play
The floor you come and sweep
With the huge broom
The dirt you sweep, what happens that,
What happens all the dirt you sweep
From flowers and people,what
Happens all that dirt? Is all the
Dirt what’s left of flowers and
People, all the dirt there in a
Heap under the huge broom that
Sweeps everything away?

Why you work so hard, why brush
And sweep to make a heap of dirt?
And who will bring new flowers?
And who will bring new people? Who will
Bring new petals to put in the water
Where no petals fall on to the
Floor where I would like to
Play? Who will bring new flowers
That will not hang their heads
The tired old people wanting sleep?
Who will bring new flowers that
Do not split and shrivel every
Day? And if we have new flowers,
Will we have new people too to
Keep the flowers alive and give
Them water?
And will the new young flowers die?

And will the new young people die?
And why?

How can we bring some of the lightness, fun, curiosity, questioning and sense of playfulness of the three year old back into learning in higher education through problem-based learning? This is the crucial question.

Fun as Playfulness

Playfulness was the third dimension of fun. The Glendalough team played with the image and the metaphor of tearing up old, useless ideas. At the start of their presentation they did this in relation to the “Help!” problem, they showed a video clip from *Dead Poet’s Society,* where the teacher was encouraging the students to tear some nonsensical pages about literacy criticism out of their textbooks, and following his instructions one student did so, and then the others did likewise. The video clip showed the student that was the first to tear out these pages.

Figure 5.5. Clip from Dead Poet's Society: Student Tearing out Pages of Textbook (Weir, P. (1989) *Dead Poets Society*. [Film])

The students played with the idea of tearing up pages, and at the end of the presentation, they presented a poem they had written communally entitled "I used to believe and then I learned some more". Each person stood up to recite the verse that she/he had written, and then tore up the paper on which the verse was written, before she/he sat down. In the discussion following the presentation, this action was explored.

Mary: So we were also connecting back then to the initial film clip where they had to tear something out so this was why we tore our poem as well, so we had to let these go
Terry: Right.
Mary: And we were hoping the Heads of Schools….(*laughing*)…that they might have to tear a page out of their book, let go of some of their beliefs. We felt we wouldn't get them on board unless they really understood they were going to have to challenge their own belief systems in relation to the book.

The Skelligs team also had a great sense of playfulness that was particularly visible in the shadow acting of their presentation. They played with the medium of shadow acting, including props and lighting. This "play with a purpose" that both teams used is crucial to the hard fun that happens at the edge of chaos; this goes "beyond the apathy of strict order and the over-excitement of chaos to generate an ordered chaos that permits freedom within structures and fun within limits" (Rea 1997:1).

Terry: … it was very enjoyable, thanks a million. Its very thought provoking and entertaining, a great combination. Can you tell us why you decided to take the angle you took; in terms of deciding the kernel of the problem and the way you presented it?
Beatrice: Well I think, as we said in the role play there, that our job wasn't introducing what PBL is and giving them all that background, because that was already going to be tackled on the first day. So we sort of sat around and thought what do we have to offer that is unique. And we felt that it was an insight into the process of PBL, to actually let them see what happens at a meeting, or a tutorial meeting and how…eh…the whole thing works. That is where it came from.
Joan: We wanted a different space for the role-play. Because we wanted them to have the, you know how sometimes you have role plays and you watch them and they can be quite distracting because you are watching say what people are wearing or thinking gosh she is a really good actor. So we wanted to have something that didn't concentrate on what people looked like, we wanted to concentrate on the voice and create some sense that you are watching something that has already taken place. To put it in a retrospective space.
Maura: The style of the presentation was designed to grab people's attention, and that it would be something you would remember afterwards. (*laughter)*
Philip: I guess also that they would have gone through a day in the seminar, perhaps having watched presentations that were more dry so this would have been something at the end, which might have caught their imagination a bit.

At the participant validation session where I presented my analysis to the teams, Kate talked about the playfulness of her students as they worked on a problem about Mary who was mid-career and considering her future options as a marketing manager. She talked about how her postgraduate marketing students played with a cardboard box representation of a marketing manager.

> I am absolutely fascinated by the way they are doing it. Yesterday one of the girls produced a cardboard box with a face painted on it and said let's use this to get a handle on Mary on whom the problem is based.

My understanding of hard fun is in its context of the play ethic to which it belongs. In terms of the play ethic, play can is viewed, not as something separate from work and learning but as a media for both. Kane (2004a)

contrasts the play ethic with the work ethic to highlight that in the future play will become our dominant way of thinking, doing, learning and adding value. Play can be a fruitful approach to different types of work including science, education and media. Kane (2004b:38) quotes Freyerabend (1999) to introduce the general applicability of his theory of play and to illustrate the role of play in science:

> [Science] is a bricolage of experimentation…initial playful activity is an essential prerequisite of the final act of understanding…new scientific practice needs time to develop its conceptual tools and its empirical data by playing with them, that is by constantly repeating and combining them until they become common usage or reality.

Kane (2004b) explains that play is about engagement and that the Indo-European root behind the old English *plegian* is found in Celtic, German, Slavic *dtegh* meaning to engage oneself. Hard fun fits very well into the modern rhetoric of play. A key figure in this scholarship of play is Sutton-Smith (1999) who views play as frivolity, play as progress, play as imagination and play as selfhood. The idea of play as "selfhood" both asserts that we are only fully human when at play and that through play we can develop a more integrated self:

> Schiller coined his timeless play aphorism ' Man only plays when in the full sense of the word he is a man, and he is only completely a man when he plays' –he was defining play like Shelley's imagination as something that could unify the divided selves of early modern society (Kane 2004b: 96).

Central to the play ethic is a way of thinking which tries to close a huge gap in modern living, the gap between who we are and what we do (Kane, 2004b).

The Hardness of Hard Fun

From the students' language-in-use, I interpreted that the hardness in learning in PBL had three dimensions: the high level of activity demanded by the nature of the learning, the hard level of difficulty associated with the learning required to work on problems, and the transformative dimension of the learning in terms of change in attitudes, values and beliefs.

The High Level of Activity Demanded by the Nature of the Learning

The high level of activity demanded by the nature of the learning in PBL was one aspect of the hardness of the learning. A defining characteristic of hard learning (as opposed to passive learning) is whether the students themselves are actively engaged in their learning rather than merely being recipients of transmitted knowledge. One way of differentiating hard and soft learning is in terms of whether the students themselves are doing the action or are passively observing others in action. A striking characteristic of the hardness of the learning in PBL was the fact that the students themselves decided the learning issues and action plans for completing the work. The students defined the problem, reviewed the facts, brainstormed ideas, sought out resources and information, reasoned through the problem, completed the other work that they decided to do, made their own decisions on which directions to take or not to take and finally, they presented their learning. Hanora talked about this activity in terms of the type of tasks that had to be completed

> working it through, tackling it and breaking it down into units (*hand moves up and down and across from left to right*) and addressing them.

