

# Authentic Discussion: Relationship with the Dimensions of Learning Environment and Students' Performance in Biological Science

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**Abstract:** This study determined the relationship between standards of authentic discussion and the dimensions of learning environment and students' performance in tertiary biological science of PHINMA Araullo University. The study wishes to improve the quality of science education by showing the importance of authentic learning and its relation to learning environment and students' performance. Descriptive method of research was applied in this study. Two hundred twelve (212) students and their respective teachers were used as sample. Data were gathered using questionnaires, interviews and classroom observations. Environment of Authentic Discussion and Standards of Authentic Instruction Instruments were administered to students and teachers respectively. Results of the study revealed that: students were satisfied in their learning environment and thus, favorable for learning; there was a high level of authentic discussion inside the classroom; majority of the students got a very good grades. There was a significant relationship between: standards of authentic discussion and the dimensions of learning environment, dimensions of learning environment and students' performance, and standards of authentic discussion and students' performance. The study signifies that standards of authentic discussion are affected by the dimensions of learning environment. Moreover, the study implies that authentic discussion and learning environment have a great impact on students' academic performance.

**Keywords:** Authentic Discussion, Learning Environment, Students' Performance, Biological Science.

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## I. INTRODUCTION

Traditional patterns of science education have remained largely unchanged for most of the last century. Very often, science instruction in the lower grades has lacked a clear focus and has been provided by teachers ill-prepared to deal with science content. The natural curiosity of children, eager to understand their surroundings, is often diminished by instruction that discourages inquiry and discovery. In the upper grades, science instruction becomes increasingly textbook-centered. Even though laboratory experiences or demonstrations usually are included, students are rarely encouraged to use scientific methods to solve problems relevant to their perception of the world (Christensen, 1995).

The typical pedagogical pattern reflects an authoritarian, didactic approach to classroom management. The reason may be that many teachers have never encountered a learning experience in which they constructed meaning from the experience. Similarly, the professional preparation of most administrators has not provided experience with this type of learning. It is little wonder, therefore, that many classrooms present an environment in which students learn by rote and repetition from teachers who exercise authoritarian control over the learning process. Many educators who would like to change this approach lack the support of colleagues, administrators, and parents, who only remember a more traditional approach (Christensen, 1995).

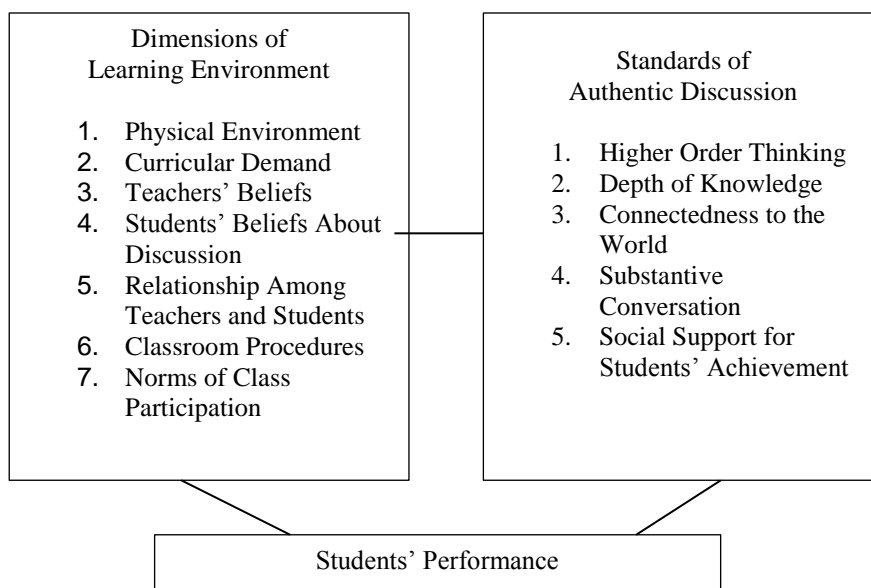
A new vision of science learning is emerging - one that calls for instructional strategies far different from most traditional conceptualizations. The new paradigm for science learning emphasizes engagement and meaning in ways that are not consistent with past practices. The anticipated outcome of this new approach to teaching is a higher level of student achievement in the sciences. This constructivist teaching and learning models include authentic instruction.

