GRADE 10 STUDENTS' PERCEPTION OF LEARNING ENVIRONMENT: PROSPECTS FOR KTO12 SCIENCE TEACHING ENHANCEMENT

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ABSTRACT

Creating a positive psychosocial learning environment (PsLE) that holistically considers the learners' needs is vital to optimizing learning productivity in Science. This study investigates the Science learning environment as perceived by the students in actual Science classes. Anchored on the three PsLE dimensions namely: relationship, personal development, and systems maintenance and change, it tracks for alignment of the current Science teaching and learning practices to the expectations of the Kto12 Science curriculum standards. A survey method was done to gather the students' perception ratings based on a 5-point Likert scale (with 5 as most indicative) using the adapted established learning environment instruments, namely, the Constructivist Learning Environment Survey, the Individualized Classroom Environment Questionnaire, and the Science Laboratory Environment Inventory. The data was collected from 105 Grade 10 students in one of the provinces in Central Visayas, Philippines, and treated statistically using descriptive statistics to get the mean percentage score and standard deviation. Results showed a high perception rating of the scales in the relationship dimension with a mean perception score (MPS = 3.7, SD= 0.36) and least in the personal development dimension. The specific scales that are of low perception include independence, open-endedness, shared control, and differentiation. These findings bear implications for potential interventions for the improvement of Kto12 Science teaching. Re-tooling the teachers with professional development training is a practical move that can be undertaken by the school leadership. Some concrete teaching practices anchored on the PsLE framework are discussed for the enhancement of Kto12 Science teaching.

Keywords: psychosocial learning environment; positive climate; student-centered teaching; non-recipe laboratory type; teachers' facilitation role

INTRODUCTION

The teachers' mindful provision of a favorable learning environment (LE) is equally important as their preparation, and competence, for instructional content and strategies. Learning productivity is said to be associated with the quality of LE created in a given learning space (Panayiotis & Fraser, 2019). The Department of Education, in DepEd Order No. 39 (2016) strengthens the importance of providing a quality learning environment recognizing that it is one of the factors that affect the learning behavior and the learning outcomes achievement among the students. This is supported by educational studies culled from the literature on the impact of classroom environment on student academic learning outcomes in basic Science (Patrick, 2016).

Two learning environment theories are worth mentioning. This includes-- the *Lewin field model*, and the *Educational productivity model* (Walberg, 1978). The former indicates that human behavior (**B**) is a result of the interaction between the person (**P**) and environmental factors (**E**) based on the formula that Lewin developed in 1936, i.e., **B = f (P, E)** in Afari (2013). This theory is greatly relevant in a Science classroom setting on the aspect of having students' display of behavior as determined by one's personality plus some interactions with the environment in a learning situation. The *Educational productivity model*, on the other hand, recognizes the influential factor of the learning environment (**LE**) alongside the students' talent (**T**) (i.e., ability, development, motivation) and the quality and quantity of the teachers' instruction (**I**) to the students' learning (**L**) and productivity in school. The factor on the teachers' instructional practices would involve the teaching approaches used and the way the class is being facilitated to improve students' learning achievement. This is simplified thru the formula— **$L = f\ (T, I_{qual\text{-}quan}, LE)$**.

The LE in the context of this study is based on the holistic provisions of the three dimensions of the psychosocial learning environment (PsLE) framework in Moos (1974). Consideration of these PsLE dimensions in teaching has been incorporated as one factor in a multi-factor psychological model of educational productivity (Fraser, 2002) indicating in research that classroom and school environment is a strong predictor of both achievement and attitudes among the students (Patrick, 2016). These two theories serve as the backbone for learning environment studies to assess programs like the currently implemented K to12 educational program in the country. It is an interesting field to undertake learning environment research to monitor program implementation since the kind of learning environment in science class, for example, can be translated into the quality of teaching, and hence, learning gains among the students.

