REVITALIZING STUDENTS' GEOGRAPHICAL IMAGINATION IN A DIGITAL WORLD

Jacky Pow
Department of Education Studies, Hong Kong Baptist University, Kowloon Tong, Kowloon, Hong Kong

Abstract: *Many geographers have argued that geographical imagination plays a crucial role in geography education. Unfortunately, geography teachers often find it difficult to stimulate their students' geographical imaginations. One emerging concern is to determine how geography teachers can foster their students' geographical imaginations so that they can develop real understandings of the nature and value of geography. In this paper, two possible areas in which IT can serve a role in revitalizing students' geographical imagination are presented. These areas include volunteered geographic information and digital cartography.*

Keywords: geographical imagination, information technology, geography education, volunteered geographical information, digital cartography

Introduction

Imagination and reason are the main mental faculties of human beings (Sallis, 1987), with educators expected to develop both in their work with students. In general, individuals are curious about the world around them, and may imagine places that they have never visited. Individuals also can use reason to discover what is true about the world. Equipped with the two powerful tools of reason and imagination, individuals begin to explore the world in which they live. This natural investigation of space and time has gradually developed into the discipline of geography (Harvey, 1990). However, due to the changing conditions and needs of contemporary society, the disciplinary boundaries of geography cannot be drawn easily. Thus, the discipline of geography has become fragmented and compartmentalized (Harvey, 1990). More positively, new possibilities in information and communication technology including voluntary geographical information (VGI) and digital cartography have emerged that may assist to promote geography as a cohesive discipline. Specifically, these two technologically enhanced fields have pulled together various fields related to the study of spatial issues (Sui 2004; Tate & Unwin, 2009) and have released geographers' from their previous foci on technical issues.

The shift of focus from technical issues to theoretical and social concerns has called for a rekindling of the geographical imagination. Meeting this challenge requires greater intellectual engagement of geographers towards making geography a more respected and vibrant discipline (Sui, 2004). To date, the new technologies mainly have enabled the reason side of geography, including the study of maps, scales, and coordination. These kinds of studies have gained a dominant role in the discipline, as these aspects of geography can be taught in a systematic manner (Rodríguez, 2010). However, the recent developments of IT also can facilitate teaching and learning of content as well as procedural knowledge of geography (Stoltman, 2006). In this paper, I explore the possibility that similar to reason, IT

can foster geographical imagination.

To some geographers, geographical imagination refers to a mode of thinking and understanding of the world. It involves scrutinizing the relative importance of places and the relationships between one location and other locations (Daniels, 1992; Gilley, 2010). The notion of geographical imagination has received increased attention among geographers. Relph (2014) described geographical imagination as analogous to the thinking of an artist:

> The artist must draw upon insight and feelings and literally imagine them into forms that will make an effective connection with the lives of others. The geographical imagination is a particular means of attempting this that is especially valuable for human geography and environmental understanding; it is a way of thinking that seeks to grasp the connections between one's own experiences of particular landscapes and the larger processes of society and environment, and then seeks to interpret these in a manner that makes sense for others. (p. 157)

Likewise, Morgan (2013) emphasized that the notion of thinking geographically is connected to geographical imagination, with this concept frequently applied in discussions about the purposes of geography education. Morgan believed that geography educators should be concerned with geographical imagination because "it taps into the wider notions of what teaching and learning are for, to create and then to nurture the *imagination*" (p. 273).

Information technology serves an important role in many academic disciplines since the proliferation of personal computers in the mid-1970s. Geography is one of the disciplines that has benefitted from the advancement of IT, with increasing sophistication in digital cartography as well as the rapid development of VGI as a result of Web 2.0. While there seem to have been no systematic studies about how IT can help in nurturing geographical imagination, it is agreed that geography educators can play a role in harnessing the potential of IT in revitalizing students' geographical imaginations (Downs, 2014).

Geographical Imagination

Harvey (1970) was a pioneer in using the term geographical imagination, paraphrasing a similar concept introduced by Wright Mills (1959) concerning social processes and justice (i.e., sociological imagination). Harvey brought together concepts related to individuals' spatial consciousness, personal sense of societal roles, and the social issues and interactions that shape urban social justice (Marcano, 2011). By explicitly combining sociological and geographical perspectives, Harvey introduced the geographical imagination as a kind of spatial consciousness that, "enables the individual to recognize the role of space and place in his own biography, to relate to the spaces he sees around him, and to recognize how transactions between individuals and between organizations are affected by the space that separates them" (Harvey, 1973, p. 23). Harvey proposed that individuals possess a disposition towards linking personal difficulties with public issues that affect society and shape urban landscape. He believed that the necessity to produce or reproduce space is largely dependent on geographical imagination of social systems that are shaped by the interplay of environmental, socio-economic, and political realities.

