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DETERMINATION OF EFFECT ON STUDENTS OF DIFFERENT INTERPERSONAL  
ORIENTATIONS IN BSCS BIOLOGY CLASSES HAVING  
SIMILAR CLASSROOM CLIMATE

by

Donald L. Rogers

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Department of Secondary Education

Under the Supervision of Professor James A. Rutledge

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**TITLE**

Determination of Effect on Students of Different  
Interpersonal Orientations in BSCS Biology Classes  
Having Similar Classroom Climate

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## CHAPTER I

### INTRODUCTION AND THEORETICAL DIMENSIONS

#### Introduction of Problem

The developers of new science curricula have had a dramatic effect on the total K-12 curriculum. Their impact has resulted in a shift in emphasis from content lectures to classroom inquiry, from brief treatment of numerous topics to in-depth treatment of a few topics, from memorization of descriptive materials and definitions to the development of understanding through experimentation, from the procedures of technology to the process of science, and from a teacher-centered classroom to a student-centered classroom.<sup>1</sup>

These changes were encouraged by the post-Sputnik influence of the federal government through science curriculum projects, science teacher education, and science materials for schools. This influence was expressed primarily through a combination of efforts from the National Science Foundation and the United States Office of Education.

And of no small importance to both efforts was the legal designation of science as a "critical area" for our national defense--thus making change in the science curriculum the law of the land.<sup>2</sup>

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<sup>1</sup>James A. Rutledge, "Selecting Suitable Content and Procedures for the Junior High School" (Lincoln: University of Nebraska, September, 1966), p. 2.

<sup>2</sup>Laurel N. Tanner, "Curriculum Change in Science: Power and Processes," Educational Leadership, XXVI (March, 1969), 575.

Through an evaluation of science teaching research, science curriculum development, and the United States Office of Education statistics, the following statements may be supported:

1. The student enrollment in traditional science courses is greater than in those developed since Sputnik.<sup>3</sup>
2. The percentage of high school seniors taking introductory physics is declining.<sup>4</sup>
3. In research employing proper sampling technique and good experimental design according to standards established by Ramsey and Howe, the comparison of student scores on traditional standardized tests reveals no significant difference with respect to course design, traditional or innovative.<sup>5</sup>
4. The individuals in control of science curriculum changes, those who issue grants, cannot be held publicly accountable for the results of their efforts because they have no legal connection with our educational system.<sup>6</sup>

The above statements illustrate further need for exploring science teaching. Taking into account this need, Ramsey and Howe

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<sup>3</sup>U.S. Office of Education, Digest of Educational Statistics (Washington, D.C.: U.S. Government Printing Office, 1967), Table 16.

<sup>4</sup>Ibid., p. 32.

<sup>5</sup>G. A. Ramsey and Robert W. Howe, "An Analysis of Research on Instructional Procedures in Secondary School Science," The Science Teacher, XXXVI (March, 1969), 62-68.

<sup>6</sup>Tanner, op. cit., p. 575.

as recently as 1969, pointed to an area of needed research:

Much more useful information is likely to be gained by investigating different instructional procedures for teaching a given course or instructional module than by attempting to compare one course with another.<sup>7</sup>

Increasing emphasis is being placed on finding out the actual classroom behavior of teachers and pupils, and more sensitive instruments are being developed for this description. Attention can now be directed to the nature of interaction between students and the teacher in different instructional situations to determine the effectiveness of instruction.<sup>8</sup>

Research to analyze the effect of the interaction between teacher and student upon the student's achievement and attitude has been limited. The work of Wispe<sup>9</sup> and of Stern and Cope<sup>10</sup> showed some relationship between teaching methods, structured or unstructured, and college student differences, dependent or independent. However, most of the criteria for this study were observational and lacked a strong theoretical basis. Thelen performed a similar study with high school teachers and students, but his criteria were based on individual teachers and students of a given school, therefore making replication

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<sup>7</sup>Ramsey and Howe, op. cit., p. 68.

<sup>8</sup>G. A. Ramsey and Robert W. Howe, "An Analysis of Research on Instructional Procedures in Secondary School Science, Part II--Instructional Procedures," The Science Teacher, XXXVI (April, 1969), 79.

