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Thinking about Creativity in Science Education

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ABSTRACT

In this paper we discuss the notion of creativity in the contexts of science and science education. In doing so, we consider and reflect on some taken-for-granted ideas associated with school science creativity, such as inquiry science, and integrating art and science, while we search for a notion of scientific creativity that is compatible with both the nature of science and the general notion of creativity, and also realistic in the context of school science education. We then propose a number of activities/strategies that encourage creativity, and more specifically imaginative/creative thinking, through the learning of school science.

KEYWORDS

Creativity; Imagination; Science; Science Education

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References

- [1] Asay, L. & Orgill, M. (2010). Analysis of essential features of inquiry in articles published in The Science Teacher. *Journal of Science Teacher Education*, 21, 57-79. doi: 10.1007/s10972-009-9152-9
- [2] Ashley, C. (2011). Avenues to Inspiration. *Science Scope*, 35, 24-30.
- [3] Barrow, L. (2010). Encouraging creativity with scientific inquiry. *Creative Education*, 1, 1-16. doi: 10.4236/ce.2010.11001
- [4] Boden, M. (2001). Creativity and knowledge. In A. Craft, B. Jeffrey, & M. Leibling (Eds.), *Creativity in education* (pp. 95-102). London: Continuum.
- [5] Boden, M. (2004). *The creative mind: myths and mechanisms*. New York: Routledge.
- [6] Bohm, D. (1998). *On creativity*. London: Routledge.
- [7] Brent, D., Sumara, D., & Luce-Kapler, R. (2008). *Engaging minds: Changing teaching in complex times*. New York: Routledge.
- [8] Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press
- [9] Craft, A. (2001). Little C creativity. In A. Craft, B. Jeffrey, & M. Leibling (Eds.), *Creativity in education*. New York: Continuum International.
- [10] Csikszentmihalyi, M. (1994). The domain of creativity. In D. Feldman, M. Csikszentmihalyi, & H. Gardner (Eds.), *Changing the world: A framework of the study of creativity* (pp. 135-158). Westport, CT: Praeger.
- [11] Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: Harper Collins.
- [12] Dietrich, A. (2004). The cognitive neuroscience of creativity. *Psychonomic Bulletin & Review*, 11, 1011-1026. doi: 10.3758/BF03196731

