

Talking about the unknown

by Jan Visser & Muriel Visser

Any scientist . . . who wants to make important discoveries must study important problems. Dull or piffling problems yield dull or piffling answers.... The problem must be such that it *matters* what the answer is.

Peter B. Medawar, 1979 (p. 13)

From Lwów to Dallas

Consciousness about what we don't know is a major condition for the advancement of any science. Thus, in the first half of the 20th century, Polish mathematicians, who used to gather in the cafés and tearooms of places like Lwów to discuss the defining questions of their field, developed a handwritten book in which they inscribed – and continuously annotated – the great unsolved problems of their discipline. This book was called the *Scottish Book* as it was kept in the Scottish Café in Lwów. Ulam (1991) describes how, whenever there was a need to add a particular problem or annotation to the book, a waiter was called who handed this book of problems to the mathematicians in attendance. Miraculously, this fascinating notebook, the collaborative conscience of an important school of mathematicians of the pre-World War II period, escaped the devastation of the years that followed and it eventually got published. In its time, the *Scottish Book* helped challenge interested mathematicians to work on the problems inscribed in it. Some of those problems have since been solved; others haven't. The print edition of the *Scottish Book* is now hard to come by. An edited translation (Ulam, 1957) of it was eventually published by the Los Alamos Scientific Laboratory. An

excerpt of the book can be found at <http://www.icm.edu.pl/home/delta/delta2/dlt0209.html>.)

So far about mathematics, though. The remainder of this article is not about mathematics but about the science of learning and about an initiative of the Learning Development Institute (LDI) called the *Book of Problems (or what we don't know about learning)*. This initiative – called the BOP initiative for short – brings together a transdisciplinary community of scholars. During the 2002 International Conference of the AECT in Dallas, a fair proportion of that scholarly community participated in a workshop, combined with a transatlantic teleconference on brain research, and served on the panel of a Presidential session.

Looking over the edge of the abyss into the void of the unknown

The central assumption behind the BOP initiative is that, despite appearances to the contrary, we still know very little about human learning. As this is a rather bold statement, we better qualify what we say. At first sight one may be inclined to disagree with the above assumption as so much has been achieved over the years in terms of accumulated research findings (see e.g. Bransford, Brown & Cocking, 1999) that one may rightly claim that, in fact, we have a pretty good

handle on the issue of learning, particularly in so far as we are able to create in a deliberate fashion the conditions necessary for generating, through instruction and training, specifically formulated learning outcomes. However, such a conclusion is merely correct to the extent that one defines learning as the consequence of instruction. As soon as one is willing to look at learning as something more broadly defined (see e.g. Y. L. Visser, Rowland & J. Visser, 2002), one realizes how much is still totally unknown and that, in fact, starting to look at the really big questions – looking, as it were, over the edge of the abyss into the darkness of what we do not know – is both forbidding and exciting. No wonder, therefore, that the thrill of that challenge has attracted some of the best minds to start collaborating on formulating thoughts that are meant to challenge the business-as-usual attitudes of researchers, theoreticians, practitioners, and policy makers.

The BOP community of scholars

The *Book of Problems* (n.d.) homepage lists and provides biographical information about 26 individuals, who have so far joined the BOP initiative. The fact that so many joined, and that so many of those who joined are among the top scientists in their respective fields, is a good measure of the perceived

relevance of the BOP initiative. It also justifies the expectation that the collaborative engagement of the BOP community will contribute to a notable change of perspective. That perspective is by no means limited to the disciplines that have traditionally contributed to our understanding of how people learn. In fact, it is a decidedly transdisciplinary perspective, reflecting the many different angles under which the



Members of the BOP community of scholars engaging in dialogue across the disciplines during a workshop session.

phenomenon of human learning can be represented. Thus, the dialogue among members of the BOP community must take place across the boundaries of the variety of disciplines that contribute to the understanding of human learning. The group therefore includes – in addition to those who have advanced such understanding through research and theorizing about learning in different instructional and training contexts, i.e. educational researchers, instructional designers, and the like – representatives from such fields as physics, biochemistry, philosophy, art and design, communication, mathematics, media technology, the multiple branches of psychology, neuroscience, anthropology, and physiology. A more complete picture of the rich diversity that characterizes the BOP community can be gleaned from visiting the above mentioned homepage of the Book of Problems. Readers are particularly encouraged to explore on that Web page the collection of 22 mini essays inspired

by the central question underlying the BOP initiative.

