The impact of structured argumentation and enactive role play on students' argumentative writing skills

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This paper reports the impact of using a structured argumentation board and enactive role play in *Second Life* on students' argumentative writing skills in the context of the A-level subject General Paper. Students were taught the structural aspects of argumentation based on Toulmin's (1958) argumentation framework. The structured argumentation board, Voices of Reason, supported their argumentation discourse while the *Second Life* platform supported students' contextualised role-playing activities on the topic of globalisation. Students participated in these two separate modes of technology-facilitated learning in a cyclic, interwoven fashion, alternating back and forth between two cycles of argument and enaction. Data in the form of argumentative essays were collected at the beginning and the end of a four week intervention period. We compare the pre and post intervention argumentation essays written by the students based on Toulmin's argumentation framework, contrast the findings with that of the control group's argumentative essays, and present the statistical results in this paper.

Keywords: argumentation, enactive role play, critical thinking

Introduction

The field of argumentation has long been a significant aspect of communication at tertiary level as it serves as one of the most effective approaches for participants to articulate their thinking and provide evidence for their assertions (Crammond 1998; Van Eemeren & Grootendorst 1999).With the increasing national focus on critical thinking skills, argumentation has become even more important to the discipline as a vehicle to teach critical thinking. In Singapore, critical thinking and argumentative writing skills are especially important for the A-level subject, General Paper (GP). Performance in the GP is particularly significant for local university admission to specific programmes; namely, Law, English Language and Literature, and Mass Communication. The GP is treated 'both as a preparation for university study and as an indicator of student preparedness for university admission' (Ho, 1995, p. xviii). From 2006, under the revised pre-university curriculum which offers more breadth and greater flexibility, GP is designated a Higher 1 (H1) subject under the domain of 'Knowledge Skills' (Ministry of Education, 2004) 'for broadening purposes' for tertiary level studies (Ministry of Education, 2004). The GP is 'not concerned merely with language skills' nor is it solely a 'general studies test' as the 'skills which the GP purports to assess are primarily those involving logical and intellectual argument' (Ho, 2006, p. 2). Candidates choose to write a 500-800 word essay within one and a half hours from a wide range of topics—history, economics, politics and philosophy, science and technology, literature and the arts, to topics of local interest and national concern. This is in keeping with the aim of testing not merely students' general knowledge but rather their 'ability to convey a sustained and well thought –out argument' (Ho, 2006, p. 3). Students are expected to 'draw on their knowledge from across disciplines as well as to show an awareness of current, global, and significant local/national issues' (Ho, 2006, p. 3).

Previous research in GP includes a range of different perspectives on students' performance in GP. Skuja's (1983) study highlighted students' specific weakness in GP by identifying and quantifying organisational features of GP essays with comparisons made to students and graduate English teachers from England and New Zealand. Seng (1990) focused on the selected variables that influenced variance in writing attainment of GP students, namely, language proficiency, rhetorical cognitive ability, background information, exposure to English, and the stream of students. One significant contribution to the research reported here was the work of Ho (1995) on the discourse features characterising the GP essay, based on a rhetorical approach, using the Toulmin (1958) framework that identified students' weaknesses in argument.

The research presented in this paper seeks to build on this study by enhancing GP students' critical thinking and writing skills through web-based scaffolded argumentation discourse (Kuhn, 1991; 2005) and enactive role play in an immersive virtual environment based on the underlying pedagogy of experiential learning (Kolb, 1984). Engagement in the argumentation process supports the intensional–comprehension mode of conceptual thinking and reflective learning while the enactive portion of the learning design supports the extensional–apprehension mode of experiential learning (Chee, 2006). Our work focuses on a four week GP curriculum, based on the Toulmin (1958) framework, designed to support junior college students in their argumentative writing skills, where students participated in the two above-mentioned modes of technology-facilitated learning in a cyclic, interwoven fashion, alternating back and forth between two cycles of argument and enaction. We report the impact on students' argumentative writing skills in this paper.