This approach to teaching and learning enables students to participate fully in a learning community where the teacher is not the only source of knowledge and information. It encourages full involvement in a community of learners that includes other students, parents, teachers, and outside experts. Technology becomes a tool, supporting the learning process as students seek new knowledge and understanding. The challenge is to define the new approach to teaching and learning with sufficient clarity that it becomes a useful vision for educators as they make decisions about instructional materials, activities, and strategies for teaching (Lombardi, 2007).

**Theoretical and Conceptual Framework:**

The theoretical basis of this study was anchored on Ausubel's Theory of Meaningful Learning. David Ausubel is a psychologist who advanced a theory which contrasted meaningful learning from rote learning. In Ausubel's view, to learn meaningfully, students must relate new knowledge (concepts and propositions) to what they already know. He proposed the notion of an advanced organizer as a way to help students link their ideas with new material or concepts. Ausubel's theory of learning claims that new concepts to be learned can be incorporated into more inclusive concepts or ideas. These more inclusive concepts or ideas are advance organizers. Advance organizers can be verbal phrases, or a graphic. In any case, the advance organizer is designed to provide, what cognitive psychologists call, the "mental scaffolding: to learn new information (Hassard, 2003).

Meaningful learning has the following characteristics: non-arbitrary, non-verbatim, substantive incorporation of new knowledge into cognitive structure; deliberate effort to link new knowledge with higher order concepts in cognitive structure; learning related to experiences with events or objects; and affective commitment to relate new knowledge to prior learning. All these characteristics support authentic instruction.



**Figure 1: The Conceptual Model of the Study**

**Statement of the Problem:**

The primary problem of this study was to determine the relationship of authentic classroom discussion with the learning environment and students' performance in biological science. The answers to the following specific problems were sought: (1) How may the dimensions of learning environment be described?; (2) How may the standards of authentic discussion be described?; (3) How may the students' performance be described?; (4) Is there a significant relationship between: (4.1) Dimensions of learning environment and standards of authentic discussion?; (4.2) Dimensions of learning environment and students' performance?; and (4.3) Standards of authentic discussion and students' performance.

**Hypotheses:**

The following statistical hypotheses were tested: There is no significant relationship between (1) the dimensions of learning environment and standards of authentic discussion in biological science; (2) dimensions of learning environment and students' performance; and (3) standards of authentic discussion and students' performance.

***Scope and Limitation of the Study:***

The study focused on the relationship of authentic discussion to learning environment and students' performance in tertiary biological science of PHINMA Araullo University for the second semester, school year 2007-2008. Two hundred twelve students and their respective teachers were used as the samples. Biological science classes were observed and data were gathered using observations, questionnaires and interviews. The higher order thinking skills of the students in this study was delimited to cognitive level only.

***Significance of the Study:***

Under the new vision of science teaching and learning, teachers must alter significantly the types of instruction that they have used in the past. First, they must understand that simply "studying the content of science" is not the same as learning science. While knowledge of facts is important, facts must be learned within the context of authentic experience. Science teachers must rethink their traditional role as "knowledge deliverer" and accept a new responsibility as facilitator, coach, and coordinator of experiences. Science teachers will need more planning time and more instructional time than is usually allocated to make these changes (Christensen, 1995). Learning environment is vital to the learning process. It has a reciprocal impact on academic achievement, and motivation and students' attitude toward learning subject matter. Studying the relationship of authentic classroom discussion with learning environment and students' performance may lead to the transformation of science education. The relationship may guide teachers and students how to improve the quality of science education in the country.

## **II. METHODOLOGY**

***Research Design:***

This study was a descriptive-correlation study which used survey method centering in the dimensions of learning environment and authentic discussion.

***Instrumentation:***

Two Likert-scaled instruments were used in the study. The first instrument, Environment of Authentic Discussion Instrument (EADI) described the classroom discussion as learning environment and the other instrument, Standards of Authentic Instruction Instrument (SAII) described the standards of authentic discussion inside the classroom. Environment of Authentic Discussion Instrument (EADI) consists of 7 dimensions and 20 statements while the Standards of Authentic Discussion consists of 5 dimensions and 15 statements. The instruments were pre-tested on a group of students other than the target respondents. The pre-test obtained a reliability coefficient of 0.92 and 0.95 indicating the consistency of the instruments.

