

# **Sense and Sensibility**

## **Collaborative & Interdisciplinary Problem Design in PBL Initiatives**

Michael O'Grady<sup>1</sup>, Gavin Barrett<sup>1</sup>, Terry Barrett<sup>1</sup>, Yvonne Delaney<sup>2</sup>, Nuala Hunt<sup>3</sup>, Thomas Kador<sup>1</sup> and Valerie O'Brien<sup>1</sup>

### **Abstract**

This paper was conceived in response to an identified need for new PBL practitioners to be able to access a range of sample problems that would help them develop PBL within their own disciplines, particularly when outside of the life sciences. Likewise, a need for new approaches to problem design was also identified. Taking cognisance that problems should be grounded in the 'real world', we need to reconceptualise problem design. It is proposed that conceptualising problems as triggers that stimulate knowledge development by harnessing sensory experiences is a way forward. This paper will be of particular interest to new PBL practitioners, teachers in the various disciplines considering PBL and educational developers teaching PBL.

**Keywords:** Problem Design, Problem Based Learning, Senses, Social Sciences.

### **Introduction**

Problem Based Learning (PBL) is a total approach to education that involves students working in small teams on problems that are presented at the start of the learning process (Barrows 1989). Aspiring PBL practitioners face a number of challenges when considering how to introduce PBL into their own curricula; institutional policies, adverse reactions of colleagues and students and their own fear and lack of confidence in the PBL approach may all seemingly conspire against its use. In making the decision to introduce PBL, it is natural that other people's experience in a similar or cognate discipline may be canvassed. And it is here that a key difficulty is first encountered. There is not an abundance of sample PBL problems, particularly in the social sciences, for new PBL practitioners to learn from.

All of the authors except one are lecturers who had completed a staff development module on problem-based learning in higher education. The learning processes used in the module were experiencing problem-based learning as PBL students in PBL tutorials and engaging in workshops in different aspects of PBL. One author was the co-ordinator of this module and PBL tutor to the group of lecturers who later decided to author this paper. The PBL tutorial group decided to continue to meet after the module to help one another design and implement PBL initiatives. The first task was to help one another design and peer review problems for students in a range of disciplines. We thought that

---

<sup>1</sup> University College Dublin, Ireland

<sup>2</sup> University of Limerick, Ireland

<sup>3</sup> National College of Art and Design, Ireland

sharing some of these sample problems and what we learned about problem design would be useful to other PBL practitioners and hence the idea for this paper.

Well-designed and authentic problems are crucial to the success of PBL (Gijsselaers & Schmidt 1990; Jonassen & Hung 2008).

Problems have always mobilised and stimulated thinking and learning; they energise our activity and focus our attention. When problems are experienced as relevant and important, people are motivated to direct their energies towards solving them (Barrett & Moore 2010, 3).

One approach to designing problems is to ground them in the real world where possible. A further verification of this, from a prospective PBL practitioner's perspective, is to consider what combination of senses will students use while they engage with a particular problem.

### **Where are the sample problems?**

While PBL is well established in some disciplines in higher education such as medicine and science, generally, it is not used extensively across other areas such as law, archaeology, social science, computer science, business, art and design. Sample problems can provide, an example, an approach to problem design, and an effective choice of media. They can also trigger ideas and create connections. This paper provides a number of sample problems, especially for disciplines outside of the life sciences. All the problems documented aim to encourage learning through activating the senses.

## **Designing Problems: Engaging with Learning through the Senses**

When the phrase *to sense* is used, it means that all the senses are being tapped for information and that this results in what we call “perception”. The role of the senses is to inform the mind. Perception will thus be as keen or as dull as the quality and the validity of the information the senses affirm (Erikson, 1985, 85).

Problem-based learning practitioners have benefited from much advice from the literature about problem design that tells them that quality problems should be: authentic, engaging, deliberately loosely-structured, linked to learning outcomes and key concepts, multidimensional, and graduate attributes and professional practice focused (Barrett 2005; Barrows & Tamblyn, 1980; Conway & Little, 2000; Gijsselaers 2005; Margetson 1997). In addition some theoretical models have been provided to give problem designers new ways of thinking about and hence new ways of engaging in problem-design. Hung's (2006, 2009) 3C3R (content, context, connection, researching, reasoning and reflecting and Barrett's (2006) reconceptualisation of problems as provokers of liminal spaces provide us with some theoretical frameworks for designing problems. However we argue

that also incorporating an understanding of learning through the senses adds a further dimension to designing engaging, challenging and effective problems that help us link practical, tangible sensorial experiences to theoretical concepts.