Toulmin's framework: Examining the structural aspects of arguments

Toulmin's Argument Pattern (TAP) has been applied as a methodological tool for the analysis of a wide range of school subjects such as English (Mitchell, 1996), Science (Jim´enez-Aleixandre, Rodr´ıguez,& Duschl, 2000; Zohar & Nemet, 2002), and History (Pontecorvo & Girardet, 1993). It has also been used as a heuristic for assessment of student work (e.g.,Hart, 1998) as well as for supporting student learning (Andrews, 1995). For example, Mitchell (1996) has successfully adapted TAP as a heuristic to scaffold university students' writing (Erduran, Simon & Osbourne, 2004). The TAP framework (see Figure 1) suggests that the statements that make up an argument have different functions that can be classified into one of six categories: claims, grounds, warrants, backings, qualifiers, and rebuttals.
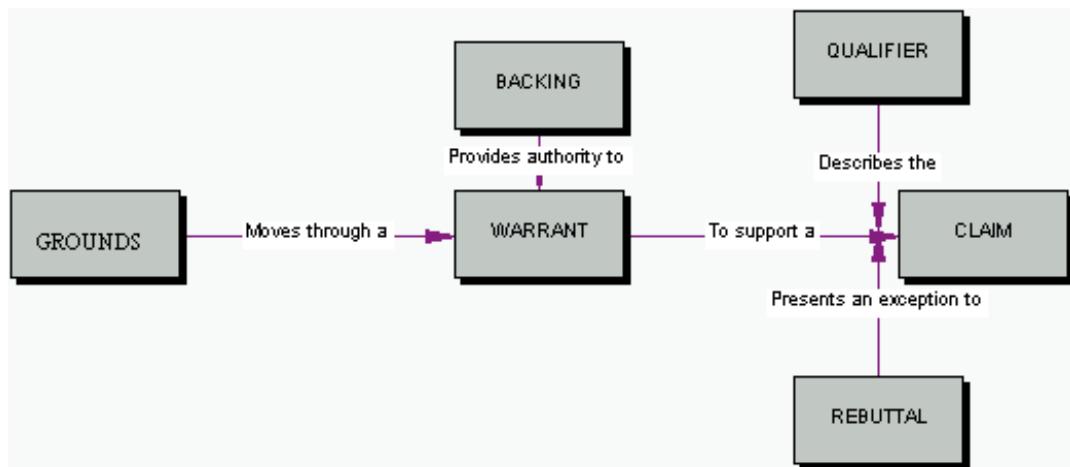

Figure 1: TAP structure of an argument (Toulmin, 1984)

According to this framework, a claim is the assertion that an individual makes and grounds are the facts that a person explicitly appeals to as a foundation for their claim. Warrants are used by individuals to justify why data is relevant to the claim. The strength of the warrant is indicated by including a modal qualifier. The backings of an argument are the comments that are used to establish the general conditions that strengthen the acceptability of the warrants so that the connection between the data and the claims will not be scrutinised. Finally, a rebuttal indicates the "circumstances in which the general authority of the warrant would have to be set aside" (p. 101). From this perspective the strength of an argument is based on the presence or absence of these different structural components. Stronger arguments contain more of these different components than weaker arguments. In this study, we adapted the coding framework developed by Varghese & Abraham (1998) for analysing students' argumentative writing (see Table 1).

Toulmin, Rieke, and Janik (1984) suggest that the strength of an argument also depends on the persuasiveness of that argument, whether counter-arguments raised are balanced, and integrated viewpoints are elucidated (Varghese & Abraham, 1998). In this regard, the adapted analysis model for this study not only focuses on the quality of the structural components of an argument on a three point scoring scale but also takes into account how the arguer relates to the text and context by adopting a textual stance that is unique to argumentation, recognising the existence of differing viewpoints, and addressing them as anticipated counter-arguments (Varghese & Abraham, 1998).

Table 1: Coding framework

	Quality of Claim	Score
Argument structure	No explicit claim stated and/or no consistent point of view. May have one subclaim.	1
	Explicitly stated claim. Somewhat consistent point of view. Relevant to the task. Has two or more subclaims which are developed. No solution.	2
	Specific, explicitly-stated claim with consistent point of view. Several well-developed subclaims, explicitly tied to the major claim. Feasible solution.	3
	Quality of Ground	
	Data of the "everyone knows" type. Not developed.	1
	Data of the "everyone knows" type. Minimally developed (i.e., by at least two sentences)	2
	Data that is specific and well-developed of a variety of types.	3
	Quality of Warrant	
	Most warrants not reliable because they represent unshared values and opinions for which no backing is provided. May include logical fallacies.	1
	Some warrants reliable because they represent shared values or public knowledge. Some distortion and informal fallacies evident.	2
	Most warrants reliable because they represent shared values or public knowledge. In the case of unshared warrants, backing (in the form of data, expert testimony, etc.) is provided.	3
Argument stance	**Stance towards discourse of argumentation**	
	Inability to convey either view adequately.	0
	One-sided discussion	1
	Ability to see both sides (raise counter-arguments)	2
	Ability to see both sides (balanced, integrated viewpoint) and provide a solution	3

