ISSN: 2186-8492, ISSN: 2186-8484 Print
Vol. 1. No. 3. August 2012

THE POTENTIAL OF SCIENCE COMMUNICATION IN THE CULTURAL CHANGE: RHETORIC AND CONTEXT

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ABSTRACT

This study examines the application of a rhetorical approach to investigate science communication on television programs in relation to cultural changes in the context of Indonesia. Although in many societies science, for example, about human life, can be communicated to the public through, for example, television, cinema, literature, and theatrical performance, different cultures might have different ways to communicate science including choosing any elements in the chosen media of communication which can then represent characteristics of the cultures. Science communication itself can be seen as a means of bridging the gap between science and culture which in turn may contribute to change the culture of a society. In addition, the science itself can be seen as the catalyst by which our societies are being swiftly changed. However, there are still a small number of studies with regard to how cultures might be changed through science communication. Since in science communication the chosen media of communication is aimed at persuading people through persuasive rhetoric of verbal and non-verbal elements, the study in this article focuses on rhetorical aspects in terms of how the persuasive 'tools' are used in delivering scientific messages on television and how audiences of the science television programs make potential meanings about these persuasive 'tools' and the scientific messages in Indonesia. This study offers an alternative approach to examine how ways of communicating science might influence people's perception and behavior about their life regarding the portrayal of science on television.

Keywords: Cultural change, rhetorical approach, science communication, television program

INTRODUCTION

Communicating science via television programs employs audio-visual elements and any supporting tools as a set of sign systems which convey meanings. The meanings are generated through the sign systems which are important in cultural changes. The process of cultural change itself is concerned with the nature of shared social meanings. Regarding informing science through television programs, different societies might have different types of science television programs. In order to communicate science there are many devices that communicators can use in what they believe to be the most suitable and effective ways to deliver such a message to their target audiences. This relates to the use of a set of methods aimed to persuade the audiences by

using language within the sign systems. This means our communication with others might sway opinion in our favor. For example, if the science is addressed to children, the language used to deliver the message including its materials (e.g. audio and/or visual elements) and the means of communication should be easy to understand by the children. The audiences make meanings of information delivered via the media of communication using their knowledge and experience relating to the messages. The messages might, in turn, influence the ways the audiences think about their life including their social practices which are possible to change. In a more general sense, the messages have great potential to change people's lives, moreover, to change the culture of a society.

Since information about science has the potential to change cultures, communicating science to the public is important to take into account in terms of *how* it can change the cultures, and *why*. The ways to communicate science, which are the ways to persuade people and the uses of any devices for this purpose, might play an important role in cultural changes so that investigating them might help us to explain the process of cultural change. This means rhetorical aspects of this process of communication is important to explore. The rhetorical aspects of science communication are related to cultures of certain societies in a way that different cultures might have different ways to employ their rhetorical devices embedded in the messages delivered to their audiences. Rhetoric itself has been studied as a means by which orators or speakers articulate persuasive arguments and express personhood that resonates or is consubstantial with the realities of those to whom one is speaking (Jackson II, 2004, p. 90) and has the potential to be applied in the discussion of this article.

Previous research on science communication with regard to culture focuses on, for example, sociological nature of science communication (d'Andrea & Declich, 2005). Regarding media of science communication, previous research mentions the use of website, radio, and museum as shown by, for example, Park and Thewall (2006). Ways of communicating science are also mentioned by Roundtree (2010) who studies rhetoric of computer simulations. Those examples of research, however, have not explored relationships between science communication and cultural changes from a rhetorical perspective in the context of television. This is an important omission as in the contemporary society television has become important sites for the production and circulation of a proliferation of knowledge and experience. In addition, television is one of the important media which might influence the ways its audiences think about their life. This indicates that science television programs, which comprise audio and visual elements and might persuade the audiences, need to be taken into account in this signifying process.

In the study that this article draws on, the terms *science* refers to: (1) systematic studies of the structure and behaviour of the physical and natural world through observation and experiment and (2) a systematically organised body of knowledge on a particular subject or about a universe (Brake & Weitkamp, 2010). In this article I will examine how a rhetorical approach can help us to understand cultural changes through science communication, and why. Firstly, I will explain a

ISSN: 2186-8492, ISSN: 2186-8484 Print
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short description of relationships between science communication and cultural change in terms of how the cultural change process is possibly influenced by science communication. This will be followed by an explanation about science communication on television programs in Indonesia and a discussion of rhetorical perspective in communicating science in relation to cultural change in the context of this country. Then, I will describe an implication of the application of the rhetorical approach in this study and recommendation for further studies. Data in this study is obtained from Indonesian national television programs about science, particularly natural sciences including physical and life sciences which are broadcast from January to June 2012.