We think it is important to return to the basic learning principle that all knowledge construction at each stage of life starts with direct sensory experiences.

Sense experience is that vital communication with the world which makes it present as familiar setting for our life (Merleau-Ponty 1962, 61).

As sensory experiences provide a connection to the real world, problem designers would be advised to draw more fully and explicitly on the senses in order to engage learners in all the dimensions of real life, in both social and professional settings.

Many PBL problems focus on the use the “higher sense” of sight (text-based and pictorial-based problems) while the “lower” senses of smell, taste and touch – are rarely engaged by the curriculum, as they are not considered to provide “ways to wisdom” (Classen, 1999, 271). We argue that there should be no hierarchy of senses in higher education and ‘exactly which of the senses may or may not be most important at any particular moment depends on the activity or task being undertaken and the context and cannot be specified in advance’ (Tilley 2004, 16). Therefore, the potential for learning from problems could be further exploited by consciously focusing on a fuller range of senses: sight, hearing, touch, taste and smell. For example, let us consider designing problems based on the senses of sound and touch.

‘Sound can get inside you and shake you up, in a way that light cannot’ (Ingold 2000, 244).

In contrast with pictorial space, ‘acoustic space is dynamic, always in flux, creating its own dimensions moment by moment [...] it does not pre-exist and enclose the speakers and listener but rather takes shape around them in the very process of their auditory engagement with one another and with the environment’ (Ingold 2000, 249). Designing problem triggers that focus on the powerful sense of hearing and are presented to the students aurally only can be very effective. They may include listening to a radio interview of a victim of abuse, hearing a song with controversial lyrics, listening to a poem read by the poet or overhearing a conversation at work.

In terms of the sense of touch, our ‘skin, which from head to foot relates us sensitively to the world in which we live, our matrix, is indeed our most consistently active and informing organ of sense’ (Erikson 1985, 89). Touching physical objects can present powerful problem triggers. This can involve: the brief to create an object, being presented with a broken or fragments of an object, placing order upon a range of randomly assembled objects or facilitating people’s engagements with objects unfamiliar to them.

In addition to problem design, what about encouraging students to work though problems in a variety of ways and with a variety of media in order to connect with different senses

and to make sense of the problem? We argue that problem designers should be aiming to facilitate students to develop an embodied rather than disembodied knowledge, personal understanding rather than abstract laws and multi sensorial rather than primarily text-based learning. Designing problems with an understanding of learning through the senses is key to this deep sensorial learning.

## Sample Problems

In the following sections, a variety of problems from a range of disciplines are described. These are based on or are applicable to real-world problems. In each case, the problem stimulates the senses and, in turn, the effective use of senses is critical to the understanding and resolution of the problem. Each problem will be presented by giving a short background to the problem and then the problem will be presented exactly as the students will receive it. Finally the problem will be discussed in relation to both learning through the senses and the key transferable features of the problem design.

### *Hearing the words and undertones: a conversation on the factory floor*

#### *Background*

The Certificate in Management programme is offered to front line managers at the University of Limerick and delivered through PBL. The managers attended the university for one day per month over a nine months period. They covered several different management topics in addition to the preparation of a reflective journal and participating in a range of skills-based exercises. In the case of a Management and Leadership module the problem is addressing the development of Pat, a front line manager, into a more organised and disciplined manager and leader. However it highlights the need for Pat to manage and listen to his subordinates. Coupled with this, Pat needs to interpret the undertones of a conversation with his boss. The problems below was presented to the students aurally only but are presented here in text format to share with the readers.

#### *Problem Statement*

<b>Pat:</b>	So sorry that I'm late for our meeting. Not enough hours in the day. The canteen is very busy this morning. Just came from the production planning meeting; cannot trust those planners to get things right. Mr James' priority order for the UK will be late. [ <i>Clink of cups</i> ].
<b>Mary:</b>	No worries. I just wanted to have a word with you about getting some time off. [ <i>Crash of canteen tray</i> ]
<b>Pat:</b>	Sorry, Mary, what did you say?
<b>Mary:</b>	It's just that I may need some time off to handle a personal issue.

