

Dramatized Environmental Issues : Empathetic Learning Beyond the Classroom

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Abstract:

Re-enacting science through creative drama is known to help students to visualize abstract scientific concepts and enhance deeper environmental understanding. The Association for Science and Mathematics Education Penang (ASMEP) has, since 2006, been organizing an annual drama competition, for secondary students, to promote awareness on environmental problems and to elicit suggestions for innovative resolutions. The drama combines the different disciplines of science, art, music, language, sports with students' creativity to express, act and role-play their emotional with aesthetic awareness. They may empathize the feeling of despair on environmental degradation, but more importantly to elucidate suggestions to arrest lavish lifestyle, beginning from their own daily habits and roles in tackling environmental problems. This paper offers a qualitative and evaluative account of the scientific investigation, communication and cooperation skills among young learners in promoting environmental awareness based on drama competition in the last few years. It attempts to analyze the trends in the environmental issues during this period and the progress in resolving any problematic issues.

Keywords: *Drama; Role-play; Creativity; Environmental awareness*

1. Introduction:

Science and Technology in education has always been an important component of the *Malaysian-National-Education-Policy(MOE,-2003)*¹. The purpose is to give Malaysia the edge in developing into an industrialized nation that is competent, confident and innovative in harnessing, utilizing and advancing science and technology (S&T) towards achieving the goals of *Vision-2020-(MOSTI,-2013)*². The formulation of the Second National Science and Technology Policy (STP II) was launched in the year 2003. One of the key areas emphasized is to develop and expand the human resource based on S&T. Hence the Ministry of Education adopts a different approach to education, that is, from an examination-oriented and rote learning to hands-on and innovation-oriented approach, particularly in Science and Technology Education *(MOE,-2003)*³. In respect to this, specific initiatives have been taken to encourage 60 percent of the upper secondary students to study in Science stream and the rest in Arts stream.

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¹ MOE. (2003). *Integrated curriculum for secondary schools, science syllabus*. Putrajaya: Curriculum Development Centre.

² MOSTI. (2013). *Malaysia's science and technology policy for the 21st century*. Retrieved 15/07/13 from: <http://www.mosti.gov.my/mosti/images/pdf/dstn2bi.pdf>

³ Ibid;(Ref-1)

This 60 : 40 ratio is also hoped to be achievable for the university or college students pursuing science, technical and engineering, and arts disciplines respectively (MOSTI,-2013)⁴. This initiative posed a great challenge to the Ministry of Education because until today the participation rate in the Science stream is far below the targeted ratio of 60 percent, whereas the Arts stream exceeds the expected 40 percent (Muhammad-Zaini-Mohd-Zain,-2010)⁵. In respect to that, relevant stakeholders at all levels are still trying to work in concerted effort to develop strategies towards achieving the 60:40 ratio of students pursuing Science and Arts in higher secondary level. The *Association-for-Science-and-Mathematics-Education-Penang-(ASMEP)*⁶, though a non-government organization (NGO), is also participating in projects to encourage the learning of science and technology among secondary school students since 2006 by organizing an annual drama competition to promote awareness on environmental problems and to elicit suggestions for innovative resolutions.

2. Review of Related Literature and Methodology of Implementation:

2.1 Meaningful Learning and Significance of Project in Dramatizing Environmental Issues:

Recent research indicates that the teaching of school science needs to change in the ways which are meaningful to the students (Lycos, 2006)⁷. Often, students also comment on the lack of relevancy of much of the school science to their daily lives. In fact, the call for more hands-on teaching approaches in secondary science is a direct response to the appeal of making science learning more fun and meaningful. The usual way of doing confirmatory experiment designed to repeat scientists' way of work would hardly bring any empathetic learning. Solomon(2002)⁸ points out those stories in science education can contribute to understanding of the nature of science, and enhance ethical understanding as well as inculcating genuine empathetic feeling. According to Yoon(2006)⁹ science drama has a 'live-ness' characteristic from the 'presentation' and 'action' of participants to translate a story. The 'live-ness' of science drama is surmounting to experiments or demonstrations. Besides, science drama has much less cognitive burdens than experiments. In drama, verbal expressions and body language can be facilitated explicitly to express certain meaning and feeling. This 'live-ness' of science drama is therefore more obvious and convincing than written text. Science drama offer more space for students to talk, express, adapt and evaluate their science knowledge and thoughts. This helps to create an unauthoritative learning environment.