She also talked about the high level of activity in terms of having to do the presentation themselves:

> Em I would love to leave them with the fact that we were so creative, and the amount students, we put it all together without anybody's help, no lecturers.

Frank saw PBL as a solution to two major problems he had, namely, implementing a new, demanding curriculum and the high failure rate at the international examinations for a programme for aeronautic engineering technicians. There were new topics introduced to the curriculum and it was essential for students to pass the exams in order to gain employment as aeronautic engineering technicians. A continuation of the same approach that

was being used would not address these two crucial issues. At the time of the participant validation session, Frank, who had piloted PBL with aeronautic engineering technicians and was doing research on this initiative had this to say:

> We are close to employers. It's very obvious we cannot continue the way we are going… PBL is a very clear solution to some of the problems we are trying to grapple with. I got them to do it in a difficult module and it was very successful… I had an interview with the head of the Aviation Authority this morning. The first thing he said was that this new curriculum cannot be done in the time the teacher has face-to -face. You are going to have to get these people in some shape or fashion to do it themselves. I was nodding my head and making sure the recorder was working well (*laughter*). If I had written the speech for the man! (*laughter*). I said as it just so happens I have piloted PBL.

Frank's students had to do much active learning themselves, however, a PBL approach meant there was a possibility that this hard work could also be hard fun.

The Hard Level of Difficulty Associated with Learning

Not only was the learning hard due to the high level of activity, it was also hard because of the hard level of difficulty. As well as defining the difficult problem, deciding on learning issues, engaging in independent study and sharing their knowledge in an academic debate, the students had to go beyond academic debate and synthesise their learning to design and produce the product required for the problem for a specific audience.

The Glendalough team talked of their learning in terms of "I used to believe" versus "and then I learned some more" and summarised their learning about problem-based learning in a poem, entitled *I used to believe and then I learned some more.* The learning they talked about was hard in terms of the difficulty level of meeting the challenge of the problem. In particular, they talked about the high difficulty level associated with the learning required in the way they decided to address the problem:

Kate: And sometimes the harder thing to do probably distils the essence a bit better. It was extremely difficult to come up with that poem. What it actually did for us, distil the essence of what the PBL experience was like for us.

The Transformative Dimension of the Nature of the Learning

The transformative dimension of the nature of the learning was the third dimension of the hardness of the learning in PBL. I begin my discussion of this dimension by presenting a poem that the students from the Glendalough team wrote. This poem shows how the learning was hard because of the transformation in their beliefs and attitudes. The learning extended deeper, beyond levels of knowledge and skills acquisition, to attitudinal change. At the end of the presentation for the " Help" problem the Glendalough team decided to recite the following poem they had written.

Sue: (*Stands up to read verse*)
I used to believe
that I was the lead, and what the students need was to follow
and then I learned some more. (*Tears up written verse and sits down*)
Noel: (*Stands up to read verses*)
I used to believe
that my teaching style gave cause to smile
and I enjoyed my delivery style
and then I learned some more
I used to believe that students learned according to my notes
would give me cause to gloat
and then I learned some more.(*Tears up written verses and sits down*)
Bob: (*Stands up to read verse*)
I used to believe
that students will always be bright and white
and all would be enabled and not disabled
and then I learned some more.(*Tears up written verse and sits down)*

Sue: (*Stands up to read verse*)
I used to believe
that the knowledge learned in college
gave lifelong sources for my courses
and then I learned some more.(*Tears up written verse and sits down*)

Julie: (*Stands up to read verse*)
I used to believe with all my might and height *(laughter*) [she is short]
I could shelter students from the mess of real life
and then I learned some more. *(laughter*)
(*Tears up written verse and sits down*)

Frank: (*Stands up to read verse*)
I used to believe
that I'd be beholden
to the curriculum of olden
and then I learned some more. (*Tears up written verse and sits down*)

Kate: (*Stands up to read verse*)
I used to believe
that there were new learning and teaching methodologies
and they were a load of codologies
and then I learned some more. (*Tears up written verse and sits down)*

Ruth: (*Stands up to read verse*)
I used to believe (*laughing)*
I used to believe
that talk of process
was all hocus-pocus
and then I learned some more. (*Tears up written verse and sits down)*

Kate: (*Stands up to read verse*)
I used to believe
that their workload was vicious
and that their assessment was not pernicious
and then I learned some more.
(*Tears up written verse and sits down)*

Mary: (*Stands up to read verse*)

I used to believe that education of the visceral should be peripheral
and stirring emotion would cause commotion
and then I learned some more. (*Tears up written verse and sits down)*

Ruth: (*Stands up to read verse*)
I used to believe
That the role of assessor was not an oppressor
that lecturers grades need not to be explained
and then I learned some more. (*Tears up written verse and sits down)*

Sue: (*Stands up to read verse*)
I used to believe
that you can start new courses
with promises of resources
and then I learned some more *Tears up written verse and sits down)*

Mary: (*Stands up to read verse*)
I used to believe
that Heads were there to fear
I'd better watch out and steer well clear
and then I learned some more. (*Tears up written verse and sits down)*

All: *(Stand up to say lines)*
Now we are going to ask for ear
its time we got everything out in the clear
(All sit) (Audience applause and laughter)

The form and function of the language-in-use in this poem is that of a poem of transformative learning. In the first line of each verse, the verb is in the past perfect tense " I used to believe" while the verb in the fourth line is in the past tense "I learned". This shows that over time, each person changed what she/he believed. The action of each person tearing up her/his verse and letting the pieces of paper fall after they have read their verse(s) symbolizes the letting go of old teaching beliefs and approaches.

Agency can be seen very clearly in the use of "I" and "we" in the poem. The concept of agency acknowledges that the actions of people are partly, but not totally, socially constructed, and that agents "have their own 'causal powers', which are not reducible to the causal powers of social structures and practices" (Fairclough 2003:22). Each person stood up for her/his verse and read what she/he wrote. For the final two lines, the full team stood up and recited the lines together. I argue that the students were remaking their selves, and having their selves remade through the context of learning in the PBL tutorials and that these twin processes occurred simultaneously. There was a dialectic relationship between agency and contexts (Giddens and Loyal 1998). This transformative learning contained characteristics outlined by Mezirow (1991:161) as:

> An enhanced level of awareness of the context of one's beliefs and feelings, a critique of their assumptions and particularly premises, an assessment of alternative perspectives, a decision to negate an old perspective in favour of a new one or to make a synthesis of old and new, an ability to take action based upon the new perspective, and a desire to fit the new perspective into a broader context of one's life.

