Peer Sharing Facilitates the Effect of Inquiry-based Projects on Science Learning

HUI-MIN CHUNG, KRISTINA JACKSON BEHAN

ABSTRACT

Authentic assessment exercises are similar to real-world tasks that would be expected by a professional. An authentic assessment in combination with an inquiry-based learning activity enhances students' learning and rehearses them for their future roles, whether as scientists or as informed citizens. Over a period of 2 years, we experimented with two inquiry-based projects; one had traditional scientific inquiry characteristics, and the other used popular culture as the medium of inquiry. We found that activities that incorporated group learning motivated students and sharpened their abilities to apply and communicate their knowledge of science. We also discovered that incorporating popular culture provided "Millennial" students with a refreshing view of science learning and increased their appetites to explore and elaborate on science.

Key Words: Inquiry-based learning; peer sharing; authentic assessment; project management.

Science education plays an essential role in developing the skills that every student needs to flourish in a 21st-century work force (BSCS 2008). Whether students become scientists, physicians, or business people, their skills in problem solving, data analysis, critical thinking, organization, and communication have a direct impact on their success. We have experienced challenges in designing course activities that will help college students develop skills in these domains. Nicolette and Merriman (2007) analyzed learning preferences among the "Millennials" (students born between 1982 and 2003) and found that they prefer a collaborative, fun, yet structured learning environment and like to use technology as a tool to accomplish a learning task. Millennial students tend to be less patient and have shorter attention spans. As a result, these students often encounter extra challenges in the conventional college science classroom. Our fear is that they may lose interest in learning science.

The National Science Education Standards for K–12 (National Research Council, 1996) stress inquiry-based science education and the roles of assessment in science reform. Authentic assessment exercises are similar to real-world tasks that would be expected by a professional. An authentic assessment rehearses students for their future roles, whether as scientists or informed citizens. Ideally, students will become self-directed learners, capable of reflection and self-critique and able to give constructive criticism to others. This requires faculty to behave as coaches, to provide framework for learning, feedback, and opportunity for revision. Students should be involved in improving the assessment, and their input can be collected by survey (Seymour et al., 2009).

Inquiry-based learning is effective in shaping students' abilities to think critically and apply their knowledge. The approach is based on "5 Es": engagement, exploration, explanation, elaboration, and evaluation (Bybee, 2006). Two elements that we chose to reform in our course were (1) an authentic assessment in science using an inquiry-based learning activity and (2) peer sharing of work. Peer sharing and peer review develop active communication and management skills and increase feedback.

Over a period of 2 years, we experimented with two inquiry-based projects, one featuring traditional scientific inquiry and the other using popular culture as the medium of inquiry. We executed these two projects in three formats (paper writing, poster presentation, and oral presentation) that were

Table 1. Project descriptions and scope of peer sharing.

<table>
<thead>
<tr>
<th>Format</th>
<th>Project Type</th>
<th>Type of Performance</th>
<th>Individual or Group Performance</th>
<th>Scope of Peer Appreciation</th>
<th>Students Participate in Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual written report</td>
<td>Scientific proposal</td>
<td>Written report</td>
<td>Individual</td>
<td>2 students</td>
<td>No</td>
</tr>
<tr>
<td>Group poster</td>
<td>Scientific proposal</td>
<td>Poster exhibition</td>
<td>Group</td>
<td>Entire class</td>
<td>Yes</td>
</tr>
<tr>
<td>Group oral presentation</td>
<td>Science in pop culture</td>
<td>Oral presentation</td>
<td>Group</td>
<td>Entire class</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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combined with various degrees of peer sharing. A summary of the projects is given in Table 1. We included these projects in the Genetics course at the University of West Florida, a core course for Biology majors. Each format has its benefits and drawbacks. We found that activities that incorporated group learning motivated students and sharpened their abilities to apply and communicate their knowledge of science. We also discovered that incorporating popular culture provided Millennial students with a refreshing view of science learning and increased their appetites for exploring and elaborating on science. We concluded that use of authentic assessments with peer sharing and inquiry-based small-group activities improved college students' science learning.