RELATING SCIENCE COMMUNICATION TO CULTURAL CHANGES

As mentioned previously, science communication has the potential to change cultures as the ways the science television programs are broadcast generate meanings which can then be shared by members of a society. This means the ways people make meanings about their life might also change. This process of meaning production is signifying practices (Barker, 2010, p. 7). In order to understand cultural changes, we need to explore how meanings are produced as a signifying system which is generated through language, whether verbal or non-verbal. This indicates that the concept of meaning is core to the investigation of culture (Barker, 2010, p. 110).

Given that communicating science also means generating meanings, in this context cultural meanings are formed and communicated through the ways the science is communicated. In addition, science communication including information about science itself can be seen as a means and a medium through which we form knowledge about ourselves and the social world. In turn, science communication, with the assistance of language, might construct meanings. In this context the process of constructing meanings can be seen as a dialogue between scientists, policy makers, and common people. Laypeople, however, are often seen as having deficient knowledge of science. This assumption might be now outdated (Brake & Weitkamp, 2010, p. 2) as new opportunities to reach out to and engage a wide range of people with science are developing at a rapid pace. The potential of social networking sites, podcast and blogs for science communication may offer exciting and interactive ways of reaching both new and traditional audiences (Brake & Weitkamp, 2010, p. 2). In addition, ways people interact with a medium of communication might give an impact on their interaction with other media. For example, those who are familiar with audio-visual media will use their knowledge and experience in interacting with such media when they interact with other audio-visual media. This indicates that people's previous knowledge and experience about any audio-visual elements will influence the way they interact with the media containing information about science.

As a good deal if cultural studies is centered on questions of representation (Barker, 2010, p. 7), it is important to explore how the world is socially conditioned and represented to and by us in meaningful ways. This means cultural changes in relation to science communication can be understood as the signifying practices of the representation of science communicated via media. The cultural representations and meanings are embedded in audio and visual elements which

bring knowledge within science. Those elements are produced, enacted, used, and understood in specific social contexts (Barker, 2010, p. 8) in everyday life of the audiences of the television programs.

SCIENCE COMMUNICATION THROUGH INDONESIAN TELEVISION PROGRAMS

Although science can be communicated through various kinds of media, television is one the important media to deliver information about science to its audience which can then contribute to constructing a world in which knowledge and experience portrayed on the television programs are ever present. In terms of communicating science television has become an important site for the production and circulation of a proliferation of knowledge and experience about science that is broadcast via science television programs. According to Hook and Brake (2010, p. 32), the mission of television is to inform, to educate, and to entertain its audiences. This means television programs including science programs might have those purposes. To achieve those purposes science as portrayed on television can be classified into two types: (1) *obvious* which broadcasts television programs as science in forms of, for example, documentary and (2) *incidental* which shows science as part of everyday interaction of the scientific method with the wider world, for example, scientific film which relies upon forensic scientists which in reality is about the human condition (Hook & Brake, 2010, p. 33).

In the study that this article draws on criteria to select the television programs refer to that category. In addition to those criteria, this article is also concerned with any programs which are not under those criteria but they provide information about science, for example, news programs which have a section informing science. In Indonesian television programs science is broadcast under categories of news, documentary, edutainment, adventure, and entertainment. Some television science programs in this country are not specified into those categories, but they are classified into ‘others’.

Figure 1 and Table 1 provide data about Indonesian national television stations which broadcast information about science from January to June 2012. These science television programs are about natural sciences and their application. The science programs listed in Table 1 are targeted for various age levels. Some of the programs are clearly stated for children, for example, *Dunia Air, Dunia Binatang, Teropong Si Bolang, Laptop Si Unyil, Buku Harian Si Unyil, Si Bolang,* and *Si Bolang Jalan-jalan* broadcast on Trans 7.

The way the science is informed to the audiences through the television programs is possible to influence the way the audiences make meaning of it, as mentioned previously. A possible reason for that is that the way information about the science is delivered might inform or advocate the audiences to do something related to the portrayed information. Understanding the science including the ways it is communicated is likely influenced by audiences’ familiarity with them including their previous knowledge and experience which can be obtained from any sources including museums, films, magazines, and etcetera. This means the process of understanding the

ISSN: 2186-8492, ISSN: 2186-8484 Print
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science broadcast on the television programs might occur culturally as the way the audiences understand it is formed through their relationships with their culture and community. The audiences as members of a community have certain ways of interactions which might represent relationships between them, the community, and the culture.

