ETHICS IN THE SCIENCE CLASSROOM

FINAL EVALUATION REPORT

Prepared for

Northwest Association for Biomedical Research

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EXECUTIVE SUMMARY

EVALUATION BACKGROUND

The Collaborations to Advance Understanding of Science and Ethics (CAUSE) program is funded by the National Center for Research Resources of the National Institutes of Health (NIH) and represents a partnership between the Northwest Association for Biomedical Research (NWABR) and the University of Washington. The program’s goals are to, “Increase understanding of ethics and its relation to science, with the aim of fostering thoughtful analysis, critical reasoning, and rational discourse,” and “Provide learning experiences for students that will increase their understanding of bioethics, specific science content, and the nature of the scientific process.” The program addresses these goals by conducting teacher professional development sessions, and by designing related curriculum units for classroom use.

This evaluation report presents outcomes for CAUSE Phase 1 (September 2003-August, 2006). In particular, this report focuses on the program’s primary professional development strategy, the residential, week-long Ethics in the Science Classroom (ESC) Workshop. The assessment looks at the effects of participating in the ESC Workshop and at the impacts on faculty members who served as the program’s Teacher Leaders in either a Curriculum Developer or Lead Teacher capacity. Earlier evaluation reports that assess program materials and curricular units, as well as initial teacher outcomes, are available through NWABR.

The findings in this report draw on the results of three years of Workshop participation (2004, 2005, 2006) and two years of classroom implementation (2004, 2005), using the evaluation strategies listed below.

- Site Observations: ESC Summer Workshop, Ethics Short Course, May Reunion, and classroom visits.
- Participant Surveys: ESC attendee program entry, Workshop satisfaction, and program exit surveys; Teacher Leader survey, Year 1 Teacher follow-up survey.
- Interviews with participants and program staff.

OUTCOMES

The report provides an analysis of two areas—trends in satisfaction with the ESC Workshop, and the extent to which Workshop participation affected teachers’ school year practices. It includes teacher insights on student impact, illustrates how ethics discussions take place in the science classroom setting, and reports on the Teacher Leader outcomes and on the program’s professional development activities that are held in addition to the Workshop. Finally, it captures participants’ recommendations for program improvements. Evaluation feedback, in particular suggestions for next steps, are noted in boxed sections throughout the report.

Overall, we found solid evidence, although primarily from self-report, that the Workshop does a good job of immersing teachers in key concepts about ethics and preparing them to integrate ethics into their lessons. We also found evidence that teachers’ understanding of the relationship between ethics and science improved over the year. Teachers consistently rate the Ethics Primer highly, and note that they appreciate the support of the program’s Education Director.

Summer Workshop Survey Results
By its third year (2006), the ESC Workshop had begun to demonstrate interest from a national audience, with eight of twenty-five participants attending from outside Washington State. This cohort represented both public and private schools, and several science subject areas—primarily biology and life science—but also bioethics, forensics, and physical science. Several of the participants had backgrounds in conducting research as well as in teaching.
The evaluation examined three years of ESC Workshop results relying on evaluator observations, interviews and focus groups conducted during the Workshop, and a survey completed by participants on the last day. Overall, participants expressed a high level of satisfaction with all aspects of the Workshop, and these findings were consistent from year to year. In general terms, Workshop ratings increased between the first and second year of operation (2004 to 2005). Ratings for the third year, 2006, tended to mirror those of the previous year. Altogether, this pattern suggests that the greatest improvements occurred based on what Workshop staff learned from the experiences of the first year, and that improvements were sustained in the third year. Because teachers had already given the Workshop very high ratings in 2005, significant improvement in 2006 would have been difficult to document with numerical ratings, which were already at or near the top of the scale. The participants soundly praised the organization, resource materials, and the way the Workshop was constructed. Several of the open-ended comments echoed feedback similar to the following:

*All of the guest speakers (experts) were invaluable. I loved having the opportunity to ask questions to someone who knows the answer firsthand. Also, all the curriculum resources we received were great too… a little overwhelming because of so many, but it will give me something to do the rest of the summer!*

*The flow of the week really built an incredible framework.*

Looking at survey results for the three years, we found that at the close of the week-long summer Workshop, teachers reported a positive change in their perceptions of their own comfort and preparedness to incorporate ethics discussions. They sustained this level of self-reported change through the end of the following school year. A set of questions assessed the Workshop’s impact on teachers’ knowledge relating to science and ethics. Showing clear alignment with program goals, the highest rated item in all three years was “I have a better understanding of strategies to incorporate ethics into science lessons.”