**Pat:** [Loud music playing on over canteen intercom]  
 What personal issue???  
 [Pat's mobile rings]  
**Mary:** My husband...  
**Pat:** Hello [Pat's phone].....No!! No problem I can be there right away.  
 Sorry Mary must dash. Mr James needs to see me at once urgently - an important issue.  
**Mary:** When can we talk?  
**Pat:** Later today, or tomorrow. I'll catch up with you!  
 Must go!!

**Mr James:** Pat...take a seat  
 [Low hum of traffic in the background]  
**Pat:** Lovely office Mr James. Great natural light.  
**Mr James:** How are our customers?  
 [Scuffle of papers and click of Parker Pen]  
**Pat:** I have just come from the production planning meeting; a few issues; nothing that cannot be sorted.  
 [Clears his throat]  
**Mr James:** Was Tom at the meeting?  
 [Short silence]  
**Pat :** Nooo...didn't see him.  
 [Pat's face went red. Strong eye contact from Mr James]  
**Mr James:** I suppose you heard he's leaving us.....This will create an opportunity for the right man.  
 [Silence. Only the clunk sound of Mr James glasses case being closed snapped Pat back to reality, the General Managers office]  
**Pat:** Noooo. I mean yes.  
**Mr James:** We can leave it at that Pat. Keep up the hard work.  
 Good bye.

### Discussion

This problem has two parts; it is introduced with loud **backgrounds sound** of a busy canteen. The disorganised Pat arrives late for his meeting with a staff member (**not listening to her**) and displays no real management or leadership skills. The second part shows Pat meeting with Mr James in his office Pat is trying to interpret the **undertones** from the conversation but is lost for words, total **silence**.

The problem allows the student to identify the need for Pat to listen and embrace the importance of time management and prioritising. Pat would need to develop deeper insights and understanding into personal management strengths and development areas. This problem addresses a real life situation and this style of problem could be applied to a number of situations

## ***Getting communities in touch with their past: doing archaeology in the ‘real world’***

### *Background*

This problem is the first of two on a module in community engagement for archaeology, designed for students with an advanced understanding of archaeological theories, methods and contemporary practice (i.e. final level undergraduate or MA students). Alternatively, it could also be specifically targeted at professional archaeologists, who are currently struggling to find employment in mainstream archaeology, wishing to develop new skills in community engagement.

### *Problem Statement*

You are working as a team in a small archaeological research organisation and receive the following letter:

Dear Sir / Madam,

We, the Ballybeg Archaeological and Historical Society, have raised €1000 to investigate a site in our locality known as the ‘fairy ring’ (see enclosed map). But our County Heritage Officer told us that as non-professional archaeologists we are not allowed to carry out any archaeological work. All we want to do is find out as much as possible about the history of our own area and present it to the wider community. What can we do?

### *Discussion*

Given the strict legislative framework protecting archaeological sites and monuments in Ireland (Government of Ireland 1930; 1954; 1987; 1994; 2004), it is very difficult for community groups that take a keen interest in the history of their locality to find ways to actively investigate such places. Therefore this problem addresses a real life issue for many people around the country and the second problem involves putting this into practice through an actual collaborative engagement with a community group with a view to producing a strategy for a community-based archaeological research programme.

Despite having a longstanding tradition as an amateur and voluntary activity, community based approaches to archaeology have only recently been recognised as making a valid contribution to the discipline. Consequently, this area is significantly under-theorised and without a blueprint for best practice. Moreover, practical approaches to community archaeology vary greatly between countries, due to differing traditions and legal frameworks concerning the treatment of archaeological remains. For these reasons a problem-based approach would seem well-suited to exploring the issues and challenges arising in relation to the practice of community archaeology. A PBL model will also

allow the students to engage directly with community groups in developing community-based archaeological research programmes. This will also address the fact that archaeology students generally are not trained in working collaboratively with non-professionals. At the same time, there is a great public interest in the workings of archaeology and this model represents an excellent opportunity to bring archaeology closer to public audiences and into communities.

Archaeology deals with the material remains that people left behind, with the aim of gaining an understanding of their social, cultural and economic lives. In essence, archaeology grants us access to the past through the *sense of touch*, by engaging with the physicality of artefacts, structures and landscapes that have been shaped by people in the past. But often this past also forms part of our present, as we all inhabit places shaped by previous generations. In this sense doing archaeology, through being actively engaged in excavating, surveying, documenting and interpreting, can enable people to get in *touch* with their own history and identity.

