

Appreciative Inquiry - A New Dimension in Problem-Based Learning

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Abstract

This research study suggests that there are limitations to the traditional problem-based learning (PBL) model and recommends the introduction of appreciative inquiry (AI) as an innovative and contemporary addition to PBL. Proponents of AI suggest that instead of looking for problems and aspects of a scenario that does not work or is problematic, that students first look for the strengths and the more affirmative influences inherent in a problem situation. This results in students approaching a problem with a more appreciative and value-adding outlook. Approaching a problem with this new approach allows students to look much more holistically at the situation in question. By introducing the AI dimension, this enhanced model of PBL was shown to have a positive impact on the students' learning and experiences, and ultimately in their clinical and social care practice as occupational therapists. The study used a qualitative phenomenological approach, and based on the nature of the research problem, an interpretative phenomenological analytical approach was chosen using semi-structured interviews with eighteen PBL experienced tutor facilitators with at least three years of experience with the AI pedagogy. The study showed that there was extensive concern amongst the tutors that a perceived over emphasis on problem solving on behalf of the students adversely affected their creativity in their learning experience.

Keywords

Appreciative inquiry, problem-based learning, healthcare education, occupational therapy

Introduction

In this paper, the author examines the incorporation of the principles of appreciative inquiry (AI) into problem-based Learning (PBL) as a means of providing a more effective, client-centered approach to problem solving in a variety of healthcare educational and practice settings. PBL is described as 'an approach to structuring the curriculum which involves confronting students with problems from practice which provide a stimulus for learning' (Boud & Feletti, 1997, p. 15). PBL is predominantly carried out through small group work where chosen problem scenarios or case studies are presented to students with an expectation that learning needs will be identified, with subjects delegated to group members where responsibility for researching and sharing knowledge is put back onto the student group. The focus and expectation are often on the outcome being a solution to a problem solved collectively by a team. PBL as a pedagogical approach to healthcare education is described as an "apprenticeship for real-life problem

solving” (Stepien & Gallagher, 1993, p. 26), and should not be confused with ‘problem solving’, although many would argue that it will enhance the student’s ability to improve their problem-solving skills.

Problem-based Learning and Appreciative Inquiry in a Healthcare Setting

Table 1 outlines a traditional 5-stage PBL cycle from the point of exposing the students to the problem scenario to the point of potential problem solving and evaluation, and illustrates one way in which a student’s focus on problem solving is influenced by PBL.

Table 1. Model 1 - traditional 5-stage PBL cycle

Stage	Activity in stage
Stage 1	Trigger/scenario (problem situation) given to the student group (problem-focused questioning)
Stage 2	Students identify learning needs and allocate tasks and subjects to be researched using self-directed learning (problem-focused position)
Stage 3	Students share knowledge and skills (learn from each other) (problem-focused position)
Stage 4	Aim to problem solve
Stage 5	Evaluation

This approach to PBL encourages students to identify the problem, and to discuss the process of working towards a potential solution. Given concerns over the problem-solving focus of some programmes, healthcare educators may need to consider newer and more contemporary approaches to learning and teaching including AI (Whitcombe, 2013; Clouston, Westcott, Whitcombe, Riley & Matheson, 2010). Wineburg (1987) and Murphy, Campbell and Garavan (1999) argue that enhancing learning and teaching can be more rewarding and easily attained by promoting more affirmative perceptions of success rather than failure. Considering AI in the context of a problem-solving approach may be seen as making an innovative, modern and more affirmative contribution to healthcare education evidenced by studies undertaken by Rubin et al. (2011) and Machon (2010). In this context AI as a paradigm is stated to be a “philosophy, a revolutionizing force, a transformational change process, a life giving theory and practice, and even a new world view” (Orem, Binkert & Clancy, 2007, p. 24). It is suggested that a positive aspect of ourselves and our relationships should be a starting point from which we can find a way forward (Kelm, 2005). Based on these principles, AI, a mode of ‘intervention’ learning and research, encourages organizational development through group discussion and teamwork (Ludema, Cooperrider & Barrett, 2001, p. 189).