○ Project Descriptions & Reflections

Project 1: The Traditional Approach

In our first project (spring 2006 to spring 2007), we asked the students to develop a scientific proposal based on a human genetic disease, either investigating an unknown aspect of the disease or promoting public awareness of the disease and its related treatment. Proposals were written individually as papers or in groups as poster displays; both are authentic assessments, given that they are frequently used in formal scientific presentation.

In the first round, in spring 2006, the student output was a scientific paper. The writing went through several steps of improvement.

Figure 1. Rubrics for (a) written assignment with peer review, (b) poster production, and (c) oral presentation.

(a) Rubric for written proposal, scored by instructor and peer reviewers: Each of the following elements should be given a score from 0 to 3 (0 = the element was not addressed, 1 = the issue was addressed in a superficial way; there are significant problems with clarity, accuracy, or completeness, 2 = the issue was addressed, but some elements are unclear or inadequately addressed, 3 = the author has completely and thoroughly addressed the issue.)

<table>
<thead>
<tr>
<th>Score (0-3)</th>
<th>Element</th>
<th>Comments for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Information about the disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logic &amp; organization of the introduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completeness &amp; breadth of the literature reviewed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clear statement of the research involved in the proposed activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Method of the proposed activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Predicted results</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of writing: Is the paper understandable?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality of writing: Are there lots of typos &amp; grammar mistakes?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>References</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall impression of the paper</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

(b) Rubric for poster presentation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the background information sufficient &amp; logically displayed? (0-20 points)</td>
<td></td>
</tr>
<tr>
<td>Are the purpose &amp; method of the proposed activity clearly stated? (0-20 points)</td>
<td></td>
</tr>
<tr>
<td>Is the predicted result carefully discussed? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Is the project interesting &amp; significant? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Is the poster display visually clear &amp; expressive? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Is the information complete &amp; easy to follow? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Total points</td>
<td></td>
</tr>
</tbody>
</table>

(c) Rubric for oral presentation of the group project

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the presentation give a good analysis of the scientific accuracy &amp; completeness of the film? (0-25 points)</td>
<td></td>
</tr>
<tr>
<td>Does the presentation give a good analysis of the scope/depth of the scientific topic in the film? (0-20 points)</td>
<td></td>
</tr>
<tr>
<td>Do the presenters give a good discussion of the originality of the film? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Is the presentation well organized? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Is the presentation done in a good manner? (0-10 points)</td>
<td></td>
</tr>
<tr>
<td>Does the group answer questions well? (0-15 points)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

Every student submitted a first draft, which was commented on by the instructor and anonymously reviewed by two fellow students using a common rubric (see Figure 1A). The rubric provided the framework of the instructor's expectations for success. The students were expected to revise their drafts to accommodate suggestions before submitting their final drafts. Only the final draft was graded. The peer review process gave each student the opportunity to improve his or her writing and to assess the quality of the work of two other students. Reflection and comparison of an individual's own work with that of other students is expected to improve the individual's output.

In the following two semesters (fall 2006 and spring 2007), the students worked in small groups to create the proposal but presented it on a publicly displayed poster. The students chose their own group members, and each group consisted of two to four students. In addition to developing a proposal, the group had to develop an aesthetically pleasing and content-rich poster to display their work. The scope of the peer sharing increased to include the entire class, as students participated as presenters, audience, and jurors at the poster exhibition. Figure 2 shows two students discussing a poster from that session. Information about many genetic disorders were shared during those sessions, including breast cancer, Tay Sachs Disease, alcoholism, color blindness, and Cri du Chat, among others. Each poster described background information about the disease, including symptoms, genetic inheritance, and testing for the disorder. The proposed activity and its significance were awarded more points than the background information (Figure 1B). Examples of proposed activities include raising public awareness of the disease and of how prenatal testing can improve the quality of life of the fetus in certain conditions.