Penang, being a small state is well connected in terms of whatever happenings within its territory. Its citizens are sensitive towards the implementation of developmental projects, especially those that are

⁴ Ibid; p-1 (Ref-2);

⁵ Muhammad Zaini Mohd Zain. (2010). Educational Policies and Measures for Implementing the National Science and Technology Policy: the Malaysian Experience. Educational Planning and Research Division, Ministry of Education Malaysia

⁶ ASMEP. (2020). https://www.facebook.com/Association-for-Science-and-Mathematics-Education-Penang-ASMEP-1526710260707421/?ref=page_internal

⁷ Lycos, T. (2006). Different countries, same science classes: Students' experiences in their own words. *International Journal of Science Education*, 28(6), 591-613.

⁸ Solomon, J. (2002). Science stories and science texts: What can they do for our students? *Studies in Science Education*, 37, 85-105.

⁹ Yoon, H.G. (2006). The nature of science drama in science education. Paper presented at the 9th International Conference on Public Communication of Science and Technology: Scientific Culture for Global Citizenship. Korea.

related to environmental issues, town planning, greening, landscaping, healthy living conditions and so on. The science drama project is a platform to connect the students' science learning in the classroom to the outside world that affects their daily lives. The usefulness of contextual learning and subsequent understanding of science concepts from classroom activities can best be reflected by how students are capable to react to the real-life situations. When science and technology related issues are translated through drama, it not only gives meaning to learner, but inculcates a sense of societal responsibility (Campbell&Robottom,2013)¹⁰.

Group projects that entail positive group experiences have been shown to contribute to student learning, retention and overall college success (Tinto, 1998; NSSE, 2006). Properly structured group projects with good supervision can reinforce skills that are relevant to both group and individual work. This includes the ability to-

- plan and manage time;
- break complex tasks into parts and steps;
- refine understanding through discussion and explanation;
- give and receive feedback on performance; and
- develop stronger communication skills.

The ability of the students to undertake project and perform to audience is undeniably an effective way to develop self-confidence in students. The guidance of teacher adviser in each participating team and the eagerness to lead is a hidden motivation to push for student learning to a greater height.

2.2 Using Drama as Framework of Implementation to Promote S&T Education:

Based on observations, local school science is still a very content driven subject with transmissive mode of delivery and confine to a procedural set of experimental activities in classroom learning. These approaches do not appeal to students. There were several attempts to make science learning more engaging and interesting. For example, in April 2001, an enhancement teaching program, Active Teaching and Learning Approaches in Science (ATLAS)¹¹ was introduced nationwide in Malaysia to promote student-centered teaching and learning in science. In this initiative, science teachers were provided with instructional enrichment, new ideas for teaching science and the opportunity to move away from traditional teaching philosophies. By utilizing strategies such as small group discussion, active reading, active writing, games simulations, role play, drama and problem-solving, ATLAS aims to enhance students' potential for developing scientific skills (Bevins,-Windale,-Ong&Harrison,2001)¹². Similarly, ATLAS made teachers realized of the inappropriateness of didactic approach in teaching science, and they were convinced that student-centered approaches were often more effective for teaching by helping to enhance student interest in learning. However, due to heavy load in our school curriculum, ATLAS was gradually dissipated from school science lessons.

¹⁰ Campbell, C., & Robottom, I. (Eds.). (2013). Learning science beyond the classroom. Penang: SEAMEO RECSAM.

¹¹ ATLAS. (2020). <https://www.stem.org.uk/cx5kn>

¹² Bevins, S.C., Windale, M., Ong, E.T. & Harrison, B. (2001). Active teaching and learning approaches in science: towards a model for Malaysian science education. *Journal of Science and Mathematics Education in S.E. Asia* Vol. 24, No. 1

As a matter of fact, most teachers know that there is a need to enthuse and inspire students in science learning, by engaging them directly involved in the learning activities. Unfortunately, requirement for curriculum coverage reduces teacher's time to teach creatively to inspire students. Teachers do believe that science teaching should involve a fun element and it must be relevant to students' everyday lives in order to create interest and inspiration. If we want science learning to be more humanistic in approach, then we should create learning scenarios that are more appreciative, empathic, imaginative, and personally fulfilling. In this respect, science drama which is more humanizing in nature can fit in well to play its role to improve scientific literacy in students (Stancey,2010)¹³. Participation in science drama would enable students to acquire scientific knowledge, emotional commitment and desire to participate in taking action to correct any environmental ills (Yoon,2004)¹⁴.