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- [13] Drayton, B., & Falk, J. (2001). Tell-tale signs of the inquiry oriented classroom. *NASSP Bulletin*, 85, 24-34. doi:10.1177/019263650108562304
- [14] Di Trocchio, F. (1997). *Il genio incompress*. Milan: Mondadori.
- [15] Egan, K. (1990). *Romantic understanding*. Chicago: University of Chicago Press.
- [16] Einstein, A. & Infeld, L. (1938). *The evolution of physics*. Cambridge: Cambridge University Press.
- [17] Feynman, R. (1995). *Six easy pieces*. Reading, MA: Helix Books.
- [18] Feldman, D., Czikszenmihalyi, M., & Gardner, H. (1994). *Changing the world: A framework for the study of creativity*. Westport, CT and London: Praeger.
- [19] Gardner, H. (1993a). *Multiple intelligences. The theory in practice*. New York: Basic Books.
- [20] Gardner, H. (1993b). *Creating minds*. New York: Basic Books.
- [21] Gardner, H. (2004). *Changing minds: The art and science of changing our own and other people's minds*. Boston: Harvard Business School Press.
- [22] Gardner, H. (1997). *Extraordinary minds*. New York: Harper Collins.
- [23] Gardner, H. (2010). *Five minds for the future*. Cambridge, MA: Harvard Business School Press.
- [24] Gaut, B. (2003). Creativity and imagination. In B. Gaut & P. Livingston (Eds.), *The creation of art* (pp. 268-293), Cambridge: Cambridge University Press.
- [25] Ginsberg, H. & Opper, S. (1969). *Piaget's theory of intellectual development: An introduction*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- [26] Girod, M. (2007). A conceptual overview of the beauty and aesthetics in science. *Studies in Science Education*, 43, 38-61. doi:10.1080/03057260708560226
- [27] Hadzigeorgiou, Y. (2005). Romantic understanding and science education. *Teaching Education*, 16, 23-32. doi:10.1080/1047621052000341590
- [28] Hadzigeorgiou, Y., & Stefanich, G. (2001). Imagination in science education. *Contemporary Education*, 71, 23-29.
- [29] Hadzigeorgiou, Y., & Fotinos, N. (2007). Imaginative thinking and the learning of science. *Science Education Review*, 6, 15-22.
- [30] Heisenberg, W. (1971). *Physics and beyond*. London: Allen & Unwin.
- [31] Holton, G. (1996). *Einstein, history, and other passions*. Reading, MA: Addison-Wesley.
- [32] Jackson, P. (1998). *John Dewey and the lessons of art*. New Haven, CT: Yale University Press.
- [33] Jenkins, E. (1996). The "nature of science" as a curriculum component. *Journal of Curriculum Studies*, 28, 137-150. doi:10.1080/0022027980280202
- [34] Kind, P., & Kind, V. (2007). Creativity in science education: Perspectives and challenges for developing school science. *Studies in Science Education*, 43, 1-37. doi:10.1080/03057260708560225
- [35] Klassen, S. (2006). The application of historical narrative in science learning: The Atlantic Cable story. *Science & Education*, 16, 335- 352.
- [36] Kuhn, T. (1970). *The structure of scientific revolutions*. Chicago: University of Chicago Press.
- [37] Latour, B., & Woolgar, S. (1986). *Laboratory life: The construction of scientific facts*. Princeton, NJ: Princeton University Press.
- [38] Lunn, M., & Nobel, A. (2008). Revisioning science "love and passion in the scientific imagination" : Art and science. *International Journal of Science Education*, 30, 793-805. doi:10.1080/09500690701264750
- [39] Mannheim, K. (1972). *Ideology and utopia*. London: Routledge and Kegan Paul.
- [40] Maslow, A. (1968). *Toward a psychology of being*. New York: Van Nostrand Reinhold.