Despite the fact that attendees taught across a range of science subject areas, they expressed satisfaction with what they learned and materials provided. At the same time, there were disappointments expressed over time spent on materials and units that did not fit into their individual curriculums. This issue is further discussed under “Suggested Next Steps” below.

**Long Term Effects on Teacher Skills, Attitudes, and Knowledge**

While ESC participants expressed strong satisfaction with their training immediately after the Workshop, what is most important is to see whether, and in what ways, they acquired skills, attitudes, and knowledge that they were able to apply in their classrooms. Although based on self-report, the surveys administered at the end of the school year following the Summer Workshop indicate sustained participation effects. Following are summary points from a comparison of entry and exit surveys completed by 2004 and 2005 teachers.

- The professional development program appeared to affect two separate but closely related areas in integrating ethics and science—feeling comfortable with the idea of incorporating ethics, and feeling prepared to do so. In terms of comfort, teachers tended to agree at the beginning of the Workshop that they felt comfortable incorporating ethics, but by the end of the academic year, they strongly agreed.
- The professional development training also appears to have a positive impact on teachers’ views of their own preparedness to incorporate ethics discussions into science curricula. At program entry, 72% said they were not adequately or somewhat adequately prepared to integrate ethics discussions. In contrast, at the end of the school year teachers showed a significant increase: over three quarters of participants (78%) rated themselves at least fairly well prepared to incorporate ethics into science lessons. A composite scale of survey items constructed to further assess perceived preparedness to integrate ethics into science teaching also found a significant improvement in both 2004 and 2005.
- Participants reported a positive effect on their understanding of the relationship between ethics and science. Measured through a composite scale, in both years the trend was towards greater understanding at the end of the school year.
• Between entry and end of the Workshop, teachers showed a significant increase in familiarity with classroom resources from scientific institutions such as the NIH. This change appears to have been sustained throughout the following school year.

We make special note of the consistent reports of the usefulness and versatility of the program’s core curricular resource, the Ethics Primer. The Primer’s value was detailed by teachers of every science subject, and by those who worked with every level of student including International Baccalaureate, Honors, ‘Regular’, and Special Education. Following the Workshop, one teacher wrote, I found lessons in the primer my ’Pot-of-Gold’. At the end of the school year, another noted:

First, the primer has been my primary resource. I have taken lessons directly from the primer and used them. For example, I use the intro to ethics (lifeboat activity, general ethical perspectives, etc.) directly from the primer. I copy them off and give them right to the students. It is very well organized, clear, and concise. I have also adapted lessons from the primer to fit my needs.

While survey findings provide validation that the training seems to have a sustained effect, site observations and the responses to open-ended questions elucidate change in teacher practice:

I have completely modified my cell division unit to focus on cancer using the NIH unit. I also have students complete a bioethics research/debate project during the biotechnology unit....

It was nice to have the primers and resources this year to help me integrate ethics into already existing units. I used many of the Internet sites and topics given at the workshop. I felt a lot more comfortable addressing stem cell research after the summer workshop. Presentations at the workshop were excellent and gave me a better understanding of the ethical aspects of many issues I teach in biology.

Program Impact on Frequency of Ethics Integration
In order to further understand which materials were most useful to teachers, the 2005 participants were asked to report on how often they used each resource. Nearly all (14 of 17 respondents) reported using the Ethics Primer at least twice, and eight reported using it six or more times. Other most frequently used materials included the Genetics and Race Case Study, Animals in Research Unit, and Stem Cell Resources Unit. The items noted by 2005 teachers as least used were the Genetic Science Learning Center materials, HIV Research Curriculum, and lessons posted on the NWABR site by other teachers.

Measuring to what extent the Workshop affected how often teachers used the ethics discussion strategies proved problematic. Although the gains in teachers’ report of their knowledge, comfort, and preparedness to incorporate ethics were striking, as a group, teachers showed only a modest increase of ethics-related lessons. Overall, it appeared that their frequency of incorporating ethics increased by a few lessons on average, although there was variation among participants with some reporting adding many more lessons, and others little or no change.