<sup>9</sup>L. G. Wispe, "Evaluating Section Teaching Methods in the Introductory Course," Journal of Educational Research, XLV (1951), 161-86.

<sup>10</sup>G. C. Stern, "Environments for Learning," The American College (New York: John Wiley and Sons, 1961), pp. 690-730.

difficult.<sup>11</sup>

In 1966, Hunt developed constructs for discriminating the cognitive level of the individual based on the learning process theories of Piaget, Bruner, and others.<sup>12</sup> When Hunt's constructs were applied to the scoring of student-written, subjective-type tests, a theoretically derived measure was obtained. This measure has been referred to by researchers variously as conceptual level, interpersonal maturity level, and interpersonal orientation.

Hunt and Joyce correlated the conceptual level of teachers with a factor they identified as the reflective index of the teacher. The teacher's reflective index was determined by the ratio of teacher talk which encouraged student participation in classroom learning to total teacher talk.<sup>13</sup> These investigators used Joyce and Harootunian's "Manual for Coding the Oral Communications of Teachers"<sup>14</sup> as the classroom observation instrument for determining this reflective index. When they compared the teacher's conceptual level with his

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<sup>11</sup>H. A. Thelen, Classroom Grouping for Teachability (New York: John Wiley and Sons, 1961), pp. 83-85.

<sup>12</sup>D. E. Hunt, "A Conceptual Systems Change Model and Its Applications to Education," Experience, Structure and Adaptability, ed. O. J. Harvey (New York: Springer Publishing Company, Inc., 1966), pp. 277-302.

<sup>13</sup>D. E. Hunt and B. R. Joyce, "Teacher Trainee Personality and Initial Teaching Style," American Educational Research Journal, IV (1967), 253-59.

<sup>14</sup>B. R. Joyce and B. Harootunian, The Structure of Teaching (Chicago: Science Research Associates, 1967), pp. 228-39.



reflective index, a correlation at the  $p < .05$  level of significance was found for the degree teachers, but with teacher trainees a non-significant correlation resulted. In a study of a similar nature, Harvey et al. were able to indicate that the interpersonal maturity level of teachers was related to the kind of behavior they exhibited in the classroom.<sup>15</sup> In all these studies, however, no direct attempt was made to investigate the student-teacher interaction effect.

Hunt, in the development of his model, did an exploratory study to gain some indication of the educational relevance by exposing students of similar levels of conceptual understanding to the same educational environment. His purpose was to determine if student-group characteristics observed by teachers and other observers were in agreement with model criteria. Teachers were also to relate their personal preference to teaching the classes. This was done in an inner-city junior high school where Hunt tested and grouped half of the ninth grade student population into three different levels of conceptual understanding. A homogeneous, experimental class was formed within each conceptual level. No special grouping procedures were used to form the control classes from the other half of the ninth grade students. After six weeks of departmental type teaching, the teachers, as well as outside observers, were asked to characterize all ninth grade classes. Teachers and observers alike were aware of

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<sup>15</sup>O. J. Harvey et al. "Teachers' Beliefs, Classroom Atmosphere and Student Behavior," American Educational Research Journal, V (1968), 151-66.

some type of experimental and control class grouping, but had no idea of the criteria used by Hunt. The experimental classes were picked as having homogeneous populations by the teachers and outside observers. Their detailed description of experimentally grouped classes was surprisingly similar to Hunt's grouping criteria. Teachers also felt that they were more effective with students in different experimental classes, giving support to the hypothesis that individual teaching behavior can be related differently to students at different conceptual levels.<sup>16</sup>

Santmire, in an unpublished dissertation, hypothesized that high school students whose conceptual level was appropriately matched to a teacher's reflective index will achieve significantly higher on teacher evaluated measures than those students for whom there was no such matching, when the effect of IQ is controlled.<sup>17</sup> In Santmire's study, five teachers of American History in summer classes were used. Student paragraph responses to sentence stems were evaluated using Hunt et al.'s, "Conceptual Level Scoring from Paragraph Completions in Adolescents," to determine the conceptual level of students in

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<sup>16</sup> D. E. Hunt, "A Conceptual Systems Change Model and Its Applications to Education," Experience, Structure and Adaptability, ed. O. J. Harvey (New York: Springer Publishing Company, Inc., 1966), pp. 294-97.