Geographical imagination can involve individual or collective conceptions about what place should be, how place is produced, and its actuality. Thus, all beliefs, rationales, or negotiations that give

meaning to the political use of space can serve as foundations for geographical imagination (Marcano, 2011). Yusoff and Gabrys (2011) affirmed that geographical imagination is a means of trying to "understand how unifying or dominant views shared by communities, nations, or distinct groups of people are negotiated, consolidated, and reproduced through images (such as maps, diagrams, icons, and descriptive imagery)" (p. 530). Hence, geographical imagination seems to play an essential role in shaping geographical thinking, perceptions, and models of the world (Gregory, 1993). This kind of imagination is not merely a set of images in individuals' minds, but a reflection of individuals' *Weltanschauung* or worldview.

Massey (2006) argued that individuals carry mental images of the world. As images are unique to individuals, they may sometimes come into conflict, or they may serve as sources of conflict. Hence, identifying and explicitly discussing these contradictory mental images seems to be a good starting point for examining geographical imaginations. How these imaginations are developed and produced as a result of geography curriculum or a result of the rapid flow of information through the Internet can then be examined. Massey (2006) suggested that, "we can explore, too, how such imaginations have powerful effects upon our attitudes towards the world and upon our behavior. One of our (many) abilities as geography teachers is to unearth these taken-for-granted imaginations and subject them to questioning" (p. 46).

The concept of the geographical imagination seems academic and theoretical at times, but it can be quite practical as well. For instance, the concept has been used in tourism marketing and development (Chang & Lim, 2004), environmental protection, sustainable household practices (Davies, Doyle, & Pape, 2012), and migration studies (Lin & Yeoh, 2010). Thus, mastery of this concept may help geography graduates apply the knowledge they gain in geography studies for the betterment of society. Hence, geographical imagination is an important disposition for geography students to acquire.

Issues in Revitalizing Students' Geographical Imagination

The language of geography has consisted of three main elements: literacy, numeracy, and graphicacy (Balchin & Coleman, 1967). These three elements form a unique approach for the study of geography. If these are the key communication elements in geography, then it is impossible for the geographical imagination to exist in isolation from these elements. Hence, before students can develop their geographical imaginations, a firm grasp of these three elements in the language of geography is essential. Thus, geography teachers should integrate IT appropriately in teaching the elements of literacy, numeracy, and graphicacy as well as in fostering of students' geographical imaginations.

The key concepts in geography are space and place, scale and connection, proximity and distance, and relational thinking (Jackson, 2006). The mastery of these concepts represents foundational learning outcomes for geography students. These concepts, although they involve abstraction, can be taught systematically to geography students. Developing the geographical imagination, however, is different from learning geographical concepts. While geographical imagination is intuitive and spontaneous in nature, the other geographical concepts are relatively well structured and stable. Moreover, geographical imagination is interdisciplinary. The question arises as to how educators can foster geography

students' geographical imaginations effectively.

Spatial information and imagery about previously remote places is now available as a result of technological advancements. For instance, students readily can watch digital videos about tropical rainforests or the tundra regions on *YouTube*. They can gain access to information and images about international migration trends, or interact with computer simulations of landscape formations, plate-tectonic movements, tsunamis, or volcanic activities. All of these tools can assist students develop comprehensive understandings of geographical concepts, possibly leaving less room for imagination. Some believed that students in the pre-digital world tended to develop a different kind of geographical imagination from that developed by digital world students (Downs, 2014). One assumption is that the geographical imaginations of pre-digital world students were more creative and visionary than their digital world peers, as the information these students could receive was limited.

However, it also can be argued that the geographical imaginations of digital world students are more active than those of their pre-digital peers, and that IT can enhance the geographical imaginations of these students as a result of the ample information that is available through Web 2.0 technologies (O'Reilly, 2005). How then, can we foster students' geographical imagination in this digital world, so that they develop a real understanding regarding the nature, value and creative practice of geography? This is a thorny question, with an emerging concern that the advancement of geography may be hindered if future geographers do not have the propensity to think and imagine geographically.