Structured argumentation discourse

Previous research on argumentation has shown that technology can support social negotiation and the explication of informal reasoning in the form of argumentation through computer-supported collaborative argumentation (CSCA) (Jonassen & Remidez, 2002). CSCA can be used to embed the learning opportunities provided by argumentation, for example, through the availability of a textual history of the argument (Veerman, Andriessen & Kanselaar, 1999), and discourse structuring that can be beneficial to knowledge exploration and acquisition (Karacapilidis & Papadias 2001). It has been found that structuring argumentation discourse through the use of sentence openers and prior classification of a student's response not only improves participants' orientation on the subject matter, reduces off-task talk, leads to more coherence in discussing the subject matter, and focus on the topic, but also enhances students' articulations through more critical and reflective thinking (Hron & Friedrich, 2000).

In this study, we introduced the use of a web-based structured argumentation tool, Voices of Reason (VoR), that was developed in a separate research project (Chee, 2007; Hong, Brudvik & Chee, 2006; Brudvik, Hong, Chee & Guo, 2006), to facilitate students' development and acquisition of argumentation skills through cooperative and collaborative dialogical group argumentation. Scaffolding for the development of students' argumentation skills takes the form of appropriate sentence openers. The VoR implements an argument scheme based on Toulmin's Argument Pattern which includes the elements claim, grounds, qualifier, warrant, backing, and rebuttal (Toulmin 1958/2003; Toulmin, Rieke, & Janik, 1984). A screenshot of the VoR interface, with its threaded discussion functionality and built-in sentence openers as scaffolds, is shown in Figure 1.

Enactive role play in second life

The enactive portion of our learning design supports the extensional–apprehension mode of experiential learning. We incorporated enactive role play through *Second Life* to allow students to participate in a form of being (Heidegger, 1953) and to experience, in an embodied way (Lakoff & Johnson, 1999; Varela, Thompson, & Rosch, 1991), the issues that they will write critically about (Chee, 2006) in their GP essays. *Second Life* is an Internet-based virtual world developed by Linden Lab, which enables its users, called "Residents", to interact with each other through motional avatars, providing an advanced level of a social network service combined with general aspects of a metaverse. Residents can explore,
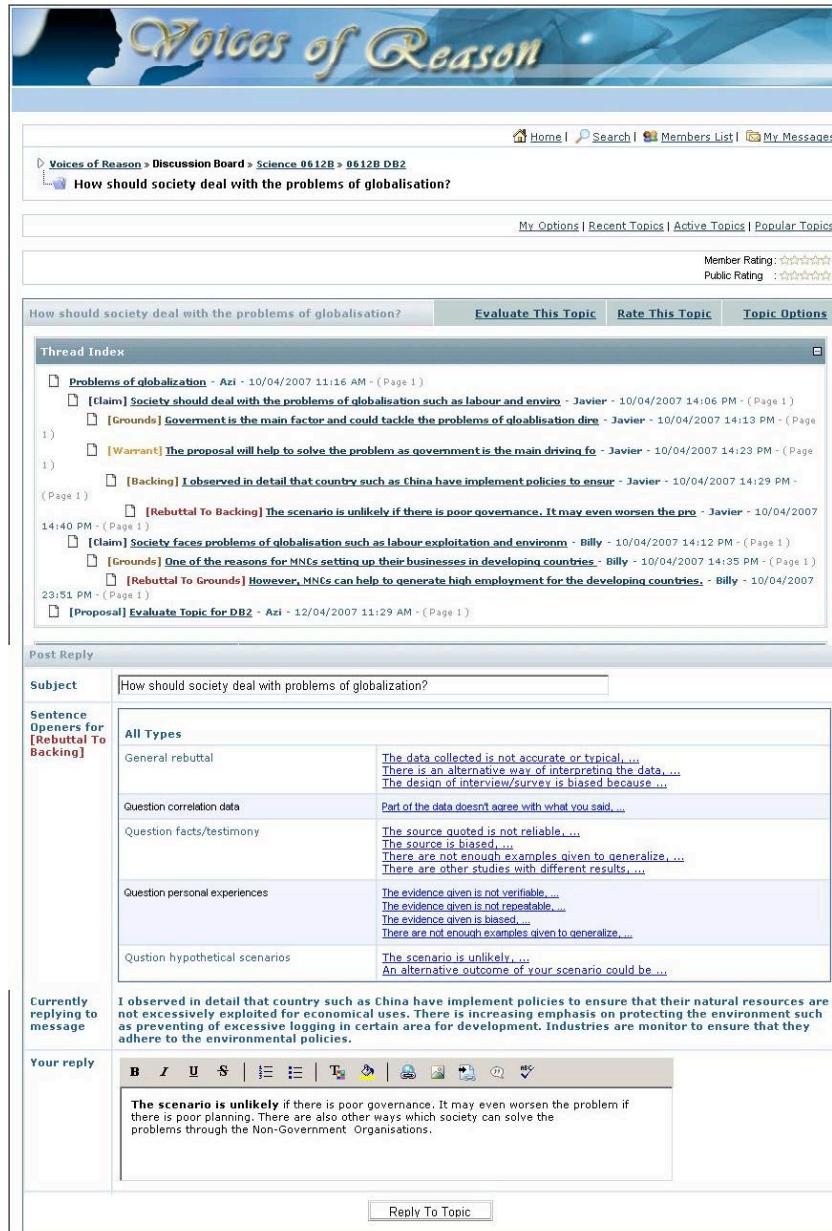
Figure 1: Screenshot of the VoR interface