Transformative learning involves the imaginative insights of visualisations, that is, of playing with new possibilities. The students talked in terms of "I used to believe and then I learned some more." Letting go of old perspectives is part of this perspective transformation. Learning involves a transformation of self. The change to a new way of learning through PBL, with the associated changes in the students beliefs about different aspects of learning and teaching are manifested in the change to a new genre, the genre of a poem. At the end of the presentation, there was a discussion and I asked the students why they had chosen to write a poem.

Terry: And why a poem?
Mary: Well it was because it was something that would be shared. And that we could tease out what we were challenged. So the title of the poem was *I Used To Believe*, its quite provocative, because we in the kernel of this project had to include that we really saw this whole PBL process for us as a big major change, managing change, so in all management of change one's beliefs are always questioned and challenged. So that is why we decided to do it…
Julie: PBL was something new for the students, a new process that they had to go through and I think when Mary came in with the idea of a poem,

it was like Oh My God! I am not a poet! *(laughter)* , to write something like that. So it's something like that experience that the students would have to go through as well, just doing something new.
Kate: It's taking you out of your comfort zone, gets you, challenges you a bit more.
Sue: It's also a different way to reflect on parts you had contributed to the group work and the process, the PBL process, nice from that point of view and summarise it in two sentences.

Fairclough (1992) uses the term genre referring to a relatively stable set of conventions that is associated with a socially ratified way of acting and interacting. He views changes in genre and changes in social practice as being dialectically related. In *Discourse and Social Change* this relationship is described as follows:

> Changes in social practice are both manifested on the plane of language in changes in the system of genres, and in part brought about by such changes (Fairclough, 1992:126).

Poetry is often used, as it was in the PBL students' poem, to capture emotional and attitudinal change. In the poem, students described how their beliefs and attitudes about many aspects of learning and teaching have changed, as a result of experiencing problem-based learning as students in an education development module.

Through their poem the students were engaging in ideological critique by questioning their beliefs. This de-mythologising of their learning and teaching situations involved them questioning both their teaching strategies and their intentions. There was some movement from a teacher focus to a student focus and the students were also deeply questioning their underlying attitudes. In the poem, there is some movement away from the intention of the transmission of information. This de-mythologising of reality had the potential to lead to transformative social action. The learning was hard as it is working at the transformative level of beliefs, values, attitudes and ideologies. The students were experiencing attitudinal change that is the hardest, and also the most important type of learning. When long-held beliefs, values and attitudes

are challenged, turned upside down or replaced by new ones, it may be experienced as both hard in terms of transformative work, and fun, in the sense of a liberating freedom of having new attitudes and beliefs that may serve ourselves and others better. And so how can we enhance hard fun in PBL initiatives?

Nine Practical Enhancers of Hard Fun

Enhancer one: Design hard fun problems
Enhancer two: Design assessments as learning opportunities
Enhancer three: Design PBL compatible assessments
Enhancer four: Facilitate tutorials in ways that combine academic rigour with enjoyment.
Enhancer five: Encourage effective team formation
Enhancer six: Give attention to the physical environment
Enhancer seven: Be transparent about how you assess the team product and/or the team process
Enhancer eight: Design PBL staff development initiatives to include opportunities to reflect and work on beliefs and values about teaching and learning.
Enhancer nine: Give lecturers opportunities to experience hard fun as PBL students in order to provide a good starting point for them to encourage their students to have similar experiences.

Enhancer One: Design hard fun problems

Understanding the concept of hard fun can stimulate problem designers to design problems that are hard enough to really challenge students and open-ended or creative enough to have space for fun. I have set participants on problem-writing workshops the challenge of writing hard fun problems. Having a team of stakeholders e.g. lecturers (from the discipline and others from a different discipline), students, professionals from workplaces, librarians, education developers and education technologists working together

to design problems helps to give them the depth and breadth that can make them engaging and challenging.

Variety and challenge are important in learning and designing problems in different media and encouraging students to work in different media is one way of providing this variety. The following problem (in the form of a project brief) was for a toxicology module for third year science students, where they were encouraged to work in different media and to be creative and playful.

Figure 5.6 Toxicology Module Problem by Carmel Hensey

- Each group is required to design a learning aid to teach the fundamentals of organ specific toxicology.
- Be creative, you are free to work in any media (e.g. film, model, poster, wiki, app, podcast…..).
- The learning aid should convey the key points regarding toxicity in a particular organ and the mechanisms of damage in a particular organ using at least 3 major toxins to demonstrate toxic mechanisms in the organ.
- On completion of this task each group will have to give a brief overview of their strategy and type of learning aid developed to the class. The learning aids will then be available to all students during the practical periods, where you will use the available tools to learn about toxicity in different organs.
- All aspects of organ based toxicity will be examined in the end of term MCQ, so it will be important that students take this opportunity to learn from each other's projects

Carmel Hensey found that games were popular; both traditional and computer format

Figure 5. 7 TOX HOP- Board game- focus is on liver toxicity

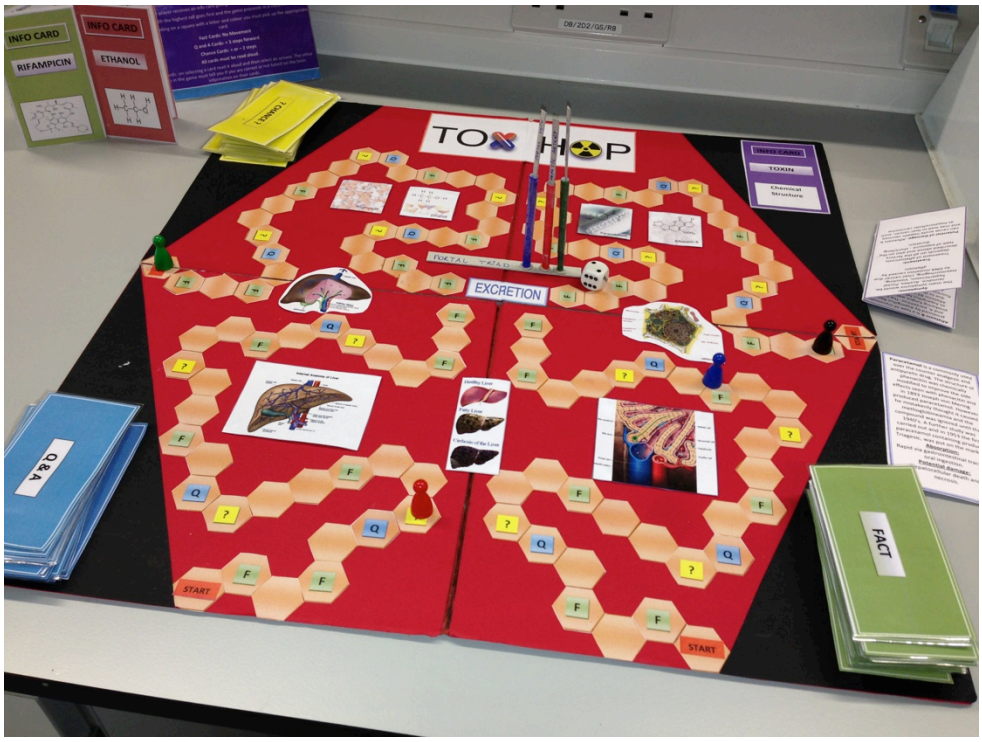


Figure 5. 8 Renal Pursuit Board Game focus is on kidney toxicity.

