

1966

Constitution of the Iowa Science Teachers Section

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Recommended Citation

(1966) "Constitution of the Iowa Science Teachers Section," *Iowa Science Teachers Journal*: Vol. 4: No. 2, Article 4.

Available at: <https://scholarworks.uni.edu/istj/vol4/iss2/4>

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course) and a post-post-test (unannounced, three and one-half months later).

Table I gives the group results of these tests. Forty points was a perfect score on each test.

A t-test was applied to the means of the two groups for each test and no significant difference was found between the means of the various tests. There was however, a significant increase in the post-test mean over the pre-test mean and also a significant drop from post-test to post-post-test in the self-study group as is to be expected from looking at the raw data above.

From the above data and from the data presented by recent research being done with Audio-Tutorial instruction (1), programmed learning (2) and the use of T.V. in teaching (3), it appears that good students can successfully operate in a less

structured situation than now being employed in the typical classroom in most school systems.

I personally feel that short units or intervals of self study, spaced throughout the academic year would provide a beneficial "change of pace" for high ability high school students, giving them some "Academic Freedom" that they could use profitably during their high school years and also provide a "preview" for the type of study necessary at the college level.

Bibliography

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CONSTITUTION OF THE IOWA SCIENCE TEACHERS SECTION

Article I. Name

This organization shall be known as the Iowa Science Teachers Section of the Iowa Academy of Science.

Article II. Membership

Section 1. Any teacher of science in the state of Iowa, any supervising or administrative officer of any school in the state of Iowa, and any other person interested in or concerned with the teaching of science in Iowa may become an active member of the section by paying the required annual dues and applying for membership through the section secretary, membership chairman, or secretary-treasure of the Iowa Academy of Science.

Section 2. The membership year shall coincide with the calendar year as with all other sections of the Academy. However, the yearly activities will be organized and the officers elected for the academic year (from fall meeting to fall meeting.) Members joining in the fall will receive the journal upon payment of dues although official membership will not begin until the following January. Members joining between January 1 and the time of the spring meeting will be considered members for the calendar year. They will receive earlier issues of the journal and will be listed as members for the entire year although the action will be retroactive.

abilities, interests, and intentions of our biology students. It is really of little concern whether or not the student will become a physician, nurse, veterinarian, research biologist, biology teacher, or a member of some other field of biology. Instead, any experience which will give tomorrow's citizens a richer and fuller understanding of life is a reward in itself.

Learning the basic concepts of biology is of vital importance; the application of these concepts is equally important for it is recognized as the learner's key to comprehension and retention.

SUMMARY

1. Surgical techniques are feasible in the senior high school biology program.
2. The knowledge of surgical techniques is of value to the layman as well as the biologist.
3. More living organisms should be utilized in the study of "biology".
4. The increasingly diverse abilities, interests, and intentions of our biology students must be met.
5. The learner's key to comprehension and retention is application.

CONSTITUTION OF THE IOWA SCIENCE TEACHERS SECTION

Article III. Organization

Section 1. This organization is a section of the Iowa Academy of Science and an affiliate of the Iowa State Education Association. Its state meetings shall coincide with the annual meetings of the Academy and the Iowa State Education Association.

Section 2. Other section meetings shall include the annual Short Course cosponsored with Iowa State University and regional meetings held in each region each year under the direction of the particular regional director.

Section 3. This section is a state chapter of the National Science Teachers Association. It is also officially affiliated with the National Association of Biology Teachers. It shall designate a representative to serve as a liaison to other national science teaching societies. Ordinarily this representative will be the official membership chairman for the national society in Iowa.

Section 4. A meeting of the Board of Directors will be held on Thursday preceding the day of the fall meeting. Newly elected officers who will be installed during the meeting will be invited to attend this session of the Board. A meeting of the executive committee will be held following the sessions of the annual fall meeting for the purposes of organizing committees and other activities for the new year.

An executive committee meeting will be held in January of each year to consider committee reports, especially those concerning the forthcoming short course and the spring meeting. An executive committee meeting will also be held at the time of the short course in March.

A meeting of the Board of Directors will be held Saturday afternoon following the spring meeting. Business can be transacted by majority vote of those present. The reports of the election committee and the fall meeting committee will be considered.

more knowledge to be ignorant of!

