Exploring Negotiation and Sustainability behaviour of University Learners through a Serious Game: The case of Darfur is dying

Eleni G Makri

University College Dublin/Insight SFI Research Centre for Data Analytics, Ireland

Corresponding author: Eleni G Makri, Email: eleni.g.makri@gmail.com

Claiming no fixed rules for efficacious negotiation, civic and sustainability game-based learning and capacity decisions, this study builds on investigating negotiation/conflict and civic/sustainability-related attitudes and skills surveyed in serious game play university setting. We report on 110 Greek private university graduate students' negotiation/conflict and civic/sustainability management-associated attributes after gaming when compared with lecture instruction as part of negotiation module in psychology course sessions in the academic year 2019/2020. After gaming, male and female students indicated beneficial civic learning-associated attributes like knowledge of and favorable orientation towards engagement and practice of political activities, nation-wide, community and town-related challenges. Overall, this civic capacity seemed to be facilitated by less impulsive negotiation/-conflict and positive civic/sustainability management behaviour in both genders post-gaming. The negotiation / conflict resolution and civic/sustainability management continuum attributes indicated after gaming are discussed together with theoretical and practical implications and avenues for further research regarding serious games negotiation/civic pedagogy and experience.

Keywords: Serious games, Negotiation/conflict management, Civic/sustainability development, Tertiary education, Greece.

2023. In Saroj Hiranwal & Garima Mathur (eds.), *Artificial Intelligence and Communication Technologies*, 437–446. Computing & Intelligent Systems, SCRS, India. https://doi.org/10.52458/978-81-955020-5-9-41

1 Introduction

Serious games facilitate learning and innovation by providing immersive spaces for interaction and co-creation of knowledge [1], developed to instruct students, educators and citizens about real life challenging issues. Such challenges tend to include but are not limited to negotiation/conflict resolution and civic/sustainability development-related knowledge, attitudes and skills (e.g. urban water systems planning and management) including building capacity for social, economic, environmental and technical consequences in favour of policy making [2]. Although serious game learning contribution across disciplines has been documented [3], yet, there seems to be no consistent evidence about the influence of gameplay on student civic/sustainability development attributes [4]. In this context, the current paper aims to elaborate on the research executed as part of classroom instruction in negotiation module in a psychology course at a private college in Greece. Exploring lecture and gameplay student shared negotiation/conflict management and civic/sustainability-related attributes in learner-centered "hands on" lab sessions run during the academic year 2019/2020. The study was implemented in 110 graduate full time students to evaluate the range of their learning outcomes after lecture and post-gameplay instruction for negotiation/conflict and civic/sustainability-related continuum as ways to facilitate effective negotiation/conflict resolution and civic/sustainability management through serious gaming and vice versa. Building on the above reasoning, therefore, the research question that adheres to the capacity of the existing study is indicated as next:

- Are there any significant relationships between negotiation/conflict management and civic/sustainability attributes in favour of political awareness explored by gender after serious gaming?

Almeida and Buzady [5] report on their research on Fligby, a serious game targeted as entrepreneurial tool which led learners/players set up a business enterprise in a game context which included negotiation and conflict management topic as embedded entrepreneurial-associated attributes in its' design elements. It includes 23 scenarios of which the learners/players have to choose between 2 and 5 options followed by their effects under a 3 step-iteration based on challenge/issue, decision made and the outcome/feedback generated. Students' gameplay experience was assessed through system's performance indicators (e.g. decision made, financial consequences, effect on emotional state, etc.) and measurement of various dimensions which included diplomacy, involvement and social dynamics, among others. 8 students half of them originated from management and computer science degrees respectively, formed a focus group, were introduced to the game and played it. Their 90 minute gaming session time included 75% of that time allocated to related theoretical concepts discussion and 25% to comprehension of associated queries, respectively. Students with previous professional practice indicated that the game was helpful in instructing them on how to run a business venture, with their peers of no prior professional expertise reporting that gaming practice was very significant in instructing them throughout the challenge of running a business enterprise. Chatziiliou and Paraskeva [6] discuss their study of exploring 40 education degree students' civic knowledge, attitudes and skills, including creative thinking, negotiation/conflict management and group work competencies during their pre-and-post gaming practice of a serious game designed and embedded in the Virtual environment of Second Life. The game integrated a negotiation/conflict resolution scenario between 2 different cohorts of opponents in a civil conflict placed in Greek mythology era. After their gaming, the students reported higher scores in civic attributes in comparison to the corresponding ones before their gameplay. Miguel et al. [4] report on their study assessing which of the critical skills for sustainability development suggested by UNESCO [7] can be improved by students after engaging in serious games like "The Island", being integrated into the civic/sustainability curriculum. "The Island" is the name of