meet other Residents, socialise, participate in individual and group activities, create and trade items (virtual property) and services with one another (*Second Life*, 2007). Given that *Second Life* affords easy creation of interactive learning experiences that would be hard to duplicate in real life (Brandsford & Gawel, 2006), we develop a private island, Youtopia (Figure 2) for contextualised role-playing activities within the immersive environment.

It is intended that the name of the *Second Life* island, "*You*Topia", seeks to convey to students that, as residents of the island, they can create their own perfect or ideal society. The social state of the island depends on them; what happens in this world essentially rests upon their power to enact how they want things to be and their ability to negotiate issues from their own perspective. Within YouTopia, a context for globalisation was developed (Ho, 2007). The role structure for the enactments was provided for in the form of five interest groups of a fictitious island called Waga Waga (WW): native peasants, women's peasants, International Monetary Fund, a non-governmental organisation, and a multi-national corporation.

The settings for these five groups were designed to convey the differing status, power, and resources between the groups. For example, the native peasants had a simple, sparsely furnished hut as their meeting place in YouTopia while a concrete office building, complete with office furniture and equipment, was designed for the multi-national corporation interest group (Innova Junior College, 2007).

Figure2: YouTopia in *Second Life*

Research objectives

In this research, we seek to enhance GP students' critical thinking and writing skills, in preparation for tertiary level study, through a more concrete and vicarious experience, engaging students through two complementary modes of experiential pedagogy (Kolb, 1984)——web-based structured argumentation board and the immersive virtual environment. It is intended that the web-based scaffolded argumentation discourse supports the intensional–comprehension mode of conceptual thinking and reflective learning while the enactive role play portion of the learning design supports the extensional–apprehension mode of experiential learning. Our main research objectives are:

- to investigate the impact of students' use of structured argumentation and enactive role play on the quality of their argumentative writing and their development of deep content knowledge related to GP topics
- to investigate the learning interaction between students' structured argumentation discourse, enactive role play (experiential learning) and development of argumentative writing skills (critical thinking)

We report changes in the quality of students' argumentative writing for their GP essays before and after they engage in the designed learning activities, and substantiate our findings with qualitative data from students' interviews and open-ended feedback.

Research design

This study forms part of a larger research project involving two cycles of a design experiment. The participants are 45 (23 male, 22 female) final-year pre-university students aged between 17 to 18 and who are of average to low ability in the GP subject (mean of recent standardised test scores was 51). The majority of the students come from families with predominantly middle to low income background residing in a typical public housing neighborhood estate.