Before the poster session, each group submitted an outline to the instructor and was given guidance for improvement. During the poster exhibition, all students evaluated all posters, except their own, using the rubric (see Figure 1B) provided by the instructor. The instructor and guest faculty evaluated all posters using the same rubric. The students voted for their favorite poster, and the faculty voted for the poster that was the most scientifically intriguing. Because of time constraints, two poster sessions were required for all the projects to be viewed. Many students commented that the second group had a built-in advantage and that some of the groups made last-minute improvements to their projects. While this seemed unfair to the students, to the instructor it was evidence of peer-driven improvement.

Rubrics were made available at the introduction of the project. Students and instructors used the same rubric during the process of drafting and revising the proposal or presentation. For the poster and the oral presentation, all students scored all projects except their own.

Figure 2. Poster presentation. One of the authors of the poster explains the content and significance to a peer reviewer.
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guest faculty also assessed all presentations using the same rubric. Alter-

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ties. Our second inquiry-based project was a group project in which

students were immersed in group dynamics and were faced with issues such

as learning to coordinate with each other's talents and shortcomings,

communicating even in disagreement, and organizing the time and effort

that are needed to complete a project. Their enjoyment of being able to

accomplish the project and communicate with their peers about science

was so evident during the poster exhibition that the instructor and guest

faculty could sense it. Overall, this group experience transformed the

students' learning attitude and encouraged the instructor to continue

using the "peer sharing" strategy to design future course assignments.

Project 2: The Pop Approach

Science-fiction movies often reflect how the public perceives science. As scientists, we know that they can be grossly inaccurate. We thought

an assignment that required analyzing scientific components in science-

fiction movies would be attractive to students and constitute a means

for them to apply their scientific knowledge and critical-thinking abili-
ties. Our second inquiry-based project was a group project in which

two to four students analyzed a sci-fi movie based on genetics or genetic

ingineering and made an oral presentation that critiqued its accuracy.

Before the presentation dates, the students submitted outlines of their

MS PowerPoint® presentations and were given opportunities to do a

practice presentation with the instructor. All students evaluated all

presentations, except their own, using a common rubric (see Figure 1C)

provided by the instructor. As before, the rubric was meant to both guide
development of the project and evaluate its success. The instructor and
guest faculty also assessed all presentations using the same rubric. Alter-

atively, students could use their imagination and knowledge to create a

short film centered on a particular aspect of genetics research. In the fall

2007 semester, we had 11 presentations: 10 film critiques and 1 student-
made animation video. Nine of the 10 critiques looked at the science

in movies such as Jurassic Park, Gattaca, and The Island; the other cri-
tique discussed the documentary film Journey of Man. The student-made
animation video, The Horror from Below, was later posted to YouTube
(Gernmard83 et al., 2007).

Most of the students found this "science in pop" project espe-
cially appealing. They pulled together multimedia presentations that
challenged the instructor to keep up. Most of the groups showed video
clips of the movies, especially of scenes that had subtle or not-so-subtle
errors. Several students said in their presentations that they had found

a new outlet for using their knowledge (not just studying for an exam).
Students who did this pop-flavored science project reported that they

learned a great deal from their peers. They enjoyed having brainstorm
moments with peers, they appreciated each group member's talent, and
they learned to coordinate with each other's working style. In their own

assessment of learning gains from the film project, the students reported
improvement in project management, communication, organizational
skills, and critical peer review (Table 2).

The students were polled on their preferences among the types of

authentic assessment: written paper, poster presentation, film critique, and
group or individual project. Almost all favored having a group project in
the course assignments, and 76% favored the "science in pop" type of group
project over the project on making scientific proposals (see Figure 3A).