The PsLE framework in Moos (1974) gives a holistic consideration of LE provisions to establish a quality atmosphere in the Science classes. The term psychosocial involves consideration of the dynamic connection between psychological aspects of one's experiences and the wider social experience (INEE, 2016). The PsLE does not only encourage students to learn but also become motivated for Science learning (Ullah & Sarfraz, 2019). This is important since, during instruction, learners and teachers are psychologically affected by the surrounding social conditions that may hinder or enforce the quality and effectiveness of learning. And facilitating instruction that endures every learner in an environment that is physically safe, emotionally secure, and psychologically enabling is a constant call of practically all educators, not just in Science as this becomes part of the students' learning productivity (National Research Council, 1996).

The PsLE framework considers three basic dimensions namely, *relationship dimension* (RelD), *personal development dimension* (PdD), and *systems maintenance and change dimension* (SmcD). The *RelD* aspect refers to the nature and intensity of personal relationships within the learning environment and the extent to which students support and help each other. In this study, the learning environment scales or factors that are included are *personal relevance*, *personalization*, *participation*, *uncertainty*, and *student cohesiveness*. The *PdD* aspect refers to the basic directions along which the students' personal growth and self-enhancement tend to occur. This includes the learning environment factors namely, *critical voice, shared control, independence, investigation, open-endedness,* and *integration*. The *SmcD* aspect, on the other hand, refers to the extent to which the environment is orderly, clear in expectations, maintains control, is safe, and is responsive to change. The scales on *student negotiation*, *differentiation*, *rule clarity*, and *material environment* are included in the study for this aspect.

Incorporating these PsLE dimensions with the respective scales in one's teaching is considered vital to create more quality, a greatly facilitative, highly engaging, and more student-centered learning environment that potentially yields optimal learning outcomes in Science among the students. This is shown in Figure 1.

Establishing a positive PsLE is guided by constructivism epistemology that views learning as a result of the students' interpretation and reflection of a given concept towards the construction of a new one based on ones' real-life experiences (Chaplowe & Cousins, 2016; Schunk, 2012). Constructivism is one of the significant Kto12 Science curriculum educational pedagogies with its basic premise that knowledge acquisition and understanding expansion are carried out through active construction and reconstruction of the mental frameworks of the students (Killen, 2013). The teachers' provision, therefore, of authentic tasks, and significantly, of the favorable positive climate based on the three dimensions of the PsLE is crucial to challenge students' thinking (Schunk, 2012) and to support them towards the construction of meaningful learning for long-term memory retention of Science concepts (Boladola, 2018).

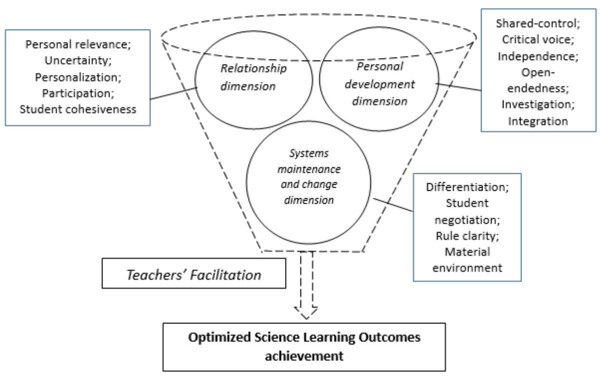

Figure 1. Incorporating the PsLE Framework in the Teachers' Facilitation Role

Gathering students' perceptions in a survey, in this study, is deemed practical since they are better determinants of student behavior than genuine situations like class observations which, at times, can be made artificial due to consciousness of being observed. This is supported by the widely known maxim, a " Thomas theorem" in (Bornmann & Marx, 2020) saying:

"If men define situations as real, they are real in their consequences."

This means that the students' perception rating on certain learning environment characteristics being measured can be real, i.e., true to their personal encounter and experiences.

While numerous learning environment studies can be viewed from existing works in Western countries and few Asian countries in Afari (2013) there is yet a minimal or no account on learning environment studies in the Philippines that specifically profiles the PsLE dimensions using learning environment perceptual measures as being related to the Science teaching practices in the currently implemented Kto12 program in the Philippines. The students' perception of the PsLE dimensions in the actual Science learning environment is thought to provide a practical measure to see the alignment of the Science teaching practices with the Kto12 curricular reform expectations that are anchored on constructivism, among others, that capitalizes on student-centered teaching (Bada, 2015; K to 12 Science Curriculum Guide, 2016).