These problems allow the students to apply their knowledge of archaeology to the benefit of the wider community by enabling members of the public to participate directly in an otherwise highly specialised and restricted activity. Clearly, issues of access and expertise are not peculiar to archaeology. Hence a similar approach could easily be adopted in relation to a different, non-archaeological, subject matter, be it environmental, social or cultural. The problem trigger could be in the form of a letter, an e-mail or a telephone conversation requesting assistance from specialists to work with amateurs to work on a local social, community, economic or technological project.

### ***Visualising participatory arts, and culture in community contexts***

#### ***Background***

This problem will be given to a group of students taking a post-graduate course in, community, arts, education. Typically students will already have an undergraduate qualification in Fine Art or Design, and hope to work within the arts in further or community education settings. As part of the programme students are required to undertake a community based placement. A PBL approach will be adopted for this module to encourage active participation, problem solving and collaboration among students. The module aims to enable students to plan, facilitate and evaluate participatory arts activities in response to identified needs within a community.

Studio practice has been the dominant model in art and design higher education for many years. Consequently, participatory or community arts found it difficult to gain a foothold in the arts world. However, it has become a recognised feature of visual arts education and practice, with some innovative and sophisticated models emerging. Funding for participatory arts is difficult to acquire and in the current economic climate funds for projects and activities are especially scarce.



**Figure 1.** The Fatima flat complex in Dublin's South inner city.

### *Problem Statement*

#### Emergency Meeting

An emergency meeting has been scheduled in the local community centre to consider ways to address the crisis facing inner city communities as a result of financial cutbacks.

You are one of several visual artists invited to the meeting to contribute ideas and propose ways in which you could participate in arts, and cultural activities locally. Ideas or proposals should be sustainable and in keeping with models of participatory arts practice which the communities have a reputation for developing.

There is a strong activist tradition within the area, the arts are often used to address social and developmental issues locally. You have forty five minutes to present using visual and audio facilities.

### *Discussion*

The community this problem is identified with exists in the south inner city of Dublin; it is known as Fatima (Figure 1), and has been transformed as a result of an urban regeneration project. The initiative began over a decade ago; since then there have been major physical, social and cultural changes, resulting in the demolition of old corporation flats which have been replaced with new two storey dwellings, and a community and

cultural centre. Previously the area was stigmatised by housing problems, drug issues and unemployment.

Several urban regeneration projects are underway in Ireland. Fatima represents a positive collective response to issues of change, urban renewal and cultural identity. Arts and culture have been a central plank in strategic planning for the regeneration of the area. Key moments of transition and transformation in the life of the community are recorded in a range of visual arts and performance projects.

Placement can be a challenging experience for students, particularly as communities have distinct social and cultural identities. The problem presented here as a funding crisis is common in the arts, though resources alone will not solve the issues. Students will be required to navigate the complexity of community, arts and participation, at a local level recognising that established or inherited visual arts practices may not fit within this context. A PBL approach should facilitate students to discuss, examine, and create solutions in response to the challenge. Visual artists, and designers are visually aware, they acquire a visual language through exploration and experimentation. This visual sensibility manifests itself in their work and approach to learning, consequently the outcomes here will be visual.

This style of presenting a problem in both visual (e.g. photo) and textual formats, and expecting students to present their work on the problem visually as well as with words, can be effective in many disciplines for helping students visualise creative future possibilities while resolving problems.

***‘Sniffing Out’ legal issues: using PBL to teach European Union internal market law at masters level***

*Background*

A central skill which must be acquired to become a good lawyer is the ability to 'sniff out' the legal issues buried in a sometimes complex matrix of facts. The opportunity to innovate in developing such skills recently presented itself in teaching a postgraduate course involving a weekly two hour class taught over six weeks on European Union Internal Market Law at UCD Dublin Law School.

*Problem Statement*

Provide legal advice to Horace, Boris, Norris and Doris.

Horace is a Haitian carpenter who worked in France for years but whose qualification is not recognised in Ireland. Boris, a Belgian Russian-trained doctor, has worked in Portugal and is being charged a fee for recognition of his qualification. Norris, an Irish Danish-educated therapist, can't get his Danish qualification recognised in Ireland. Doris is a German clockmaker who can't get her German course recognised because it is shorter than the equivalent Irish course.