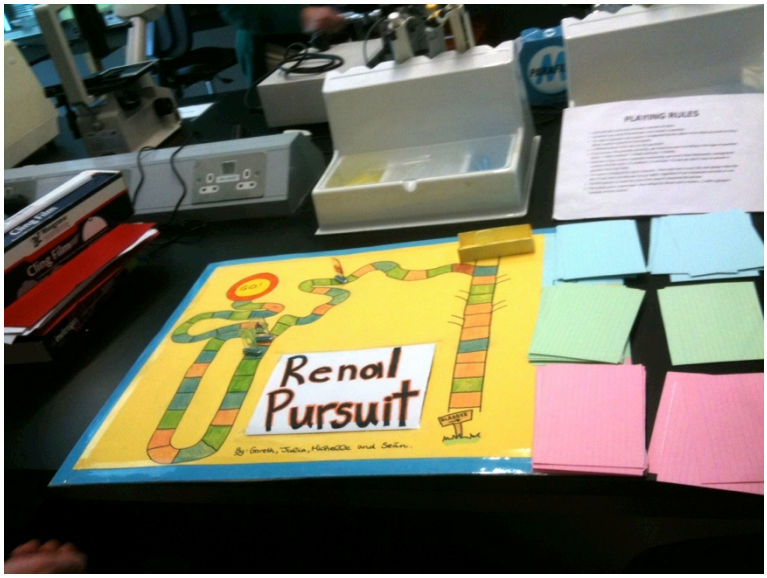
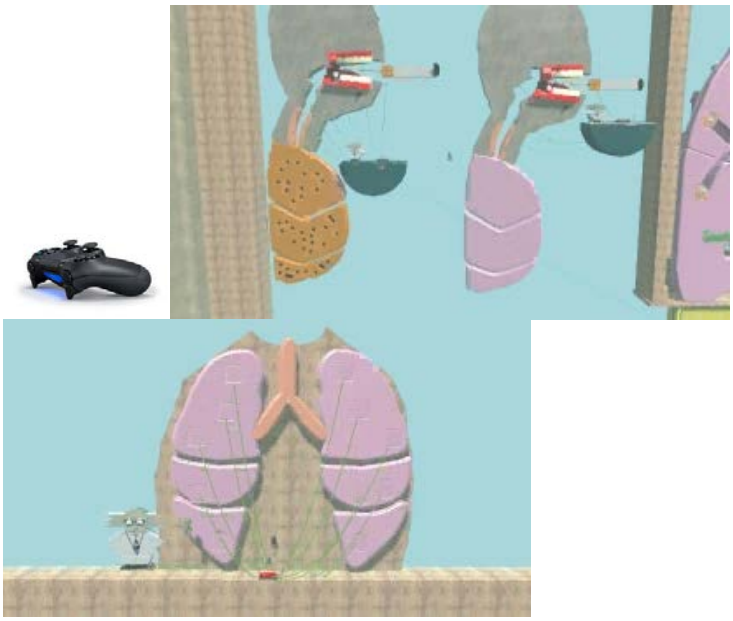


Figure 5. 9 Screen shots from Lung Tox PlayStation game.



Also websites and digital media designed for use on smartphones or other mobile electronic devices proved popular including the following:

A website on reproductive toxicology designed for smartphones: note the series of videos created for this application.
http://myapp.is/repro%20tox

A wiki on blood toxicity: note the different pages designed for visual learners, audio-visual learners and “table people”. Mnemonics and Rhymes were also created.
http://toxic-responses-in-the-blood.wikispaces.com/Welcome%21

A website on kidney toxicology:
http://toxicologyofthekidney.weebly.com/

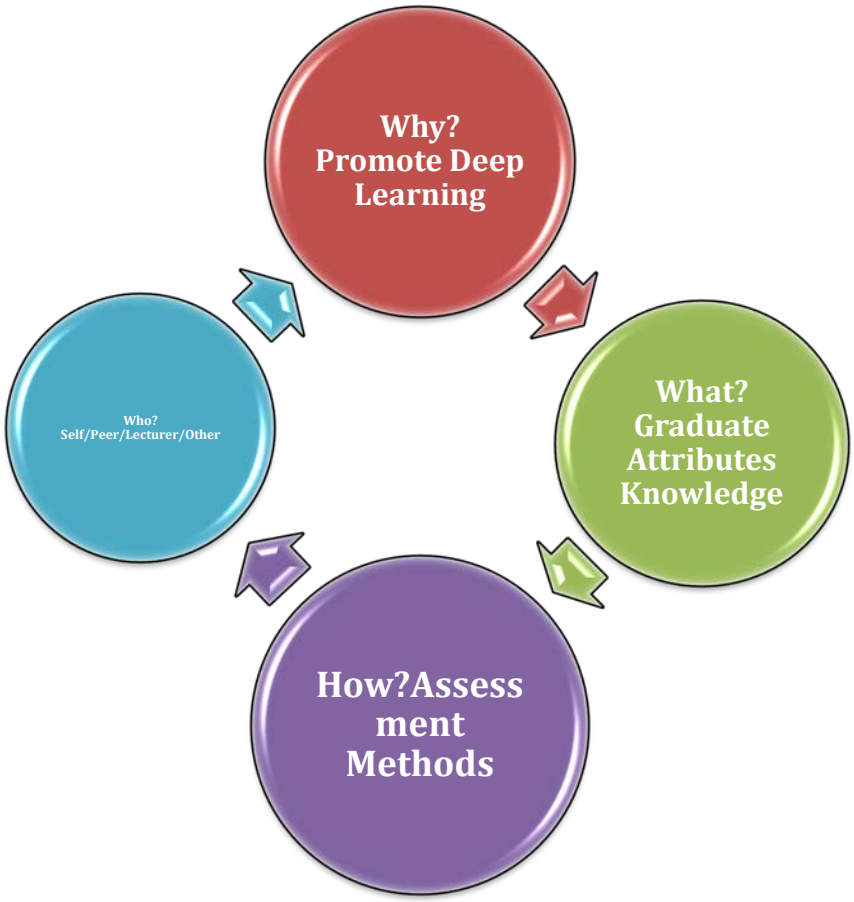
See chapter two for further practical strategies for designing problems together with some more sample problems.