Using a composite scale we measured reported frequency of integration of ethics into science curricula at entry and exit. Teachers reported slightly greater integration of ethics into their science curricula (although not statistically significant) a year after participating in the summer Workshop. The mean response at exit was just under the range of six to ten lessons during the year for each of the five behaviors measured in the scale. The survey data suggest that although teachers clearly report increased preparedness to integrate ethics, they register small increases in their actual use of these strategies, at least during the first year or two after the Workshop. It is possible that full integration of ethics materials and perspectives requires a longer period of time or that teachers need additional professional development training or support during the school year as they begin to practice implementing the units and discussion strategies. However, as discussed under “Future Evaluation” below, we are not sure that the survey question was an accurate measure of how often ESC materials were used, especially as the open-ended comments indicate that teachers applied their Workshop learnings in many ways. We also don’t know whether teachers improved the quality of their ethics lessons, even if they did not increase their frequency. This issue warrants additional investigation.
Exploring Student Impact
The evaluation took initial steps to identify potential impacts on students. Teachers were asked to comment on student effects, and in general, they reported increased engagement and interest in the subject matter. Typical comments included the following:

I have noticed that my students pay attention to the news more! They understand that different perspectives exist outside of their own. My goal, that which I teach and try to model, is that I don't have to agree with a different perspective, but I do need to try and understand it. I feel that teaching ethics in science greatly increases a student's critical thinking skills, and helps them to develop a way to analyze new and different situations. They are also beginning to recognize the tremendous power of science, as well as the significant need for a strong ethical perspective in science to guide decisions.

Developing a Cadre of Teacher Leaders
In addition to the ESC Workshop, CAUSE has actively worked to develop a cadre of teacher leaders who train their peers, share program information, and develop specific curriculum units. These leaders have been hand-picked, and for the most part, stayed with the program over time. They are strong program advocates, and their roles in development, recruitment, and dissemination could be further expanded, especially within their own schools and districts.

Suggested Next Steps
Based on the evaluation findings, we make recommendations for program consideration in the following areas.

Expand workshop participant recruitment efforts. Currently, the summer session can only accommodate about twenty-five participants. In each of the three sessions to date, the program received applications for about the number of available slots. As the program expands its professional development activities and scope, it will need to recruit more heavily, and acceptance should be on a competitive basis, thus allowing selection from among the best participants. The program might also consider specifically targeting and inviting participants based on their leadership and teaching reputations.

Deepen effect in schools and districts. The program could require “buy-in” from department heads, principals or districts as part of the application process, asking administrators to describe upfront how they will support the dissemination of the ethics discussion strategies. It could also provide incentives for schools to send a teaching team in order to encourage a deeper effect and more coordination at the building level.

Address participants’ differing needs. Each summer cohort has been relatively small, yet heterogeneous in terms of science subjects taught. As a result, individual teachers have often commented that some of the units presented were not applicable to their classrooms. The program may want to consider deliberately recruiting a more homogenous subject area group, or expanding its numbers so that all participants attend general sessions on the ethics framework and discussion strategies, and then break into smaller groups for working with subject-specific curriculum.

Bolster school year support. Teachers may benefit from ongoing support during the school year. Past participants have indicated interest in attending one-day workshops in their district or at a central location. One way to further the program goal of building a community of practice may be to beef up the support provided during the school year. Also, the annual reunion, currently held in May, might be more beneficial earlier in the school year. As one teacher wrote:

I think small follow up sessions would be helpful. I loved our reunion in May, but it’s so late in the year. I know people come from all over to do this program, but maybe a January or November workshop would keep the enthusiasm up from the summer workshop. It’s so easy to get swept away when the school year starts and I think a little follow up would be good.
Another strategy would be to proactively address the fact that there is quite a difference between learning the strategies in a workshop and actually managing them effectively in the classroom. Teacher Leaders could be further trained in structured academic controversy techniques and then deployed to provide ongoing school year support to past Workshop participants.

**Continue to document and share how teachers are incorporating ethics in the classroom.** As the program grows, it can capture and share lessons learned by its alumni. Areas that seem particularly fruitful include innovations in using discussion strategies, tips for finding time to work ethics into a demanding science curriculum, and hearing how others faced and addressed barriers to implementation. These lessons might be shared through a variety of venues including brief videos.