A pre-test GP essay on globalisation was administered in Week 1 of the four week intervention. Students then participated in two cycles of technology-facilitated learning in a cyclic, interwoven fashion, alternating back and forth between argument and enaction on the topic of globalisation. In the first cycle (VoR1), students participated in online argumentation discourse on the VoR platform, discussing the qualities of a global citizen. Subsequently, they participated in the first round of enactment (VR1), where students were randomly assigned to one of the five interest groups of the fictitious Waga Waga Island (WW) which seeks to join the community of regional and international democracies after decades of totalitarian government. Members from these five different parties sought to establish an alliance, raise questions about resolutions offered by other alliances, and address questions concerning their own resolutions. In the second cycle, students participated in argumentation discourse on the VoR platform (VoR2), discussing the problems of globalisation and how society should deal with these problems. They then participated in the second round of enactment (VR2) where their drafted resolution was submitted for members of opposing alliance(s) to question or critique, after which the original resolution was amended. Each VoR and VR session lasted about one and a half hours and took place across a period of four weeks. Prior to these sessions, students had also gone through a series of classroom lessons which introduced them to elements of Toulmin's argument pattern. A post-test GP essay was administered at the

end of the four week intervention to assess the development of students' skills in argumentative writing. The results from the pre and post test essays were contrasted with similar topic essays from students of the control group. The control group students did not participate in the technology-facilitated learning but went through a series of face-to-face classroom lessons on argumentative writing, according to the normal GP curriculum.

Findings

Students' pre and post test essays were analysed for quality of their claim, grounds and warrants and their stance towards the discourse of argumentation. Inter-rater reliabilities were calculated using Pearson product moment correlations, and they averaged .823 for essay scoring using the four criteria analysis. The first step of our analysis sought to establish the improvement in students' quality of argument structures: claims, grounds, warrants, and stance towards argumentation (Varghese & Abraham, 1998). The results showed a significant increase, from pre- to post-intervention, in the means across all four categories of analysis: quality of claims, quality of grounds, quality of warrants, and argumentation stance for the experimental group of students (Table 2).

Table 2: Means for components of argument structure

Argument Components	Pre-test[1]	Post-test[1]	t-test[2]
Claim	1.75 (.44)	2.10 (.55)	-2.67*
Grounds	1.70 (.47)	1.95 (.39)	-2.03*
Warrant	1.75 (.44)	2.00 (.32)	-2.03*
Stance towards argumentation	1.60 (.68)	1.80 (.70)	-1.00*

[1]Standard deviations are shown in parentheses
[2] $p<.05$; $n=20$

Significant results were obtained for students quality of claims ($t(19) =-2.67$, $p<.05$, $r=.52$), quality of grounds ($t(19) =-2.03$, $p<.05$, $r=.42$), quality of warrants ($t(19) =-2.03$, $p<.05$, $r=.42$), and students' stance towards argumentation ($t(19) =-1.00$, $p<.05$, $r=.22$) from pre to post intervention. The effect size ($r=.52$) for quality of claims also represents an encouraging substantive finding for students' ability to formulate better developed claims after the technology-facilitated learning. The following qualitative excerpts from students' pre and post test essays further substantiate our statistical findings:

Pre (Student A):
Promotion of free trade has reduced transportation costs, as containerisation is introduced and free trade agreements would minimise the time taken before the good is allowed for capital consumption. This would reduce the time in which these goods are stored in warehouses and warehouse costs are reduced. It also helps to harmonise subsidies for local business such that no particular company is given any competitive edge over their competitors. Subsidies are constant throughout countries and this will force the producers to look for cheaper means of production. By doing so, it increases the actual productivity of these companies and help to save resources.

Post (Student A):
There are more free trade agreements being signed as a result of globalisation. Some of these agreements are the North American Free Trade Agreement between the rich countries. This has a positive impact of increasing the Gross National Product of the country itself, and even has a further reaching impact on the country's Foreign Direct Investment portfolio. With this increased wealth, these countries can then try to help the poorer countries by monetary means to build infrastructure needed for development in the industrial sense. This, however, may not be completely true as these countries may choose to keep its' wealth to itself. Also, with this increased wealth, the country can now improve upon the social development and improve the standard of living. However, Free trade and foreign direct investment might result in lower wages and or unemployment for low skills workers, who are usually poorer, in developed economies while on the other hand, exports industries that sells to the global market would demand for more highly skilled workers, who are usually the rich, contributing to higher wages for these workers. This is an example of the increasing income disparity.