Enhancer Two: Design assessments as learning opportunities

Assessments serve many purposes including encouraging students to engage in deep learning, measuring what students have learned, checking the competency of practitioners and assuring the standards of awards. In problem-based learning the major focus on the design and review of assessments needs to be on how well the assessments promote *deep learning*. In deep learning the intention is for students to seek personal meaning for themselves, working at understanding concepts and their interrelationships and using evidence to give explanations and make arguments (Martin and Saljo 1976, Entwistle 1988). In PBL contexts, the intention is for students to understand new concepts by linking them to what they know and relating them to the problem they are working on so that they will be able to use their new understanding again with new problems in different contexts. As assessments drive learning we can design them to foster deep learning. This will also mean re-educating students to see assessments as learning events and opportunities for feedback as steps in a wider developmental process. In problem-based learning, assessments should not just be about testing students but should also be designed to be learning opportunities and so there is assessment as learning for the students. For example students can learn much from seeing different assessed team presentations and asking each team questions about their presentations. Designing assessments as learning opportunities allows the potential for learning as hard fun to be realised. For example, in the toxicology module, students learned much from working with the learning aids produced by the different groups.

In PBL initiatives if the main answer to the “Why?” question of assessment is to promote deep learning then this provides a basis for answering the other “What, “How?” and “Who?” questions.

Figure 5.10 Designing PBL assessments to promote deep learning



In the toxicology module, Carmel Hensey reports that the rationale for introducing problem-based learning generally and PBL compatible assessments in particular was to improve student engagement with the subject, promote deep learning and peer learning. The innovation was in reversing the lecturer-student roles for a component of the course and facilitating students to research and develop learning aids for use by their peers.

It is crucial to re-educate students to see assessments as learning events and opportunities for feedback as steps in a wider developmental process. Doing feedback well in PBL contexts includes building in calibration mechanisms as

part of the assessment process that is both formative and summative. These include:

> Channels to enable learners to check knowledge sources, develop understanding, calibrate their judgement against expert and peer work, regular opportunities to judge their own work before it is marked (Molloy and Boud 2013:26).

Sharing their learning from their independent study enables them to check and widen their knowledge sources. Fixed resource sessions where an expert makes a presentation and answers questions allows them to compare their knowledge to expert knowledge. Sometimes I get students to peer review their assignments. A student writes to a fellow student about what type of feedback they want. The pair discussions are an opportunity to review the work of a peer and their own work in comparison. For this to work well it is important to teach students how to give and receive feedback. I agree that we need to "focus more on students using feedback than on giving feedback" (Walker 2015:232). I encourage students to receive feedback as a gift or present and as an addition to their learning. Encouraging them not to be defensive and to make and carry out an action plan based on the feedback is key. In discussing how feedback is the breakfast of champions I sometimes tell stories of how my own work benefited from feedback that I acted on.

Self and peer summative assessment in conjunction with tutor assessment can help to " obtain a holistic view of students' contributions" (Alias et al 2015: 309), particularly when assessing teamwork. Guidelines on assessing group work incorporating self, peer and tutor assessments are provided in the further resources section.

Enhancer Three: Design PBL compatible assessments

If you have designed challenging engaging problems and facilitated PBL tutorials well, it would be a contradiction then to continue unreflectively with previous old assessments. It is important to give serious thought to making the assessments PBL compatible. When working with curriculum teams I challenge them to make strong links between the problems and the

assessments. I ask them “How can you design the assessments so they fall out of the problem?”

Assessment strategies “must support the central concept of PBL such as contextual learning, constructive learning and collaborative learning” (Schuwirth and van der Vleuten 2010:193). In this book I have focused on four key characteristics of PBL namely, the problem, the PBL tutorial, the PBL process and learning. So in reflecting on how PBL compatible proposed assessments are, it is useful to review them in relation to these characteristics.

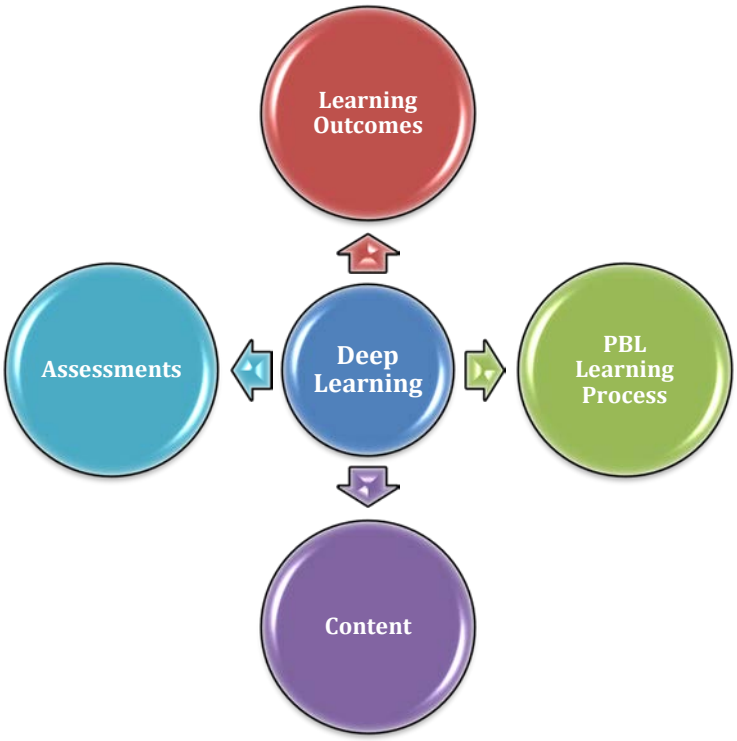
Fig 5.11 Reviewing the PBL compatible assessments

PBL characteristic	Review questions
Problem	What is *the relationship between the problems and the assessments*? Do students see clearly by working well on the problems they will do well in the assessments? Have you considered how some or all of the products that students produce from working on the problems could be assessable products? Could students do a reflective paper on what they have learned from working on the problems and how?
PBL tutorial	How is *the work in the PBL tutorial assessed*? Is it the team product and/or the team process to be assessed? How is it self-assessed by the students/ peer-assessed, and/or tutor assessed? What group assessments are there? What is the balance between group and individual assessments? Can students name the title of some of their assessments i.e. what they want to learn, like they name their learning issues in PBL tutorials?
PBL process	How do the assessments encourage students to make *connections* between the different elements of the PBL process e.g. the problem, the tutorial work, independent study, practicals/labs, lectures, work placements, skills sessions, research seminars etc. How do the assessments encourage students to see PBL as a *continuous developmental process* and to reflect individually and in groups where they are in that developmental process?
Learning	How are the assessments designed to promote *deep learning*? How are the assessments designed to encourage students to engage in *metacognition* and to be reflective on the content and processes of their learning? How do the assessments encourage students to develop high levels of skills in information literacy and become *independent learners*? How do the assessment encourage students to take responsibility for their learning? How do the assessments encourage students to be clear about what they know and what they don't know? Has the overall assessment strategy been reviewed for the

	danger of over-assessment? What weighting is given to the different assessments and what does this signal to the students?