**Employ multiple dissemination strategies.** Teacher leaders offered several suggestions for further dissemination. These included working more closely with principals, offering mini-courses during professional development days, and finding a way for Lead Teachers to travel to other schools and model lessons in a classroom.

**Future Evaluation**

The future evaluation direction will depend on where the program puts its efforts in Phase 2. Clearly, in addition to the site observations, interviews and focus groups, and participant surveys, additional objective measures should be developed and employed wherever possible.

**Document student outcomes.** The Phase 1 evaluation explored potential student outcomes. Further work should follow up on the initial findings of increased engagement with the material, and explore how that affects students’ science knowledge, ethics understanding, and academic and civic skills in general.

**Document classroom use more effectively.** The evaluation uncovered many promising ways that teachers are using ESC material in their classrooms, but was unable to clearly document how much of an impact attending the Workshop had on their curriculum. There are other means to further evaluate these questions of use and impact, including development of new survey questions, and further qualitative investigation. If teachers are not able to integrate the ethics components as strongly as the program hoped, the reasons for this must be identified so they can be addressed.

Teacher comments indicate an intriguing range of ways that Workshop participation affected teaching, far beyond the implementation of discrete, formal lessons captured in the Phase 1 survey. Future evaluation should explore these more subtle effects. For example, the comments below lead us to believe that for some, the Workshop paved the way for informal, yet powerful classroom interactions, and comfort with trying new activities.

> *I would say the most value has come from my ability to introduce and discuss topics when the issues may come up unexpectedly.*

> *I did create an activity in my genetics unit that looked at genetic discrimination and the ethical implications of being genetically tested and who has access to this information. I hadn't done it before this year. It wasn't an activity I got at the NWABR workshop but the workshop gave me the skills and confidence to find an article for my students and create an activity with it.*

**Evaluate new program developments.** Innovations implemented this year should be assessed. As one example, in 2005, teachers did not report high use of the lessons they developed for themselves during the Workshop. The program revised that activity this year so that instead, each teacher developed an “action plan.” The evaluation
should follow up with teachers to see to the extent to which they were able to implement their plan. In the future, we recommend that as part of the action plan, teachers describe how they will assess their own success.

The program has developed two curriculum units as part of this project (HIV/AIDS Vaccine and Stem Cell Research), and is in the process of developing a third (Genetics and Smoking Cessation). During the grant period, these units were in the trial phase. Further evaluation should look at feedback, level of use, and effect of these units.

**Follow Dissemination Paths.** As the program grows, it will be useful to see how information is shared in order to develop and refine dissemination activities. Following up with department heads, principals, and district level staff will provide indicators of inroads made and next steps needed in promoting this work.
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SECTION 1: EVALUATION BACKGROUND

This is the final evaluation report of Phase One of the Collaborations to Advance Understandings of Science and Ethics (CAUSE) program, which was funded by the National Center for Research Resources of the National Institutes of Health (NIH). The grant partners a nonprofit organization, the Northwest Association for Biomedical Research (NWABR) with two colleges at the University of Washington: Health Sciences and Education. The program’s overall identified goals are to, “Increase understanding of ethics and its relation to science, with the aim of fostering thoughtful analysis, critical reasoning, and rational discourse,” and “Provide learning experiences for students that will increase their understanding of bioethics, specific science content, and the nature of the scientific process.” The program addresses these goals through two “arms”—teacher professional development training, and curriculum development. The initial program evaluation, conducted by Horizon Research, provided an assessment of curriculum materials, in particular, an expert review of the Ethics Primer. It also took an initial look at the effects of the professional development workshop. These findings shaped the ongoing development of curricular materials and improvement of workshop design. ¹

In the final year (2005-06), the program transitioned to a new evaluation firm, Cohen Research and Evaluation. Assessment focused on the professional development workshop, and explored how teachers were able to operationalize ethics discussion strategies and to use CAUSE curriculum units in their classrooms.

Findings for the period of July-December, 2005, are presented in the Interim Report (see Appendix A). The primary focus of this report is to describe outcomes of participating in the program’s key professional development training component, the Ethics in the Science Classroom (ESC) Summer Workshop. Findings derive from an analysis of the following: observations of classrooms and program activities, informal interviews, pre and post surveys administered to ESC Workshop participants, and a follow-up survey of Year 1 participants. In addition, we employed focus groups and surveys to explore the effect of serving as a Teacher Leader (i.e., serving as Lead Teacher or Curriculum Developer).