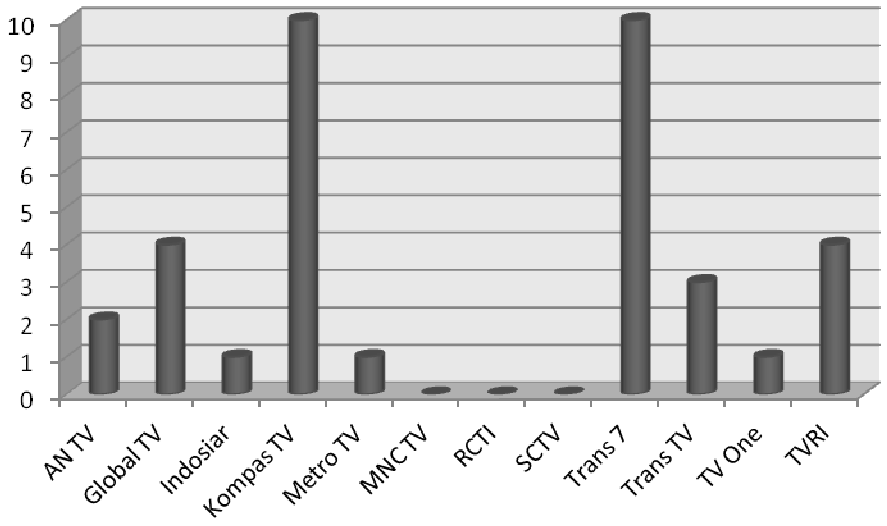

Figure 1. Number of science programs in Indonesian television stations from January to June 2012

Table 1. Names of science programs in Indonesian television stations from January to June 2012

No.	Name of television station	Television program	
		Category	Name of program
1	AN TV	Others	*Dokumenter*
		Children	*Dink the Little Dinosaur*
2	Global TV	Entertainment	*Profesor X*
		Adventure	*Steve Ewon Sang Pemburu, Gadis Petualang, Petualangan Panji*
3	Indosiar	News	*Ragam* (a section of a news program)
4	Kompas TV	Entertainment	*Science is Fun, Bumi Kita, Tekno, Human Planet, Orang Utan Diary, Wild Tales, Sis the Science Kid, Inside Life*
		Adventure	*Ekspedisi Cincin Api, Teroka*
5	Metro TV	Documentary	*Inovator*
6	MNC TV	N/A	
7	RCTI	N/A	
8	SCTV	N/A	
9	Trans 7	Edutainment	*Sang Kreator, Teropong Si Bolang, Dunia Air, Dunia Binatang, Laptop Si Unyil, Buku Harian Si Unyil, Si Bolang, Si Bolang Jalan-jalan*
		Documentary	*Asal Usul Flora dan Fauna, Asal Usul Cari Tahu*
10	Trans TV	News	*Jelajah, Reportase Investigasi*
		Entertainment	*Nature's Life*
11	TV One	News	*Tabir* (a section of a news program)
12	TVRI	Education	*Siaran Pendidikan, Dokumenter*
		Entertainment	*Cerdas Ceria, Sang Penemu*

Note N/A: not available

Customs and traditions including ways of meaning-making are communicated rhetorically within a society which in turn relates to how the audiences understand the science television program. This means in this process of understanding rhetorical aspects play an important role in terms of how the way the programs are delivered might influence the audiences' way of meaning-making about their life which in turn might influence their culture.

A RHETORICAL PERSPECTIVE IN SCIENCE COMMUNICATION IN RELATION TO CULTURAL CHANGE

The ways the producers of television programs deliver information about science to the audiences are related to the ways they persuade the audiences to watch the programs and to understand information portrayed on the programs. According to Murcott (2010, pp. 110-112), several television program genres which are used to deliver information about science are news, magazine, documentary/features, and fiction. In the study in this article the program genres are not only under categories of news and documentary, but also under some other categories such as entertainment and edutainment (see Table 1). In addition, in Indonesian television stations categories of education, adventure, children, and others are also used to provide science programs.