Stoltman (2006) argued that geography education has undergone tremendous changes with the advances in IT. The amount of geographical information available to individuals has increased greatly. The options for organizing such geographical information have become more numerous and more efficient. These developments mean that students have greater opportunities to access and handle geographical information as they learn. Notwithstanding the numerous opportunities offered by the new technologies, there seems to be a growing need to look more closely at the social and personal affects associated with the use of IT (Sui & Morrill, 2004). Although there has been substantial research on the teaching and learning of geography, few studies have been completed regarding the fostering of students' geographical imaginations. This paper explores possible ways that geography teachers may harness IT to improve their students' geographical imagination.

Revitalizing Geographical Imagination with IT

Recent advances in IT may help students to develop a geographical imagination that expedites their exploration of the world. For example, VGI (Fahy & Ó Cinnéide, 2009) and digital cartography (Scoffham, 2013) may engage students in activities that enhance geographical knowledge and foster their capacities for geographical imagination.

Volunteered geographical information. Advances in Internet technology have led to a proliferation of information sources that have caused dramatic changes to quantity, accessibility, availability, and nature of geographical information. One significant change that has caught the attention of geographers is the easy accessibility of VGI. According to Flanagin and Metzger (2008), when the general public participates in the provision

of data on various digital geographical platforms, geographical data is increased dramatically. Public participation has been made possible by technological advances in networking and mobile communication (e.g., Wikipedia) that empowers the general public in producing useful, sharable geographical information (Hardy, Frew, & Goodchild 2012; Sui, 2008). Joint efforts between experts and non-experts in using geographical information systems seems like a natural outcome of emerging Web 2.0 technology that invites contribution from the public (O'Reilly, 2005; Wood, 2005). Using a common mapping platform, non-experts can upload photos and information easily onto platforms designed by geographical information system experts. For instance, individuals can upload and share their photos and geographical information on *Google Earth*, one of the most popular geographical information system platforms. Information about particular places that was previously unavailable now can be made available for reference. Moreover, as individuals from the community provide updated information, it is likely to be representative of the community.

There are several initiatives that involve VGI. One of these initiatives is community mapping. Maps have been commonly used in the study of geography, traditionally to abstract reality and show data in an objective manner. Maps have proven themselves very useful, and they are popular tools that are still used widely. Apart from their utilitarian value, maps have also been regarded as cultural artifacts that reflect the geographical imaginations and worldviews of mapmakers (Soini, 2001). The rapid development of information and communication technology has opened up new opportunities for the public to create and use maps. Community mapping has become a popular tool for individuals to show what they value in their neighborhoods, and thus, to express their imaginations concerning their local communities. In the process of creating community mapping, individuals develop a sense of identity with their localities.

Fahy and Ó Cinnéide (2009) argued that community mapping serves as a repository of socially constructed knowledge. They reported on a community-mapping project where non-expert locals determined what information was recorded and thus available for public access. They argued that such community mapping projects could be used as tools to practice sustainable development. Teachers should encourage students to participate in community mapping projects, as this may help them to develop geographical imaginations regarding their local communities through connecting their experiences with the local environment from a spatial perspective. This practice also might be useful for the students' future studies of other communities at the local, national, or international levels.

Although VGI has enhanced geographical data and, in many cases, has made such information readily available, it also has created issues in terms of credibility and usability. Some of the information posted has not been verified and hence, the quality of available information is not assured (Flanagin & Metzger, 2008). Issues of credibility and reliability threaten the overall value of posted information. Thus, teachers are encouraged to introduce information literacy to their students. Geography teachers should develop students' skills in verifying geographical information. For example, verification of VGI depends on other individuals who know the place well and who report errors to the relevant geographical information system platform (e.g., *Google Earth*). Geography teachers also should inform students about the challenges of too much information and misinformation. Sui (2004) emphasized that as the lines

between computational, spatial, social and environmental dimensions become blurred as a result of the increasingly complex issues associated with the information age, the development of students' critical attitudes towards digital media is crucial. With this provision, using VGI to revitalize students' geographical imaginations seems to be a positive way forward.