In this paper, we report on the following:

• Program outcomes for the Year 2 Participants, i.e., those who attended the July, 2005 ESC Workshop
• Multi-year outcomes for Year 1 and Year 2 ESC participants
• Workshop satisfaction reports for Year 1, 2, and 3 participants ²
• Lead Teacher and Curriculum Developer outcomes for the 2005-06 school year

The report is divided into seven sections. The first and last sections cover the evaluation background, and participant recommendations for future steps respectively. The remaining five sections focus on program assessment. Sections 2 and 3 report on outcomes for ESC Workshop participants; Section 3 describes examples of how teacher participants integrated ethics in their classrooms, as well as supplementary program activities offered in addition to the Workshop; Section 5 looks at student outcomes; Section 6 explores participation effects for Teacher Leaders. Sections 2-6 each include a boxed-off set of evaluation insights on the findings for that particular topic.

¹ Previous reports completed by the Year 1 evaluator, Horizon Research, may be obtained from the NWABR education director.

² The Phase One grant included providing the ESC Workshop in 2004 (Year 1), 2005 (Year 2) and 2006. We are referring to the final group as Year 3, however, the grant ended after the workshop but before the school year. As a result, this group is not included in the assessment of outcomes.
The surveys referred to in this report are listed below.

<table>
<thead>
<tr>
<th>Name of Survey</th>
<th>When Administered</th>
<th>Grant Year</th>
<th>Evaluation Firm *</th>
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<td>• Lead Teacher Survey</td>
<td>May, 2006</td>
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<td>CR&amp;E</td>
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Horizon Research (HR)
Cohen Research and Evaluation (CR&E)
SECTION 2: THE ESC SUMMER WORKSHOP 2004-2006

One of the most useful part of the week was just spending time with teachers with a passion for teaching science. The activities and speakers gave a good base for our work, but the most useful part of the week was the time spent working on the specific project for my curriculum.

This has been a true workshop I can use. I will need to take a few days to review and organize the materials. I want to weave these materials throughout my curriculum. My thinking and planning have been shifted and I have a better perspective on teaching science and ethics in the classroom.

The CAUSE Summer Workshop was offered in 2004, 2005, and 2006, with a participant survey conducted at the close of the week’s activities. The Workshop Satisfaction Survey asked questions in five general areas. Close-ended scales were used to capture participant feedback on the following five areas:

1. Overall quality of the Workshop structure and program materials
2. Impact of the Workshop on knowledge relating to science and ethics
3. Usefulness of the Workshop in developing skills to incorporate ethics into science curricula
4. Usefulness of each of the Workshop activities and presentations
5. Likelihood that participants would use the specific curriculum units/lessons presented at the Workshop

In addition, teachers responded to several open-ended questions, so that the evaluation could further identify Workshop impacts, strengths, and weaknesses.

The findings presented here compare results from surveys conducted for the three years of the Workshop. Detailed tables displaying the means for every item in 2005 are provided in Appendix A (Interim Report) and for 2006 in Appendix B. A separate report of 2004 results is also available. In the cases where Workshop activities were changed or survey questions were modified from year to year, comparisons are not possible. In comparing outcomes, it is important to bear in mind differences in the Workshop from year to year, as well as differences in participants’ skills, interests, and effort brought to the Workshop. Because of these cohort and Workshop differences, strong conclusions about changes in the Workshop from year to year are not warranted, but findings that are consistent with other information gathered in the evaluation are emphasized.

In general terms, Workshop ratings increased from the first year of operation, 2004, to 2005. Ratings for the third year, 2006, tended to mirror those of the previous year. Altogether, this pattern suggests that the greatest improvements occurred based on what Workshop staff learned from the experiences of the first year, and then those improvements were sustained in the third year. Because teachers had already given the Workshop very high ratings in 2005, significant improvement in 2006 would have been difficult to document with numerical ratings, which were already at, or near, the top of the scale. A decline in the rating of any item from year to year was uncommon. Overall, in all three years including 2004, participants gave high ratings of the Workshop’s quality, impact, and usefulness. The following sections describe specific three-year trends.