What is at stake?

Multiple issues are at stake. First and foremost there is the issue of starting to look at learning beyond the limitations of what happens in purposefully structured learning environments in which desired attitudinal or competence goals are to be achieved along the lines of well designed processes. While no one doubts that important learning takes place within such limited contexts, the BOP community is acutely aware that such learning is merely a component of a much more complex process and that it thus matters to get to know the more complete equation of interdependencies. It wishes to share this concern with the larger community of researchers and practitioners and to be influential in changing research agendas and policies in line with its concerns.

A second issue at stake has to do with the nature of the problem area under consideration, which, as will have become clear from the above, is essentially transdisciplinary. In other words, it requires attitudes and procedures within the research community that elevate people’s thinking and work habits to a level that transcends what each individual would tend to do within her or his discipline. It also implies a willingness to recognize that no single discipline can claim to unveil the complete truth, but that the same phenomenon can, and usually must, be viewed from different perspectives, revealing multiple realities, the

units of analysis ranging from what happens at the micro level within the neuronal structures of the brain to the social behavior of entire communities within particular cultural-historical contexts. It furthermore means that attaining insight from a transdisciplinary point of view is contingent upon the disciplined creative collaboration among scholars instead of mere individual efforts.

A third major issue is one that goes to the heart of the scientific enterprise. It’s something that was, for instance, referred to in a letter from Charles Darwin to C. Lyell (1859): “You would be surprised at the number of years it took me to see clearly what some of the problems were.... Looking back, I think it was more difficult to see what the problems were than to solve them” (p. 524). Clearly, if one wants to avoid that every new research effort is no more than the next incremental refinement of what we already know, then the art of asking questions must be more prominently developed. How difficult that can be is perhaps most evidently demonstrated in the effort it took most members of the BOP community to put in writing their respective thought inputs, now available on the Book of Problems (n.d.) homepage.

What happened in Dallas

Of the total of 26 BOP community members, a total of 12 were able to gather for two days during the AECT conference in Dallas. Three more of them, brain scientists from the



The Presidential Panel Session on the Book of Problems

University of Oxford, UK, could be brought in via teleconferencing with Oxford and London (see sidebar).

To ensure that the entire community could benefit from and contribute to the process, all members had been asked to provide written thought inputs and to formulate initial questions and issues they felt should be discussed. A total of 22 mini essays, ranging in length

from less than half a page to as much as seven pages, were submitted and added to the BOP homepage as they came in. As the collection grew, they served to inspire the community. At the time of the conference they served as food for thought for the more than six hours of continuous dialogue – partly in small sub-groups – on the first day in Dallas and for the hour-long teleconference with the

Oxford-based brain researchers the next day. A precious audiorecorded document, accompanied by written notes, resulted from this process and is in the process of being analyzed.

To ensure that the work of this group would benefit not only its 26 members but the AECT membership at large, a two-hour Presidential panel session – consisting of a general introduction and five brief

Walking through the brain: A journey of discovery, a cascade of questions

Central to the Book of Problems is the quest to start mapping out what we do not know about learning. It constitutes a discovery journey into the unknown with partial answers leading to further and more complex questions. Because the brain is so central to what and how we learn, an important part of this journey involves examining what we know and don't know about how the brain functions and how this impacts on learning. A teleconference between Dallas, London and Oxford as part of the BOP activities at AECT 2002 allowed three prominent British brain scientists, Susan Greenfield, Nick Rawlins and John Stein, to participate in the dialogue and shed their light on these issues.