***Data Collection:***

The researcher sought the help of biological science instructors to administer the first instrument to their respective students. The second instrument was administered personally by the researcher to biological science teachers. The purpose of the study was discussed to respondents in order to get their full cooperation. Each statement was explained to the respondents for a better understanding of the instrument. Each biological science lecture classes were observed by the researcher. Data were gathered through observations and interviews. These data support the analyses of instruments administered to the respondents. The midterm grades of students in Biological Science of the school year 2007-2008 were recorded to determine its relationship to the dimensions of learning environment and standards of authentic discussion.

***Statistical Analysis:***

Based on the objectives and hypotheses of the study, the data were analyzed by means of the following statistical tools: (1) Frequency counts, percentage, and weighted mean were used to describe the dimensions of learning environment, standards of authentic discussion and students' academic performance; (2) Pearson product moment correlation was used to determine the relationship between dimensions of learning environment and standards of authentic discussion, dimensions of learning environment and students' academic performance, and standards of authentic discussion and students' academic performance. All analyses were performed using Statistical Package for Social Sciences (SPSS) software.

### III. FINDINGS

#### *Dimensions of Learning Environment:*

Results revealed that students were very satisfied with the following statements: the teacher does not pressure students in giving test; the teacher encourages conversations and negotiations, accept and delighted by the expression of various ideas and opinions; the teacher makes the subject relevant and comprehensible to the students by connecting it to the previous classroom experiences and by inviting students to think of other pertinent examples; the teacher encourages and even modeled the presentation of personal responses that included making connections with other science works and connecting the text under study with personal experiences; the teacher has tremendous respect for students and their learning capacities; the teacher acts as facilitator; students initiate topics, express opinions, make comments, and provide information, elaboration, and clarification; students enjoy and value class discussions; the teacher treats students as human beings rather than simply as students needed to teach; the teacher is interested in students as individuals and actively sought to get to know them well; the teacher respects opinions and takes and considers it; there is mutual feeling of caring and friendliness between the teacher and the students; and there is the presence of respect as a fundamental rule of the classroom community. Students were satisfied in the following statements: the classroom exudes an air of comfort and belongingness; the class shapes its curriculum around quality instructions; the lessons sought to problematize and render salient certain issues and invited students to consider them; classroom management is very much present at any given moment of classroom life; students feel comfortable to participate in class discussions because their opinions and ideas are welcomed and valued; students listen attentively and respectfully to the contribution of other classmates; and teacher and students share stories from their home lives and mention knowledge gained in out-of-school experiences (Table 1).

This result of the study revealed that students were satisfied in their learning environment. They are comfortable and welcome inside their classrooms. This is supported by the interview to students who were asked if they were comfortable in their classroom. Some students mentioned that there were minimal problems in their classroom such as pieces of papers. However, according to them, this did not affect their learning capabilities. Most of the students also agreed that they were comfortable and felt welcome in their classrooms; there was the presence of respect among them, they felt comfortable in participating in class discussions, and their teachers treated them as friends. They mentioned:

*“Our teacher encourages us to speak and express our opinions. We don’t have the fear to be rejected because all our ideas and opinions are welcomed and accepted”*

*“ ....yes, the topic was very interesting. We learned many things today. All members of the group were contributing ideas and opinions when our teacher gave us group activity. It also developed deeper friendship among us because we became more close to each other after the discussion”.*

*“Our teacher is a friend to us, she respects our opinions. She entertained our questions and made sure that all our queries are addressed. We also feel that we are personally connected because of the concern and advises that she gives to us when we open some problems”.*

This finding showed that physical environment of the classroom community has great potential for fostering interactions that are socially demanding and that required individuals to allow themselves to be vulnerable by offering opinions, and sharing personal experiences (Hadjiannou, 2007).