A. Quality of Workshop Structure and Materials

The first set of questions asked for feedback on the Workshop structure and program materials. The highest areas of “strong” agreement in 2006 were:

- The workshop reflected careful planning and organization
- The take-home materials were appropriate for the program

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3 Previous reports completed by the Year 1 evaluator, Horizon Research, may be obtained from the NWABR education director.
• The take-home materials will be helpful to me in the classroom
• The presenters were well prepared
• The subject matter was clearly presented

Figure 1 shows a consistent pattern: the ratings for these items were fairly high in 2004, but they improved in 2005, and in 2006 the ratings remained nearly identical. Teachers tended to strongly agree with most items. The only item not to receive high ratings was “adequate time was allowed for participants to reflect on and relate material to their experiences and needs.” This item was consistently rated lower than all others each year: about one out of four teachers disagreed with this statement in 2005 and one in five disagreed in 2006. This was the only aspect of the Workshop that did not show some improvement.

![Figure 1. Quality of Workshop Structure and Materials](image)

B. Impact on Knowledge Relating to Science and Ethics

A set of questions assessed the Workshop’s impact on teachers’ knowledge relating to science and ethics. The highest rated item in all three years was “I have a better understanding of strategies to incorporate ethics into science lessons.” Teachers tended to strongly agree that the Workshop was fulfilling this core mission. Other highly rated items included:

• I feel more comfortable incorporating ethics into my science units.
• I am familiar with classroom resources (e.g. curriculum units) available from scientific institutions such as the NIH.
• I have a better understanding of ethics as a discipline.

Figure 2 shows once again that the ratings for several items measuring Workshop impact, already highly rated in 2004, were rated higher in subsequent years. The main exception to this rule was “I have a better understanding
of the role of ethics in scientific research,” which showed a larger gain after the first year and then a larger decline.

![Figure 2. Impact on Knowledge Relating to Science and Ethics](chart)

C. Perceived Workshop Usefulness in Developing Skills to Integrate Ethics with Students

Participants were asked to rate how useful the Workshop was in developing their skills to work with students in integrating ethics into science lessons. Ratings of the usefulness of the Workshop in working with students in 2006 were very similar to the results of 2005 (2004 results cannot be compared because the question was asked differently). The highest ratings of usefulness in 2006, which were quite similar to 2005, related to the following (see Figure 3):

- Guide students’ learning related to ethics in science lessons
- Help students recognize ethical dilemmas in science
- Modify a curriculum unit in science to include ideas about ethics
- Incorporate ethics into a science lesson

Figure 3 also shows the item with the largest drop, which was still relatively small: from 2005 to 2006, the mean rating for “Help students understand perspectives different from their own” declined by .26. Nevertheless, the mean of 4.48 in 2006 remained high and indicated that most teachers perceived the Workshop to be more than “somewhat useful” in this area. The lowest rated item in both years was “Aid students in separating fact from opinion,” which was still rated “somewhat” to “very” useful by the vast majority of teachers. All of these items align with the program goals, and the strong positive findings appear to validate that the Workshop is meeting its intended purpose.
D. Ratings of Individual Workshop Activities

Comparisons across the three years of the Workshop are only possible for a small number of activities because of changes in activities or presenters. Table 1 displays mean ratings of the usefulness of Workshop activities that were common to more than one year. Variations from year to year in activity names are indicated. In 2004, there were more ratings below 4 (between “somewhat” and “very useful”) than in either of the subsequent years, consistent with the overall pattern of improvement after the first year of operation and sustained higher quality afterward.

The strongest improvement in ratings from 2004 (or 2005) to 2006 occurred in the following activities:
- Norm Setting (Ethics, Values, and Diversity) (+.62)
- Overview of Ethical Theory (+.60)
- Stem Cell Research Issues (Stem Cell Science) (+.53)

The pre-Workshop homework has consistently been a lower-rated item, but the rating has increased steadily over the three years, by nearly half a point (.49) in total; by 2006 teachers rated pre-Workshop homework between “somewhat” and “very useful.” Ratings for the films (which are shown in the evenings and attendance is optional) have changed over the years, but they have also tended to be among the lower-rated activities (not shown). One item mean dropped half a point from 2005 to 2006, the Consumer Awareness Curriculum.
Table 1. Post Workshop Survey: Usefulness of Selected Workshop Activities 2004-2006

Please rate how useful you feel the following workshop activities will be in helping you integrate ethics into your curriculum. (1=Not at all…5=Very Useful)