Weighing Group Projects in Course Performance

We were curious whether students preferred group projects to the

conventional assessments of their learning in a content-based course.
The Genetics course is a 3000-level course that traditionally uses three

exams and four or five quizzes to assess students' course performance.
Figure 3B shows that the majority of students in spring 2007 rated

written exams and poster design as very good to excellent means of

assessing their learning — and that research papers did not get a sim-
ilar rating. These opinions were echoed by students in fall 2007 who
did the "science in pop" group project. This group was polled on the
value of different methods for assessing performance. All the students

preferred inclusion of a group project in the overall assessment of the
course, and 90% of them preferred to have exams and quizzes as well
(see Figure 3C). This result suggests that while students valued having
their performance assessed by diverse means, that did not diminish

their preference for exams as a form of assessment.

In the fall 2006 and spring 2007 semesters, the group projects were

graded using both student and instructor scores. Our rationale for peer
involvement was to sharpen critical-thinking skills and allow students to
rate themselves against their peers in self-reflection. Our main concern
about having students evaluate their fellow classmates' performance was
that the students might be unfair or apply lower standards than instruc-
tors. The survey done in the spring 2007 semester indicated that stu-
dents too were concerned about having peers as evaluators (see Figure
3B); 33% of them felt that a peer critique was frequently a poor or unfair
evaluator, 33% felt that it was a good evaluator, and only 18% felt that
it was excellent. With respect to instructor critique, only 11% of stu-
dents felt that it was frequently a poor or unfair evaluator, 47% felt that
it was good, and 37% felt that it was frequently an excellent method to
evaluate learning. This perception of peer review as deficient is similar
to the finding of Cho et al. (2006). Like those researchers, we found that
in spite of negative student perceptions about the validity of peer review,
the peer reviewers' evaluations actually agreed well with those of the

Table 2. Student assessment of learning gains: percentage of students who responded with "helped" or
"helped a great deal" to the leading phrase of "How much did this project help your learning?"

<table>
<thead>
<tr>
<th>Qualifiers</th>
<th>Poster Project n = 28</th>
<th>Film Project n = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your ability to envision a project from start to finish</td>
<td>79%</td>
<td>67%</td>
</tr>
<tr>
<td>Communicating your ideas to members of your group</td>
<td>82%</td>
<td>86%</td>
</tr>
<tr>
<td>Your ability to work effectively with others</td>
<td>79%</td>
<td>81%</td>
</tr>
<tr>
<td>Your organizational skills (setting deadlines, following through)</td>
<td>82%</td>
<td>81%</td>
</tr>
<tr>
<td>Your ability to critically review someone else's work</td>
<td>89%</td>
<td>76%</td>
</tr>
</tbody>
</table>
Figure 3. Student preferences. (a) Proportion of students showing preference for method of assessment. These are responses to the question "If you favor a group project to evaluate your performance, which project do you prefer?" (fall 2007, n = 21). (b) Student responses to the statement "Rate each of the methods of evaluation with respect to its ability to assess your learning" (spring 2007, n = 28). Bars represent total number of students. (c) Student responses to the statement "Evaluate the benefit of a group project as an assessment in this class. Is it worthwhile to use a group project to evaluate your performance, and should it be used alone or as an adjunct to exams and quizzes?" (fall 2007, n = 21).

- Written exam
- Research paper
- Poster design
- Peer critique using a rubric
- Instructor critique using a rubric
- NA or no response
- Good
- Poor or unfair
- Very good to excellent

- Written report
- Oral critique of pop culture
- Poster exhibition
- Oral presentation

- 100%
- 76%
- 5%
- 5%
- 0%
- 5%

- No, just exams and quizzes
- Yes, with exams and quizzes
- No, replace with individual term paper
- Yes, with exams & no quizzes
- Use project only with no exams

- Instructors. Some students gave insightful comments in grading their fellow students' work. The instructors did not observe grade inflation in the peer reviews.

○ Using the Assessment to Improve Our Teaching

In this study, we strove to determine an assessment that would motivate and improve students' learning of science. Our findings are based on two inquiry-based projects, one following a conventional scientific inquiry track and the other using pop culture as a platform. Below are reflections of what we learned from this study.