Biggs and Tang (2007) highlighted the importance of constructive alignment that is, aligning learning outcomes, teaching methods and assessment. In PBL it is vital that these are all aligned to promote deep learning.

Figure 5.12 Aligning PBL curricula



In the toxicology module Carmel Hensey decided on the mixture of a group assessment based on the product and process of working on the problem and an individual MCQ to test breadth of knowledge from learning from the learning aids created by all the groups.

Figure 5.13 Group assessment of the learning tool, Carmel Hensey

• Comprehension of topic. 30% • Identification of Key concepts/Clarity of Delivery/Level Appropriate to Stage 3 Pharmacology. 30% • Enhancements to learning (visual/auditory/interactive etc.). Novelty/Creativity & rational for chosen methodology-submit a

paragraph (max 250 words). 30%
- Reflection on group work- submit a paragraph (max 200 words) on what went well and did not go well within the group. What actions would you take to improve the group process? 10%

Pettigrew et al (2010) challenge us to tailor our PBL compatible assessments to the abilities of our students and the nature of our discipline by providing a variety of assessments by choosing between the following variables

1. Group or individual assessment
2. Oral or written
3. Formative or summative
4. Peer or tutor assessed
5. Classroom or workplace context.

A meta-analysis by Gibels et al (2005) reviewed the influence of the reported effects of problem-based learning:

> Three levels of the knowledge structure that can be targeted by assessments of problem-solving are used as the main independent variables: (a) understanding of concepts, (b) understanding of the principles that link concepts and (c) linking of concepts and principles to conditions and procedures for application. PBL has the most powerful effects when the focal constructs being assessed were at the level of understanding principles that link concepts (Gibels et al 2005:27).

So when we are designing PBL compatible assessments it is advisable that they test not only the understanding of concepts but also an understanding of the application of principles that link the concepts. Principles help in understanding the nature of a problem and are an aid to brainstorming, planning and evaluating actions for problem resolution.

In addition to curriculum alignment Macdonald and Savin-Baden (2004: 7) suggest the following guiding principles that are particularly relevant to professional programmes but can also be adapted for other programmes

- Assessments should be ideally based in a practice context in which students will find themselves in the future-whether real or simulated

- Assess what the professional does in practice, which is largely process-based professional activity, underpinned by appropriate knowledge, skills and attitudes.
- Assessments should reflect the learner's development from a novice to an expert practitioner and so should be developmental throughout the process.
- Students should begin to appreciate and experience the fact that in a professional capacity they will encounter clients, users, competitors, statutory authorities, etc. who will, in effect, be assessing them
- Students should also be able to engage in self-assessment, evaluation and reflection as the basis for future continuing professional development and self-directed learning.

For further details of specific assessment methods to choose from, see the further resources section of this chapter.

Conceiving of learning as hard fun also has implications for assessment of learning in PBL. Students should be encouraged to exploit both the "hardness" and the "fun" of assessment as learning by having appropriately high standards and demanding assessments and yet some freedom to try new things, re-define the challenge, take a few risks occasionally and work in chosen media. Sometimes it can be appropriate for students to decide the focus and title of their own assessment. This mirrors the PBL process where students define their own learning issues, the questions they want to research further. In a module on problem-based learning for university lecturers I facilitate, one of the assessments is a team assessment based on the work on a problem. The second assessment is an individual assessment, where students choose the title of the question they want to work on. Consideration can be given to having all or some of the assessments marked on a pass/fail basis (rather than graded) as well as some assessments being team assessments in order to encourage creative and cooperative learning in PBL. In my module on problem-based learning both the individual and the team assessment are marked on a pass/fail basis.

Enhancer Four: Tutors facilitating tutorials in ways that combine academic rigour with enjoyment.

Understanding learning as hard fun in PBL encourages us as PBL tutors to be intellectually challenging and academically rigorous with students, but also to have space for student creativity and room enough for laughter and joy. Tutors clearly giving students the responsibility for defining their own learning issues and doing the learning themselves sends a strong signal to them that they must actively engage in hard work in order to resolve the problem. It is helpful to facilitate students being academically rigorous by being very clear about the high standards and hard work expected e.g. high level of research, reading peer-reviewed journals and synthesising what the research says that is relevant to the problem. Bringing previous students in to do a presentation on their experiences of PBL and showcasing some of their work is another way of demonstrating the high expectations that need to be met.

Tutors can ask “hard” questions and challenge students to think through their responses. This modelling can then encourage students to ask one another the type of questions that will lead to deep learning. I have also found that having appropriate outside experts/stakeholders come to the presentations (resulting from work on problems) to ask questions and review them can be one way of signalling that you are raising the bar, and this encourages students to do themselves proud. For example, I had some staff from the university’s international office and international postgraduate students come to listen to the presentation, ask questions and review the work of students working on a problem, which they had framed about designing a new course that aimed to attract many international students.

This hard work needs to take place in the context of students being comfortable with and enjoying their fellow team members. One way of creating this space is giving students the opportunity to get to know one another a little. For example, on the first day with one tutorial group, I brought in postcards of paintings and places and asked each one to pick a postcard that told us something about themselves (other than work or study) and to say a few words about this. In the tutorial space there should be room enough for joking and laughter. As the tutorial teams are small, eight or less, there is the

opportunity for students to get to know one another and to enjoy being with one another. This is particularly important for first years making the transition to higher education. Tutors and students who enjoy working in a PBL team show this naturally and their positive emotions can be contagious. A key result from a review by Albanese and Mitchell (1993) was that students found PBL to be more enjoyable and nurturing than traditional teaching. Enjoyment and fun help with motivation that is vital to learning (Barrett 2005).