<sup>17</sup> T. E. Santmire, "An Investigation of the Role of Conceptual Level and Teacher-Radiated Environment in Achievement" (unpublished Doctor's dissertation, University of Rochester, 1969), pp. 23-24.

these classes.<sup>18</sup> A sampling of the teacher's oral communications was coded using the "Manual for Analyzing the Oral Communications of Teachers," by Joyce and Harootunian,<sup>19</sup> modified by Joyce in 1967 for Santmire's study. From this, a ratio of teacher communications which encouraged student participation to total teacher talk was determined and used as the teacher's reflective index. Teacher evaluated measures used were the results of a teacher-prepared test, the final course grade, and the grade on the New York State Regents' Examination in American History.<sup>20</sup> In the analysis of teacher-prepared test scores and student course grades with matched and unmatched students, no significant difference was found. On the New York State Regents' Examination, the mean score of matched students was higher than the mean score of unmatched students, but only in classes with teachers of low reflective indices was it significant at the  $p < .05$  level.<sup>21</sup>

The general consistency of the data in her study has guided Santmire to suggest that attempts be made to extend research to (1) develop and use other measures of teacher reflective index,

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<sup>18</sup>David E. Hunt, R. C. Kingsley, D. J. Massari, R. E. Shore, and J. S. Sweet, "Conceptual Level Scoring from Paragraph Completions in Adolescents" (New York: Syracuse University, 1967), pp. 1-57. (Mimeographed.)

<sup>19</sup>Joyce and Harootunian, op. cit., pp. 228-39.

<sup>20</sup>Santmire, op. cit., pp. 39-61.

<sup>21</sup>Ibid.

- (2) separate the effects of conceptual level development in a given subject from the general conceptual level of the individual, and
- (3) determine the appropriate teacher reflective index for students of different conceptual levels.<sup>22</sup>

The interpretation of oral interaction between teacher and student in the classroom using Flanders' interaction analysis has led to an objective method of determining classroom environment and teacher influence.<sup>23</sup> As a result of Flanders' research employing his interaction analysis instrument, he has concluded that students learn more from and have better attitudes toward teachers who are more flexible and less direct.<sup>24</sup>

The University of Nebraska/McREL research project has modified Flanders' instrument to produce multi-keys for differentiating between classroom environments.<sup>25</sup> The primary key or ratio for analyzing the classroom environment has been the ratio between indirect teacher talk and total teacher talk (I/I+D). The higher this ratio, the less

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<sup>22</sup>Ibid., pp. 73-74.

<sup>23</sup>James R. Campbell and C. W. Barnes, "Interaction Analysis--A Breakthrough?" Phi Delta Kappan, L (June, 1969), 589.

<sup>24</sup>Ned A. Flanders, "Some Relationships Among Teacher Influence, Pupil Attitudes and Achievement," Interaction Analysis: Theory, Research, and Application, ed. E. J. Amidon and B. Hough (Reading, Mass.: Addison-Wesley Publishing Company, 1967), pp. 230-31.

<sup>25</sup>F. D. Urbach, J. E. Lux, and A. T. Seagren, "Inquiry Influence Component II--Trainer Assessment" (Kansas City, Missouri: Mid-Continent Regional Educational Laboratory, 1969), pp. 14-15. (Mimeographed.)

direct the teacher is considered to be.<sup>26</sup>

The purpose of this investigation was to determine if the effect on students of different interpersonal orientation was measurable in biology classrooms where teachers have maintained a similar classroom climate. This study combined classroom climate, as determined by the "Inquiry Analysis System," developed by the University of Nebraska/McREL Project<sup>27</sup> and interpersonal orientation, a measure of conceptual development.

### Theoretical Dimensions

#### Interpersonal Orientation

Piaget, Bruner, Guilford, and others have theorized that the way an individual processes information or thinks develops from the simple motor perceptions of a young child to a level of concrete operation of the school-aged individual. After this concrete operation level is reached, the individual then can advance through the levels of more abstract thinking. Piaget's technique of observing developing levels in the pre-adolescent child has given support to

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<sup>26</sup>Ned A. Flanders, Teacher Influence: Pupil Attitudes and Achievement, Cooperative Research Project, No. 397 (Minneapolis: University of Minnesota, November 30, 1960), pp. 49-50.