In Indonesian national television stations information about science is delivered in forms of quiz (i.e. *Cerdas Ceria*), laboratory demonstration (i.e. *Profesor X* and *Science is Fun*), part of news program (i.e. *Tabir* and *Ragam*), and stories with narration (e.g. *Bumi Kita, Dunia Air, Dunia Binatang*, and *Laptop Si Unyil*). Some of the programs intended for children such as *Dunia Binatang* use cartoons to support explanations about animals' life. In the study in this article the stories with narration can be classified into several forms based on types of narrator: (1) the narrators are not part of the story (i.e. *Bumi Kita, Ekspedisi CIncin Api*, *Inside Life, Jelajah, Tekno, Human Planet, Orang Utan Diary, Wild Tales,* and *Teroka*) and (2) the narrators are part of the story or one of the actors in the story (i.e. *Gadis Petualang*, *Steve Ewon Sang Pemburu,* and *Petualangan Panji*). Within this last type of narrators, the narrators are also the presenters of the programs and they interview some actors in the story (i.e. *Dunia Binatang, Asal Usul Flora dan Fauna*, *Teropong Si Bolang, Dunia Air, Laptop Si Unyil, Buku Harian Si Unyil, Si Bolang, Si Bolang Jalan-jalan,* and *Asal Usul Cari Tahu*).

The above categorisation and the way information about science is delivered are related to the purpose of the programs whether for informing, entertaining, and et cetera which can be indicated not only from the categories of the program genres which are clearly stated on the television programs, but also from the characteristics of the programs including audio and visual elements in the portrayed programs. For example, *Reportase Investigasi* and *Jelajah* in Trans TV are categorised as news as these are published reports. In terms of the program of *Reportase Investigasi*, it usually shows recent cases about using dangerous substances for consumption products occurred in Indonesian contemporary society. An example of this program shows the use of synthetic dye for food, where it should be used for textile, is described by showing the

ISSN: 2186-8492, ISSN: 2186-8484 Print
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way people use it for food dough, followed by an explanation of the impact of the dangerous food additive on human body. The explanation of this impact is supported by a laboratory experiment to examine whether the examples of food contain such a chemical substance. Some experts in related fields also explain this impact scientifically and offer some possible solutions to the problem on how to choose good foods. This kind of program indicates 'news' as it has the simplest narrative style (Murcott, 2010, p. 109) because it is straightforward and has linear structures of who did what, when, where, why, and how, though not necessarily in that order. That example of the television program shows that adding dangerous chemical substances such as synthetic food dye to food dough is dangerous to human body. In addition, the programs of *Inovator, Asal Usul Flora dan Fauna*, and *Asal Usul Cari Tahu* are classified into documentary since these are recording events and sometimes including interviews with the contributors. Informing science through documentary program will allow the producers of the program to take the audiences along a much longer and more convoluted (Murcott, 2010, p. 109). For example, in *Inovator* when the producer of the program shows information about fish freshness sensors, the producer shows how the inventor of the tool create it, what components forming it, how to use it including its strengths and weaknesses. Also, the inventor of the tools is interviewed to explain his invention including possibilities to apply the invention to the society.

Whether the television programs are classified into news, documentary, entertainment, and edutainment, the way information about the science is broadcast in the Indonesian television programs is generally through telling stories. Telling stories are part of Indonesian culture that has been socially conditioned in the society (Rodgers, 1995, p. 6). It might be easier for Indonesian audiences to understand information in the television programs if it is delivered through that way. In the context of broadcast media telling story is often seen in Indonesian advertisements to describe products (Venkateswaran, 2011, p. 121) as it might be easier for Indonesian audiences to understand messages through describing an event, experience, or sequence of events in the form of a story.

In Indonesian television programs mentioned above information about the science is portrayed by using some persuasive 'tools', for example, metaphor (analogy) and metonymy. It can be seen, for example, in explaining the impact of food additives on human body the contributors of *Reportase Investigasi* use bullets to describe human cells. The contributors transfer the meaning associated with the bullets to the notion of human cells. This is similar to what the contributors of *Dunia Air* and *Dunia Binatang* use. They use bullets frequently to describe Deoxyribonucleic Acid (DNA) chains to explain animal breeding cells. The use of metaphor in this case can persuade the audiences as well as provide heuristic model for our meaning-making about the message (Leach, 2000, p. 216). In terms of metonymy, it has close relations with metaphor in a way that it allows us to shift attributes and characteristics from one thing to another (Leach, 2000, p. 217). For example in *Sang Kreator* when the contributor is interviewed to explain joints of bamboo slats in a bamboo shelter, he demonstrates how to make the joints and how the joints work in the bamboo shelter to form the shelter by using two bamboo slats as an example. The

joint of two bamboo slats can represent the joints of all bamboo slats in the shelter. The use of persuasive 'tools' in those examples of programs is an aid to our understanding and description by creating an analogy between two concepts (metaphor) and providing the part for the whole (metonymy).