Group Learning: An Effective Learning Vehicle for Hard & Soft Skills

Murnane and Levy (1996) described the skills that make students competitive, include the hard skills (e.g., the skills of comprehension and problem solving) and the soft skills (e.g., the skills of interacting with and persuading others). An inquiry-based group project seems to be an especially good tool for building these basic skills. We found that group projects stimulated and increased opportunities for communication among peers. Both students and instructors reported that students' critical-thinking and communication skills improved. The survey results (Table 2) and informal discussion revealed that students felt that—in addition to applying their scientific knowledge—they had improved their skills for working and communicating with people of different backgrounds to complete group projects. Thus, the strategy of using a group assignment in combination with the public presentation format can be a useful tool in course design.

Baby-stepping the Scope of the Project: Less Is More

The skills of posing and answering a relevant question based on logical reasoning and specific methodology are essential for developing a scientific proposal. In the earlier projects, we found that students often gave inadequate consideration to the logistics of their scientific hypotheses and to the details of implementing the proposed activities. In addition, a significant number of projects were related to public awareness and education, while fewer than 20% were focused on developing empirical inquiries on unknown aspects of the diseases. These findings suggest that the projects were too broad in scope, given the students' skill levels and the time constraints of the semester. Furthermore, since the project counted for only 12% of a student's final grade, there was insufficient incentive to invest in a thorough proposal. Therefore, we revised our approach and designed the "science in pop" project, limiting our focus to improving students' skills in data analysis (in our study, the data were the content of their chosen films), critical thinking, and communication.

Although the students who worked on the smaller projects of film critique did not thoroughly master critical-thinking skills (as evidenced by their presentations), they nevertheless seemed better able to apply their knowledge with specifics in assessing the accuracy of the science depicted in the films. This suggests that working on small projects that target training of particular sets of skills one at a time may be a better strategy than assigning a large-scale project. In other words, to be effective, an instructor would be better off identifying only one or two particular training skills as the goal of the assessment when designing an inquiry-based group project. This finding is similar to that of Wilke and Straits (2005), who also determined a benefit of focusing on a small number of science process skills at a time.
Building Ties with Students' Learning Preferences: Teaching the Millennials

We observed that students welcomed our unconventional approach of using pop culture as a podium for exercising their critical-thinking skills. We think that this approach is particularly useful for teaching today's college students, many of whom are part of the Millenarian generation. As noted above, the Millennials are loosely defined as the generation of students who were born roughly between 1982 and 2003 (Howe & Strauss, 2000). They are sometimes called the "net generation" because they grew up using computer technology and are very comfortable with it. Characteristics of this cohort of students are that they are team oriented, confident, structured, and technologically savvy; work well together in groups; and like a customized, flexible, fun class (Howe & Strauss, 2000; Nicollete & Merriman, 2007). That analysis seems consistent with what we found in our study. Our surveys showed that the students overwhelmingly preferred to have a group assignment that utilized technology, like doing a PowerPoint® presentation, which suggests a correlation between the project preference and the Millenarian students' learning styles. In our fall 2007 Genetics class, 83% of the students were Millennials, with an average age of 24 and a median age of 22. When we surveyed the class regarding their project preference, we found that 95% favored a group project, 81% favored an oral presentation format, and 76% preferred the project on critiquing pop culture (see Figure 3A).

Although the concept of the traditional student who enters college directly after high school does not accurately represent all of our students, we think that addressing the learning preferences of the Millennial students is extremely beneficial; the approach of using pop culture in our project is just one example. Notably, The Chronicle of Higher Education recently reported that more faculty are using the Internet as a learning platform to accommodate the contemporary college student's preferences. YouTube has gained popularity with faculty and students as a medium for designing and recording teaching material, and some professors also encourage activities such as blogging or writing a wiki page (Young, 2008).