Advocates of the problem-solving approach may question whether AI is relevant in the context of PBL. Some may believe that inherent within PBL is an invitation for students to value the strengths and weaknesses presented part of each problem scenarios or case. Evidence within the Rubin, Kerrell and Roberts’ (2010) study and the Orem, Binkert and Clancy (2007) literature however indicates that AI may push individuals and groups to be more open and positive in their thinking and actions thus taking a more affirmative attitude towards the scenario in question.

Applying AI skills in this manner therefore may go some way to improving attitudes and behaviors amongst students, to create a more realistic and more client-centered approach to healthcare and ultimately to improve the way in which we equip the workforce of the future to be more positive and inclusive.

In the UK, the nature of healthcare higher education has recently been scrutinized and criticized (Francis, 2010). There are many reasons behind this debate around the need to reform curricula content and the manner in which healthcare programmes are delivered and in particular the way in which certain pedagogical approaches have been adopted. Reasons include the outcome of the widely publicized Francis Report (2010) which outlined evidence gathered by an inquiry into falling standards at English Hospitals. The inquiry highlighted clearly that for many patients the most basic elements of care were neglected, with issues of healthcare workers showing negative, and at times uncompassionate and undignified attitudes towards vulnerable patients. Some of the blame was directed towards university courses which were reported as not adequately preparing future healthcare professionals to take a more positive and affirmative attitude towards their work and to approach their duties with the required depth of dignity, compassion and care.

In response to the Francis (2010) report, it appears that British society has begun to question the manner in which higher education prepares healthcare professionals of the future, and interest in AI's potential may create a new foundation for enabling positive, transformative change in PBL facilitation, students' learning and ultimately in healthcare practice.

Recognizing the Issues - Research

A study by Roberts (2010a) revealed that a significant number of practitioners in the healthcare profession believed that use of an AI/PBL model could be beneficial in most clinical and healthcare work environments. Practitioners reflected on the potential effectiveness of the model in areas such as palliative and end of life care, mental health and stroke rehabilitation.

Study participants expressed concern relating to the perceived limitations of a framework such as PBL which is focused primarily on problem solving. They concluded that students' over dependency on problem solving inhibited a more open and creative approach to their learning and healthcare practice. In a separate eight-year evaluative study of final year students (Roberts, 2010), students reported the problem-solving focus of PBL inhibited creativity of thinking, doing and learning. Students became overly anxious when problems could not be solved thus influencing the way in which they were able to take a more holistic and client-centered approach to professional practice. As a way to influence such limitations, the study suggested the value of promoting the potential use of AI as an added dimension within PBL. AI suggests that tutors may encourage students to consider that which is working well as a first step by using the vision of the appreciative eye (Machon, 2010). Findings which emerged from the study showed that AI as a new dimension may indeed empower students to use this particular mode that maximizes the very best of what it has to offer in order to create a better attitude and behaviors that will encourage working towards a more positively envisioned future.

Some of the study participants expressed concern at the way in which some students perceived their future role as healthcare practitioners. It was suggested that aspiring to be more holistic and

client-centered may be best achieved through a partnership between the collaborative and appreciative approach and the problem-solving approach. In theory PBL provides an opportunity for students to utilize their personal initiative in order to influence the way they approach their learning needs. Using their own experience together with their peer group as a resource, students aspire to refine and allocate the information required to best influence the learning outcome of problem solving. Traditionally and because of its focus on problem solving and by its very nature, PBL creates a learning situation which is objective and analytical that largely sees problems and their solution. The focus on problem solving becomes a ritual and at times may inhibit creativity in the need to seek a solution. Whilst directing their own learning as a way to attempt to problem solve, students are almost forced to take individual responsibility to achieve a positive outcome to the problem. As a way of empowering and inspiring students to participate in the ownership and development of their learning, AI may be seen as complementary because it stimulates inquiry, discussion of ideals, forward thinking and planning.

