Research Paper

OPEN ACCESS

ELEMENTARY EDUCATION AS A BRIDGE TO CHANGE THE EARTH'S GOVERNANCE SYSTEM FOR THE FUTURE

[1,2]Mahmud Alpusari, [1]Neni Hermita, [2]Victor Amrifo, and [3] Tommy Tanu Wijaya

[1] PGSD, Universitas Riau, Pekanbaru 28293, Indonesia
[2]Program Studi Doktoral Ilmu Lingkungan, Universitas Riau, Pekanbaru 28293, Indonesia
[3]Department Mathematics and Statistics, Guangxi Normal University, China

ABSTRACT

The sustainability research from Biermann has a center on collaborating on the earth system governance network based on five research challenges namely architecture, agency, adaptability, allocation, and accountability Research in order to link the relationship between social and environmental sciences with the earth's governance system. To link this relationship, it must be started from elementary education in shaping the character of students so that in the future it can be minimized. The results of this research show that there are many things that can be done to form the character of students, one of which is a game. The game will contain environment and social learning by inserting a sense of responsibility, analyzing problem solving so that it will form a good character and can reduce the negative impact of changes in the earth's governance system.

Keywords:, *Elementary Education, Earth System Governance, Social and Environmental Sciences.*

INTRODUCTION

In 2001, there are four programs in the world that always identify changes in the world environment. This research community believes that earth system operating outside of normal conditions and even human activity far exceeds natural variability (Biermann, 2007). So, this is a major challenge for policy makers in making decisions both from the biogeophysics cycle to the improvement in terms of political, legal, social and economic. Changes in the global environment will be difficult to stop (Rockstrom, et al., 2009). Therefore we must prepare for rapid changes and sustainable livelihoods if the earth's governance system affects livelihoods.

Researchers conducted further research from the 2007 Biermann research, which focused on the management of the earth system as an alternative to the development of the concept of earth system governance with five research challenges. Then, the sustainability of research conducted by Biermann et al., (2010) on a research framework that to answer previous research requires a management strategy to manage the earth system. One of the management strategies is to carry out major reforms in all fields that affect the governance of the earth system, for example in the field of international law, legitimacy in the Biermann et al., 2012 research. This objective integrates economically and socially with environmental sustainability. Finally, the latest research carried out by Biermann et al., (2019) is that there are many international caloboration programs to discuss global change based on social

science. This article critically reviews the Earth System Governance network experience and its integration and interaction with other programs. This research discusses a lot about the community, innovation and what strategies are used.

Therefore, the sustainability of this research from biermann will focus on collaboration to link elementary education character-forming relationships with the Earth Governance system with a qualitative approach that considers the five challenges. In Indonesia, there are still many basic learning standards, one of which is speaking politely. The learning is good, it's just that the level of learning is too basic so character building will be slow. So, there needs to be innovation in learning renewal now, one of which is to use a game to attract students so that they are enthusiastic about learning. This game will shape the character of students by research (Lester, et al., 2013) with environmental principles and (Okada and Matsuda, 2015) with social principles. The hope is that this method will be useful for shaping the character of students that will have an impact in the future.

BUILD CHARACTER CARE FOR THE ENVIRONMENT IN ELEMENTARY EDUCATION

Environment education is based on four pillars of education (Simbolon, 2010), namely (1) (learning to know), (2) (learning to do), (3) (learning to live together), and (4) learning to be). The attitude of environmental concern is not only to prevent environmental damage but there are efforts to improve it. This showed by (1) working hard, (2) thinking ahead, (3) appreciating health, (4) devotion (damanik, 2020). Humans as social beings are also obliged to interact with nature by always protecting and preserving it (Wardhana and Arya, 2003).

There are many ways that can be done to educate humans starting from elementary school. One of them is (Lester, et al., 2013) making a game-based learning method system designed for elementary science education, namely Crystal Island: UNCHARTED DISCOVERY. This tool is developed with theoretical learning in the form of science content that is applied to a gameplay by means of interaction between the user and the game (narrative, problem solving, and involvement). Rapid technological advances certainly make every human being also have to experience developments in terms of learning. the creation of a game-based learning environment is a good lesson to apply to the curriculum (Kebritchi, et al 2010; Wouters, et al 2013).