Digital cartography. Maps, as essential aspects of graphicacy, have been important tools in the study of geography (Balchin & Coleman, 1967). Lydon (2003) described the importance of maps in geography, showing that they have the capacity to link knowledge, learning, and power. Maps attempt to capture specific spatial realities in objective manners, or to serve as cultural products that represent mapmakers' worldviews in a particular space and time. Maps are communication tools or records of geographical imagination. As Soini (2001) stated, maps can be a creative response to "the environmental perception and the geographical imagination of humans" (p. 225). In other words, maps can be objective and require a high level of accuracy and precision, or they may be subjective expressions that represent individuals' imagination or memory of geographical spaces. Cartography is the systematic study and practice of map-making, with this practice traditionally dominated by professional cartographers (Fahy & Ó Cinnéide, 2009). Not until recently, with the advance of IT, has transformational change come to this field of study.

Balchin and Coleman (1967) studied the role of computers in cartography in the 1960s, identifying a number of barriers. At that time, university students attending cartography class used hand-drawing techniques to make maps. The available computing technology was not advanced sufficiently to process large amounts of graphical data. Balchin and Coleman (1967) explained that, "graphicacy is the most neglected aspect. Digital computers are essentially numerate, and insofar as they master the other skills it is by numerate methods" (p. 120). Nearly 50 years later, the situation has changed greatly as a result of rapid advancement in computing technologies and the increasing networking powers of the Internet. Computers now handle 2-D graphical data and 3-dimentional models efficiently, and can be used to create maps instantly as most base maps are stored in digital form and thus, readily available. Students can then use these digital base maps to create specific maps as needed by applying additional geographical data (Sui, 2004). Students can create on-demand maps that previously would have required hundreds of hours of effort quickly. These developments advance the field of cartography and work to reduce barriers to acquiring the necessary techniques and skills for making maps. As Fahy and Ó Cinnéide (2009) stated, "in recent times maps have escaped the clutches of professional cartographers and are no longer the preserve of an elite discourse" (p. 168).

The process of creating a map can help cartographers reflect on the underlying reasons for producing desired maps. As Scoffham (2013) elucidated:

> Maps of many different types and forms are the geographers' stock in trade; and they are not the dry, descriptive documents which they are sometimes thought to be. Every cartographer has to decide what to include, what to leave out, and how best to portray the information they have selected. On one level this means that maps can be regarded as highly imaginative representations of reality. At another level, the complexities of digital mapping and the analysis of spatial information, which is now available using

> geographical information systems, represent cutting edge scientific thought. (p. 373)

In this sense, the motive for map making is driven by geographical imagination. At the same time, the process of creating the map is an expression of geographical imagination, with or without the aid of technology. Thus, cartographers' geographical imagination matters in map-making, and this imagination should be honestly reflected in the maps they produce. In making general maps, the practical skills involved are usually more important than imagination, as accuracy and precision are needed for representing the spatial distribution of geographical features and boundaries. In this context, "cartography has been defined as a factual science", and "the premise is that a map should offer a transparent window on the world" (Harley 1990, pp. 3-4; as cited in Sullivan, 2011). In the making of thematic maps, however, a particular theme or idea may overshadow the need for accuracy and precision. Population cartograms are strangely shaped maps used to represent topologically corrected ideas, and thus, inevitably distort the actual shapes and boundaries of the regions being mapped (Dorling, 2012b). This kind of cartogram contrasts sharply with topographic maps that typically demand accurate and precise representations of regions. Imagination is thus a relatively lesser factor in most topographic maps but a greater factor in most thematic maps.

With the affordable access to powerful IT, cartographers can take advantage of these technologies to produce a variety of topological maps provided that the necessary geographical data is available. Dorling (2012a) stated that children's geographical imagination develops over time. Thus, the ways in which individuals draw maps change over time. With access to powerful map-making tools, it is possible that individuals' geographical imaginations can be more liberally reflected in the maps they produce. If digital cartography is integrated into school geography courses appropriately, then students' geographical imaginations likely will become more active and vivid over time.

Discussion

IT is an important tool for fostering students' geographical imaginations. Advances in computing and Internet technology have made it possible for students to use VGI and digital cartography. These technological advances may change the ways students study geography. Through VGI, students will be able to interact with geographical data (Flanagin & Metzger, 2008). Using digital cartographical technology will enable students to be creative and produce sophisticated thematic maps that were not producible previously (Fahy & Ó Cinnéide, 2009; Scoffham, 2013). Students may have more time to think and reflect on their learning, rather than attending to the technicalities that were required in the pre-digital world (Downs, 2014).