In normal classroom teaching, science drama can be carried out with-scripts and without-scripts. The without-script drama can be performed through role play based on the context of the lesson. In this case, students should decide the cast and improve their own act. Drama can also be designed as setting the scene to facilitate deeper learning. Furthermore, drama provides an assessment opportunity to see what students know and their unique ways of thinking.

2.3 The Roles of ASMEP in Science Drama Competition:

ASMEP is a local non-governmental organization formed in 1966 with members who are the science, mathematics or technology related teachers or educators. The aims of the association are to improve the teaching and learning of science and mathematics supported by technology, to foster and enhance the appreciation of science and mathematics culture. Before the impact of the technology-laden era, retrieving information from internet or electronic sources back in the 70s to the 90s was not convenient. ASMEP played a crucial role in organizing talks, workshops and field trips related to science and mathematics education for its members. However, with the advancement of internet access, the participations of members to face-to-face talks and workshops dwindled. Since 2006, ASMEP undertakes another new challenge by organizing science drama competition to promote and disseminate alternative approach of science learning among secondary students through a science and technology literacy project. According to Holbrook-and-Rannikmae(1997,p-15)¹⁵, "the science and technology literacy encompasses the scope of developing the ability to creatively utilise sound science knowledge in everyday life or in a career, to solve problems, make decisions and hence improve the quality of life."

ASMEP has secured annual financial funding from the Penang State Government under the Promoting Science and Technology Education Program to run this project known as Science and Technology Literacy Competition for the secondary school students in Penang. As the term implies, this project intends to promote science and technology learning through drama and sketches. Many levels of stakeholders are involved in organizing the project. For examples, the Penang Education Department and SEAMEO-

¹³ Stancey, K. (2010). Mathematical and scientific literacy around the world. *Journal of Science and Mathematics Education in Southeast Asia*, Vol. 33 No. 1, 1-16.

¹⁴Yoon, H.G. (2004). Science education using science drama. *Proceedings of the 46th conference of The Korean Association for Research in Science Education*. 26-43

¹⁵ Holbrook, J., & Rannikmae, M. (Eds.). (1997). *Supplementary teaching materials promoting scientific and technological literacy*. Tartu, Estonia: ICASE (International Council of Associations for Science Education).

RECSAM¹⁶ have always been the collaborators to support the drama project. The drama is presented in the form of competition. Usually ASMEP working committee would fix an environmental theme for the participating teams to work on the manuscripts and trying out dramas. However, it is mandatory to have official approval from the Penang State Education Department to invite participation from any of the 125 secondary schools in Penang.

3. Methodology of Implementation:

3.1 Preparation of Implementation:

As have been mentioned earlier, upon obtaining approval from the State Education Department to host the science drama competition, invitation letters and all relevant information regarding the competition were sent to all the secondary schools in Penang. This means that the competition was restricted to secondary students only. Participants were given about three months to prepare their respective dramas for the competition. In the period of study, there were 13 to 21 teams participated in each of the competition. The best six dramas were awarded with prizes.

3.2 Project Themes and Rationale:

As stated, the initiative of organizing Literacy Science and Technology Competition to encourage science learning through drama began in 2006. In order to create rooms for alternative approach of contextual science learning and instill awareness of societal responsibility, the themes of the annual competition had been pivoted to promote awareness on environmental problems and socio-scientific issues, and so to elicit suggestions from students for innovative resolutions through scientific and technological knowledge. The themes for the drama competitions were usually generic. This was to provide more leeway for students to relate what they learned from the science and technology lessons in the classroom and translate the knowledge and ideas into drama.

3.3 Judging Process:

The science drama competition was open to Penang secondary students only. The drama presented must depict the scenarios to promote awareness on environmental problems and provide suggestions for innovative resolutions. A drama was deemed to be good if it combined the different disciplines of science, art, music, language, sports together with students' creativity to act and role-play the environmental and/or socio-scientific issues as well as proposing innovative resolutions. Another aspect of a good drama might show that the student actors or actresses empathized the feeling of despair on environmental degradation to gain sympathy from the audience. But more importantly, the drama should attempt to advise the audience to arrest lavish or wasteful lifestyle, beginning from their own daily habits and roles in tackling environmental problems.

A panel of three judges presided over the judging process. The chief judge was always a specialist in drama. The other two judges could be science educators or environmentalists. Judging was based on criteria as illustrated below-

¹⁶ SEAMEO RECSAM- www.recsam.edu.my

- (i) **Content:** relevancy to the theme, relating to current environmental or social issues, subject matter must be critical but constructive, showing clear evidence that content support the real situation
- (ii) **Presentation:** logical sequence, easy to follow the storyline, evidence of showing good collaboration and cooperation among team members, high degree of engagement, thought provoking and promoting higher order thinking skills
- (iii) **Approach:** appropriate choice of mode of presentation in conveying ideas, presentation style interesting, innovative, informative and giving high level of impact
- (iv) **Questions and Answers:** demonstrate confidence in handling questions raised by audience immediately (after the show), able to provide convincing answers, exhibit excellent coordination among team members in handling impromptu situation, demonstrate ease of expression.