The Paradox – A New AI/PBL Model

Inherent within the AI framework is the 4D model outlined below (Ludema, Cooperrider & Barrett, 2006, p. 192) which guides students through four stages to enable the process of building on success, affirming ideals and goals, and planning ahead. The four stages of Appreciative Inquiry are:

- Discovery – where the focus is on identifying the most positive aspects of experience;
- Dream – where ideal future development is envisioned based on this experience;
- Design – where participants consolidate plans and ways in which their ideal can be attained; and
- Destiny – plans are put into practice, and continue outside the group discussion.

When considering particular strengths of the 4D model students can reflect and apply the learning gained from their past experiences and successes and relate them to their future aspirations and hopes. It is highly participatory and inclusive and respects different views and values. The results of a 4D process are directly action-oriented as it motivates students to approach the problem with different attitudes and aspirations. The belief within AI encourages students to replicate influences that give attention to, and a more positive response to what is working well. When reflecting on OT education and practice in particular, PBL has been historically used as a method that encourages students to see activity and occupations often through an analytical lens whereas AI encourages a more affirmative and positive outlook. The proposed model in Table 2 illustrates how the traditional PBL model can be adapted to embrace and value the integration of the 4D model.

Table 2. Model 2 - Integrating AI into PBL through the application of the 4D model (Adapted from Cooperrider & Srivastva, 1987)

Stage	Students exposed to the trigger/scenario
Stage 1	Applying AI – students look for what is working, looking at the situation initially with an appreciative eye. Appreciating and valuing the ‘best of what is’. <i>(new contemporary AI inclusion at the onset – DISCOVERY stage – affirmative questioning)</i>
Stage 2	Identification of problems <i>(traditional PBL problem solving approach – problem- focused questioning)</i>
Stage 3	Envisioning ‘what might be’ <i>(AI approach – DREAM stage- affirmative questioning)</i>
Stage 4	Students identify learning needs and allocate tasks and subjects to be researched and analysed. <i>(traditional PBL learning needs stage – problem- focused questioning)</i>
Stage 5	Dialoguing ‘what should be’ <i>(AI approach – DESIGN stage – affirmatives questioning)</i>
Stage 6	Action plan and intervention <i>(traditional PBL sharing of knowledge stage – problem -solving questioning)</i>
Stage 7	Innovating ‘what will be’ <i>(AI approach – DESTINY stage – affirmative questioning)</i>
Stage 8	PBL/AI stage – Possible solution and evaluation

It is proposed that AI starts the process from a place of what works at the onset rather than over relying on the need to solve the problem. The model outlines the importance of what questions are asked, the manner and context in which they are asked and the sequencing of such questions when assessing needs. AI invites system-wide dialogue and learning through a process of appreciative interviewing and questioning using the following interaction at each of the 4D stages as an example:

- What’s working well now? *versus* what’s not working well?
- What opportunities are there? *versus* what are the main challenges?
- What has the patient achieved so far? *versus* what s/he may not have been able to achieve?
- What does the patient find easy to achieve? *versus* what does the patient find most difficulty with?
- What are the patient’s aspirations?
- What is the optimum outcome for the patient?

In this sense the AI technique motivates and empowers stakeholders to change their life, situation or organization (Lewis, Passmore & Cantore, 2008). For these reasons, AI is now becoming widely used as a means of educational evaluation. Encouraging negotiation in this manner supports attempts to give collective and organization-wide ownership and authorship of positive transformation. It provides a procedure in which evaluation becomes a collaborative means of improving individual and organizational systems and is negotiated within the PBL

group, not imposed. Therefore, consequential changes are more likely to be accepted by students since they have jointly been involved in evaluating themselves and their learning (Baume, 2008).

When evaluating AI in this manner, Machon and Roberts (2010) showed that the approach invites the student to share in the discovery of the source of yet unrealized potential and growth within the scenario in question and specifically in relation to a patient in practice. They also suggested that, when introducing AI as an added dimension to PBL, the process invited lecturers to engage more fully and on a different and more positive level with the students.