<table>
<thead>
<tr>
<th>Item</th>
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<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
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<td>3.74</td>
<td>3.96</td>
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<tr>
<td>Overview of Ethical Theory</td>
<td>3.88</td>
<td>4.38</td>
<td>4.48</td>
</tr>
<tr>
<td>Genetic Science Learning Center Materials</td>
<td>4.35</td>
<td>4.52</td>
<td>4.64</td>
</tr>
<tr>
<td>Stem Cell Ethics</td>
<td>--</td>
<td>4.19</td>
<td>4.16</td>
</tr>
<tr>
<td>Individual Lesson Planning Time</td>
<td>--</td>
<td>4.48</td>
<td>4.52</td>
</tr>
</tbody>
</table>

E. Feedback on Specific Curriculum Units

Participants were asked how likely they would be to use nine specific units, materials, or lessons presented during the course of the Workshop (Figure 4). The likelihood of use might have varied depending on teachers’ subject matter, and therefore these results should not be interpreted as a judgment on the intrinsic usefulness of any particular curriculum unit.

Thus it is not surprising that teachers rated the lesson they worked on as the one they were most likely to use (rated “very likely” by all but three teachers) in both 2004 and 2006 (and second most likely in 2005). The Ethics Primer, an essential part of the Workshop, was also consistently highly rated compared to other materials. Teachers reported being “very likely” to use both their own lesson and the Ethics Primer in 2005 and 2006.

The following items received ratings below 4 (between “somewhat” and “very likely”) in 2006:

- HIV Research Curriculum
- Consumer Awareness Curriculum
- NIH Curriculum Units

Means ratings for both the HIV Research Curriculum and the Consumer Awareness Curriculum fell from 2005, the first year these materials were offered. The HIV Research Curriculum mean rating dropped 0.37, from 4.05 to 3.68. The drop was greater for the Consumer Awareness Curriculum, from 4.48 to 3.56, or almost one point.

Despite rating themselves very likely to use the lesson they created, teachers who attended the Workshop in 2005 used that lesson less than other materials. These results are reported in Section 3C below, “Integration of Ethics into Science Curricula.”
The NIH Curriculum Units were offered all three years, starting with a mean of 3.88 in 2004, rising 0.60 points to 4.68 in 2005, and then dropping back to 3.88 in 2006. These results show that, unlike other parts of the survey, mean ratings on curricular materials showed no consistent pattern of either improvement or decline as a group, most likely because of changes in the subject area composition of each teacher cohort.

F. Open-Ended Comments

The responses to open-ended questions are useful in amplifying closed-ended question results. Highlights of open-ended responses from the 2006 survey follow, and full results can be found in Appendix B.

- When asked what aspects of the Workshop participants thought would be most useful in helping them integrate ethics into science lessons, the two most mentioned were the Ethics Primer, and the opportunity to learn and practice the ethical frameworks.
- When asked what barriers teachers expect to face, thirteen of the twenty-five respondents identified time concerns, especially conflicts with meeting other curricular requirements. Also, six mentioned concerns about parent reaction, not necessarily as a barrier, but as something that would need to be addressed. One said, “The barriers I anticipate are from parents and possibly administration. I’m not too worried though—once it’s explained why ethics are being included I think no one would object.”
- Participants expressed their appreciation for the way material was presented in an applied manner. One noted, “… experiencing the activities as a student would. I’m much more likely to use an activity that I’ve seen in action and participated in.”
- There were several comments (and in the Exit survey as well) praising the program, the organization of the Workshop, and the support offered by the program’s Education Director, Jeanne Chowning.

There were also suggestions for future improvement:
As always, it is difficult to provide enough time for these things. I would have used a small time slot everyday to organize, reflect and “schedule” materials (for future class lessons). More time would have been helpful, however, I did not feel overly pressured or rushed.

It would have been helpful to work through the ethical decision-making framework with more case studies. I would have liked more time to work on the projects earlier in the week and perhaps in the morning rather than the end of the day when I was ready to get outside.

I felt we only touched on the most challenging aspects of the ethical issues related to stem cell research and use of animals in research. Learning how to facilitate discussion in the classroom where students disagree on when an embryo has moral status or whether or not animals should be used at all for research is critical. This workshop only touched upon these fundamental issues. I see value in going into these issues more deeply.

