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ABSTRACT

This paper suggests that although good attitudes towards science on the part of teachers are very important in teaching, attitudes are difficult to measure. Prospective candidates for teaching should be chosen because they have good attitudes toward science coupled with an adequate self-concept. Prospective science teachers need adequate preparatory coursework and field experiences. Science teachers may assess themselves to see if they have the qualifications to be good science teachers. A five-point Likert scale may be developed and used to see if teachers meet the criteria established for successful science teaching. Twelve important teaching attributes identified by R. Cattell (1931) can be updated to reflect the modern student and the realities of today's schools. A major goal of science teachers must be to help students learn as much as possible in their ongoing lessons and units of study. (SLD)

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Assessing Teacher Attitudes in Teaching Science

Marlow Ediger

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ASSESSING TEACHER ATTITUDES IN TEACHING SCIENCE

Positive attitudes toward teaching students in the public schools is vital. Rational thinking would tell us that good attitudes of teachers is superior to negative attitudes in the school curriculum. Rational thought is used to appraise teachers, curricula, students, and assessment procedures. Rational thinking may be compared to objective, measurable results in terms of assessing what has transpired in teaching and learning situations. Attitudes are difficult to measure. Attitudes, as compared to subject matter learnings, are a more subjective factor in which a plethora of attempts have been made to measure and objectify how good the attitudes are of an individual or group. In doing his doctoral dissertation (1963), the author used the California Test of Personality to measure the attitudinal dimension and its affects of student teachers on student achievement in the public schools. Pupil achievement was significantly higher at the .05 level in personal adjustment with student teacher assistance as compared to no student teacher assistance. Pupil growth in social development did not differ significantly, however, with or without student teacher assistance in the classroom, according to The California Test of Personality.

Teacher Attitudes in Teaching Science

The author has held quality attitudes toward science on the part of teachers to be of utmost importance in teaching and learning. He has completed assessing a Ph D dissertation (Thamilmani, 2000) entitled Teacher Competency, Teacher Personality, and Teacher Attitude on Student Achievement in Science, for Madurai Kamaraj University, in India. Thirteen Hypotheses were treated in this study. The following differed significantly in data provided from the study:

- 1. teaching competency was related to attitudes toward teaching science.**
- 2. teacher personality was related to attitudes in teaching science.**
- 3. students of more competent teachers achieved significantly higher than those students who had less competent science teachers.**

The attitudinal dimension emphasizes factors such as acceptance of self and others, prizing oneself and others, as well as mutual trust and empathetic understanding. Placing a high value on learning subject matter and skills in science is indeed vital! From this study, the following appear to be salient:

- 1. teacher attitudes are highly important and prospective candidates for teaching need to be chosen on the basis of having positive attitudes toward science as well as toward students in the**

kindergarten -high school setting.

2. candidates for teacher education should possess an adequate self concept. The self concept relates well to knowing and imparting science subject matter and skills as well as accepting pupils as learners and as human beings.

3. a demanding academic program in science for undergraduate students should be in the offing. Competency in subject matter knowledge is of utmost importance. Breadth and depth of subject matter must be in the offing. Subject matter acquired must be relevant and used in teaching pupils in the public school setting (Ediger, 2000, 25-32).

To impart science subject matter knowledge in teaching and learning situations, the prospective teacher also needs to experience

1. methods of teaching course work which should be directly related to field experiences. Here, the prospective teacher may apply methods acquired to actual teaching situations in the public school setting. Methods of teaching learned should not be isolated, but integrated with practical experiences in the classroom.

2. pre-teaching situations which might well provide readiness for the internship. The pre-teaching experience needs to emphasize working with and teaching students within the class as a whole, assist learners in committee work, as well as in individual endeavors.

3. a semester long internship, as a minimum, should stress a broad scope of active involvement with supervision from a licensed, certified teacher. The sequence of these experiences in the internship should involve working in all facets of a school work deemed necessary for a regular classroom teacher. The sequence of experiences needs to be challenging and yet emphasize continued success for the intern.

4. the field experiences, pre-teaching, and the internship need quality supervision under the guidance of the cooperating teacher and the university supervisor of student teaching.

5. upon completion of the internship, the intern should be ready to assume full responsibility for quality classroom instruction. The beginning teacher should experience inservice education when entering the profession (Ediger, 1998, 31-35).

Inservice education should consist of workshops, faculty meetings, independent studies, and course work leading to a master's degree in science. Another possibility is working toward professional certification with the National Board Professional Teaching Standards. Continual inservice education should guide the teacher to increase knowledge and skills as a professional teacher.

To stress quality attitudes in teaching science, the prospective teacher and the regular teacher need to

1. experience success in ongoing endeavors.
2. experience meaning within involved tasks in teacher education.
3. experience interest and challenge in ongoing endeavors.