Encouraging students to apply a more appreciative process to PBL from the onset encouraged the unfolding of innovation and creativity in this context. A study by Roberts (2010) revealed that students showed a tendency to overly rely on the pressure to problem solve, often to the detriment of their creativity. Participants in the study overwhelmingly reported their concern that students felt as if they were failures, appearing stressed and anxious when they had been unable to solve a given challenge. When applying AI principles as an alternative, tutors reported that students tended to ask affirmative questions before considering the challenges of problem solving.

In a healthcare setting, affirmative questioning of clients was believed by the tutors to have been overlooked and undervalued as the pressure to solve the problem was immense. The analytical perspective when applied as a primary focus often critically evaluates a situation before progressing to define a possible solution. Questions focusing on problem solving may include a direction such as:

- What is your presenting problem?
- How is the problem weighed against others in your life?
- Does this problem hide a further deeper challenge you face?
- How might you engage in problem solving in a truly client-centered manner?

Applying AI principles in this manner may provide a platform to create a more positive approach to the traditional PBL cycle, resulting in tutors encouraging students to move from a focus on problem solving towards a more appreciative one. One potential danger in focusing on the problems was the students' preoccupation with problem solving, finding the answer which limited a more holistic and realistic vision of the problem scenario and/or client. It was reported that tutors observed a pattern where students aspired to want to learn from mistakes by focusing on what they did wrong. What needs to be remembered in a healthcare context is that such professionals naturally aim to problem solve. The main challenge here is such an approach through PBL may at times hide the crucial need to not see and treat patients as merely the problem with which they present. This may be perceived by patients as students' (therapists') devaluation of the educational role of those who seek their support and intervention. These are questions that are key to students' better understanding and value placed on a more holistic and sustainable client-centered practice.

Evaluating the AI/PBL model

Rubin, Kerrell and Roberts' (2011) study of occupational therapy (OT) undergraduates indicated additional concerns and limitations in relation to the PBL approach. When interviewed, students perceived the PBL approach as being restrictive in nature, encouraging an approach with a one-dimensional vision through an analytical lens. This lens was experienced as being overly critical, encouraging students to limit their observations of the world of teaching, learning and practice experience purely as one of problems needing to be solved. Employing only the analytical eye, one that focuses excessively on problems, resulted in students concentrating excessively on the need to find more problems to be solved. Rubin, Kerrell and Roberts (2011) question whether this focus may well be inhibiting the opening of a more valuable learning experience, that of seeing patients in a more realistic and holistic way. A potential danger expressed by Cloke and Goldsmith (2003, p. 180) is that "in thinking that we know the one correct answer and in deciding to enlarge our ego, we do so at the cost of reduced skills in the person who has to live with the result". This is not meant to deny the great value of the practical, scientific and focused technical expertise required of a healthcare student or practitioner to problem solve.

The study by Roberts (2010a) recognized that tutor facilitators tended to direct students to health-related problem scenarios as a way to acquire problem-solving skills. Some participants expressed concern that students showed tendencies towards labeling individuals by diagnosis. Focusing on diagnosis in this way tended to limit students' lateral thinking and their willingness to be creative in client centered manner. One tutor expressed her own anxiety in relation to the problem-solving focus of PBL. From personal experience of working in mental health she believed that therapists may not at times be able to solve the overarching problem, but simply facilitate the individual client to live a meaningful life with the problem.