### *Discussion*

A 'mixed' rather than pure form of PBL was used in the class (Bailey, 2006). Each week, a complex problem relating to a particular area of internal market law was put up on the class internet page.

Two students were assigned principal responsibility for the problem and requested to come back one week later to present and discuss possible solutions. Powerpoint presentations soon became standard among students, adding a valuable visual element and facilitating in- and post-class study. Problems were thoroughly discussed in class.

This approach involved a sensory approach on several levels. The metaphorical 'sniffing out' of legal issues combined fun with intensive learning. Powerpoint presentations used students' sense of vision. Listening to their peers in pre-class and in-class discussions was a valuable - and for some students - a very new learning experience. Student reaction was positive, aided by there being no final examination and the relatively relaxed atmosphere. The quality of presentations varied, but tended to be high, and occasionally exceptionally so, with students working harder than they would have using standard lecturing methods and demonstrating knowledge of cases decided by Courts only days previously.

This is an example of a problem that is deliberately short and loosely-structured, which forces students to sniff out and define for themselves what the key issues are. It gives them freedom to maximise the use of a range of up-to-date resources to work creatively and to a high standard on these issues. In addition to these transferable features we can all use humour as a powerful medium for engaging students, regardless of the discipline.

### ***Feeling the Pain: Utilising the film 'Ladybird Ladybird' as the problem in child welfare education***

#### *Background*

The film 'Ladybird Ladybird', a 'docu drama' directed by Ken Loach (1994) is a highly emotionally charged film and its portrayal of a family's encounter with social service and social work interventions in relation to care and protection of the children is raw, unnerving and highly emotional (Figure 2). The emotional resonance evoked by the social issues depicted in the film, while being entirely fictional, make it extremely well suited as a problem for the teaching of a child welfare module at Masters level for students with limited child welfare experience.

#### *Problem Statement*

After receiving an introductory overview of child welfare in which the interconnectedness of relationships, context, process and outcomes is stressed, the students watch the entire film in one sitting. Cinema conditions are recreated as far as possible without the advantages of the ice cream and pop corn!
--



**Figure 2.** A scene from Ladybird, Ladybird.

Prior to watching the film, the students are divided into groups of 7/8 and each group is presented with a selected juncture within the film. These junctures are based on the evolving story line in the film and they are also mapped onto the child welfare continuum: family support - child protection - alternative care options.

The students then have to track issues and identify questions in terms of the emotional impact of the designated film juncture. This provides the basis for discussion immediately after the screening and facilitates the processing of the emotional and cognitive reactions. Secondly, each group has to prepare a 30 minute presentation which addresses the key practice, policy, legal and value issues the respective juncture raises within an Irish context and make recommendations for any change needed based on a best practice framework. The creative use of multimedia is encouraged for the presentation.

### *Discussion*

Film has a role in education (Blumer 2010) as it has the capacity to evoke emotion and jettison the viewer into a heightened emotional state and, through watching it, the viewer's own narratives and identity can be constructed, reinforced, challenged, and opened up. This can potentially lead to a process of change in the viewer's beliefs, actions and understandings. As most students will not have solid practical experience of child welfare, it is useful to utilise a case study as an anchor for child welfare education. The fictional element allows for multiple possibilities to be explored. The raw emotion in the film engenders a strong emotional response. This can help the students to make connections between 'head' and 'heart', thus tuning into their own feelings and emotional

responses, which is extremely important in professional social work education programmes.

However, the use of film and audio-visual media as a problem trigger has clearly much wider applicability in PBL. In particular, such media can create a uniquely strong emotional response among students, as is the case with the example presented here. Therefore the judicious use of film and video clips allows students to appreciate the roles and responses of different stakeholders in a given scenario, and provides them with opportunities to clarify their own emotional and planned professional responses to problems within established best practice frameworks.

### ***Reconciling conflicting senses: applying mobile computing in a botanical setting***

#### *Background*

Mobile computing is the dominant paradigm for computer usage. Yet the classic workstation remains the predominant platform through which computing concepts are taught, resulting in a generation of graduates having completed their studies without exposure to mobile computing. Indeed, their experience of configuring such devices may be limited to them changing the ring tone. At present, mobile computing is usually taught at graduate level, as students will, at this stage, have mastered key computing constructs. However, while there are commonalities between both paradigms, there are significant differences. To understand these, students need to be exposed to situations where such differences, and the implication of such, are clearly illuminated.