Caring for the environment is one of the characters developed in schools in accordance with Ministry of National Education policies. However, the character of students is not formed instantly. The formation of the caring character of students must go through several stages, namely understanding kindness, commitment, behaving well and having a sense of culture-based habituation (Wibowo and gunawan, 2015; Rezkita, 2017). So, teachers, students and the school environment must have a sense of responsibility and care for the environment.

In addition to how to educate through a game, students must also have a sense of responsibility to protect the environment (Adriansyah, et al., 2016). The value of environmental concern can be taught by teachers to students with models, namely discussions, field practice, laboratory, seminar and debate so that later students can play an

active role in reconstructing their mental skills to build knowledge, experience and skills and can be transferred to others.

BUILD SOCIAL CHARACTERS IN ELEMENTARY EDUCATION

Globalization has influenced Indonesia with increasingly sophisticated technological developments, namely the era of the industrial revolution 4.0. This will be a challenge for educators so that education in Indonesia must pay attention to quality for the next generation. One of the Indonesian government programs is implementing the Adiwiyata program which is a program which combines learning with social action (Yasin, 2019).

Not only in Indonesia, but Japan will also implement a program in 2020 like that because the program in the past only targeted primary skills like greeting, hearing to other people and speaking courteously. The application of this program is to combine basic knowledge of lessons and problem solving (okada and matsuda, 2015). Usually social skills are not subject-based lessons, only if the teacher applies them. Matsuda (2015) proposes a problem-solving design that could be take in every sector so that later it will become something important to be taught to students. The way it is implemented is with a card game which will help teachers in teaching which goals to motivate students to consider about breaking problems in a social context.

MATERIAL AND METHODS

This research is based on a qualitative approach by focusing on the study of scientific literature on earth governance systems. The application of elementary education is carried out by playing a game to hone children's intelligence in cases of environmental and social care. this will have an effect on the earth's governance system because students are the bridge to these changes and will become the future of the earth's governance system. Therefore, this research develops from a Biermann study as a reference that occurs in the current earth governance system that needs to identify the problem. The development of this method is based on biermann research (2007; 2010; 2012; 2017; 2019) with five research challenges including agency, architecture, accountability, allocation and adaptiveness.

a. Architecture

The first research challenges of the Analytical Framework is Architecture, it relates to the interconnected institutional framework for sustainable development of principles, institutions and practices that shape decisions at all scales (Biermann, 2014). There are 3 main researches cited in this research, namely Manning and Reinecke (2016), Brandis et al., (2014) and Falaleeva, et all., (2011). The three studies discuss how to make government structures more participatory and easier for all parties involved.

b. Agency

Agency is the research challenges of this Analytical Framework that depict the character of state and non-state actors that have an impact on society and the ecosystem of earth governance (Biermann, 2014). There are 3 main researches cited in this research, namely Novalia et al., (2020), Swyngedouw (2005) and Dellas et al, (2011). The research discusses the need for cooperation in order to create a good government system.

c. Adaptiviness

Adaptiviness is the third research challenges of the analytical framework which is used to see responsive adjustments by various actors and responses to the stimuli of global change at various levels (Biermann, 2014). There are 3 main researches cited in this research, namely Chaffin and Gunderson (2016), Djalante (2012) and Werners, et al., (2009). The research discusses the government and private sector policies needed to keep up with changes dynamically to global changes.

d. Accountability

Accountability is the fourth research challenges of the Analytical Framework is an environmental responsibility that occurs. There are 3 main researches cited in this research, namely Chan and Pattberg (2008), Clap (2005) and Jedd and Bixler (2015). The research discusses about Complaints services are needed by the community so that the public or non-state actors can perform the function of control related to the performance of a country's government in the earth's governance system, so that the government has a sense of accountability in issuing its policies.

e. Allocation

Allocation is the fifth research challenges of the Analytical Framework which discusses the fair and effective allocation of resources. There are 3 main researches cited in this research, namely Kanie et al., (2010), Gupta and Lebel (2010) and Kalfagianni and Meisch (2020). The right allocation is needed to answer the problems of the earth's governance system so that there is no waste of resources and disputes at various levels.