But I come to bury Mark Hopkins, not to praise him. We are science teachers, and teaching science does pose special problems. In particular, we preside over labs instead of slabs, in which we hope to guide students from their own observations to their own discoveries or at least demonstrations of significant relationships between observable facts. The essence of science is generalization, and generalization eventually means simplification. Herein lies our only real hope of "putting science back together." In a sense it keeps putting itself back together, but in patterns that keep breaking through established bound-

aries of narrow specialization. Encompassing principles, such as evolution or quantum mechanics; common techniques, such as spectrophotometry or the use of isotopes; interdisciplinary programs, such as the IGY or the moon shot—all contribute to a spirit of unity still detectable in science.

However, the point I wish to make today is that school teachers have perhaps a greater opportunity than others, and hence a particular obligation, to do something intentional to put science back together. In the first place, the students you teach are less likely to be already committed to specialization than college students. In the second place, you yourselves can

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Article IV. Officers

Section 1. The elected officers of this section shall consist of a President, a Vice-President, a Secretary, and a Treasurer.

Section 2. The Executive Committee of the section shall consist of the four elected officers in addition to the immediate past-president, one regional director (to be selected by the other regional directors at their fall meeting), and the Journal Editor (ex-officio).

Section 3. The Board of Directors of the section shall consist of the members of the Executive Committee as well as the nine regional directors who will be appointed each year by the Executive Committee to represent the members in the particular region.

Section 4. Any active member of the section is eligible to hold any office with the exception of the presidency. The two nominees for the office of president must have served on the Executive Committee prior to nomination for office.

Section 5. The election of officers shall be held before the fall meeting of the section with a vote by mail. A majority of affirmative votes of those members returning marked ballots shall be necessary for election to any office.

Section 6. The term for each office shall be for one year. A duly elected officer shall serve until his successor is elected and assumes office unless he reigns or is voted out of office by two-thirds of all members of the Board of Directors.

Section 7. A simple majority of the membership of the Executive Committee shall constitute a quorum for the transaction of business.

Section 8. All vacancies in the offices of this section when not specifically provided for in this Constitution shall be filled temporarily by appointment by the Executive Committee. Such duly appointed officers shall hold office until the close of the fall meeting when new officers are ordinarily elected or appointed.

subject is generally set by the teacher. We have the **experiments** opened so the student can grasp relationships for himself—but we structure the **course** for him, to avoid confusion.

The point I do want to make here is that a certain amount of confusion is an important aspect of modern science, and that there is no single logical structure for science as a whole or for any of the sciences in particular. The early reductionist models of the structure of science are simply no good any more. That pyramid in which biology was being reduced to a branch of chemistry, chemistry to physics, and physics to a few basic mathematical equations—well, that was an inverted pyramid and it was bound to topple. What we have now is more like a sphere with the various sciences staked out on its surface, and you can roll the sphere around any way you want and make the whole thing rest on **your** branch of science. That's the way the sphere bounces, and young people should be made aware that no science is logically more basic than any other science. You cannot put science back together today by stacking the other sciences

in the "proper" order on top of physics. A goose named physics may have laid all the golden eggs a few years ago, but have you taken a gander at modern biology? What was good for that goose has now set the gander up in business: just as biological behavior was thought to be "explained" on the basis of physical phenomena, human behavior was realized to be "explainable" on a biological basis—and what behavior is more characteristic of humans than the development of abstractions such as physics and mathematics? Hence, physics is as much a specialized branch of biology as biology is a specialized branch of physics.

It is true that a cyclic model of the structure of science is not fully appreciated or welcomed by scientists. A bipolar model, even a horizontal one, is simpler and less disturbing to our hubris. With the sciences polarized toward the simplicity of physics and math at one end and toward the complexity of biology (and the gosh-awful mess of the social sciences) at the other end, a scientist could find a cozy niche surrounded only by his fellows of nearly identical polarity. Reading the same scientific paper, some of us study only the equations

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Article V. Duties of the Officers

Section 1. The President

The president shall preside at all meetings of the section, all meetings of the Executive Committee, and all meetings of the Board of Directors.