3.4 The Objectives and Research Questions of Science Drama Competition:

The initial intent of the science drama competition was to create awareness among students that hard facts and concepts of science could also be learnt through drama and sketches. These fun ways of learning science could probably change the perspective of students about science learning and eventually come to love the subject. This interesting alternative approach could be far reaching so that students' affinity for science learning would gradually shift towards the target number of 60:40 ratio of science to arts students.

Hence, in this study on science drama, the researchers were looking at how students learn about science and technology beyond the classroom. Specifically, this study focused on the following research questions (RQs):

- (i) Was an alternative approach to science learning through drama, sketches and role play meaningfully introduced?
- (ii) In what ways does the alternative approach make students aware of the relationship between science and technology, the environment and society?
- (iii) In what ways and to what extent does the alternative approach raise awareness of students on the status of the quality of environment in which they live?
- (iv) In what ways and to what degree does the alternative approach inculcate citizenship responsibility through thinking globally and acting locally to the potential use of science and technology to resolve related environmental issues and problems? and
- (v) To what extent does the alternative approach could help to develop inquiry, problem solving, socio-scientific study and communication skills of students?

Hence, the researchers would attempt to acquire sufficient information based the following queries in order to derive solutions for the research questions.

- (i) What were the main environmental and socio-scientific issues highlighted in each drama in the period of study?
- (ii) Did the environmental and socio-scientific issues change over the years as portrayed in the dramas within the period of study?

4. Data Analysis and Discussions of Findings

Table 1 outlines the themes of the competition adopted over the past few years from 2006 to 2019.

Table- 1: Themes for Science and Technology Literacy Competition

Year	Theme
2006	The effect of current science and technology related issues to the people and environment of Penang for today and tomorrow
2007	Repeating the above
2008	Repeating the above
2009	Repeating the above
2010	Repeating the above
2011	Greening the environment of Penang in year 2012 through science and technology
2012	Tackling issues of daily living in Penang through science and technology
2013	Embracing Science and technology for sustainable living
2014	Resolving issues of daily living in Penang through science and technology
2015	Espousing Science and technology for sustainable living
2016	Addressing societal issues and problems in Penang through science and technology
2017	Adopting science and technology to resolve address issues and problems in Penang
2018	Implementing science and technology programmes to propel Penang to be the first green state in Malaysia
2019	Futuristic Innovation towards sustainable living

(Note: 2013-2018 themes translated from Malay with slight amendment)

Table 2 illustrating a total of 113 science dramas during the period 2006-2012 that had been enacted on stage and selected for discussion. Thereafter, the subsequent analysis was only elaborating on the main issues highlighted in each of the themes.

Table- 2 : Topics/Issues Enacted in the Drama Competition

Year	Theme	River/ sea pollution	Noise/Haze/ air pollution	Environment/ greening/ recycling	Enzyme/ fermentation	Global warming	Importance of water	Electricity	Medical technology	Technology	Total
2006	The effect of current science and technology related issue to the people and environment of Penang for today and tomorrow	1	3	4	-	2	-	1	4	-	15
2007		2	-	6	-	3	2	1	-	2	16
2008		2	1	4	-	2	-	-	2	2	13
2009		2	-	6	-	1	-	3	2	3	17
2010		1	3	5	1	2	-	-	4	2	18
2011	Greening the environment of Penang in year 2012 through science and technology	1	-	13	2	3	-	-	-	2	21
2012	Tackling issues of daily living in Penang through science and technology	1	4	3	3	1	1	-	-	-	13
Total											113

At the turn in the new millennium, environmental and socio-scientific issues have been the buzz phrases of concern all over the world. In Penang, among the concerns include garbage disposal, air, water, river and sea pollution, traffic congestion, and inappropriate development such as hill cutting, land reclamation, etc. By dramatizing these problems through acting, it exposed the environmental problems at the same time provoked critical thinking of how to overcome these problems. The critical thinking skills would enable learners to comprehend, analyze and use the information to change non-caring behaviour to adapt to sustainable living. It, therefore, appeared that dramatizing environmental issues as an alternative approach in science learning had been meaningfully introduced to the liking of the learners. *[Addressing RQ(i)].*