In the pre-test essay excerpt, a series of unsubstantiated claims, missing grounds, and a lack of awareness of qualification of claims are evident. There is no indication of limits to arguments posed and the stance towards argumentation is significantly one-sided, with absence of counter-perspectives throughout the essay. In the post-test essay, however, there is specific exemplification in the form of supporting evidence as concrete grounds to support the claim of positive impact of free trade. There is also the qualification of claim showing awareness of limits of argument —signaled by 'however' and 'while, on the other hand'. The results from Table 2 indicated that the greatest mean increase was that of the pre-test to post-test quality of claims. The following pre-test and post-test excerpts (from a different student), exemplify the student's ability to provide better-developed claims, supported by stronger grounds.

> *Pre (Student B):*
> Although globalisation may lead to improvement in economy, but it creates pollution.
> These pollutions have negative impact on the people when they cause illness and money
> has to be spent on health care.

> *Post (Student B):*
> The movements of MNCs also cause more pollution especially in developing countries
> where the factories of MNCs are set up. The factories of MNCs emit toxic gas without
> much consideration of the cost and the host countries are not able to do much to stop the
> pollution by MNCs as MNCs play important roles in their economy, thus they are afraid
> that the MNCs may withdraw from their countries if they are not a good host. Globalisation
> also increases accessibility of the world. Information can now be sent throughout the world
> due to the advance in technology. Goods can also be delivered from one place to another in
> a very short time, thus this increase efficiency. Increase in efficiency will increase
> productivity of the countries involved, thus this benefit both the rich and the poor

In the next step of our analysis, we conducted a repeated measures test to contrast the experimental group's pre and post essays with that of the control group. While no significant interaction occurred for each category of analysis between the experimental and control groups, the statistical results showed lower means for quality of claims (pre-test $M=1.61$, post-test $M=1.89$), grounds (pre-test $M=1.39$, post-test $M=1.89$), warrants (pre-test $M=1.44$, post-test $M=1.89$) and stance of argumentation (pre-test $M=1.39$, post-test $M=1.78$) for the control group as compared to the experimental group, with no significant interaction between the control group's pre and post test means. To investigate further the effect of technology-facilitated learning, we qualitatively analyse and contrast the pre and post essays between the experimental and control groups. The following randomly selected excerpts demonstrate the weakness in argument structuring among the control group.

> *Pre (Student C):*
> Globalisation may look good to many developed countries that are benefiting from it, but at
> this very moment, there are people who are suffering because of globalisation.

> *Post (Student C):*
> Education is part of our lives. It educates us in various ways, but does it really benefit all of
> us? Those who were born intelligent or can be very hardworking would definitely find
> education beneficial. However how about those who do not fit in those two categories?
> They struggle extremely hard to compete with the brighter students, who are already
> competing among themselves. Likewise globalisation is a magnified vision of education.
> Globalisation has helped to boost the world's status and standard of living but it is only
> restricted to countries who knows how to handle it.

While Student C tries to show the parallel between education and globalisation, the post test excerpt demonstrates a limited perspective of the impact and reach of globalisation on society. The argument revolves around a narrow view of education and its implications, and is limited in terms of the reach and extent of the impact of globalisation on economic, political, and social implications at the international level.

> *Pre (Student D)*
> Globalisation has convinced people of several nations that it is primarily fuelled by
> Westernisation. Some people are unwilling to let their country be influenced by
> Westernisation as they hold their beliefs strongly and they think that such an influence is
> bad. This has led to anti-globalisation groups but they attack using violence instead of

words and they are known as terrorist groups. They view globalisation as something seeking to replace their culture and they will not have it.

Post (Student D)
Globalisation, to date, has most of the time benefited the rich while the poor just get poorer because the rich simply just want to have it their way. This can be seen in African countries or even in developed countries where there are growing income gaps between the rich and the poor.

Student D provides sweeping generalisations and unsubstantiated claims of the notion of globalisation, that it is primarily fuelled by Westernisation. A narrow perspective of the impact and extent of globalisation is also demonstrated, with lack of concrete evidence from the real world.