This profiling of the PsLE scales, in this study, in the actual Kto12 Science classrooms would give a better grasp on how student-centered are the Science classes being conducted. The assumption is, the more student-centered are the Science teaching practices, on the lens of the three dimensions of the PsLE framework, the more quality is the learning environment provided by the teacher. This is tantamount to saying that the Science classes are then conducted fairly based on the Kto12 Science teaching expectation. This is important to give a more informed decision on some prospects to either strengthen the existing teaching practices or reshape some to enhance Kto12 implementation for more productive learning gains among the students

OBJECTIVES OF THE STUDY

This study aimed to characterize the Grade 10 Science classes in terms of the fifteen PsLE scales that have relevance to the Kto12 Science teaching expectations based on the students' perception of their Science classes particularly some classroom teaching practices and processes. The findings on the PsLE scale profile that can be generated from this study, will serve to guide educational leaders to make informed action (i.e., potential innovation and intervention) for the improvement of Science teaching among its teachers. It would also provide the basis for strengthening and/or reshaping teaching practices among the teachers for the furtherance of Kto12 Science curriculum implementation.

METHODOLOGY

This study employed a non-experimental cross-sectional study that aimed to assess the extent of implementation of the Kto12 Science curriculum based on classroom practices as perceived by the students involving Grade 10 students in the selected Junior High Schools in one of the provinces in Central Visayas, Philippines.

Permission was sought from the respective school principals and the respective parents of the students from the randomly selected sections. A survey method was done to gather the students' perception ratings based on a 5-point Likert frequency scale, with 5 as most indicative using the LE instruments adapted from literature namely the Constructivist Learning Environment Scale (CLES) of Taylor, Fraser, & Fisher (1997); the Individualized Classroom Environment Questionnaire (ICEQ) of Fraser & Fisher (1982); and Science Laboratory Environment Inventory (SLEI) of Fraser et.al., (1992). The data were collected from February to March 2020.

Descriptive statistics were employed to get the mean perception score and standard deviation representing the students' perception of the LE scales in their actual Science learning environment.

RESULTS AND DISCUSSION

1. Psychosocial Learning Environment Scale Profile as Perceived by the Students

After giving the students with the CLES, ICEQ, and SLEI questionnaires, the Mean Perception Scores (MPS) and standard deviation (SD) values were computed based on their responses as summarized in Table 1.

Two significant observations can be deduced from the data as shown. One, the Science classes understudied have shown high LE characteristics that are aligned to the *RelD* category, followed by the *SmcD* and finally the *PdD* with a MPS of 3.7(SD=0.36), 3.4(SD=0.35), and 2.9(SD=0.33), respectively. Such *RelD*-learning environment characteristics in the Science classes that were consistently highly perceived by the students would more likely yield higher learning outcomes achievement as in the account of Aldridge, Laugksch, Seopa, & Fraser (2006) showing an association between important aspects of the learning environment and outcomes-based education.

Table 1
Grade 10 Students Perception Rating of their Actual Science Learning Environment (N =105)

Psychosocial Learning Environment Scales	MPS	SD
I. Relationship Dimension (RelD)	**(3.7)**	**(0.36)**
Personal Relevance[a]	3.9	0.56
Uncertainty[a]	3.6	0.59
Personalization[b]	3.5	0.56
Participation[b]	3.5	0.44
Student Cohesiveness[c]	3.8	0.62
II. Personal development Dimension (PdD)	**(2.9)**	**(0.33)**
Critical voice[a]	3.1	0.81
Shared control[a]	2.3	0.83
Independence[b]	2.5	0.53
Investigation[b]	3.2	0.53
Open-endedness[c]	2.8	0.51
Integration[c]	3.7	0.62
III. Systems maintenance and change Dimension (SmcD)	**(3.4)**	**(0.35)**
Student Negotiation[a]	3.9	0.76
Differentiation[b]	2.3	0.44
Rule Clarity[c]	3.7	0.49
Material Environment[c]	3.7	0.61
General PsLE Perception Rating	**3.3**	**0.28**