The audiences' potential meaning-making about the way information about the science is portrayed on television programs as described above does not simply exist in the audio and visual elements in the television programs. The potential meaning-making is likely to be influenced by the audiences' knowledge and experience in interacting with other audio-visual elements and other similar media and electronic devices. This social conditioning relates to conditions or backgrounds of the television audiences such as their education, gender, and age (Turkle, 1984; Trisnawati, 2007) since the audiences from different social backgrounds might have different knowledge and experience with the television programs. These knowledge and experience are socially conditioned during the lifetime of the audiences (Turkle, 1984; Wajcman, 1993) so that such knowledge and experience influences the audiences' understanding of the television programs. This process of social construction is culturally embedded in every society, including in Indonesia.

The audiences' previous knowledge and experience in relation to science communication including the persuasive "tools" of science communication in the television programs as explained in the previous paragraphs are also play an important role in investigating the audiences' potential meaning-making about the programs. This means the process of meaning-making occurs culturally and we learn it culturally. This cultural process is seen as a rhetorical process as, according to Gallagher (2004, p. 149), culture itself is communicated rhetorically. As an example, culturally we often speak of taking an argumentative position or of advocating a position, of persuading others to adopt our position (Darsey, 2004, p. 5). The way we express our ideas is also learnt culturally. We can see 'this way of communication' in several examples of 'cultural object' such as museums and memorials which in the past two decades take on added significance for scholar interested in examining how culture is communicated rhetorically (Gallagher, 2004, p. 149). Television programs can also be seen as a cultural object which can be used to deliver messages to their audiences persuasively. The science television programs to a certain extent might show how they, as the cultural objects, reproduce 'ideologies' in the life of a society such as the way members of the society communicate messages to the other members, the way they live, and et cetera, which in turn might create, sustain, and reproduce certain customs and traditions for their life which can then be generated. For example, the audiences become (more) conscious and knowledgeable about healthy food after watching the program of *Reportase Investigasi* that some foods might contain synthetic dye which is dangerous to human body. We can avoid such foods by examining food characteristics as explained by the contributor of the television program. We can follow this information and can keep the knowledge in our minds; we can deliver, share, or generate it to other members of our society. When we maintain this knowledge and experience which then generate them, it means we create, sustain, and

ISSN: 2186-8492, ISSN: 2186-8484 Print
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reproduce an 'ideology' about healthy life. To some extent this potential meaning-making has the great potential to influence the 'forming of new' culture with regard to healthy life in the society. This is similar to, for example, the discourse of the cult of thinness which creates an 'ideology' that beauty is indicated by thinness. The concept within this discourse is that beauty is seen as symptoms of the obsession with weight. This knowledge has been influenced our society so that many people buy and use some products related to this 'ideology' including diet food or beverages and products of the fitness industry to have an ideal body (Trisnawati, 2012, p. 78). Sharing and generating meanings of the information obtained from the television programs can also be applied to the other science television programs where the processes of sharing and generating meanings are really supported by the way the programs are delivered. The examples of science communication practice in the society as described above indicate rhetorical practices which create the relationship between rhetoric and community in cultural changes.

IMPLICATIONS AND RECOMMENDATIONS FOR FUTURE STUDIES

There might be some differences among rhetorical practices from one culture to another. In terms of the use of rhetorical devices on a practical level in Indonesia, spoken language is frequently used to deliver messages in broadcast media, for example, in television advertisements, which might be different from some other cultures. This is related to identities of cultures. These identities may change due to interactions among members of the societies or between members of some societies where all of them use (other) rhetorical devices in their lives which can then influence the way they make meanings about the rhetorical devices they use. For example, the influence of the development of media and technology which include the use of more visual elements might lessen the use of spoken language in television programs. This might change the rhetorical practice of the society, which in turn, after a certain period of time, might change the identity of the culture in terms of the use of persuasive 'tools' in broadcast media.