<sup>27</sup>John E. Lux, A. T. Seagren, F. D. Urbach, and D. Wright, "Inquiry Skills Component III--Inquiry Behaviors and an Inquiry Discussion Model Trainer Assessment," Technical paper written for Mid-Continent Regional Educational Laboratory (Lincoln: University of Nebraska, July, 1969), Appendix A.

the theory.<sup>28</sup> A model to differentiate the levels of information processing was theoretically constructed in the book, Conceptual Systems and Personality Organization, by O. J. Harvey, David E. Hunt, and Harold M. Schroder.<sup>29</sup>

As Hunt and others have applied these constructs to research, they have developed instruments and criteria for classification of points on this continuum of interpersonal orientation. Interpretations made by this investigator of Hunt's eight differentiated stages of interpersonal orientation are:

Stage sub-I: This person is characterized by a failure to follow an accepted mode of behavior, along with an attempt to "break away" and to define himself. He seeks immediate gratification and views interpersonal relations in a very egocentric, self-centered fashion. His immature, self-centeredness ("What's in it for me?") coupled with his sensitivity to control ("Stop bugging me!") preclude any very satisfactory interpersonal relationship.

Stage I: This individual has accepted a right-wrong standard and complies with it. He is very competitive, must have rules, rates all things as bad or good, and becomes upset when he must perform on his own. Interpersonal relationships occur as role-playing, without

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<sup>28</sup>Richard E. Ripple, "American Cognitive Studies: A Review," Journal of Research in Science Teaching, II (1964), 187-95.

<sup>29</sup>O. J. Harvey, David E. Hunt, and Harold M. Schroder, Conceptual Systems and Personality Organization (New York: John Wiley and Sons, 1961), pp. 1-250.

empathic understanding of what the other person feels or thinks.

This is considered the stage of concrete orientation.

Transition to Stage II: This person is beginning to react against absolutism, to show signs of self-delineation, and to express alternative views for situations. He shows some indications for Stage II, but hasn't reached criteria on all points considered necessary for Stage II development.

Stage II: The person in Stage II is independently breaking away from the standard and has developed self-anchored standards. This stage is concerned with self-distinctiveness ("How am I different from the rest of the world?") in contrast to the concern with self-centeredness ("I am the world.") of sub-I stage. He is capable of self-learning. His dislike of control is based on its restrictions with self-delineation. He discriminates between self and others and not between others, so he is still incapable of empathic understanding.

Transition to Stage III: This individual is ready to think compromise with others. He is also willing to accept in part what is best for another person, but not to the point of losing his personal identity.

Stage III: This person gains the first awareness of others in terms of their own personal feelings and values. He is able to generate a higher differentiating interpersonal orientation. The fact that he shows empathy for others is a basic criterion for Stage III rating. But even with these high differentiating characteristics

and feelings of empathy, he still projects a difference of standards for self and others.

Transition to Stage IV: This person can be described as indicating that he can place those standards that are applicable to self and others into a meaningful, integrated relationship. This may begin as seeing all others or himself and peers on an integrated standard.

Stage IV: This individual integrates standards as applicable to both self and others, enabling him to understand himself and others as occupying different positions on the same, unequaled dimensions, rather than being simply on different standards. He views himself as part of the relationship that he has evaluated. Therefore, he shows equal empathy to self and others on problems of concern. This stage is considered the ultimate of interpersonal development.<sup>30</sup>

After development of descriptive constructs of interpersonal orientation, researchers devised instruments to determine the individual's level of operation. This has been done by scoring the written response generated by (a) incomplete sentence stems, (b) incongruent adjectives as a stimulus for impression formation, (c) answers to essay questions on a psychology examination, and (d) a request for the specification of environmental factors relevant

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<sup>30</sup> D. E. Hunt, "A Conceptual Systems Change Model and Its Applications to Education," Experience, Structure and Adaptability, ed. O. J. Harvey (New York: Springer Publishing Company, Inc., 1966), pp. 280-83, 291-97.