the game, in which students across a given time–space domain must make economic, social, and environmental decisions that allow them to efficiently govern a defined territory. In this way, while always keeping in mind the optimal achievement of the most possible sustainable development goals, the students need to collectively decide what actions should be taken and how and when they will be implemented in the game to satisfy the citizens and avoid negative ecological impacts within the available budget. The Island players are the mayors of the island, and their aim is to maximize the welfare of the inhabitants (the best use of natural resources, R&D, and infrastructures). The students must manage the economy of the island to achieve the most sustainable balance. On this island, users have access to different sources of non-renewable energy, such as oil, natural gas, and uranium. They also have renewable energy sources, including water, the sun, and the wind. Moreover, since they live on an island, they must properly manage the available space. Their aims are to maximize the use of the resources available. The strategies implemented must consider the relevant framework of limitations, like in the real public management of resources (i.e., a budget comprising income and expenditures and possible new problems caused by the decisions made and the space involved). The authors claim that the game is designed to assist students develop diverse knowledge, attitudes and skills, as they observe and value the various future scenarios that arise in the game. In addition, they need to understand the relationship between decisions taken and citizens' benefits, using diverse problem-solving in the face of the different situations outlined by the game mechanics. Further, game learners are offered the possibility to question their own practices and opinions or those of others, reaching conscious decisions and acting responsibly from economic, social, human resource and environmental perspectives, as well. The authors investigated the perceptions of 208 graduate and postgraduate students from different disciplines (e.g. business marketing management, account auditing, actuarial sciences and finance) and courses (e.g. business, accounting and financial information management, key professional skills for sustainability, corporate social responsibility) regarding: a) the number of courses they had worked with serious games, b) the number of courses they had dealt with issues related to sustainable development, and c) the relationship and the degree of association between their overall satisfaction with the use of the corresponding game to foster the development of sustainable curriculum. The assessment was based on their degree of perception (low vs high on a relative 5-point Likert scale) about the improvement of each of the following key professional skills for sustainability (i.e. Systemic Thinking, Anticipation, Normative, Strategic, Collaborative, Critical Thinking, Self-awareness, Integrated Problem-solving) through the application of the game exercised. The researchers indicate that the overall findings revealed that the students tended to acquire the competence of anticipation because the game seemed to allow the study of different hypothetical scenarios in the medium and long term. The competence of systemic thinking was facilitated by the game making the students exercise a complex system of decision-making based on economic, social, human resource and environmental situations. Problem solving was perceived to be successful as the game tended to provide learners with various case scenarios according to the level of difficulty. At the end, future graduates/learners were motivated to make responsible decisions as regards sustainability from a process point of view while questioning their decisions, thereby developing critical thinking. Additional evidence demonstrated that competitiveness experienced throughout the game by producing a final ranking of the obtained scores based on individual decision-making, did not appear to facilitate the practice of systemic, anticipatory and collaborative skills, as it seems that the students did not collectively improve/develop sustainability competencies and thus did not perceive that they are developing strategic skills. Limited generated group feedback, seemed also to affect the collaborative skill not perceived to be developed through the game. Finally, decreased space for the reflection of each individual offered in relation to the group, tended to indicate lowered self-awareness perceptions post-gameplay. Overall, the potential of the explored serious game "The Island" proved to be successful as a potential virtual sustainable development instructional tool for tertiary education learners. The authors conclude that the most perceived sustainable development skills seemed to be the following, as indicated next. That of

anticipation, since the students were able to analyze and assess diverse future scenarios; the ability of systemic thinking, given that the students framed and comprehended their relationship with society, thereby investigating a complex ecosystem; integrated problem solving, since the learners employed various strategies of problem solving to the diverse situations/conditions presented by the game and learning mechanics; and last, critical thinking skills, which was made evident through the chance to question policies and attitudes, ensure deliberate decision-making and act proactively without diminishing any current and (or) future economic, social, technical, human resource and environmental sustainability indicators. Indicated to be equally applicable to management instruction, as the aforementioned decision-making attributes tend to be deemed necessary resources for successfully addressing enhanced decision making and business management challenges in organizations worldwide.