Although science communication is rhetorically transmitted in everyday life, it is not easy to investigate audiences' way of meaning-making about science communication including information about science as the audiences have their own values in their life. The meanings obtained from the television programs might be negotiated in their everyday life to suit the values they receive from the television programs, including the media of communication they interact with, with their previous values. The meanings will be easier to be accepted by the audiences if it is aligned with their cultures.

Investigating cultural changes needs a research design and methodology which does not only include the media or observe the society for a short period of time. Although this paper did not observe a society for a certain time period, it provides an insight on how the culture is changed in terms of science communication from a rhetorical perspective. Apart from its usefulness, applying a rhetorical approach in this study has some limitations. This investigation can be subjective while objective at the same time. The strength of the approach, however, over-rides its

limitations as it can help us to reveal the potential meaning-making which can then be important to investigate cultural changes.

It has not paid attention to social sciences broadcast on television. We, however, need to take these kinds of science into account as they might be communicated differently in comparison to natural sciences and they might also play an important role in cultural changes. In addition, as this study observes television programs from January to June 2012, there might be more science television programs after this time duration which also be important to be explored.

In the context of Indonesia, as the culture of the country is heterogeneous comprising various customs and traditions, investigations of cultural change should represent the whole culture in the country. The example of analysis in this article is a general investigation which needs to be developed by providing data from the audiences of the television programs and using several methods to support rhetorical analysis.

REFERENCES

Barker, C. (2008). *Cultural studies: Theory and practice* (3rd ed.). Los Angeles: Sage, (Chapter 10).

Brake, M.L., & Weitkamp, E. (Eds.) (2010). *Introducing science communication*. New York: Palgrave Macmillan.

d'Andrea, L., & Declich, A. (2005). The sociological nature of science communication. *JCOM,* 4 (2), 1-9.

Darsey, J. (2004). James Baldwin's topoi. In P.S. Sullivan, & S.R. Goldzwig (Eds.), *New approaches to rhetoric* (pp. 5-29). London: SAGE Publications.

Gallagher, V.J. (2004). Memory as social action: Cultural projection and generic form in civil rights memorials. In P.S. Sullivan, & S.R. Goldzwig (Eds.), *New approaches to rhetoric* (pp. 149-171). London: SAGE Publications.

Hook, N., & Brake, M. (2010). Science in popular culture. In M.L. Brake, & E. Weitkamp, *Introducing science communication* (pp. 29-51). New York: Palgrave Macmillan.

Jackson II, R.L. (2004). Cultural contract theory: Toward a critical-rhetorical identity negotiation paradigm. In P.S. Sullivan, & S.R. Goldzwig (Eds.), *New approaches to rhetoric* (pp. 89-107). London: SAGE Publications.

Leach, J. (2000). Rhetorical analysis. In M.W. Bauer, & G. Gaskell (Eds.), *Qualitative researching with text, image and sound: A practical handbook* (pp. 207-226). London: SAGE Publications.

Murcott, T. (2010). Broadcasting science. In M.L. Brake, & E. Weitkamp, *Introducing science communication* (pp. 105-127). New York: Palgrave Macmillan.

ISSN: 2186-8492, ISSN: 2186-8484 Print
Vol. 1. No. 3. August 2012

Park, H.W., & Thelwall, M. (2006). Website science communication in the age of globalization. *New Media & Society,* 8 (4), 629-650.

Rodgers, S. (Ed.) (1995). *Telling lives, telling history: Autobiography and historical imagination in modern Indonesia*. California: University of California Press.

Roundtree, A.K. (2010). The rhetoric of computer simulations in astrophysics: A case study. *JCOM,* 9(3), 1-9.

Trisnawati, S. (2007). *Applying an integrated communications approach to the study of user multimedia interactions*. Unpublished doctoral thesis, University of Southern Queensland, Queensland, Australia.

Trisnawati, S. (2012). Rethinking processes of meaning-making television advertisements: The representation of cultural identity in media research. *Asian Journal of Social Sciences & Humanities*, 1 (2), 70-82.

Turkle, S. (1984). *The second self: Computers and the human spirit*. New York: Simon & Schuster, (Chapter 5).

Venkateswaran, A. (2011). Advertising in Indonesia: Balancing an "Asian" socio-culture with economic growth, multimedia convergence and expanded consumerism. In E.C. Alozie (Ed.), *Advertising in developing and emerging countries: The economic, political and social context* (pp. 111-135). Surrey, UK: Gower Publishing Limited.

Wajcman, J. (1993). *Feminism confronts technology*. Cambridge: Polite Press, (Chapter 1).