David Ryan, a second year medical student from the University of Edinburgh remarked to me *" I would not have enjoyed university as much without PBL".* He said he got to know more people and made friends through PBL. He mentioned that in first year at the end of a problem the tutor would get them to do a round where each student would share a "fun fact" they had come across when working on the problem with the rest of the team. Here are a few of the fun or interesting facts David told me:

- Warfarin and other anticoagulants were originally used as rat poisons and were thought to be unsafe for humans. This belief changed in 1951 when an army inductee survived a large dose of warfarin in a failed suicide attempt
- Carbonated alcoholic drinks make people drunker more quickly than non-carbonated drinks.

In Aalborg where play has been consciously incorporated into problem-based learning in a new model of PpBL where it led to more relaxed and open relationship with the tutor, honest and meaningful sessions fun and where:

> the students seemed to get the needed confidence and courage to let go of their desire to be in control. They began to engage in the world more authentically and intuitively, which encouraged them try out new ways to approach the project and the learning process as a whole. We interpret this as an important step towards development of more creative students (Thorsted et al 2015: 75).

Enhancer Five: Encourage effective team formation

It is no fun if in a group of eight only five show up and are left to do all the work. Encouraging attendance is important for team formation. Attendance

can be linked to assessment. For example in one course I taught, students signed in and you had to have at least 80% attendance to pass the course. It is important to explain to students that important learning takes place in the tutorials and why it is vital to attend. Also students' responsibility for the team product and process can be discussed. Students can also be encouraged to explore in their teams how they will work with issues of attendance e.g. if students cannot attend for a good reason that they e-mail the student chair to let them know that they will not attend and how they will continue to work on the problem and engage in the teamwork. Good attendance and hard work together can help a team to bond.

Enhancer Six: Give attention to the physical environment

It helps to make the physical environment as welcoming and comfortable as possible. If it is possible to have tea and coffee facilities and if students can bring in some snacks, this can help to create a good relaxed atmosphere. Students can have the freedom to bring in artefacts that can help with the problem and to make the space their own. With some problems it is possible for students to choose to work with media they find particularly enjoyable e.g. video, webpages etc. Students can come up with and follow through their own ideas for making the physical space and the virtual learning space enjoyable and their own.

Enhancer Seven: Be transparent about how you assess the team product and/or the team process

Assessing the team product and process is often a thorny, hard and difficult issue in PBL. Firstly it is important to explain to students that in professional work you are often assessed as a team not individually e.g. a team submitting a funding proposal, a team submitting a tender etc. So sometimes being assessed as a team in college is compatible with certain professional work. In professional work we rarely get to choose our project team and students working in allocated teams mirror this demand that can sometimes be hard work.

It is crucial to be very clear about the criteria that will be used for assessing the team product and or/process. These explicit criteria can be written by the lecturers, the students, negotiated between these two parties or set by another party e.g. professional body or client. The discussion of these criteria is very important for learning. It needs to be clear who is doing the assessment-self/peer/tutor/other? There is a range of ways to assess teamwork for you to choose from. In the further resource section investigate the options for assessing group work. Being clear about how the product and/or process of the teamwork will be assessed provides opportunities for the teamwork to be a combination of hard work and enjoyable fun.

Enhancer Eight: Design PBL staff development initiatives to include opportunities to reflect and work on beliefs and values about teaching and learning.

Following Cooper and Trowler's (2002) model PBL staff development initiatives should include hints and tips but move beyond this, to include opportunities for the internalisation of learning theories and concepts, and adopting new value-based approaches to teaching and learning. Supporting lecturers to develop as reflective transformative practitioners includes encouraging them to reflect on their values and beliefs about teaching and learning and to critically analyse the assumptions underpinning these beliefs and values.

Figure 5.12 Dimensions of Teaching Development in New Academic Staff in Higher Education (Cooper and Trowler 2002)

Aspects of Development (effects)	**Activity or Learning Involved**
Accumulation	• Tips and tricks of teaching-memorised and practiced
Assimilation	• Internalisation of learning theories and improved understanding of learning and teaching processes. Extension of pre-existing cognitive and emotional schemata associated with everyday learning but no fundamental change
Accommodation	• Restructuring of cognitive and emotional schemata due to dissonance. A Gestalt 'aha' experience of 'penny drop' moment. New practices and attitudes are adopted
Transformation	• Identity change often associated with a crisis. Completely new approach to teaching and learning that can be life changing

Prosser and Trigwell (1996:80) argue that academic development that focuses on teaching strategies " is unlikely to be successful without an on-going focus on the intentions that are associated with the strategy".

It is helpful if PBL staff development initiatives provide space for the explorations of motivations, intentions and values for introducing this approach to higher education. This discussion does not have to be separate but can be interwoven into discussions about the purposes and processes of PBL. For example in discussing why people use PBL, this can be linked to what people value in higher education and the specific professions. When discussing practical strategies for facilitating tutorials there can be a discussion of the intentions and motivations behind these strategies. Then lecturers can share some of this understanding about their intentions and motivations for using PBL with their students. Lecturers working at the level of beliefs, values and intentions about teaching can be both hard work and an enjoyable liberating experience at the same time.

Enhancer Nine: Give lecturers opportunities to experience hard fun as PBL students in order to provide a good starting point for them to encourage their students to have similar experiences

Whether a PBL staff development initiative is a short one-day event or a longer event e.g. a module, it is important to design opportunities for academic staff to experience PBL as students. Having experienced learning as hard fun first-hand, viscerally, cognitively and emotionally they will be well placed and motivated to facilitate similar experiences for their students. When I do evaluations of PBL staff development initiatives and ask people what was most useful and why, they always highlight the opportunity to experience PBL as students. They then talk about things that were difficult e.g. hard to get the process going at the start and the high level of challenge of the problem and the things they found enjoyable e.g. they enjoyed the different characters and viewpoints within the team and the creativity.

Conclusion

I consider hard fun as a threshold concept in understanding the lived experience of learning in PBL. A threshold concept is defined as:
a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting,

or viewing something. (Meyer and Land 2003: 1). I found hard fun as a new way for me to interpret and understand the students' talk about learning.

Threshold concepts are considered to be transformative, integrative and troublesome (Meyer and Land 2003:1). This experience of creating the concept of learning in PBL as hard fun has transformed my understanding of learning in PBL. This important insight has influenced both the way I think about and the way I implement PBL and PBL education development. The concept of hard fun is integrative in that it brings together the different dimensions of learning as hard fun.

Learning in PBL is about the fun of laughter, creativity and playfulness and the hardness of the demanding activity levels, the difficulties, and the transformations. Fun without hardness is frivolity and hardness without fun is drudgery. Learning in PBL demands both the fun of playing with ideas and the hardness of refining and reworking ideas. Hardness and fun are complementary parts required for learning.