2 Methods

110 private college psychology graduates (58 male, 52 female) participated in the present study as part of their three hour lab session in negotiation module [8]. Post-informed consent provided, they were first required to complete demographic information concerning gender, residency, age range, working status (public vs private) and registration to vote in elections questions. Afterwards, they attended an hour of negotiation/sustainability lecture (including completion of corresponding assigned tasks). Next, they answered a) the negotiation/conflict resolution continuum items obtained by the Five Factor Negotiation Scale (FFNS) [9] and b) the Civic Attitudes and Skills Questionnaire (CASQ) reflecting civic/sustainability issues [10]. All FFN scales indicated moderate to high α consistency reliabilities (i.e. 0.75 to 0.80) except self-confidence and communication scales that were not included in the analyses due to lower reliability. Similarly, all CASQ scales demonstrated moderate to high α consistency reliabilities (i.e. 0.75 to 0.88), apart from diversity attitudes and leadership skills scales that were not included in the analyses due to decreased reliability. In both tools, questions negatively worded for presentation were reverse coded before analyses were executed. Students completed their negotiation/conflict management attitudes and skills and civic/sustainability questionnaires based on their overall experience with the negotiation lecture introduced (post-lecture). The second and third hour of their lab session the lecturer/instructor first introduced them to a civic/sustainability serious game through a demo. Students were encouraged and instructed to play the game as long as they pleased either individually or in pairs across all game levels and actions for up to one hour. After [11] suggesting that debriefing post-gameplay tends to sustain the bridge between game practice and learning, debriefing of the participants indicated that the majority of them were engaged in their gameplay sessions and completed all required game tasks. Following [12] the lecturer/instructor acted also as facilitator/moderator throughout gameplay and encouraged students to participate in shared discussions leading to reflection during and post-gaming. After gameplay, students were required to complete the same negotiation/conflict and civic/sustainability-related attitudes and skills questionnaire as after lecture (post-gameplay).

Darfur is Dying is a serious game where player(s) assume the role of a displaced Darfurian living in a refugee camp. Players are facing lack of water and have to find new sources of water resource. During their search they have to be very cautious and hide, otherwise they end up captured by aggressively set militia. Each player chooses an avatar and forages the water to assist other refugees in the camp. Escaping militia's cars is needed. The players have to garner food and build shelter inside the camp, or forage for water outside of the camp by searching it and supporting other refugees within it. The game was developed by students at the University of Southern California (Susana Ruiz-Take Action games; interFUEL, LLC; https://www.gamesforchange.org/game/darfur-is-dying/)[13], winners of Darfur Digital Activist contest and in cooperation with humanitarian aid workers with broad experience in

Darfur. The ultimate goal is to instigate awareness and practice of active help of college students to stop the humanitarian crisis in Darfur. Action items are integrated within the game, so that the player(s) may send an automated note to President Bush to care for the people of Darfur, or petition Congress to pass legislation that reliefs Darfur's refugees, and by doing so advance the overall health of the camp. To further enhance the reach of the game, Darfuris Dying was developed to be spread virally. Players are able to contact everyone in their email address books and social networks about the game with a click of the mouse. Figure 1 below illustrates an example screenshot of the game.