Based on the dramas performed by the participating students, it was found that students generally were aware of the issues that affected their communities. Some dramas that suggested the ways to care for the environment were by doing recycling, reducing the use of plastic bags, preventing river pollution, and taking steps to reduce global warming. In the year 2006, there was a high incidence of dengue fever in the community because there was a sudden increase in the number of *Aedes* mosquitoes. *Aedes* mosquito is the vector of the disease. Three teams enacted drama pivoted on keeping the environment clean, and by destroying the breeding ground for *Aedes* mosquitoes to eradicate dengue fever. This illustrated a clear case of using drama as an alternative approach enabling students aware of the relationship between science, technology, environment and society. *[Addressing RQ(ii)].*

In general, air and water pollution, deterioration of environment and global warming were the issues that many participants raised over the years till today. These were positive indications that they were aware of such issues threatening the environment. In the drama, many awareness raising episodes were injected, some very sarcastically done yet amusing. There were suggestions on how to handle the issues and reminding the audience of their responsibility towards a cleaner, greener and sustainable environment. In drama, students could freely act in different ways to raise awareness on the status of the quality of environment in which they live. *[Addressing RQ(iii)].*

In year 2010, there was an emergence of using enzyme to treat biodegradable waste. Accordingly, a number of dramas related to the methods of making enzymes and their uses were presented. In 2011, the organizing committee decided to fix a theme for the drama on greening the environment. As a result, a wide range of ideas on how to green the environment was depicted in the drama. The potentials of the students and their creative thinking should never be underestimated. The content knowledge combined with the skills of acting and presentation uncovered another dimension of the students whom we hardly know in the classroom. It was impressive to watch them showing off their confidence of being on stage acting and putting forward convincing ideas to support their argument. In the formal setting of the class, such opportunity rarely comes by. It was apparent that dramatized science learning could inculcate citizenship responsibility through thinking globally and acting locally to adopt the use of science and technology to resolve related environmental issues and problems. *[Addressing RQ (iv)].*

The themes of the drama competition till 2012 were rather generic; whereas, the themes were more focused and specific from 2013. Several teams pivoted on the haze issues and deterioration of air quality

that affected Penang. In the drama, participants enacted on how irresponsible citizens contributed to the seriousness of haze by open burning. On the other hand, it was the responsibility of the public to make reports to Department of Environment to curb such wrongdoings.

In many episodes of the drama, participants were able to relate the current happenings and environmental issues in their vicinities on the stage. Participants exhibited a considerable command of science related knowledge and conveyed the message clearly through drama. Many of the participants were critical about issues and exuberated critical thinking skills to offer constructive suggestion and solutions to provide possible remedies to overcome the problems faced by the local community. In the most recent presentation in 2019, students were looking beyond adopting the principles of science and technology in solving societal and environmental problems. They began to adopt a futurist vision of making better use of science and technology to enrich sustainable living and resources.

Most of the presentations had combinations of many acting skills which many teachers would not expect to see them happening in a normal science class. There was emergence of some hidden talents such as their ability to sing, dance, act with emotion and gestures. The teacher advisor played a very important role in each drama by checking on the accuracy of the information to be presented. He or she tirelessly gave weeks of moral support from preparation until the performance on stage. The success of each team in producing a drama also revealed a good collaboration and cooperation among the students in all the teams. Hence, this alternative approach of dramatizing science learning not only developing investigative skills but also enhancing social and communication skills in learners. *[Addressing RQ(v)].*

6. Conclusion:

Over the last few years, the science drama competition had served as a platform for students to experience science learning through a humanistic approach that gave meaning to their daily lives. They were given the chance to voice their concerns and grievances about the deteriorating environment they live in. There were portrayals of commitment to eradicate environmental problems and socio-scientific issues to make their environment a better place to live. Collaboration and cooperation among team members enhanced the ability of each individual to present the message of the drama to the audience. The ability to set up a play incorporating dialogue and acting creatively about the environmental and socio-scientific issues was no doubt an achievement well above a normal traditional science lesson.

The science drama also provided rooms to develop multiple intelligences of the students involved. The stage provided avenues of communication for students to voices their views through integration of sophisticated multimedia to the audience to bring about greater impact.

The drama competition had been gaining good support from schools. Students found drama interesting and fun as an alternative dimension of learning science. This approach could promote scientific thinking, and it is certainly authentic and humanistic way of raising environmental awareness to promote societal commitment in creating a healthy environment to live in.

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