He shall notify each member of the time and place of all such meetings.

He shall represent the association wherein possible at other state, regional, and national meetings.

He shall appoint the chairman and members of all committees with the advice and consent of the Executive Committee.

He shall be an active worker on the spring Meeting Committee and the chairman of the Policy and Resolution Committee.

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olism to demonstrate both the basis and the application of chemical principles. And physics—what of physics? At which end of physics is it most alive—at the imperfect crystallinity of DNA which seems to drive physicists into philosophy, or at the substructure of the nucleus, where a “menagerie” of strange particles keeps popping out, driving physicists to higher and higher energies to get to the bottom of the quirks in their quarks? And mathematics—has all the life been squeezed out of it? Hardly, with biologists on the staff of IBM to assist in computer design—or when statistical grappling with biological and social complexity is considered part of mathematics. And what is going on in astronomy, that coldest and most distant of the natural sciences? What will be found in that moon dust? And what are those “quasi-stellars” with either their incredible sizes or their incredible distances? Clearly there is life in the space sciences whether or not there is life in outer space!

The problem for us as teachers is to recognize the **life** in science and introduce it in our classes. I realize that this is not easy; life in its fullness is always complicated and therefore unpredictable and difficult. A museum is easier to manage than a zoo! And there is the serious danger of dilution if we bring in too much that is peri-

pheral; safer to stay “on dead center”! Broaden a course, or a stream, you will say, and it gets shallow. Of course, there are rivers that are both broad **and** deep, and trickles that are narrow **and** shallow—and the latter are the ones that are most liable to go dry.

Putting Science Back Together— Longitudinally

Having said all I dare about giving breath—and breadth—to your courses, I want to stress your role in another dimension, the “longitudinal” one. I think that is the term used in psychology for studies carried out over the life-span of a child. Here again, however, a cyclic or helical model may be more appropriate than a linear one. That is, instead of placing elementary education at the obvious beginning and graduate school at the obvious end-all, we should also remember that in “higher” education we prepare people, be they teachers or potential parents, to start the cycle around again. I think science education has come apart, however, in this dimension, those who teach at one point on the continuum seldom understanding what goes on at other loci, although we have all looped the loop at least once ourselves.

(continued next issue)

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Section 2. The Past President

The immediate past president shall be a part of all meetings of the Executive Committee and the Board of Directors.

He shall serve as an ex-officio member of the Election Committee.

He shall serve as chairman of the Spring Meeting Committee.

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students to cover the material.

SUMMARY

The material, then, was planned to include four major divisions: (1) algae, (2) protozoa, (3) insects, (4) spiders, and the following areas were developed for each division:

1. Historical background
2. Basic criteria for the organisms as a group
3. Divisions of the group
4. Simple key
5. Equipment for study
6. Where to look and how to collect
7. Laboratory techniques
8. Vocabulary

In the actual planning and organizing, it was found that the free and inexpensive material available was of little or no use. It was not specific enough on any subject. The conservation officers interviewed would be of excellent help in carrying out a summer course but not in the planning of one. Books on the specific topics involved proved to be the most useful in organizing the material of each division. The books used for reference were not written on a ninth-grade level; therefore, the material had to be suitably adapted for use at that level.

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Section 3. The Vice-President

The vice-president shall perform the duties of the president whenever the president is absent or unable to function.

He shall assume the office of the president should that office become vacant during the period between annual fall meetings.

He shall serve as chairman for the fall meeting committee.

He shall be a member of the Policy and Resolution Committee.

Section 4. The Secretary

The secretary shall maintain an accurate and correct record of all business meetings of the section.

He shall submit official minutes of these meetings to the editor for publication in the journal or for release in a separate mailing to the membership.

He shall maintain a correct membership list with the aid of the membership chairman.

He shall serve as secretary of the Executive Committee.

He shall be a member of the Membership Committee.

Section 5. The Treasurer

The treasurer shall work with the membership chairman in collection of dues.

He shall keep records of all financial transactions of the section.

He shall collect payments for advertisements in the journal.

He shall direct pay for all legal obligations of the association.

He shall prepare an annual fiscal report to be presented at the fall business meeting.