Implications

This section offers key implications, and questions for future research. First, the statistical results show a general increase in the means on the four categories of analysis. This finding is supported by the significant t-test interaction between the pre-test and post-test essays of the experimental group. To investigate further, we conducted qualitative interviews and sought open-ended responses from the students. Students' responses indicated that they valued the scaffolding afforded by the VoR in terms of argument structuring as well as the ability to develop multiple perspectives and identify closely with the character whose role they enact within the *Second Life* virtual environment:

> Using the VoR, I find the argument is more structured and I feel more confident in writing – Student E

> This project has allowed me to literally put myself in one's shoes so that I can fully understand and respond to the scenario thus I would be better able to prove better and stronger examples to justify my stand– Student F

> It helps me to formulate my arguments for GP essay and allow me to look at wide spectrum of views that others may have. It gives me the chance to identify the reasons that different people have in supporting their views. – Student G

Evidently, the cyclic, interwoven nature of participation using the two technologies of structured argumentation and enactive role play empowers students in terms of their knowledge base, argumentation skills, and affinity to characters related to the context of discussion. Given the social nature of the two technological platforms, students are motivated to do their research on the topic of discussion prior to their "performance" online. Through the enactive role play, the sense of being that the students experience as participants in the virtual world is realistic and potentially powerful for identity affiliation, as evidenced from students' qualitative interviews and open ended responses. Results show that in the post-test essays, there is a shift towards a more balanced argument stance, taking into consideration both sides of the arguments.

Second, in order to be accepted by the university community, students need to be aware of what Shaughnessy (1977) termed "rituals and ways of winning arguments in academia". The nature of argumentation, including the "web of conventions and assumptions" which, for the large part has remained "largely tacit" (Shaughnessy, 1977, p.139) is made more explicit and concrete for students, through the immersive virtual environment and web-based structured argumentation. This is especially helpful for the majority of the students, whose native language is not English. The design of the VoR learning environment, with the built-in sentence openers, is aimed at scaffolding students to the structural aspects of argumentation based on the Toulmin framework. The GP essay excerpts shown in the preceding section provide contrasting examples of structurally sound and weak arguments, and those that take into account a multi-perspective stance towards the topic of concern.

Overall, preliminary results indicate that collaborative dialoguing is influenced strongly by the nature of the learning design, as suggested in the preceding section, a finding that can be unpacked further in future studies to examine how engagement in argumentation discourse can improve GP teaching and learning.

Acknowledgements

References

Brandsford, J., and Gawel, D. (2006). Thoughts on *Second Life* and learning. In *Proceedings of the First Second Life Education Workshop, San Francisco, California.*

Brudvik, O. C., Hong, K. S., Chee, Y. S., & Guo, L. (2006). Assessing the impact of a structured argumentation board on the quality of students' argumentative writing skills. In R. Mizoguchi, P. Dillenbour, & Z. Zhu (Eds.), *Proceedings of the 14th International Conference on Computers in Education* (pp. 141–148). Amsterdam: IOS Press.

Chee, Y. S. (2006). Experientially-grounded learning in multi-user virtual worlds. In Khine, M. S. (Ed.), *Teaching with technology: Strategies for engaging learners* (pp. 295–322). Singapore: Prentice-Hall.

Chee, Y. S. (2007). *Fostering the development of argumentation skills*. Retrieved October 1, 2007, from http://yamsanchee.myplace.nie.edu.sg/NIEprojects/Argmn/argmn.htm

Crammond, J. (1998). The uses of complexity of argument structures in expert and student persuasive writing. *Written Communications,*15, 2. https://doi.org/10.1177/0741088398015002004

Erduran, S., Simon, S., & Osborne, J. (2004). TAPping into argumentation: Developments in the use of Toulmin's Argument Pattern in studying science discourse. *Science Education*, 88(6), pp.915-933.

Hart, C. (1998). *Doing a literature review: Releasing the social science research imagination*. London: Sage.

Heidegger, M. (1953/1996). *Being and Time: A Translation of Sein und Zeit* (J. Stambaugh, Trans.). NY: SUNY Press.

Ho, M. L. C. (1995). *Discourse features and strategies in students' writing at junior college level.* Unpublished MA (Applied Linguistics) thesis. Singapore: National Institute of Education, Nanyang Technological University.

Ho, M. L. C. (2006). Introduction. In Ho, C.: Teo, P; Tay, M.Y. (eds.) *Teaching the General Paper: Strategies that work (p1-4).* Singapore: Pearson Longman.