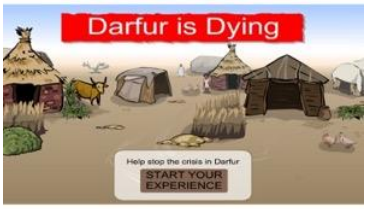

Fig. 1. Screenshot of Darfur is Dying game

3 Results

Hierarchical regression analyses were performed to test for the prediction of political awareness for graduates independently by gender and negotiation/conflict management and civic attitudes and skills continuum, correspondingly, post-gaming. Before proceeding with hierarchical regressions, we assured that all prerequisite conditions associated with this analysis (e.g. lack of multicollinearity, deviations from normality and influential cases) were met. The findings from these analyses are reported in Tables1-4 that follows next. At the first step we entered the independent variables (i.e. initially the negotiation/conflict management continuum: cooperation, compromise/bargaining, "argument"/verbal fight, "walk away"/neutral, "get an adult"/constructive action, "talk it out"/negotiation and then the civic/sustainability continuum: civic action, interpersonal and problem-solving skills, civic responsibility, social justice, seeks knowledge about political/societal issues, gains in problem-solving and leadership skills), respectively. The results presented in Tables1-4 below, indicate the outcomes of the final associations obtained between the aforementioned variables by continuum and gender, accordingly.

Regarding post-gaming session reflecting negotiation/conflict management continuum for male graduates, the relationship (s) between conflict resolution "argument"/verbal fight and "get an adult"/constructive action with political awareness were significant, indicating "get an adult/constructive action as the best predictor (β=0.33, $p<.10$, β=0.38, $p<.05$). The final model including the corresponding independent variables accounted for an additional 7 percent ($F(6, 56)=1.201$, $p<.05$) of the variance in political awareness interaction scores (Table 1 below).

Table 1. Hierarchical regression analyses for the effects of negotiation/conflict resolution-associated variables on political awareness for male learners post-gameplay (N=58)

	Political Awareness Post-gaming		
	β	R^2	Δ R^2
Step 1: Main effects		0.12*	0.07*
Cooperation	0.09		
Compromise	-0.03		
"Argument" (Verbal Fight)	0.33****		
"Walk Away" (Neutral)	0.07		
"Talk it Out" (Negotiation)	0.38		
"Get an Adult" (Constructive Action)	0.38*		
Notes: *p <0.05 (one-tailed) ****p<0.10 (one-tailed)			

As regards post-gameplay session mapping into negotiation/conflict management continuum for female learners, the relationship (s) between conflict resolution "argument"/verbal fight, "walk away"/neutral and "talk it out"/negotiation with political awareness were significant, indicating "argument"/verbal fight as the best predictor (β = 0.60, p<.01, β=0.10, p<.001 and β=0.29, p<.001). The final model including the corresponding independent variables accounted for an additional 27 percent (F(5, 51)=4.834, p<.01) of the variance in political awareness interaction scores (Table2 below).

Table 2. Hierarchical regression analyses for the effects of negotiation/conflict resolution-associated variables on political awareness for female learners post-gameplay (N=52)

	Political Awareness Post-gaming		
	β	R^2	Δ R^2
Step 1: Main effects		0.34***	0.27***
Cooperation	0.28		
Compromise	0.04		
"Argument" (Verbal Fight)	0.60**		
"Walk Away" (Neutral)	0.10***		
"Talk it Out" (Negotiation)	0.29***		
Notes: **p <0.01 (one-tailed) ***p<0.001 (one-tailed)			

Concerning post-gameplay session mirroring civics attitudes and skills continuum for male graduates, the relationship (s) between civic action, social justice, seeking knowledge about political/societal issues and gains in leadership skills with political awareness were significant, indicating the latter as

the best predictor (β=0.32, p<.05, β=.42, p<.001, β=0.28, p<.05 and β=0.44, p<.10). The final model including the corresponding independent variables accounted for an additional 6 percent (F(7, 57)=8.565, p<.001) of the variance in political awareness interaction scores (Table3 below).

Table 3. Hierarchical regression analyses for the effects of civic attitudes and skills associated variables on political awareness for male learners post-gameplay (N=58)

	Political Awareness Post-gaming		
	β	R^2	ΔR^2
Step 1: Main effects			
		0.54****	0.06****
Civic Action	0.32*		
Interpersonal and Problem-solving Skills	0.15		
Civic Responsibility	-0.12		
Social Justice	0.42***		
Seeks Knowledge about Political/Societal Issues	0.28*		
Gains in Problem-solving Skills	0.32		
Gains in Leadership Skills	0.44****		
Notes:			
*p <0.05 (one-tailed)			
***p<0.001 (one-tailed)			
****p<0.10 (one-tailed)			

Finally, as regards post-gameplay session mirroring civics attitudes and skills continuum for female learners, the relationship (s) between interpersonal and problem-solving skills, civic responsibility, seeking knowledge about political/societal issues and gains in leadership skills with political awareness were significant, indicating seeking knowledge about political/societal issues as the best predictor (β=0.40, p<.05, β=0.35, p<.05, β=.43, p<.10 and β=0.40, p<.05). The final model including the corresponding independent variables accounted for an additional 6 percent (F(7, 49)=11.392, p<.001) of the variance in political awareness interaction scores (Table4 below).