4. experience purpose in each sequential task pursued.
5. experience worthwhile, relevant feedback to increase teaching skills.
6. experience useful knowledge and skills within the framework of Inservice education.
7. experience feelings of being capable and responsible in ongoing learning activities in the classroom.
8. experience an adequate self concept within the science teaching profession.
9. experience fulfillment of recognition and esteem needs.
10. experience excellence in teaching science as being ongoing and not as having arrived at a final destination in teaching and learning (Ediger, 2000, 36-42).

Science teachers may assess the self if the above criteria are being followed in teaching. A five point Likert scale may be used in the assessment. Peers may assess each other as a result of observing teaching directly or from a videotaped presentation. A discussion format may be used in the assessment based on the ten criteria listed directly above. Feedback from the assessment need to be used to improve the science curriculum. Science teachers always need to be aware of possible future trends in teaching due to changes being in the offing. The reader has only to look at technology use in the science curriculum to notice rather rapid changes in teaching and learning. Thus, a good science teacher raises the question, "How can I improve ongoing lessons and units of study so that each student will achieve as much as possible?"

Past Research in Teaching Science

When observing and reading past research in the teaching of science, it almost appears as if its results from then may be applied to today's classroom. Cattell (1931), for example, from his assessment of teaching attributes found the following twelve to be in order of importance:

1. personality.
2. will power.
3. intelligence.
4. sympathy.
5. tact.
6. open mindedness.
7. enthusiasm for the job.
8. knowledge of psychology.
9. knowledge of pedagogy.
10. classroom technique.
11. perseverance.

12. industriousness.

The twelve above enumerated items from 1931 sound very familiar in the beginning of the twenty-first century. However, the times have changed much since 1931. For example, the author will elaborate on the above twelve enumerated items to bring them up-to-date.

1. **personality.** Students of today differ much from earlier times in the former having grown up in a technologically orientated society. The computer world of word processors, fax machines, internet, cellular phones, and centralized heating/air conditioning makes for personality changes within the science teacher as well as the learner. Science teachers need to study, analyze, and modify one's thinking toward the kinds of students in the classroom today. Changes within students must be reflected in a modified technological pedagogy in teaching and learning situations.

2. **will power.** The science teacher of today needs to possess the courage to make necessary changes in the selection of teaching procedures implemented, subject matter taught, as well as the quality of interactions among classroom participants, among others.

3. **intelligence.** Certainly, a science teacher needs adequate knowledge and abilities to plan teaching strategies appropriate for a given set of students in science.

4. **sympathy.** The author will substitute the word "caring" for sympathy. A caring teacher is needed to be concerned about and desiring that each student achieve optimally in the science curriculum.

5. **tact.** Being tactful is relevant regardless of what a science teacher is stressing in the classroom. For example, the science teacher should be able to work effectively with students who misbehave or respond incorrectly in a frequent manner. Rudeness, abruptness, aloofness, and hatred are opposites of what science teachers need as character traits to do well in the classroom.

6. **open mindedness.** Students and teachers need to be open to new ideas, hypotheses, and technology available in the science curriculum. A closed mind emphasizing dogmatism fails to meet a vital standard for possessing a scientific attitude.

7. **enthusiasm.** To serve as a model for students, the science teacher needs to be enthusiastic in subject matter taught as well as methods of teaching used. Hopefully, the enthusiasm will reflect within students.

8. **knowledge of psychology.** Behaviorism as a psychology of learning is vital to understand with its emphasis upon being able to measure student achievement. The testing and measurement movement will attest to this factor. Other psychologies also need to be implemented such as humanism, problem solving, and a subject centered science curriculum.

9. knowledge of pedagogy. Certainly, a teacher cannot teach well unless he/she attaches meaning to current trends in teaching and learning. Knowledge of pedagogy may then be implemented in the instructional arena. What is tried out may then provide feedback as to that which works effectively and that which needs modification. Pedagogy needs to be adapted to the current learners being taught in the classroom. Individual differences in the classroom need to be provided for since students differ from each other in a plethora of ways such as abilities possessed, interest factors, skills developed, attitudes revealed, social development, and purposes in life. The teacher needs to be a skilled observer of human behavior among students to truly provide for each and every student in the classroom.

10. classroom techniques need to be rephrased in terms of being organizational behavior. Thus, a teacher needs to organize the classroom in terms of teaching the class as a whole, small groups and committees, as well as individual endeavors. Teacher directed versus student/teacher planning of the curriculum, as well as in between points in this continuum, need further consideration.

11. and 12. perseverance and industriousness are two traits which present an ideal for the student in putting forth as much effort as possible to achieve in an optimal manner.

Teacher attitudes toward teaching science need to be highly positive with a major goal being to assist students to learn as much as possible in ongoing lessons and units of study.

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