There have been few studies on the effects of IT on the geographical imagination. However, it seems clear that there is a reciprocal relationship between IT and students' geographical imaginations. If used appropriately, IT may help students foster their geographical imaginations (Stoltman, 2006), with geographical imagination in turn helping to inform how IT can enhance geography information science (Sui, 2004). Clearly, more research exploring the ways that teachers can use IT effectively to foster students' geographical imaginations is necessary.

When studying the many different environmental challenges that the world is facing, students now can *see* instead of imagine the effects caused by natural

disasters in other parts of the world (e.g., earthquakes, tsunamis). The videos and pictures concerning natural disasters that students find on the Internet may provide them with new perspectives towards those disasters in terms of their scale and influences. As students access and gather more information about the world through the Internet, they develop a better understanding of the world. With ready access to relevant information, students are increasingly able to focus their imaginations on the complex socio-geographical concepts involved in asking questions and framing answers. Such skills and concepts require greater intellectual sophistication than is commonly supposed. For example, the energy crisis, global warming, privacy issues related to the emergence of VGI are complex, intricate issues that require geographical imagination in the search for solutions. The role of geography teachers is increasingly significant in fostering this sophisticated but essential skill in the study of geography. Professional development for geography teachers is required so that they develop their awareness about how they can use IT to develop students' geographical imagination and nurture future geographers.

Concluding Remarks

Undoubtedly IT plays a major role and has greatly affected the teaching and learning of geography. The infrastructure and hardware exist to facilitate 21st century learning. The question *is, are* educators ready? Teachers clearly play an indispensable role in shaping the future of geography. The provision of advanced technology is a necessary, but not sufficient condition for enhancing meaningful learning. School managers who are willing to allocate necessary IT resources, and geography teachers who are willing to design innovative and IT-enhanced learning activities in their geography classes, also are necessary for meaningful student learning and engagement.

References

Balchin, W. G. V., & Coleman, A. M. (1967). Cartography and computers. *The Cartographer, 4*(2), 120-127.

Chang, T. C., & Lim, S. Y. (2004). Geographical imaginations of 'New Asia-Singapore'. *Geografiska Annaler. Series B, Human Geography, 86*(3), 165-185.

Daniels, S. (1992). Place and the geographical imagination, *Geography,* 77(4), 310-322.

Daniels, S. (2011). Geographical imagination. *Transactions of the Institute of British Geographers, 36*(2), 182-187.

Davies, A. R., Doyle, R., & Pape, J. (2012). Future visioning for sustainable household practices: Spaces for sustainability learning? *Area*, *44*(1), 54-60. doi:10.1111/j.1475-4762.2011.01054.x

Dorling, D. (2012a). Mapping change and changing mapping. *Teaching Geography*, *37*(3), 94-98.

Dorling, D. (2012b). *Population of the UK*. London, UK: Sage.

Downs, R. M. (2014). Coming of age in the geospatial revolution: The geographic self re-defined. *Human Development*, *57*(1), 35-57. doi: 10.1159/000358319

Fahy, F., & Ó Cinnéide, M. (2009). Re-constructing the urban landscape through community mapping: An attractive prospect for sustainability? *Area, 41*(2): 167-175. doi: 10.1111/j.1475-4762.2008.00860.x

Flanagin, A. J., & Metzger, M. J. (2008). The credibility of volunteered geographical information. *GeoJournal, 72*(3/4), 137-148. doi: 10.1007/s10708-008-9188-y

Gilley, J. (2010). Geographical imagination. In B. Warf (Ed.), *Encyclopedia of geography* (pp. 1222-1226). Thousand Oaks, CA: SAGE.

Gregory, D. (1993). *Geographical imaginations*. Cambridge, MA: Blackwell.

Harley, B. (1990). Texts and contexts in the interpretation of early maps. In D. Buisseret *(Ed.), From sea charts to satellite images: Interpreting North American history through maps* (pp. 3-15). Chicago, IL: University of Chicago Press.

Harvey, D. (1970). Social processes and spatial form: An analysis of the conceptual problems of urban planning. *Papers in Regional Science, 25*(1), 47-69.

Harvey, D. (1973). *Social justice and the city*. London, UK: Edward Arnold.

Harvey, D. (1990). Between space and time: Reflections on the geographical imagination. *Annals of the Association of American Geographers, 80*(3), 418-434.