Imagination, creativity, the limits of learning, implicit and explicit learning, the link between experience and knowledge, the influence of knowledge on behavior, learning throughout life, and individual versus collective learning, are but some of the issues that emerged during this discussion. We know that the brain is in continuous dialogue with the outside world, interacting with it and learning from it. Crucial parts of the brain are in a constant state of neurological regeneration, fueled by both physical and mental activity.



Discussing the brain during the teleconference with neuroscientists in the UK

Inactivity (or passive behavior such as television viewing) will slow that process down or lead to regression. What we know about the brain thus has clear implications for both pedagogical practice and for the conception of the environments in which people learn. The importance of considering the implications of the increasingly sedentary lifestyles of children and adults in western societies stands out in this context.

And what about what we don't know? Here is a sample of the issues that were discussed.

❖ Is it possible to know too much, thereby in some way saturating the brain into passivity? This question arose considering that prominent

scientists often peak early on in life, making one or more important discoveries, but then never again reach the same level of performance.

❖ What is the importance of some of the less conscious ways in which we learn – such as through imitation or implicit learning? Both of these are areas that are at the forefront of brain research today and with very interesting implications for how we develop as human beings since most of what we learn appears to fall in this domain.

❖ Is there a clear difference between priming and implicit learning, both of which are processes that we cannot control? And how is imagination linked to priming and learning?

❖ What are the processes by which we turn the things that we learn through practice – and which we register in the form of episodic memory – into knowledge/skills that we can apply outside the specific setting in which we learnt them, transforming the experience in semantic memory? And why is this process more successful in some than in others? The question of the extent to which the rehearsal of episodic experience is necessary to generate semantic memory was identified as an interesting area of further inquiry.

❖ What role does creativity play in this process of learning, why are some people more creative than others and how can creativity be stimulated? Again many questions remain to be answered. There is some evidence that actively seeking answers may sometimes only serve to prime adjacent concepts/knowledge rather than the answer we are really seeking to find – a process known as negative priming. Various ways of breaking through negative priming, including by resorting to physical activity, were discussed.

❖ How much of our brain activity is reduced as we grow older? Is this an inevitable process and what mechanisms may compensate for this?

presentations with responses, followed by a vibrant general discussion – concluded the work of the second day. The latter event was entirely videorecorded and thus adds not only to the documentation currently being analyzed but also to the scope of questions that are being posed. The audiorecordings and videotapes will be used to produce a comprehensive report on the entire set of deliberations that took place during the workshop sessions, the teleconference, as well as the Presidential panel session.

Beyond Dallas

What happened in Dallas, and what was done in preparation for it, constitutes the mere beginning of a much longer journey. Even so, the wealth of insight generated already is too extensive and too diverse to be adequately covered in a summary report such as the present article. The sidebar on brain research may provide a glimpse of what should be expected. The BOP homepage will continue to serve the BOP community of scholars in its restricted sense as well as the larger community of all of those who take an interest in the development of human learning in a broad sense, i.e. not just for the purpose of deliberately creating particular competencies. Those who will contribute to the BOP process in an immediate sense may start including others in addition to the current group of 26.

Among the next steps is the preparation during the coming months of a comprehensive report on the Dallas deliberations. Furthermore in the pipeline is the publication of a book-length background, authored by members of the community, inspired by the central concern of the BOP initiative, namely to clarify what we don't know about learning. This may take another year. Meanwhile, the BOP homepage will continue to be the central source for updates on the initiative, which is,

decidedly, an open initiative. It is hoped and foreseen that growth of the BOP community of scholars will cater for increasing diversity among the disciplinary backgrounds of its members.

The community aims at being influential in shifting research and policy agendas as well as in inspiring researchers – those at the start of their career as well as those with established track records – to venture into the unknown rather than embellishing the known.

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Author information

Jan Visser is President of the Learning Development Institute and former UNESCO Director for Learning Without Frontiers.

Muriel Visser is a Research Associate with the Learning Development Institute and a doctoral student at Florida State University's College of Communication.

Institutional information

The URL for the Learning Development Institute is <http://www.learndev.org>.