RESULTS & DISCUSSION

The development of this method is based on Biermann's research (2007; 2010; 2012; 2017; 2019) with five research challenges, namely agency, architecture, accountability, allocation and adaptiveness by connecting character building starting during basic education, namely environmental and social awareness.
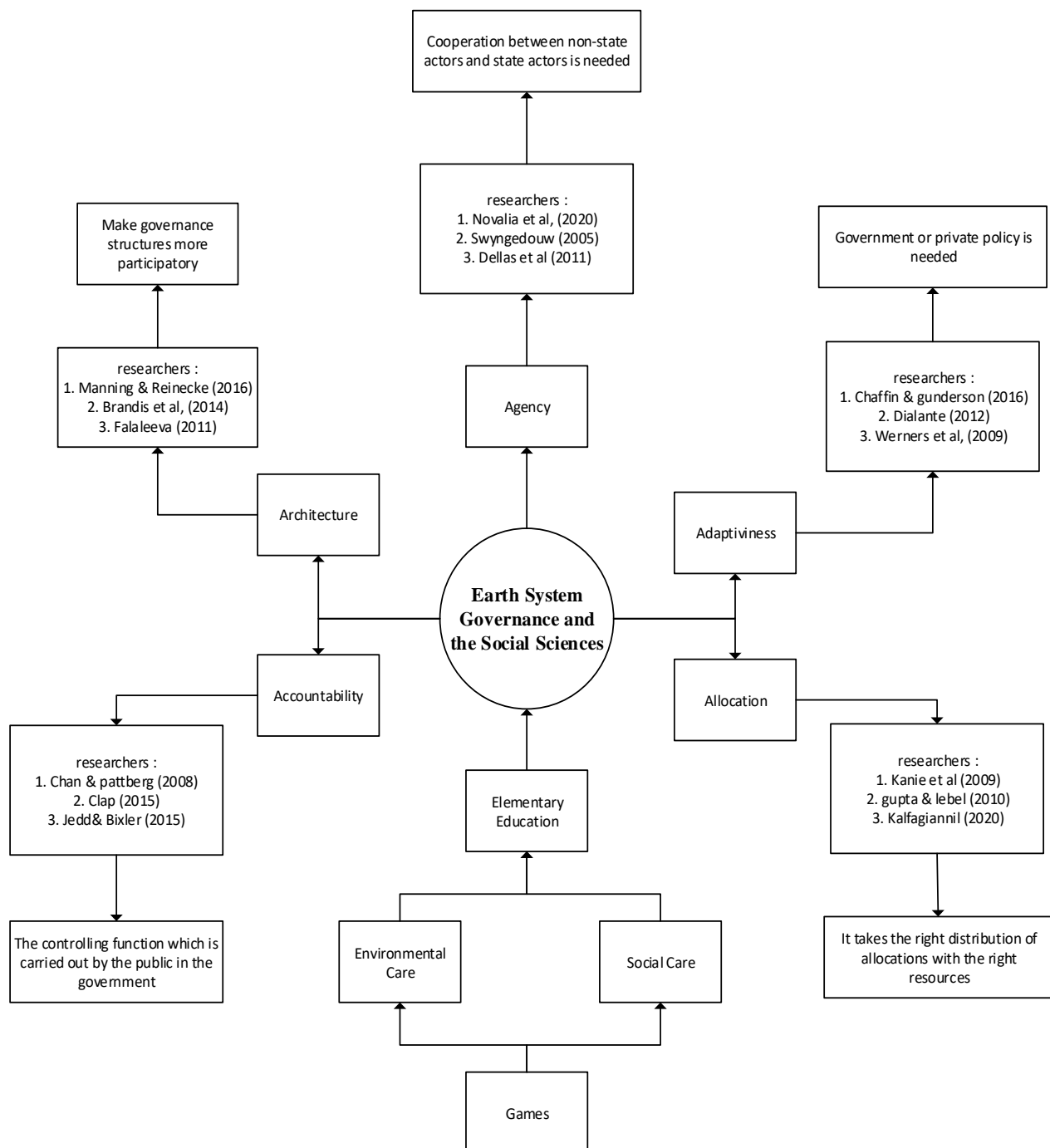
Figure 1. Analytical framework in research challenge

Earth system governance and the social science are influenced by early education, especially during the implementation of character education caring for the environment (Jayawardana, 2016). Character education here is education that instills knowledge, love, and inculcates good behavior where these character values must be repeated so that they become daily habits. There are many ways that can be done, one of which is a game. This game can provide an instinct to analyze problem solving with environmental and social contexts so that later it will help shape the character of students.