Table 4. Hierarchical regression analyses for the effects of civic attitudes and skills-related variables on political awareness for female learners post-gameplay (N=52)

	Political Awareness Post-gaming		
	β	R^2	ΔR^2
Step 1: Main effects			
		0.65*	0.03*
Civic Action	-0.04		
Interpersonal and Problem-solving Skills	0.40*		
Civic Responsibility	0.35*		
Social Justice	-0.05		
Seeks Knowledge about Political/Societal Issues	0.43****		
Gains in Problem-solving Skills	0.26		
Gains in Leadership Skills	0.40*		
Notes: *p <0.05(one-tailed); ****p<0.10 (one-tailed)			

4 Discussion

The present study seeks to be inventive by attending to, embedding and exploring two current learning open innovation in science-related experience challenges: the serious games teaching and learning methodology with/and both the negotiation/conflict and civic/sustainability development-associated management knowledge, attitudes and skills in higher graduate education. Overall, the evidence demonstrated in the existing work seems to link private university graduate learners with positive (i.e. integrative, more cooperative/assertive negotiation and conflict resolution-related) conflict management and civic learning/sustainable development-associated attributes after gaming. Lending support to prior favourable findings of serious gameplay on civic learning/sustainability-related attributes' practice in engineering graduates [Portugal; 4]. Extending other studies reflecting favourable civic agency for: a) state secondary education students in Australia [14], b) community service working graduates after climate crisis disaster in USA [15] and c) positive learning outcomes for serious games within graduate entrepreneurship discipline domain [Portugal; 5]. This prior research extension is achieved by a) integrating negotiation/conflict management and civic/sustainability development continuum and b) assessing the latter both post-lecture and after gaming instruction in a different cultural context (i.e. Greece), respectively. In addition, current findings appear to relate male and female psychology graduate gameplay in nonpublic university environment with beneficial civic learning-related attributes like awareness of and positive orientation towards involvement with present political events, country-wide and local community and town-associated challenges (e.g. political awareness). This civic capacity seems to be fostered by less impulsive and more constructive negotiation/conflict and civic/sustainability management behaviour in both genders post-gaming overall; in terms of negotiating, being updated about city news and grand challenges, informed about political campus events as well as ready to improve own leadership capacity and work together with

fellow students in a leadership assigned role. In that sense, expanding the corresponding constructive/integrative civic assumed role agency for serious games as instructional tools [6], reflecting upon ethical-linked decision making for others as assessed in AR/VR gaming [16]. Taken together, however, they seem to mirror not only computational thinking problem solving-related attributes exercised in programming languages by elementary students [17] and educational (serious) games for STEM [18], but explore and practice the United Nations 2030 Agenda for 17 sustainable development growth knowledge, attitudes and skills deemed necessary for student conscious and negotiated behaviour and proactive action for social, economic and environmental improvement for all citizens through advanced technology teaching and learning modes like serious gaming [7]. Alongside the aforementioned evidence, therefore, it might be useful to further explore a) serious gaming responsible research and innovation and engaged research tool as being interactive, social change-oriented, comprehensive and creative-based, b) in-game assessment in relation to reinforcement learning [19], c) when integrated into formal curricula learning management systems across diverse learner groups and d) when co-designed collaboratively by multidisciplinary teams of stakeholders [20] (e.g. educators, learners, software developers, gaming communities, industrial partners, etc.) to maximize learning and open innovation power. Along this line, an exploration of civic and sustainable development-related attributes tuned with individualized and adaptive to learning and game mechanics context across diverse learner cohorts cross-culturally, might be further fostered. After gaming, postgraduate students' efficient interaction with the game instructed them to practice favourable negotiation/conflict management and civic/sustainability-associated attitudes. The indicated findings tend to be encouraging in disentangling the civic capacity that serious games reflect as instructional tools for constructive negotiation/conflict resolution and positive civic/sustainability metrics. In addition, the current approach of gaming learning practice assessment across advanced university learners might facilitate the development of successful serious games in the time ahead for formally instructing higher education learners to effectively address negotiation/conflict management and civic/sustainability challenges.