Six tutors described the manner in which they had negotiated the introduction of AI into the curriculum as a means of changing students' behaviors and attitudes. In addition to sharing their experience in areas such as mental health, one tutor described how attitudes in palliative and end-of-life care environment were often dominated by a negative outlook. She had to remind students that often in such environments individuals will be positive about leading a full and affirmative life as they deal with their illness. In a hospice setting it was reported that students on clinical placement were seen to focus excessively on the dying, seeing individuals through a very critical problematic lens. Applying a more appreciative eye in this context encouraged students to take a more empathetic, positive and holistic view. One tutor summarized her experience in that AI had guided the students in a more creative way to think more positively, in an appreciative and different way from what she was used to. Seven of the tutors interviewed advocated that AI should be used in PBL because problem solving seems to be an overused method for effecting change and students should begin to explore what gave life to people when they were at their very best. With this in mind, should tutors and students dare to ask questions about hope and inspiration and begin to see people not as problems to be solved but miracles and mysteries to be embraced? A number of tutors stressed the importance of the need to be aware of their own personal positivity as a platform to create more powerful social experiences to help students discover the best about themselves, how they saw patients, team working, the group process and indeed their place within society. The expression of the constructivist principle may be fundamental to ensuring that students moved towards an appreciative perspective of themselves and their situation, that tutors and students moved toward adoption of a more appreciative language in speaking about PBL scenarios and group process and that they build a more holistic

and balanced view of themselves. In this context, PBL may be seen as an approach that has limitations which cultivate in the student (and therapist) an analytical eye that seeks largely to identify problems and determine their possible solutions.

With tutors and students expressing similar concerns about a perceived over-emphasis on problem solving within PBL, evidence is emerging that may indicate a desire to consider an alternative complementary level of intervention to the process, that of AI.

Drawing Conclusions

Respecting the vast experience of the study participants and their reflections on PBL, healthcare education may be going through a renewed period of revision. If tutors and students alike believe that the problem focus may devalue the patient's experience which in turn may limit their own creativity, then considering AI as an added dimension to PBL may offer an innovative answer to their concern. When a health practitioner can look at a problem situation through an appreciative lens a more holistic and client-centered approach may be achieved.

Whilst the apparent limitations of the traditional model of PBL cycle are not in its process of problem solving but more in its context and vision, the analytical eye critically and objectively sees the world of teaching and practice as problems to be solved. Roberts (2010) suggests that the nature of the students' learning and clinical practice and the context from which they view the intervention in essence define the outcome that they find. Through effective teaching, support and group facilitation, tutors can guide students to suspend these habits, and to approach PBL with a more affirmative and open mind and heart. Such a platform may well equip students with the capacity to see patients with fresh, inquiring, and reflective eyes. It is proposed that AI is a fundamental component of this platform and it may enable students to navigate difficulties not from a place of anxiety to solve, but from a place of enthusiasm and excitement to be innovative and creative.

Recent years has seen AI emerge as a contrasting approach to organizational development work, one in which intervention gives way to inquiry, imagination and innovation. In healthcare education, AI intervention such as the discovery, dream and design phase contrasts with negation, criticism and spiraling diagnosis. AI offers as its strength what PBL has as a limitation – the two appear to be naturally complementary. Cooperrider and Whitney (2005, p. 8) believe that AI “involves the art and practice of asking unconditionally positive questions that strengthen a system's capacity to apprehend, anticipate and heighten positive potential”. In contrast to judging situations through an analytical lens, AI instead may cultivate an ‘appreciative eye’. Healthcare students and practitioners develop highly valued problem-solving skills and knowledge by the very nature of their work. Within PBL, pressure to identify problems and develop a structured plan to solve them has historically dominated its application as pedagogy in higher education. Looking at both AI and PBL places them on polarities of a continuum, one positive, the other negative, seeing challenges as an opportunity and not as a problem. The opportunity has arisen to present an alternative and innovative model that embraces both AI and problem solving. The more positive the question students ask, the more long-lasting and successful the change effort. The most important thing a healthcare students can do that makes a difference is to ask each other, themselves and their clients more unconditional positive

questions. The research indicates strongly that tutors and students alike need not be hesitant about introducing affirmative language more carefully and prominently into their learning and practice. Approaching PBL with such an appreciative eye will go some way in providing students with a learning platform which is more positive, creative, holistic and person-centered and arguably a more realistic approach to healthcare education and practice.