#### *Problem Statement*

A curator at the National Botanic Gardens (<http://www.botanicgardens.ie/>) has hypothesised that conventional mobile phones may be used to augment the experiences of visitors in a variety of ways. However, the implications of this from a financial and technological perspective remains to be seen. Advise the curator as to what options might be pursued. Recommend a solution, and implement it as a prototype that demonstrates the requisite functionality to the widest possible audience. The prototype should be robust enough to conduct initial user trials so that visitor attitudes can be gauged, thus informing a potential final system.

#### *Discussion*

Services and applications for mobile users are usually accessed in non-conventional settings. Indeed, it is impossible to predict the prevailing context when a service might be required. It is this unpredictability that students must first understand. To achieve this, the problem must, in the spirit of PBL, be grounded in a real world setting. A botanical garden is one useful setting for this, but other settings could be used without compromising the learning objectives.

From a technological perspective, students will explore a number of technologies and be obliged to make choices that they can defend. More importantly, the question of interaction must be considered and what modalities or combinations of senses do they envisage using in this scenario. A critical challenge for them here is how they reconcile two conflicting issues. Computing devices by their nature tend to monopolise the senses. Yet in this instance, the objective is to discreetly bring attention away from the device itself and direct it to select aspects of their immediate environment, including the visual, auditory and olfactory. How effectively this conflict is managed will determine the success of their respective prototypes.

This style of problem which is a consultants brief from a client and involves visiting and surveying a public venue and analysing its services, in addition to talking with the client in order to apply an up-to-date technology solution to a real world problem can be adapted to many disciplines. Working on a project in a high profile venue can challenge the students to higher levels of creative and critical thinking than working on a simulated problem on-campus.

***Choose the media to work through the problem: Connect with your senses and develop your creativity***

#### *Background*

The context of the next problem that will be presented was a module on PBL that was part of a staff development Postgraduate Diploma in Learning and Teaching in Higher Education. These PBL students were all lecturers in higher education in Ireland. The lecturers came from a variety of disciplines including engineering, business, art and design, nursing and architecture. These participants were problem-based learning students for this module. The aim of the module was to enable participants to design, deliver, assess and evaluate problem-based learning curricula critically and creatively in their own contexts. The participants used a PBL process guide as an aid in assisting them working through the PBL process. Thus, both the content and the process of this module were problem-based learning. The second problem that the participants were presented with was as follows.

#### *Problem Statement*

### **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 and teamwork. Your presentation is on the second day and is for two hours.

You are free to work in any media.

## *Discussion*

One team chose to do their presentation using shadow acting. A group of participants acted as a PBL team behind a sheet. Thought bubbles were projected onto the sheet. One narrator narrated the story of the PBL team as it developed every week. A second narrator linked what was happening in the PBL tutorial to theory and research of the PBL process. Two students (who were given pseudonyms) from this team commented:

*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.

Giving students the freedom to work in different media encouraged both these students and their audience to learn through a range of media by connecting with many of their senses (sight, hearing and touch). Higher education aims to develop creative thinking and giving students the choice of media so that they can play with the inter-relationships of ideas and media is key to this. Creativity is characterized by Robinson (2001, p. 211) as having four main elements:

- the importance of the medium
- the need to be in control of the medium
- the need to play and take risks, and
- the need for critical judgement

There is much written about the importance of developing students' creativity in higher education (Jackson et al 2006; Kleiman 2008). One approach to bringing forth creativity is to add the sentence "*You are free to work in any media.*", or an equivalent, to the end of a problem that is presented to students. This option can be incorporated into a multitude of problems in any domain. Giving students a choice about the structure, content and media to work with is an engaging and challenging approach to encouraging creativity.

## **Conclusion**

In our desire to present sample problems for PBL practitioners outside of the life sciences, we have also elaborated the key transferable features of the design of these problems. We have argued for using a theoretical understanding of learning through the senses to complement the existing conceptual frameworks underpinning problem design.

Our contribution provides readers with new ways of thinking about and doing problem design. Finally, this paper was written collaboratively by a group of mainly new PBL practitioners to help them design problems for their initiatives. And this group continues to share experiences and to support one another in the implementation and evaluation of PBL initiatives across a range of disciplines.