**Table1: Weighted Mean and Verbal Description of Responses to Environment of Authentic Discussion**

Items	wm	Verbal escription
<b>Physical Environment</b>		
The classroom exudes an air of comfort and belongingness.	3.86	Satisfied
<b>Curricular Demand</b>		
The teacher does not pressure students in giving test.	4.34	Very Satisfied
The class shapes its curriculum around quality instructions.	4.12	Satisfied
<b>Teacher’s Belief</b>		
The teacher encourages conversations and negotiations, accept and delighted by the expression of various ideas and opinions	4.30	Very Satisfied
The lessons sought to problematize and render salient certain issues and invited students to consider them.	3.9	Satisfied
The teacher makes the subject relevant and comprehensible to the students by connecting it to the previous classroom experiences and by inviting students to think of other pertinent examples.	4.26	Very Satisfied

The teacher encourages and even modeled the presentation of personal responses that included making connections with other science works and connecting the text under study with personal experiences	4.29	Very Satisfied
The teacher has tremendous respect for students and their learning capacities.	4.44	Very Satisfied
The teacher acts as facilitator	4.22	Very Satisfied
<b>Students' Beliefs About Discussion</b>		
Students initiate topics, express opinions, make comments, and provide information, elaboration, and clarification.	4.21	Very Satisfied
Students enjoy and value class discussions	4.29	Very Satisfied
<b>Relationship Among Teacher and Students</b>		
The teacher treats students as human beings rather than simply as students needed to teach	4.39	Very Satisfied
The teacher is interested in students as individuals and actively sought to get to know them well.	4.30	Very Satisfied
The teacher respects opinions and takes it and considers it.	4.5	Very Satisfied
There is mutual feeling of caring and friendliness between the teacher and the students.	4.29	Very Satisfied
<b>Classroom Procedures</b>		
There is the presence of respect as a fundamental rule of the classroom community.	4.32	Very Satisfied
Classroom management is very much present at any given moment of classroom life.	4.19	Satisfied
<b>Norms of Class Participation</b>		
Students feel comfortable to participate in class discussions because their opinions and ideas are welcomed and valued.	4.18	Satisfied
Students listen attentively and respectfully to the contribution of other classmates.	4.08	Satisfied
Teacher and students share stories from their home lives and mention knowledge gained in out-of-school experiences.	4.12	Satisfied

**Standards of Authentic Discussion:**

Table 2 shows that teachers strongly agreed to the following statements: students solve problems and discover new meaning and understanding; students combine facts and ideas in order to synthesize, generalize, explain, hypothesize or arrive at same conclusions and interpretations; students make clear distinctions, develop arguments, solve problems, construct explanations, and otherwise work with relatively complex understandings; students cover fewer topics in systematic and connected ways; lesson topics and activities have clear connection to issues or experience beyond the classroom; there is considerable interaction about the ideas of a topic; students share ideas, ask questions and respond directly to comments of previous speakers; and teacher encourages effort, participation or willingness to express one's view. The following statements had verbal description "agree": students investigate and from which they draw conclusions; knowledge deals with significant concepts of a topic or discipline; students address real-world public problems; students use personal experiences as a context for applying knowledge; the dialogue builds coherently on participants' ideas to promote improved collective understanding of a theme topic; the class is characterized by high expectations, challenging work, strong effort, mutual respect and assistance in achievement for almost all students; and students with less skill of proficiency in a subject are treated in ways that encourage their efforts and value their contributions.

Findings disclosed that authentic discussion is present inside the classroom. The students were engaged in higher order thinking, the lessons covered operational fields in any depth and were connected to competencies beyond the classroom, the classroom talk lead to sustained conversational dialogue to create or negotiate understanding of subject matter, and the classroom environment was characterized by mutual respect and support among members of the classroom community.

Students made clear distinctions, developed argument, solved problems, constructed explanations, and otherwise work with relatively complex understandings; covered fewer topics in systematic and connected ways and knowledge dealt with significant concepts of a topic or discipline. These characteristics imply that almost all knowledge presented in the lesson sustained focus on a significant topic, and did so either through a complex structure or by demonstrating the problematic nature of information and/ or ideas. For instance, after showing and discussing the parts and functions of organs of digestive system, the students were asked to apply this deep knowledge to the task of thinking diseases, problems or issues related to digestive system. This task was dependent upon the students' having a thorough knowledge of the topic. Besides, the lessons, activities or tasks were connected to competencies or concerns beyond the classroom. For example,