The scales and learning environment questionnaire items have been adapted from the [a]CLES instrument (Taylor, Fraser, & Fisher, 1997); [b]ICEQ instrument (Fraser & Fisher, 1982); and [c]SLEI instrument (Fraser, Giddings, McRobbie, 1992)

And second, of the fifteen LE scales, four are slightly perceived by the students, i.e., below the 'sometimes' or the 3.0 MPS, level. These are *shared-control*, *independence*, *open-endedness*, in the PdD, and *differentiation* in the SmcD. This implies that more room for improvement can be done on the Science teaching practices to enhance the Kto12 Science curriculum implementation.

Figure 2 below shows the overall psychosocial learning environment scale profile of the Kto12 Science classes as perceived by the

Grade 10 students (N=105) considering the mean perception scores of the 15 LE scales.

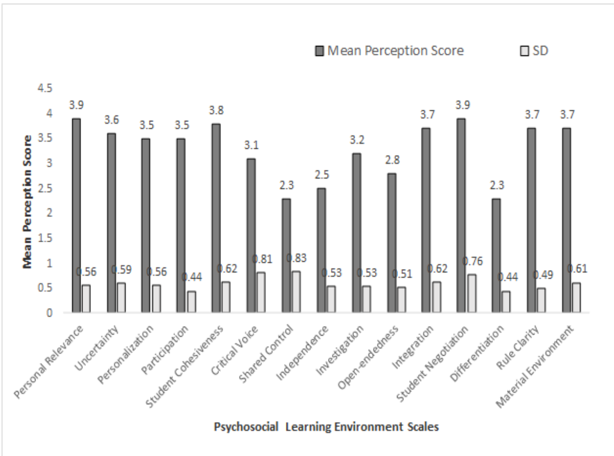

Figure 2 . Psychosocial Learning Environment Scale Profile of the Actual Science Learning Environment

On a positive note, all of the measured learning environment scales have been perceived, to some extent, by the students. This means that the teaching practices are aligned to the Kto12 curricular reform, although, room for improvement can be done to make the learning environment to be more holistic, i.e., more nurturing and supportive; more challenging and creative; and more safe and organized, on the lens of the PsLE dimensions.

2. Implications to Kto12 Science Teaching

Overall, with the manifestation of all the LE scales (or constructs) in the 3 PsLE dimensions in the actual Science learning environment in the study, one could generalize that the classroom practices, to some extent, are aligned to the Kto12 Science curriculum expectations of being student-centered anchored on constructivism with eleven out of fifteen LE scales that are within the *moderately-to-highly* perceived level. This is an identified strength in the Science classes being investigated, and a *plus (+)* factor for the Science teachers for demonstrating a holistic psychosocial LE dimension in their classroom practices with the *RelD* constructs that are consistently highly perceived by the students, although, things can be further improved in the future undertaking. This result is somewhat similar to Tomlinson and Strickland's (2005, in Chaplowe & Cousins, 2016) statement on the important role of a teacher in the classroom, i.e., to respond to the students' affective needs which include-- social cohesion, kinship, and treating them to be valuable just as they are. This is key towards more motivation to learn on the part of the students which is relevant to the *RelD,* as well as the *PdD* LE scales alongside the *SmcD* provisions. These three are important to keep a balance in creating a more positive and more productive learning climate in Science classes. This, then, poses a challenge among Science educators to always keep a healthy dose of having an affirming relationship and positive interaction with each learner in one's tutelage plus the provisions of keeping a safe learning space with the appropriate rules/etiquette and ensuring for available learning resources that are suitable to student's unique abilities and learning needs. The students' *feeling-excited* attitude to learning in a Science class as motivated by the teachers' affirming care and closeness among them needs to be sustained in Kto12 Science teaching.