Hardy, D., Frew, J. M. F., & Goodchild, M. F. (2012). Volunteered geographic information production as a spatial process. *International Journal of Geographical Information Science*, *26*(7), 1191-1212. doi:10.1080/13658816.2011.629618

Jackson, P. (2006). Thinking geographically. *Geography, 91*(3), 199-204.

Lin, W., & Yeoh, B. S. A. (2010). Questioning the 'field of motion': Emerging concepts, research practices and the geographical imagination in Asian migration studies. *Cultural Geographies, 18*(1), 125-131. doi:10.1177/1474474010385986

Lydon, M. (2003). Community mapping: The recovery (and discovery) of our common ground. *Geomatica*, *57*(2),131-143.

Marcano, L. C. (2011). *Geographical imaginations and power: An inquiry on the social production of the Venezuelan territory* (Unpublished doctoral dissertation). Clark University, Worcester, MA.

Massey, D. (2006). The geographical mind. In D. Balderston (Ed.), *Secondary geography handbook* (pp. 46-51). Sheffield, UK: Geographical Association.

Mills, C. W. (1959). *The sociological imagination*. New York, NY: Oxford University Press.

Morgan, J. (2013). What do we mean by thinking geographically? In D. Lambert, & M. Jones (Eds.), *Debates in geography education* (pp. 273-282). Oxon, UK: Routledge.

O'Reilly, T. (2005). *What is Web 2.0*. Retrieved from http://oreilly.com/web2/archive/what-is-web-20.html.

Relph, E. (2014). Responsive methods, geographical imagination and the study of landscapes. In A. Kobayashi, & S. Mackenzie (Eds.), *Remaking human geography* (pp. 149-163). New York, NY: Routledge.

Rodríguez, M. H. (2010). Geography as holistic discipline: Theoretical and empirical reflections. *Investigacion y Desarrollo, 18*(2), 390-415.

Sallis, J. (1987). *Spacings - of reason and imagination: In texts of Kant, Fichte, Hegel*. Chicago, IL: University of Chicago Press.

Scoffham, S. (2013). Geography and creativity: Developing joyful and imaginative learners, *Education 3-13, 41*(4), 368-381. doi: 10.1080/03004279.2013.819625

Soini, K. (2001). Exploring human dimensions of multifunctional landscapes through mapping and map making. *Landscape and Urban Planning* 57(3), 225-239. doi: 10.1016/S0169-2046(01)00206-7

Stoltman, J. P. (2006). Turning points in geographic education. In J. Lidstone, & M. Williams (Eds.), *Geographical education in a changing world: Past experience, current trends and future challenges* (pp. 23-37). Dordrecht, Netherlands: Springer.

Sui, D. Z. (2004). GIS, cartography, and the "third culture": Geographic imaginations in the computer age. *The Professional Geographer, 56*(1), 62-72. doi: 10.1111/j.0033-0124.2004.05601008.x.

Sui, D. Z. (2008). The Wikification of GIS and its consequences: Or Angelina Jolie's new tattoo and the future of GIS. *Computers, Environment & Urban Systems, 32*(1), 1-5. doi: 10.1016/j.compenvurbsys.2007.12.001.

Sui, D., & Morrill, R., (2004). Computers and geography: From automated geography to digital earth. In S. D. Brunn, S. L. Cutter, & J. W. Harrington (Eds.), *Geography and Technology* (pp. 81-108). Dordrecht, Netherlands: Springer.

Sullivan, R. (2011). *Geography speaks: Performative aspects of geography*. Surrey, UK: Ashgate.

Tate, N. J., & Unwin, D. J. (2009). Teaching GIS&T. *Journal of Geography in Higher Education*, *33*(1), S1-S6. doi:10.1080/03098260903165964

Wood, J. (2005). How green is my valley? Desktop geographic information systems as a community-based participatory mapping tool. *Area, 37*(2), 159-170.

Yusoff, K., & Gabrys, J. (2011). Climate change and the imagination. *Climate Change, 2*(4), 516-534. doi: 10.1002/wcc.117

Author

Jacky Pow, PhD, is an associate professor at Hong Kong Baptist University. He currently is the Secretary General of ISfTE. His research and professional interests include self-directed learning and teaching with technologies for the enhancement of students' learning experiences. Jacky can be reached at: jackypow@hkbu.edu.hk