Acknowledgement

The author thankfully acknowledges the support provided by the educational institution and the time and effort that attendees allocated in making this study possible.

References

[1] Medema, W. et al. (2016). Exploring the Potential Impact of Serious Games on Social Learning and Stakeholder Collaborations for Trans boundary Watershed Management of the St. Lawrence River Basin. *Water*, 8: 175.

[2] Savic, D. A., Morley, M. S. and Khoury, M. (2016). Serious Gaming for Water Systems Planning and Management. *Water*, 8: 456.

[3] Girard, C., Ecalle, J. and Magnan, A. (2013). Serious games as new educational tools: How effective are they? A meta-analysis of recent studies. *Journal of Computer Assistance and Learning*, 29: 207-219.

[4] Miguel, P. N. et al. (2020). Assessment of the Development of Professional Skills in University Students: Sustainability and Serious Games. *Sustainability*, 12: 1014.

[5] Almeida, F. and Buzady, Z. (2019). Assessment of Entrepreneurship Competencies Through the Use of FLIGBY. *Digital Education Review*, 35: 151-169.

[6] Chatziiliou, A. and Paraskeva, F. (2017). Building Global Citizenship Competence through a serious game in a virtual learning environment to make higher education students better employable candidates in the global workforce. In *International Conference on Education and New Learning Technologies*.

[7] The United Nations 2030 Agenda for Sustainable Development Homepage, https://sdgs.un.org/2030agenda, last accessed 2021/09/29.

[8] Hummel, H. G. K. et al. (2021). Serious game in introductory psychology for professional awareness: Optimal learner control and authenticity. *British Journal of Educational Psychology*, 52(1): 125-141.

[9] Nakkula, M. J. and Nikitopoulos, C. E. (2001). Negotiation training and interpersonal development: an exploratory study of early adolescents in Argentina. *Adolescence*, 36(141): 1-20.

[10] Moely, B. E. et al. (2002). Psychometric properties and correlates of the civic attitudes and skills questionnaire (CASQ): A measure of students' attitudes related to service-learning. *Michigan Journal of Community Service Learning*, 15-26.

[11] Nadolski, R. and Van, L. G. (2018). Self-debriefing or teacher-debriefing on a game learning for IT communication skills? In *12th European Conference on Game Based Learning*.

[12] Hauge, J. B. et al. (2021). Current Competencies of Game Facilitators and Their Potential Optimization in Higher Education: Multimethod Study. *JMIR Serious Games*, 9(2): e25481.

[13] Darfur is Dying Homepage, https://www.gamesforchange.org/game/darfur-is-dying/) accessed on 2019/11/04.

[14] Reichert, F. (2016). Who is the engaged citizen? Correlates of secondary school students' concepts of good citizenship. *Educational Research and Evaluation-An International Journal on Theory and Practice*, 22(5-6): 305-332.

[15] Moely, B. E. and Illustre, V. (2011). University students' views of a public service graduation requirement. *Michigan Journal of Community Service Learning*, 43-58.

[16] Niforatos, E. et al. (2020). Would you do it?: Enacting Moral Dilemmas in Virtual Reality for Understanding Ethical Decision-Making. In *CHI,* USA.

[17] Jun, S. J., Han, A. K. and Kim, S. (2017). Effect of design-based learning on improving computational thinking. *Behaviour & Information Technology*, 36(1): 43-53.

[18] Makri, E. et al. (2019). Computer Programming: A Case Study of Teaching Loop Statement by Using an Interactive Educational Game. *International Journal of Digital Society*, 10(2): 1497-1504.

[19] Dobrovsky, A. et al. (2019). Improving adaptive gameplay in serious games through interactive deep reinforcement learning. In *Cognitive Infocommunications, Theory and Applications*, 411-432. Springer International Publishing.

[20] Jaccard, D. et al. (2021). The co.LAB Generic Framework for Collaborative Design of Serious Games: Development Study. *JMIR Serious Games*, 9(3): e28674.