- [41] Mathewson, J. (1999). Visual-spatial thinking: An aspect of science overlooked by educators. *Science Education*, 83, 33-54. doi:10.1002/(SICI)1098-237X(199901)83:1<33::AID-SCE2>3.0.CO;2-Z
- [42] McAllister, J. (1996). *Beauty and revolution in science*. Ithaca, NY: Cornell University Press.
- [43] McAllister, J. W. (1997). Laws of nature, natural history, and the description of the world. Princeton: Voordracht Institute for Advanced Study (Conference lecture).
- [44] McComas, W. (1998). The principal elements of the nature of science: Dispelling the myths. In W. McComas (Ed.), *The nature of science in science education: Rationales and strategies* (pp. 53-72). Dordrecht: Kluwer Academic Publishers.
- [45] Medawar, P. (1967). *The art of the soluble: Originality in science*. Middlesex: Penguin Books.
- [46] Medawar, P. (1979). *Advice to a young scientist*. New York: Harper & Row.
- [47] Medawar, P. (1984). *Pluto's republic*. Oxford: Oxford University Press.
- [48] Merten, S. (2011). Enhancing science education through art. *Science Scope*, 35, 31-35.
- [49] Miell, D., & Littleton, K. (2004). *Collaborative creativity: Contemporary perspectives*. London: Free Association Books.
- [50] Miller, A. (2001). *Einstein, Picasso: Space, Time, and the Beauty That Causes Havoc*. New York: Basic Books.
- [51] Moravcsik, M. J. (1981). Creativity in science education. *Science Education*, 65, 221-227. doi:10.1002/sce.3730650212
- [52] Mumford, M. D. (2003). Where have we been, where are we going? Taking stock in creativity research. *Creativity Research Journal*, 15, 107-120. doi:10.1080/10400419.2003.9651403
- [53] Osborne, J., Collins, S., Ratcliffe, M., Millar, R., & Duschl, R. (2003). What "ideas-about-science" should be taught in school? A Delphi study of the expert community. *Journal of Research in Science Teaching*, 40, 692-720. doi:10.1002/tea.10105
- [54] Pink, D. (2005). *A whole new mind*. New York: Riverhead Trade.
- [55] Planck, M. (1933). *Where is science going?* London: Allen & Unwin.
- [56] Ricchiuto, J. (1996). *Collaborative creativity*. Cleveland, OH: Oakhill Press.
- [57] Robinson, K. (2001). *Out of our minds. Learning to be creative*. Chichester: Capstone.
- [58] Rogers, C. (1961). *On becoming a person*. Boston, MA: Houghton, Mifflin.
- [59] Root-Bernstein, R. (1996). The sciences and arts share a common creative aesthetic. In A. Tauber (Ed.), *The elusive synthesis. Aesthetics and science* (pp. 49-82). Boston, London: Kluwer. doi:10.1007/978-94-009-1786-6_3
- [60] Root-Bernstein, R. (2002). Aesthetic cognition. *International Studies in Philosophy of Science*, 16, 61-77. doi:10.1080/02698590120118837
- [61] Rowlands, S. (2011). Discussion article: Disciplinary boundaries for creativity. *Creative Education*, 2, 47-55. doi:10.4236/ce.2011.21007
- [62] Schmidt, A. (2011). Creativity in science: Tensions between perceptions and practice. *Creative Education*, 2, 435-445. doi:10.4236/ce.2011.25063
- [63] Schwartz, R. S., Lederman, N. G., & Crawford, B. A. (2004). Developing views of nature of science in an authentic context: An explicit approach to bridging the gap between nature of science and scientific inquiry. *Science Education*, 88, 610-645. doi:10.1002/sce.10128
- [64] Shapira, O., & Liberman, N. (2009). Why thinking about distant things can make us more creative. URL (last checked 3 February 2012). <http://www.scientificamerican.com/article.cfm?id=an-easy-way-to-increase-c#comments>
- [65] Shepard, R. (1988). The imagination of the scientists. In K. Egan, & D. Nader (Eds.), *Imagination and education* (pp. 153-185). New York: Teachers College Press.
- [66] Simonton, D. (2004). *Creativity in science: Chance, logic, genius, and zeitgeist*. Cambridge: Cambridge University Press. doi:10.1017/CBO9781139165358

- [67] Sternberg, R. J. (2006). Creating a vision of creativity: The first 25 years. *Psychology of Aesthetics, Creativity, and the Arts*, 1, 2-12. doi:10.1037/1931-3896.S.1.2
- [68] Tauber, A. (1996). *The elusive synthesis. Science and aesthetics*. Boston, London: Kluwer. doi:10.1007/978-94-009-1786-6
- [69] Tolstory, I. (1990). *The knowledge and the power: Reflection on the history of science*. London: Canongate.
- [70] Trefil, J. (2003). *The nature of science: An A-Z guide to the laws and principles governing the universe*. Boston, MA: Houghton-Mifflin.
- [71] Van' t Hoff, J. (1967). *Imagination in science*. New York: Spriger- Verlag. doi:10.1007/978-3-642-87040-8
- [72] Vernon, P. (1970). *Creativity: Selected readings*. Harmondsworth: Penguin.
- [73] Watts, M. (2001). Science and poetry: Passion vs prescription in school science? *International Journal of Science Education*, 23, 197-208. doi:10.1080/09500690120685
- [74] Whitehead, A. (1957). *The aims of education*. New York: Free Press.
- [75] Woolgar, S. (1988). *Science: The very idea*. London: Routledge.
- [76] Zenasni, F., Besancon, M., & Lubart, T. (2011). Creativity and tolerance of ambiguity: An empirical study. *Journal of Creative Behavior*, 42, 61-73. doi:10.1002/j.2162-6057.2008.tb01080.x