The Instructor's Role in Monitoring Projects: As Facilitator

A major advantage of having students work together in a group-inquiry-based project is that it helps students learn from themselves and from each other. In other words, it helps them develop into self-learners. The instructor's role here is to facilitate students as they develop their expertise in critical thinking, and not to over-instruct. The instructor provides guidelines and technical specifications for framing and presenting the work. In practice, this role means spelling out expectations of success in rubrics and giving timely feedback as projects progress. In addition, the instructor should have a well-thought-out plan, whether for poster exhibition or oral presentations, to facilitate an efficient process. This plan should attend to details such as estimating how many poster boards and easels are needed, how to arrange the audio and video equipment, and how much time to allot to set-up and delivery of the projects. Suggestions for which science-fiction films to use, what to critique, and what techniques to use are helpful. Although we would like for all students to accomplish their projects successfully, one should expect to see heterogeneity in students' performance as a whole when they present their project outcomes. Not every student will master critical thinking and communication within this short period, and we can all learn by making mistakes. Reexamining guidelines and revising the grading rubrics periodically is helpful to ensure higher degrees of student success. It would be very beneficial, in addition to student surveys and informal discussions, to dedicate one class period after the project evaluation to openly discuss the students' project performance and what they should do to improve their work.

Standards for Education & Assessment

The projects that we have described are consistent with the emphasis that the National Science Education Standards place on encouraging students to become self-learners. Teaching Standard A is to "Select science content and adapt and design curricula to meet the interests, knowledge, understanding, abilities, and experiences of students." In our study, students selected a topic or film of their own interest and worked within a group to develop the project. Teaching Standard E promotes allowing students to "have a significant voice in decisions about the content and context of their work." Not only did the students in our study select their own topics; their assessment of learning gains and preferences held significant weight in revising and retaining the project as a component in the course. The use of authentic assessments, described in Assessment Standard C, was addressed in a traditional manner with the written and poster presentation of a scientific proposal format. The pop-culture format engaged the students in applying critical-thinking skills to look for inconsistencies not only in their own and their peers' work, but also in the media. This skill will remain with them whether they stay in science or not. The use of a variety of inquiry-based projects allowed us to evaluate these assessments to improve our own teaching as well. The Standards state that the outcome of a successful assessment is when students use scientific inquiry, explain the content orally or in writing, and use a teacher's standards to critique their own and other students' work. This project used a dynamic approach, with planning, coordination, instructor preview and input, and public display of the product with peer review to accomplish that outcome.

Implementation & Dissemination: Tips for Your Course

Science education reform is a national and multi-tiered process, and K-12 schools and universities are partners in improvement. Reform at both levels of instruction can be initiated less expensively by changing the teaching and assessments in existing courses than by offering new courses that require new infrastructure. The types of group projects in our study could be easily modified and implemented in other science courses without making too much change in the existing curriculum. A few key issues of planning and adopting such projects should be considered:

• Keep the project small, allowing students to develop a few critical skills at a time.
• Make connections to media that are familiar to students, like science-fiction films, TV dramas such as CSI and X-Files, or news stories.
• Plan ahead according to the resources and budget in the department, and consider the time that the instructor can allocate to monitor the project.
• Provide detailed guidelines to students at the beginning of the semester, and provide rubrics that define the expectations for success.
• Keep a fair balance between the time and effort needed for students to accomplish the project and that needed for other class assignments.
• Use discussion and surveys to assess and improve the effectiveness of the project.
• Collaborate with other faculty members to help brainstorm and allocate work loads for monitoring the projects and designing and analyzing the survey data.

In summary, small inquiry-based group projects appear to be good facilitators of students' science learning. Group projects provide an
adjunct to conventional written tests for evaluating students' course performance. They can provide authentic assessment, so that students advance their understanding of science by tying it to real-world experiences. Peer sharing within and outside the group improves the process. The tools that are introduced and reinforced go beyond scientific content and will be part of their skill set in their future professional lives.

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References