in scientific method lesson, the problems to be solved given by the teacher were problems that can happen in their everyday lives beyond the classroom. Teachers also agreed that students addressed real-world public problems and used personal experiences as a context for applying knowledge. After systematically solving the problems given by the teacher, the students cited some other problems where they can apply the scientific method. Some of them addressed public problems, for instance related to crime and other students used their personal experiences in discussing how to solve problems using scientific method. These attitudes of teachers and students signify that they recognize some connection between classroom knowledge and situations outside the classroom. A real-world public problems and students' personal experiences have value and meaning inside the classroom. Likewise, a high level of connectedness can be achieved when the lesson entails one or both of these (State of Queensland DETA, 2002).

**Table 2: Weighted Means and Verbal Description of Responses to Standards of Authentic Instruction Instrument**

Items	Means	Verbal Description
<b>Higher Order Thinking</b>		
1. Students solve problems and discover new meaning and understanding	4.3	Strongly Agree
2. Students investigate and from which they draw conclusions.	4.0	Agree
3. Students combine facts and ideas in order to synthesize, generalize, explain, hypothesize or arrive at same conclusions and interpretations.	4.3	Strongly Agree
<b>Depth of Knowledge</b>		
4. Students make clear distinctions, develop arguments, solve problems, construct explanations, and otherwise work with relatively complex understandings.	4.3	Strongly Agree
5. Students cover fewer topics in systematic and connected ways.	4.3	Strongly Agree
6. Knowledge deals with significant concepts of a topic or discipline	4.0	Agree
<b>Connectedness to the World</b>		
7. Lesson topics and activities have clear connection to issues or experience beyond the classroom	4.3	Strongly Agree
8. Students address real-world public problems	4.1	Agree
9. Students use personal experiences as a context for applying knowledge	4.0	Agree
<b>Substantive Conversation</b>		
10. There is considerable interaction about the ideas of a topic	4.3	Strongly Agree
11. Students share ideas, ask questions and respond directly to comments of previous speakers.	4.3	Strongly Agree
12. The dialogue builds coherently on participants' ideas to promote improved collective understanding of a theme topic.	4.0	Agree
<b>Social Support for Students Achievement</b>		
13. The class is characterized by high expectations, challenging work, strong effort, mutual respect and assistance in achievement for almost all students.	4.0	Agree
14. Teacher encourages effort, participation or willingness to express one's view.	4.3	Strongly Agree
15. Students with less skill of proficiency in a subject are treated in ways that encourage their efforts and value their contributions.	4.1	Agree

**Students' Academic Performance:**

Forty nine students (23.1%) got an excellent grade in biological science. One hundred ten (51.8%) students were very good, 41 (19.4%) students were good, 8 (3.8%) students were average, 3 (1.4%) students were below average and only 1 (0.5%) had a passing mark. Nobody got a failing grade. These signify that the learning environment and the kind of instructions used inside the classroom were effective and thus can improve students' performance.

**Relationship between Learning Environment and Standards of Authentic Discussion:**

The following dimensions of learning environment and standards of authentic discussion were found to be highly significant: physical environment and higher order thinking, physical environment and depth of knowledge, physical environment and substantive conversation, curricular demand and higher order thinking, curricular demand and depth of knowledge, curricular demand and connectedness to the world, curricular demand and substantive conversation, teachers'

beliefs and higher order thinking, teachers' beliefs and depth of knowledge, teachers' beliefs and connectedness to the world, teachers' beliefs and substantive conversation, students' beliefs about discussion and higher order thinking, students' beliefs about discussion and depth of knowledge, students' beliefs about discussion and connectedness to the world, students' beliefs about discussion and substantive conversation, relationship among teachers and students and higher order thinking, relationship among teachers and students and depth of knowledge, relationship among teachers and students and connectedness to the world, relationship among teachers and students and substantive conversation and substantive conversation, classroom procedure and higher order thinking, classroom procedure and depth of knowledge, classroom procedure and connectedness to the world, classroom procedure and substantive conversation, norms of class participation and higher order thinking, norms of class participation and depth of knowledge, norms of class participation and connectedness to the world, and norms of class participation and substantive conversation (Table 3).