CONCLUSION

Earth system governance has five research challenges that are influenced by social science. The five challenges of this research are architecture, agency, adaptiveness, allocation, and accountability. A social system consisting of the community, government and non-government actors must work together to deal with the impact of the dynamic earth governance system. For this reason, elementary education is needed to reduce the negative impact of changes in the earth's governance system through the cultivation of character education that loves the environment and has a high social sense. Its application with a game so that students will be able to formulate, solve and interpret problems in various contexts.

REFERENCES

Adriansyah, M.A., Sofia, L., Rifayanti, R., 2016. The effect of environmental education training on child care attitudes will be environmentally sustainable. Journal of Psychostudia University of Mulawarman, Vol. 5, No. 2/Dec. 2016, p. 86-106

Biermann, F., 2007. Earth system governance as a crosscutting theme of global change research. Global Environmental Change 17 (2007) 326–337.

Biermann, F., Abbott, K., Andresen, S., Backstrand, K., Bernstein, S., Betsill, M.M., Bulkeley, H., Cashore, B., Clapp, J., Folke, C., Gupta, A., Gupta, J., Haas, P.M., Jordan, A., Kanie, N., Oravska, T.K., Lebel, L., Liverman, D., Meadowcroft, J., Mitchell, R.B., Newell, P., Oberthur, S., Olsson, L., Pattberg, P., Rodrıguez, R.S., Schroeder, H., Underdal, A., Vieira, S.C., Vogel, C., Young, O.R., Brock, A., Zondervan, R., 2012. Transforming governance and institutions for global sustainability: key insights from the Earth System Governance Project. Current Opinion in Environmental Sustainability 2012, 4:51–60.

Biermann, F., Betsill, M.M., Burch, S., Dryzek, J., Gordon, C., Gupta, A., Gupta, J., Inoue, C., Kalfagianni, A., Kanie, N., Olsson, L., Persson, A., Schroeder, H., Scobie, M., 2019. The Earth System Governance Project as a network organization: a critical assessment after ten years. Current Opinion in Environmental Sustainability 2019, 39:17–23.

Biermann, F., Betsill, M.M., Gupta, J., Kanie, N., Lebel, L., Liverman, D., Schroeder, H., Siebenhuner, B., Zondervan, R., 2010. Earth system governance: a research framework. Int Environ Agreements (2010) 10:277–298.

Biermann, F., Kanieb, N., Kima, R.E., 2017. Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals. Current Opinion in Environmental Sustainability 2017, 26–27.

Biermann,F., 2014. Earth System Governance: World Politics in the Anthropocene. Cambridge, MA: MIT Press

Brandis, K., Dzombeta, S., Haufe,K., 2014. Towards a framework for governance architecture management in cloud environments: A semantic perspective. Future Generation Computer Systems 32 (2014) 274–281.

Chaffin,C,B dan Gunderson,H,L.,2016. Emergence, institutionalization and renewal: Rhythms of adaptive governance in complex social-ecological systems. Journal of Environmental Management 165 (2016) 81-87

Chan,S dan Pattberg,P.,2008. Private Rule-Making and the Politics of Accountability: Analyzing Global Forest Governance. Global Environmental Politics 8:3, August 2008

Clapp, J., 2005. Global Environmental Governance for Corporate Responsibility and Accountability. Global Environmental Politics 5:3, August 2005

Damanik, S.E., and Damanik, M.R., 2020. Planning Model of Population Education and Environment in State Elementary School in District of Simalungun Regency. International Journal of Advanced Science and Technology. Vol. 29, No. 5s, pp. 865-873.

Dellas E., Pattberg P and Betsill M., 2011. Agency in Earth system governance: Refining a research agenda. International Environmental Agreements: Politics, Law and Economics 11(1): 85–98

Djalante, R.,2012. Adaptive governance and resilience: the role of multi-stakeholder platforms in disaster risk reduction. Nat. Hazards Earth Syst. Sci., 12, 2923–2942, 2012

Falaleeva, M., Mahony, C.O., Gray, S., Desmond, M., Gault, J., Cummins, V., 2011. Towards climate adaptation and coastal governance inIreland: Integrated architecture for effective management?. Marine Policy35(2011)784–793.

