How-To-Do-It

Getting the GIST of Laboratory Reports

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The weekly grading of formal laboratory reports for classes of around 100 students is an onerous task. The format of formal laboratory reports seems inappropriate for preplanned exercises when the laboratory manual contains the purpose, the materials to use and how to proceed. A workable alternative is to request the students' tabulated data or graphs and a GIST.

The GIST

Students were asked to write a few sentences on the GIST of the results of each exercise. They were given the definition from The *Concise Oxford Dictionary*, which reads: "GIST n. Real ground or point, substance or pith of a matter." A 5 to 8 cm long section labeled GIST was available on the data report sheet, which they completed in the laboratory and handed in before leaving.

Three examples of GISTs from laboratory exercises dealing with aerobic respiration, seed viability and cambial activation from a second year university course in plant physiology are:

> In this experiment, aerobic respiration was allowed to take place in a closed vessel. By having KOH present in the vessel, any CO_2 produced by the pea seedlings is removed. Therefore O_2 consumption can be related to the reduction in pressure in the respirometer flask, and is measured with the manometer and syringe. The rate of respiration of pea seedlings measured as O_2 consumption was similar to that of CO_2 released measured with the infra red gas analyzer.

> Seed batch A shows 90 percent viability. Batch B shows 0 percent viability. This is likely due to an extremely adverse pretreatment. Batch B seeds did not germinate, 80 percent of batch A seeds did. Seeds which do not germinate are not necessarily dead; it is possible that they are still dormant. This can be determined by a viability test where the highly respiring embryo of the seed reduces tetrazolium dye to a pink compound.

> Cambial development in the decapitated bean plant without exogenous growth hormones is curtailed. Substitution of the apex with exogenous IAA and GA reinstates cambial development. Exogenous IAA stimulates both xylem and cambial derivative development. GA stimulates proliferation of cambial cells without additional xylem differentiation. From this, we may conclude that both the absolute level and the type of growth hormone influence the pattern of cambial development.

Data reports with GISTs were used in the fall 1985 and winter 1986 semester offerings of plant physiology. The students using the GIST perceived that the lab reports add strongly to their learning in the laboratories and that they were marked fairly (lines 2, 3, 5 and 6, Table 1) in comparison to those students completing lab reports without GISTs. Students judged the GIST as being an effective summary of their completed exercises (lines 7 and 8, Table 1).

Five weeks after beginning the winter semester in 1986, we solicited written views on the GIST from students. The 41 responses fell into four categories. There were those who felt the GIST: caused them to think (11 students); required them to understand (16); was helpful in studying (6); and fostered learning (8). Representative examples are:

> –It makes you think just why and what you are doing in the experiment instead of mindlessly following the directions in the manual.
> –. . requires the student to understand the greater concepts of the experiment, which in my estimation is more important than the details of it.
> –. .good review when cramming for exam—quick glance brings back experiment.
> –To have to coordinate one's thoughts into a comprehensible paragraph really allows one to learn the material. I would be very pleased to see this incorporated into all other labs. This is what education is!!

Marking Laboratory Reports

My teaching assistants marked the laboratory reports and GISTs. They found that GISTs clearly identified difficulties with exercises. This allowed us to clarify the problems and give the students another opportunity to learn the principal idea. Marking weekly reports for some 25 to 30 students took about two to four hours. During the fall semester of 1985, one of two teaching assistants marked all the reports every other week. During winter 1986, each of four teaching assistants marked 25-30 reports weekly. Differences between markers may have lead to a drop in the perception of fairness of marking (line 6 versus line 5, Table 1). A marking sheet checklist to accompany the scrutinized reports has been developed as a guide for different markers and to allow ready and specific communication with students.

Discussion

Providing an investigative or inquiry style of laboratory was beneficial to the performance of students in general biology laboratories in high school and at the university level (Leonard 1980, 1983). The time students spent in analyzing data and interpreting results following the laboratory work was used by Tamir (1977) to evaluate the extent that inquiry occurred. Students from grade levels 9 through 11 devoted increasingly more time to the post-laboratory phase. In the college laboratories that Tamir observed, the post-laboratory discussion was absent, and individually prepared reports were used. In a study of college science students, Kyle et al. (1979) found that the behavior of questioning was low during the laboratory work itself; unfortunately the post-lab activity was not coded.

The exercises in the plant physiology course described here did not provide the extended discretion ap-

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Table 1. Student responses to three questions regarding laboratory reports and GISTs. These questions were part of the final course evaluation carried out in the penultimate week of instruction. The responses are given as percentages.

		a	*b*	*c*	*d*	*e*
Did the lab reports add to your learning in the labs?		very much				not at all
1	Winter 1985	15	33	30	8	8
2	Fall 1985*	45	33	7	5	0
3	Winter 1986*	50	37	7	3	0
Were the lab reports marked fairly?		yes				no
4	Winter 1985	18	25	30	7	15
5	Fall 1985*	60	24	5	0	2
6	Winter 1986*	38	38	14	3	1
Was writing the GIST an effective summary for you?		yes				no
7	Fall 1985*	55	21	12	0	2
8	Winter 1986*	49	25	9	4	5

* The GIST was part of the laboratory report.

The number of respondents in the course evaluation for the winter 1985, fall 1985 and winter 1986 semesters were: 73 (out of a class of 88), 42 (56) and 76 (91) respectively.

proach formulated by Leonard (1980, 1983). Introducing the GIST changed the way the laboratory sessions ended. Because the students submitted their report before leaving, they spent time discussing the work among themselves and they frequently asked questions of the instructors. Student activities such as explaining, conceptualizing and reaching deeper understanding were evident.

I view the GIST as an effective tool in the process whereby students "learn to learn." As pointed out recently by McKeachie (1986), putting material in your own words is an important part of learning. The GIST is a means of accomplishing this for larger numbers of students on a weekly basis.

Acknowledgments

I wish to thank all my students for their patience with me as I grappled with the problem of assigning grades to their laboratory work. Particular thanks go to those who expressed their views in writing so that I might make them known to colleagues, and to my teaching assistants for their suggestions.

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