Ho, M.L. C. (2007). Globalization in the language classroom: The case of the Waga Waga Islands. *Modern English Teacher (UK),* 16 (3), 29-35.

Hong, K. S., Brudvik, O. C., Chee, Y. S. (2006). The impact of structured discussion on students' attitudes and dispositions toward argumentation. In R. Mizoguchi, P. Dillenbour, & Z. Zhu (Eds.), *Proceedings of the 14th International Conference on Computers in Education* (pp. 133–140). Amsterdam: IOS Press.

Hron, A., & Friedrich, H.F. (2003). A review of web-based collaborative learning: factors beyond technology. *Journal of Computer Assisted Learning,* 19 (1), 70.

Innova Junior College (2007). *LEAD ICT @ Schools.* Retrieved October 17, 2007, from http://www.innovajc.moe.edu.sg/academics_elearning.htm

Jim´enez-Aleixandre, M., Rodr´ıguez, A., & Duschl, R. (2000). "Doing the lesson" or "doing science": Argument in high school genetics. *Science Education*, 84(6), 757–792.

Jonassen, D., & Remidez, H. (2002). Mapping alternative discourse structures onto computer conference. Paper presented at *Computer Support for Collaborative Learning 2002 Conference: Foundations for a CSCL community,* Boulder, CO. https://doi.org/10.3115/1658616.1658650

Karacapilidis, N., & Papadias, D. (2001). Computer Supported Argumentation and Collaborative Decision Making: The Hermes System. *Information Systems*, 26(4), pp. 259-277.

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall.

Kuhn, D. (1991). *The Skills of Argument*. Cambridge University Press.

Kuhn, D. (2005). *Education for Thinking*. Harvard University Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought.* Basic Books.

Ministry of Education (2004). *Framework for the new 2006 "A" Level curriculum*. Retrieved 20 August, 2007, from http://www.moe.gov.sg/corporate/preu_01.htm

Mitchell, S. (1996). *Improving the quality of argument in higher education interim report*. London: Middlesex University, School of Education.

Pontecorvo, C., & Girardet, H. (1993). Arguing and reasoning in understanding historical topics. *Cognition and Instruction*, 11(3/4), 365–395. https://doi.org/10.1080/07370008.1993.9649030

Second Life. (2007). In *Wikipedia, The Free Encyclopedia*. Retrieved August 12, 2007, from http://en.wikipedia.org/w/index.php?title=Second_Life&oldid=164043638

Seng, S H. (1990). *Factors influencing the writing attainment of junior college students in the General Paper.* Unpublished M.A.(Applied Linguistics) thesis. National Institute of Education, Nanyang Technological University

Shaughnessy, M. P. (1977). *Errors and expectations: A Guide for the Teacher of Basic Writing.* New York: Oxford University Press.

Skuja, R. (1983). *Organisational Features of Argumentative Composition: A Singapore Study*. Unpublished M.A. dissertation. Birmingham, UK: University of Birmingham.

Toulmin, S. (1958/2003). *The Uses of Argument*. Cambridge University Press.

Toulmin, S., Rieke, R, & Janik, A. (1984). *An Introduction to Reasoning*. New York:Macmillan Publishing Company.

Van Eemeren, F., & Grootendorst, R. (1999). From analysis to presentation: a pragma-dialectical approach to writing argumentative texts. In J., Andriessen, & P., Coirier. (Eds.), *Foundations of Argumentative Text Processing*. Amsterdam University Press, Amsterdam.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The Embodied Mind*. MIT Press.

Varghese, S., & Abraham, S.A. (1998).Undergraduates Arguing Their Case. *Journal of Second Language Writing,* 7 (3), pp.287-306. https://doi.org/10.1016/S1060-3743(98)90018-2

Veerman, A. L., Andriessen, J. E. B., & Kanselaar, G. (1999). Collaborative learning through computer-mediated argumentation. In C. Hoadly & J. Roschelle (Eds.), *Proceedings of the third conference on Computer Supported Collaborative Learning* (pp. 640 - 650). California: Stanford University. https://doi.org/10.3115/1150240.1150317

Zohar, A., & Nemet, F. (2002). Fostering students' knowledge and argumentation skills through dilemmas in human genetics. *Journal of Research in Science Teaching*, 39(1), 35 – 62.

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