Gupta,J dan Lebel,J., 2010. Access and allocation in earth system governance: water and climate change compared. Int Environ Agreements (2010) 10:377–395.

Jayawardana,A,B,H., 2016. character education care for the environment early on as an effort to mitigate ecological disasters. Prosiding Symbion.

Jedd,C dan Bixler,P,R., 2015. Accountability in Networked Governance: Learning from a case of landscape-scale forest conservation. Environmental Policy and Governance Env. Pol. Gov. (2015)

Kalfagianni ,A., and Meisch,S., 2020. Epistemological and ethical understandings of access and allocation in Earth System Governance: a 10-year review of the literature. Int Environ Agreements

Kanie, N., Nishimoto, H., Yasuaki Hijioka, Y., Kameyama, Y., 2010. Allocation and architecture in climate governance beyond Kyoto: lessons from interdisciplinary research on target setting. Int Environ Agreements (2010) 10:299–315

Lester, J.C., Spires, H.A., Nietfeld, J.L., Minogue, J., Mott, B.W., and Lobene, E.V., 2013. Designing game-based learning environments for elementary science education: A narrative-centered learning perspective. Information Sciences 264 (2014) 4–18. http://dx.doi.org/10.1016/j.ins.2013.09.005

M. Kebritchi, A. Hirumi, H. Bai, The effects of modern mathematics computer games on mathematics achievement and class motivation, Computers & Education 55 (2010) 427–443.

Manning, S., and Reinecke, J., 2016. A modular governance architecture in-the-making:How transnational standard-setters govern sustainability transitions. Research Policy 45 (2016) 618–633.

Matsuda T 2015 Design framework of gaming materials to cultivate problem-solving abilities: Differences and commonalities among STEM educations, in Proceedings of the 13th Hawaii International Conference on Education (pp. 2147-2159). Honolulu, HI. Retrieved from http://hiceducation.org/conference-proceedings/

Novaliaa, W., Rogersa, B.C., Bosb, J.J., Brownc, R.R., Soedjonod, E.S., Copaa, V., 2020. Transformative agency in co-producing sustainable development in the urban south.

Cities 102 (2020) 102747.

Okada Y and Matsuda T 2015 Development of a Social Skills Education Game for Elementary School Students. Simulation & Gaming 2019, Vol. 50(5) 598 – 620, DOI: 10.1177/1046878119880228 journals.sagepub.com/home/sag

P. Wouters, C. van Nimwegen, H. van Oostendorp, E.D. van der Spek, A meta-analysis of the cognitive and motivational effects of serious games, Journal of Educational Psychology (2013) 249–265.

Rezkita, S. 2017. Authentic Assessment Oriented to Strengthening Environmental Care Character for Adiwiyata Elementary School. The Proceedings Paper in the seminar on July 15 2017. Yogyakarta: IKIP PGRI Wates

Rockstrom, J., Steffen, W., Noone, K., Persson, A., Chapin, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sorlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., Foley, J.A., 2009. A safe operating space for humanity. Nature 461 (7263), 472-475

Simbolon, B. R. (2010). Package of inquiry learning materials in environmental education for improving the environmentally friendly behavior of elementary school students in Jakarta. Journal of educational science environment and sustainable development, vol.11 (02)

Swyngedouw, E., 2005. Governance Innovation and the Citizen: The Janus Face of Governance-beyond-the-State. Urban Stud 2005 42: 1991.

Wardhana., and Arya, W., 2003. Environmental pollution Impacts. Yogyakarta: Andi Offset

Werners, S.E., Flachner, Z., Matczak, P., Falaleeva, M., Leemans, R., 2009. Exploring earth system governance: A case study of floodplain management along the Tisza river in Hungary.Global Environmental Change 19 (2009) 503–511

Wibowo, A dan Gunawan. 2015. Character Education Based on Local Wisdom in Schools: Concept, Strategy, and Implementation. Print I. Yogyakarta: Pustaka Pelajar.

Yasin MK 2019 Character Education for Environmental Awareness through the Adiwiyata Program, Islamic Studies Journal for Social Transformation, Vol 3, No 2.

http://jurnalnasional.ump/index.php/dinamika