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References

- Baume, D. (2008). "An overview of Monitoring and Evaluating Staff and Educational Development." REDU
http://www.uclm.es/organos/vic_docencia/innovacion_educativa/congreso_red_u/Evaluati%20Summary.pdf (Accessed on 20 March 2013).
- Boud, D. & Feletti, G. (1997). Part 1: what is problem-based learning? In *The Challenge of Problem-Based learning* (Eds). D. Boud & G. Feletti), Kogan Page. London. 15-16.
- Cloke, K. & Goldsmith, J. (2006) *The Art of Waking People up – Cultivating Awareness and Authenticity at Work*, San Francisco, Jossey-Bass.
- Clouston, T., Westcott, L., Whitcombe, S., Riley, J. & Matheson, R. (Eds). (2010). [*Problem-based learning in health and social care*](#). Chichester. Wiley-Blackwell.
- Cooperrider, D. & Srivastva, R. (1987). Appreciative Inquiry in Organizational Life. In Woodman, T. & Pasmore, M. (Eds). *Research on Organizational Change and Development*, 1. San Francisco. Berrett-Koehler Publishers Inc.
- Cooperrider, D. & Whitney, D. (2005). *Appreciative Inquiry. A Positive Revolution in Change*. San Francisco. Berrett-Koehler Publishers Inc.
- Francis, R. (2010). Independent Inquiry into care provided by Mid-Staffordshire NHS Foundation Trust. January 2005-March 2009. 1. Retrieved from http://www.midstaffsinquiry.com/assets/docs/Inquiry_Report-Vol1.pdf (accessed 14th April 2013).
- Hammond, S.A. (1998). *The Thin Book of Appreciative Inquiry*. Practical Press. Plano TX, Thin Book Publishing Company.
- Kelm, J.B. (2005). *Appreciative Living: The Principles of Appreciative Inquiry in Personal Life*, www.AppreciativeLiving.com.

- Lewis, S., Passmore, J. & Cantore, S. (2008). Appreciative Enquiry for Change Management: Using AI to Facilitate Organisational Development. *Industrial and Commercial Training*, 40(6), 22-27.
- Ludema, J.D., Cooperrider, D.L. & Barrett, F.J. (2006). Appreciative Inquiry: The Power of the Unconditional Positive Question, in Reason, P. & Bradbury, H. (Eds). *The Handbook of Action Research*, Sage, 189.
- Machon, A. (2010). *The Coaching Secret. How to be an Exceptional Coach*. London, Pearson Education Limited.
- Machon, A. & Roberts, G.W. (2010). An evolving vision for learning in health-care education, in Clouston, T. et al. (Eds). *Problem based learning in health and social care*. Oxford, Wiley Blackwell, 147-158.
- Murphy, D., Campbell, C. & Garavan, T.N. (1999). The Pygmalion effect reconsidered: its implication for education, training and workplace learning. *Journal of European Industrial Training*, 23(4/5), 238-251.
- Orem, S. L., Binkert, J. & Clancy, A.L. (2007). *Appreciative Coaching: A Positive Process for Change*. New Jersey. Jossey-Bass.
- Roberts, G.W. (thesis unpublished).
- Roberts, G.W. (2010a). Advancing New Approaches to Learning and Teaching. Introducing Appreciative Inquiry To A Problem Based Learning Curriculum. *The Journal of Applied Research in Higher Education*. 2(1). 16-24.
- Rubin, R., Kerrell, R. & Roberts, G. (2011). [Appreciative inquiry in occupational therapy education](#). *British Journal of Occupational Therapy* 74(5), 233-240. ([10.4276/030802211X13046730116533](#))
- Salopek, J.J. (2006). Appreciative Inquiry at 20: Questioning David Cooperrider. *Trends*, August 2006. 60(8). 21.
- Stepien, W. & Gallagher, S. (1993). Problem based learning: As authentic as it gets. *Educational Leadership*. 50(7). 25-28.
- Wineburg, S.S. (1987). "The Self-Fulfillment of the Self-Fulfilling Prophecy." *Educational Researcher*, 16(9). 28-37.
- Whitcombe, S.W. (2013). [Problem-based learning students' perceptions of knowledge and professional identity: Occupational therapists as 'knowers'](#). *British Journal of Occupational Therapy*. 76(1), 37-42.

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