The concept of hard fun is troublesome because some people have difficulties with considering the notion of fun in learning as academically rigorous and practically and professionally relevant. It is also troublesome in that hard fun is counter intuitive by juxtaposing the words "hard" and "fun" to form a concept. I argue that hard fun is an illuminative threshold concept for understanding learning in PBL, that is, it offers us a new way of thinking about and doing "learning" in PBL. There are practical ways to enhance hard fun in PBL initiatives.

Summary of Practical Enhancers of Hard Fun

1. Design hard fun problems
2. Design assessments as learning opportunities
3. Design PBL compatible assessments
4. Facilitate tutorials in ways that combine academic rigour with enjoyment.
5. Encourage effective team formation
6. Give attention to the physical environment
7. Be transparent about how you assess the team product and/or the team process
8. Design PBL staff development initiatives to include opportunities to reflect and work on beliefs and values about teaching and learning.
9. Give lecturers opportunities to experience hard fun as PBL students in order to provide a good starting point for them to encourage their students to have similar experiences.

Further Resources

Resources on Deep Learning

Deep and Surface Approaches to Learning. The Higher Education Academy. Engineering Subject Centre
http://exchange.ac.uk/learning-and-teaching-theory-guide/deep-and-surface-approaches-learning.html

Atherton J S (2013) *Learning and Teaching; Deep and Surface learning* [On-line: UK]
http://www.learningandteaching.info/learning/deepsurf.htm

Creative Challenges for Science Students Video
http://www.ucd.ie/teaching/showcase/items/title,327463,en.html

Resources on Assessment

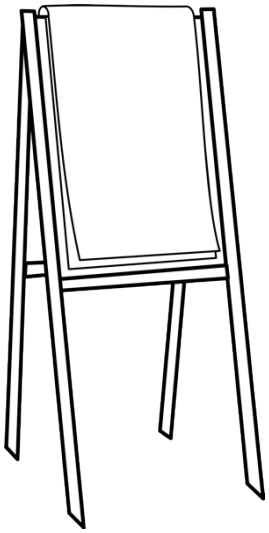
Macdonald and Savin-Baden. (2004) A Briefing on Assessment in Problem-based Learning. *LTSN,* Assessment Series No 13
ftp://www.bioscience.heacademy.ac.uk/Resources/gc/assess13.pdf

Atherton J S (2013) *Learning and Teaching; Forms of Assessment* [On-line: UK]

http://www.learningandteaching.info/teaching/assess_form.htm

The Centre for the Study of Higher Education (CSHE) Assessing Group work
http://cshe.unimelb.edu.au/assessinglearning/03/group.html

Action Plan



On your own and with your team think of a specific problem-based learning initiative you are currently designing or facilitating

- What are your intentions for introducing problem-based learning?
- What words particularly struck you in this chapter? Why?
- What new specific enhancers of hard fun would you like to use?
- What are your ideas for adapting these strategies for your contexts?
- What additional suggestions would you propose? Why?
- What will be your approach to your assessment strategy?
- What further reading or resource viewing have you been inspired to follow-up?

A PBL Practitioner's Response by Jane Ostrander

Response to the chapter by Jane Ostrander, Ph.D., Director, Experiential Learning Center, Truckee Meadows Community College, Reno, Nevada, U.S.A

Creativity, Courage, and Career Self-Efficacy through Hard Fun with PBL

There is a life force, an energy, a quickening that is translated through you into action, and because there is only one of you in all of time, this expression is unique. And if you block it, it will never exist through any other medium and it will be lost. The world will not have it. It is not your business to determine how good it is nor how valuable nor how it compares with other expressions. It is your business to keep it yours clearly and

directly, to keep the channel open.

Martha Graham, quoted by Agnes DeMille in *Martha: The Life and Work of Martha Graham* [R.S Zander & B. Zander (2000), *The Art of Possibility*, p. 116]

Our students need to have the entrepreneurial skills, confidence, and courage to find and/or create employment opportunities amidst changing technologies and cultures of work. Our approach to education needs to adjust so that our graduates are prepared for success in this changing landscape of work. PBL provides an opportunity for students to come into their life and career purpose--to dance their individual dances. PBL and hard fun specifically challenge students to stretch their limits and master new life and work skills. PBL done well can increase student engagement and career self-efficacy—the belief in one's own ability to succeed in the entrepreneurial globally competitive world of work.

PBL is neither easy to create nor simple to facilitate, yet research and our experiences in classrooms have shown that the benefits to students justify the effort required. How do you start transforming the culture of the classroom to a PBL experience? By changing the space in the classrooms to be experimental, edgy, challenging, uncertain, playful, daring, uncomfortable, and celebratory; By allowing space within the learning for individual and collective dances to unfold.

Our PBL projects (http://www.learnpbl.com/), funded by the National Science Foundation's Advanced Technological Education program, have worked with instructors, researchers, employers, and students to improve the development and implementation of PBL at community colleges across the U.S.A since 2003. We began with formal curriculum materials developed by consultants in collaboration with instructors and industry but soon realized instructors wanted to create their own materials for their students. We shifted to training instructors, either individually or in multi-discipline teams, to create scenarios and tasks for their own classrooms. Eventually we trained instructors to train others, scaling up the innovation nationally.

Our original goal was introducing professional skills (e.g. communication, teamwork, problem-solving) into the education experience of technicians. Over time we came to realize the value added by PBL is deeper and broader than we anticipated. Yes, well-designed challenges provide students the opportunity to master professional skills. However, what is even more important in our experience is that PBL challenges students to exercise courage, creativity, and leadership skills that will serve them well in their careers and life.

PBL is about exploring a philosophy of teaching and learning that centers the educational experience on the student as a whole being who co-builds the learning experience with fellow students, the instructor, and community. Our best PBL instructors challenge and support their students to do what often seems impossible. Instructors have reported that the more challenged their students were, the more engaged they became. As the Carnegie Foundation for the Advancement of Teaching (http://www.carnegiefoundation.org/) has found in their work with developmental mathematics instruction in community colleges, productive persistence by students leads to deeper learning and increased belief by the students in their ability to master challenging problems. Hard fun with PBL

provides students an experience in doing the impossible that they can build on when next faced with an impossible challenge. The fun is in meeting the challenge successfully, being able to choose what they are doing moment to moment (the freedom of creativity), the shared successes and failures, and the satisfaction in a job well done. Instructors consistently comment on how engaged the students become once they realize finding the answer is their job, not the instructors.

This chapter provides practical, practice-based strategies for implementing hard play that can be applied today by PBL practitioners in the classroom and in Professional Development Workshops to improve their practice of PBL and their students' learning. Following the steps suggested will fast track the reader's design and implementation of PBL challenges for her/his own classroom. Expanding the quality and quantity of PBL implemented in classrooms will in turn improve the quality of our graduates and our workforce.

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