## References

- Bailey, S. (2006). Can a problem-based learning unit exist in isolation on an undergraduate LLB? *Web Journal of Current Legal Issues*, 3. <http://webjcli.ncl.ac.uk/2006/issue3/bailey3.html> (accessed 12 August 2011)
- Barrett, T. (2005). Understanding Problem-based Learning. In T. Barrett, I. Mac Labhainn, I. & H. Fallon (Eds.), *Handbook of Enquiry and Problem-based Learning : Irish Case Studies and International Perspectives* (pp. 13-25). Galway: CELT, National University of Ireland Galway and All Ireland Society for Higher Education.
- Barrett, T. (2006). The problem as a provoker of a liminal space betwixt and between old and new ways of knowing. In E. Poikela & A.R. Numenmaa (Eds.), *Understanding Problem-based learning* (pp. 33-50). Tampere: Tampere University Press.
- Barrett, T & Moore S. (Eds) (2010). An Introduction to Problem-based Learning. In *New Approaches to Problem-based Learning: Revitalising Your Practice in Higher Education*. New York : Routledge, 3-17
- Barrows, H. (1989). *The tutorial process*. Springfield IL: Sothern Illinois University School of Medicine.
- Barrows, H. & Tamblyn, R. (1980). *Problem-based learning: An approach to medical education*. New York: Springer.
- Blumer, M. L (2010). And Action! Teaching and Learning Through Film. *Journal of Feminist Family Therapy*, 22, 225-235.
- Conway, J. & Little, P. (2000). From practice to theory: Reconceptualising curriculum development for problem-based learning. In O.S. Tan, P. Little, S.Y. Lin, & J. Conway, (Eds.), *Problem-based learning. Educational innovations across disciplines: A collection of selected papers* (pp. 169-179). Singapore: Temasek Centre for Problem-based Learning.
- Erikson, J.M. (1985). Vital Senses: Sources of Lifelong Learning. *Journal of Education*, 167(3), 85-98.
- Fitzgerald, S. (Ed.) (2004). *An outburst of Frankness*. Community Arts in Ireland, New Island.
- Gijsselaers, W. (2005). *Putting minds at work*. Keynote paper presented at the International Conference on Problem-based Learning, PBL in Context: Bridging Work and Education, Lhati, Finland.

- Gijsselaers, W. & Schmidt, H. (1990). Towards a causal model of student learning within the context of problem-based learning. In Z. Noonan, H. Schmidt & E. Ezzat (Eds.), *Innovation in medical education: An evaluation of its present status*, (pp. 95-114). New York: Springer.
- Hung, W. (2009). The 9 step problem design process for problem-based learning: Application of the 3C3R model. *Journal of Educational Research Review*, 4, 118-141.
- Hung, W. (2006). The 3C3R Model: A conceptual framework for designing problems in PBL. *The Interdisciplinary Journal of Problem-based Learning*, 1(1), 55-77.
- Ingold, T. (2000). *The Perception of the Environment: Essays in livelihood, dwelling and skill*. London: Routledge.
- Jackson, N., Oliver, M., Shaw, M., & Wisdom, J. (2006). *Developing Creativity in Higher Education*. London: Routledge
- Jonassen, D. & Hung, W. (2008). All problems are not equal: Implications for problem-based learning. *The Interdisciplinary Journal of Problem-based Learning*, 1, 21-39
- Kester, G. (2004). *Conversation Pieces, community and communication in modern art*. University California Press.
- Kleiman, P. (2008). Towards transformation: conceptions of creativity in higher education. *Innovations in Education and Teaching International*, 45(2), 209-217.
- Ladybird, Ladybird. Directed by Ken Loach. Los Angeles, CA: The Samuel Goldwyn Company, 1994.
- Margetson, D. (1997). *Wholeness and educative learning: The question of problems in changing to problem-based learning*. Keynote paper presented at the International Conference on Problem-Based Learning, Changing to PBL. Uxbridge, London.
- Merleau-Ponty, M. (1962). *Phenomenology of Perception*. London: Routledge.
- Tilley, C. (2004). *The Materiality of Stone: explorations in landscape phenomenology*. Oxford: Berg.
- Sayer, K. Wilson, J., & Challis, S. (2004). Problem based learning in constructed textile design. *International Journal of Art Design Education*, 25(2), 156-163.
- Robinson, K. (2001). *Out of Our Minds: Learning to be Creative*. Chester: Capstone Publishing.
- Universiteit Maastricht. Components of problem-based education, <http://www.unimaas.nl/pbl/law/law002.htm>, (Accessed 12 August 2011)