Significant relationship was found between: physical environment and connectedness to the world, physical environment and social support for students' achievement, curricular demand and social support for students' achievement, teachers' beliefs and social support for students' achievement, substantive conversation and social support for students' achievement, relationship among teachers and students and social support for students' achievement, classroom procedure and social support for students' achievement, and norms of class participation and social support for students' achievement. It can be inferred from the findings that the more the satisfaction of students in their learning environment, the more they would be engaged in the standards of authentic discussion.

**Table 3: Pearson Correlation between the Dimensions of Learning Environment and Standards of Authentic Discussion**

	Higher Order Thinking	Depth of knowledge	Connectedness to the World	Substantive Conversation	Social Support for Students Achievement
Physical Environment	0.21**	0.24**	0.20*	0.28**	0.20*
Curricular Demand	0.36**	0.33**	0.30**	0.35**	0.20*
Teachers' Beliefs	0.50**	0.42**	0.37**	0.48**	0.20*
Students' Beliefs About Discussion	0.29**	0.27**	0.24**	0.29**	0.20*
Relationship Among Teachers and Students	0.45**	0.41**	0.30**	0.43**	0.20*
Classroom Procedures	0.32**	0.31**	0.24**	0.32**	0.20*
Norms of Class Participation	0.40**	0.35**	0.29**	0.30**	0.20*

\*\* Correlation is significant at the 0.01 level (2-tailed); \*Correlation is significant at the 0.05 level (2-tailed)

**Relationship between Learning Environment and Students' Academic Performance**

As illustrated in table 4, findings show that there were significant correlations between students' performance and: physical environment (r=0.32, p<0.05), curricular demand (r=0.59, p<0.01), teachers' beliefs(r=0.64, p<0.01) , students' beliefs about discussion (r=0.48, p<0.01), relationship among teachers and students (r=0.71, p<0.01), classroom procedures (r=0.48, p<0.01) , and norms of class participation (r=0.55, p<0.01). Accordingly, learning environment can affect students' performance. Satisfied students in their learning environment tend to have better academic performance.

**Table 4: Pearson Correlation between Learning Environment and Students' Performance**

Learning Environment	Students' Academic Performance
Physical Environment	0.32*
Curricular Demand	0.59**
Teachers' Belief	0.64**
Students' Belief about Discussion	0.48**
Relationship Among Teachers and Students	0.71**
Classroom Procedures	0.48**
Norms of Class Participation	0.55**

\*\* Correlation is significant at the 0.01 level (2-tailed)

\*Correlation is significant at the 0.05 level (2-tailed)

***Relationship between Standards of Authentic Discussion and Students' Academic Performance:***

Table 5 illustrates that students' academic performance was found to be correlated with: higher order thinking ( $r=0.24$ ,  $p<0.01$ ), depth of knowledge ( $r=0.29$ ,  $p<0.01$ ), and substantive conversation ( $r=0.24$ ,  $p<0.01$ ), connectedness to the world ( $r=0.20$ ,  $p<0.05$ ), and social support for students' achievement ( $r=0.20$ ,  $p<0.05$ ). Consequently, the more the involvement of students in authentic discussion, the more their understanding, the better would be their academic performance.

**Table 5: Pearson Correlation between Authentic Discussion and Students' Performance**

<b>Authentic Discussion</b>	<b>Students' Academic Performance</b>
Higher Order Thinking	0.27**
Depth of knowledge	0.29**
Connectedness to the World	0.20*
Substantive Conversation	0.24**
Social Support for Students' Achievement	0.20*

\*\* Correlation is significant at the 0.01 level (2-tailed)

\* Correlation is significant at the 0.05 level (2-tailed)

#### IV. CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn: Students were satisfied with their learning environment and thus favorable for learning. The teachers agreed that there was a high level of authentic discussion inside the classroom. Besides, majority of the students obtained very high grades. And there were significant relationships between the dimensions of learning environment and standards of authentic discussion, dimensions of learning environment and students' performance, and standards of authentic discussion and students' performance. Consequently, standards of authentic discussion are affected by the dimensions of learning environment. It further infers that authentic discussion and learning environment have a great positive impact on students' academic performance.

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