Specifically, in the *RelD*, the teachers may undertake to establish a learning environment that enforces personal relationships and support systems created. Some concrete actions that can be undertaken that are deemed aligned with this dimension include the creation of a culture in the Science classes whereby the students are having an opportunity to— (i) relate one's Science learning to real-life context, a display of *personal relevance*; (ii) work in teams and collaborate in Science inquiry works, a display of *student cohesiveness*; (iii) experience Science knowledge buildup through actual hands-on and minds-on works in Science classes recognizing the revisionary nature and limitations of Science, a display of *uncertainty*; (iv) be motivated to interact with the teacher and peers with the teacher's prompts and affirming gestures, a display of *personalization*; and (v) participate actively in class discussions and the performance of tasks, a display of *participation* learning environment scale. These provisions in Science teaching practices need to be strengthened in the teachers' facilitation role.

In the *PdD,* the Science teachers may undertake the following tips to create a culture of learning that provides for the development of students' personal growth and self-enhancement in the Science classroom. These include the following teaching practices, namely: *(i)* having the teacher provide the students an opportunity to openly share (i.e., without fear) to their teacher--queries about the pedagogies and methods used in class and about some obstructions to their learning which is related to *critical voice* learning environment scale*; (ii)* the teacher to conduct a brainstorming session that the students can take part in the teacher's articulation of learning goals, the design and management of learning activities, and the determination and application of assessment criteria for the class to rate students' performance and products, a display of *shared control*; (iii) the teacher to allow the students to make an informed decision in their Science undertaking (upon the teacher's guidance) and for the students to be responsible of their own learning and behavior, a display of *independence*; (iv) the teacher to provide students some opportunities to practice inquiry skills and processes in problem-solving and investigations that will develop among them a high regard and love of Science and the scientific values, a display of *investigation;* (v) the teacher to provide students some opportunities to be more creative and divergent in their approach to experimentation which is attainable through facilitating a non-recipe-type of laboratory work making students explore the problem and design experimental setup to solve the problem, a show of *open-endedness*; and (vi) for the teacher to provide students some opportunities to engage in practical laboratory activities that are integrated with the theory classes, a display of *integration* learning environment scale.

In the *SmcD***,** the teachers may strive to establish a learning environment that is orderly, clear in expectations, maintains control, and is responsive to change. These are provisions for the teachers -- *(i)* to give students the opportunities to explain and justify to other students their newly developed ideas, to listen attentively, to reflect on the viability of other students' ideas and, to reflect on the viability of their own ideas, a practice that is demonstrated in the presentation of students' research undertakings during Science-fair events, a display of *student negotiation; (ii)* to provide students with varied learning opportunities that consider their diversified abilities, learning styles and preferences, interests, and rate of working (Fraser & Fisher, 1982), as well as students' favorability based on available learning resources and learning circumstances that relate to the different learning platforms, either on actual class engagement (face-to-face) or remote learning engagement (i.e., being online, or modular), or hybrid setup in flexible learning situations, a show of *differentiation; (iii)* to ensure safe and sound rules in the laboratory area in the school, in the classroom, or in the household area or community in flexible learning modality, a display of *rule clarity;* and (iv) to make sure that laboratory equipment and materials are adequate and available in the laboratory working space in school, or in the students' households, a display of material environment.

By considering the PsLE dimensions, namely the *RelD*, *PdD*, and *SmcD* in one's teaching the learning environment created can be more holistic with the whole community of learners with their teacher (as a facilitator of learning) are influencing each other towards the support of creativity (Richardson & Mishra, 2018). This is key to optimizing Science learning outcomes achievement.

3. Potential Adoption of a 'Non-Recipe Laboratory Investigation' Model for Science Teaching

The Argument-Driven Inquiry (ADI) is recognized to be a rich instructional approach (Grooms, Enderle, & Sampson, 2015) in the context of provisions of a holistic learning environment that facilitates a non-recipe type of laboratory work among the students. It provides students an opportunity to engage in meaningful inquiry using their originally-crafted method and experimental design (Sampson & Gleim, 2009). It is considered highly student-centered as demonstrated in the different stages of the ADI laboratory investigation process that involve eight stages including-- *(i)* task/problem identification; *(ii)* generation of data; (*iii*) production of tentative data; (*iv*) the interactive argumentation session; (*v*) the creation of investigation report; *(vi)* the double-blind peer review; (*vii*) the revision process; and (*viii*) finalizing the written report.

The ADI instruction in laboratory investigation is thought of as an ultimate key to creating and enforcing such needed learning environment scales in one's Science teaching. This means that the *IOS-D* classroom factors can be demonstrated thru conducting an inquiry type of lab investigation. And, just by the second stage which involves the designing aspect of experimental procedure and collection of data, practically all the classroom factors in the context of this study can be demonstrated. There is a show of *differentiation* (Diff) LE scale in the aspect of having the teacher's provision to allow the students to consider distinct and unique methods and approaches to solving the given problem. There is also a display of *independence* (Indp) LE scale in the teachers' provision to only supervise and mentor the students' undertakings because it is the students who do the planning and investigating and they are responsible for their learning in the process. Additionally, there is an *open-endedness* (OpEnd) LE scale in this model since the students are being provided an opportunity to deal with the *how's* and *why's* of the proposed undertaking, i.e., to find a solution to a problem by their means in a non-recipe type of Science undertaking. And finally, there is a great show of *shared control* (ShCon) LE scale in the ADI instructional model. Here, there is students' provision for them to openly share with their teacher --relevant concerns in the conduct of investigation during the brainstorming session in the first stage which gives the teacher valuable insights from the students' sharing of ideas that include potential enrichment activities and assessment criteria to be used in rating students' performance, a demonstration of *shared control* LE scale.

The potential shift from the traditional recipe-type of laboratory investigation to the non-recipe type of scientific investigation with the ADI laboratory instructional model is considered a novel undertaking, an innovation, and an intervention for Kto12 Science teaching in the context of this study. It caters not only to the slightly-perceived ***D****iff*-***I****ndp*-***O****pEnd*-***S****hCon* (D-IOS) but also to all the other eleven LE scales. It is a very promising model that can be used to establish a truly student-centered and inquiry-based learning environment that is demanded in 21st-century teaching with the K to12 Science curricular reform in the country. Facilitating Science laboratory instruction using the Argument-Driven Inquiry (ADI) model is thought to be a good move for educational leaders to consider adoption in high school Science. It is thought of as a practical need for the K to12 Science teachers to create a wholesomely positive learning environment towards learning productivity, i.e., with the students' meaningful and lifelong learning experiences gained in the teaching of Science.

CONCLUSION

The assessed high perception level of the learning environment characteristics in the RelD and the relatively low perception of the *D-IOS* characteristics in the Science classes can guide educational leaders towards an informed decision for further enhancement of Science teaching. This study gives a contribution to the community of Science educators in the aspect of giving awareness about the importance of incorporating the PsLE scales in one's Science teaching, providing students a wholesomely positive climate that optimizes learning among them. Significantly, the Science teachers are to strengthen the teaching practices that are aligned to the relationship dimension scales of the PsLE as was shown to be highly perceived by the Grade 10 students in the study. The teacher's mindful provision of a positive psychosocial learning environment, one that is affirming, supportive, and facilitative is greatly a *plus*(+) factor that would potentially yield higher learning outcomes achievement among the students.

RECOMMENDATION

Some concrete actions can be done such as having the teachers articulate the LE provisions in their instructional plan before instruction which is deemed a practical move for the teachers to create a wholesomely positive psychosocial learning environment in the Science classroom. Next is having the school leadership initiate relevant programs for the Science teachers to strengthen the importance of creating a positive environment for Science learning, and to invest in the *non-recipe type* of laboratory investigation in the Science classes, through professional development training.

More so, future research undertakings may be done to investigate the impact of having an enhanced Science learning environment, one that is beefed up with the teaching practices that showcase the slightly-perceived *D-IOS* learning environment characteristics, on the students' engagement in Science, and potential development of students'' higher-order thinking skills in Science.

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