### Evaluation Feedback on Workshop Satisfaction

The overall findings strongly indicate that the Workshop is meeting its intended purpose, i.e., to provide teachers with resources and strategies they can use to integrate ethics discussions into their science curriculum. For the most part, the findings support continuing with the program as is. However, there are a few areas that warrant further investigation.

In each of the three summer sessions, the teacher cohort has been composed of those who teach in varied science subject areas. As a result, in each year, some teachers identify specific curriculum units (for example Planaria, HIV, Consumer Awareness) that were not of use to them. Invariably, these same units are identified as highly useful by others. At present, each summer session has had about twenty-five attendees. The program may want to expand attendance so that there is a big enough group to break out into subject area sessions for some of the curriculum unit presentations. Alternatively, the Workshop could focus on attracting only teachers in biology and closely related subjects.

There are just three program components that have not been rated as highly as the others. First, is the evening film program, and it may be useful to consider modifying it or adding some other optional activities. Second, is the pre-program homework. The evaluation did not look at why this was not as highly rated, or what other materials participants might prefer to receive ahead of time, so this is an area recommended for future exploration. Finally, teachers said they didn’t have adequate time to reflect on the materials. However, in open-ended comments, some teachers did say they had sufficient time, or acknowledged that although they didn’t have time, they didn’t want to give up any of the content presented either. This may simply be an irresolvable tension between two competing positives: taking advantage of the opportunity to pack so much content in and having sufficient reflection time to consider how to use it in the classroom. One way that the program is dealing with this issue deserves ongoing follow up. This year, several changes were made to both time allocated and strategies for developing individual lesson plans. Also, teachers developed an “action plan” instead of working on one lesson. We recommend following up on teachers’ outcomes—both successes and barriers—in implementing these plans in their classrooms.
SECTION 3: IMPACT OF ESC PARTICIPATION ON TEACHER OUTCOMES ENTRY AND EXIT SURVEY FINDINGS

I intend to utilize both resources made available through the workshop, as well as expanding just in time lessons to focus on breaking scientific news/discoveries. I feel that it is extremely important to utilize classroom discussions, guided controversy and Socratic seminars to focus student attention on ethical dilemmas, scientific reasoning and scientific literacy.

The input I have received from the ethics workshop and the resources and materials provided have been invaluable to me. I most likely would not have ventured into this subject matter without this input and support. I truly feel that the connections that my students are making in regard to ethics and science are the most important learning they will receive from me this year. Most of my students will not become scientists, but they will become citizens who have been given some of the analytical tools necessary to bring their scientific and ethical knowledge to bear on contemporary issues that will impact them as individuals and the society they are a part of.

This section describes evaluation findings relating to how participating in the Workshop affected teacher knowledge and practice. We present findings for four areas of impact: a) teachers’ perceptions of their own preparedness to integrate ethics into science curricula, b) teacher understanding of the connections between ethics and science, c) extent to which teachers integrated ethics into their curricula, and d) examples of how teachers applied their new knowledge in the classroom.

In order to assess the long-term impact of participating in the Workshop, participants were asked to complete a survey on the morning of the first day of the session, and again at the end of the school year. Entry and end of school year (also referred to as “Exit”) surveys were administered in both Years 1 and 2. Year 1 entry and exit findings were extensively documented by Horizon Research, and for the most part, are not repeated in this section, except where noted. There were 21 responses to the Year 2 Entry Survey (100% of participants) and 18 responses to the Exit Survey (86%). Responses are only reported here for the 18 who completed both Entry and Exit Surveys. See Appendix C for detailed responses to Year 2 survey questions.

In addition to looking at changes over the course of one school year, we wanted to explore to what extent participation effects continued into future years. In order to do so, we sent a survey to the twenty Year 1 (2004) teachers in March, 2006, nearly two school years after their training. Six of those teachers responded, and relevant findings are included in this section.

A. Perceptions of Preparedness to Integrate Ethics into Science Curricula

Teacher preparedness to integrate ethics into their science curricula was assessed in a number of ways. One question set asked ESC participants to rate how equipped they were to incorporate ethics discussion strategies. A second question set, using an agreement scale, asked them to assess their attitudes towards the importance of integrating ethics with science, and their comfort and familiarity with ethics issues and classroom resources.

As noted above, in order to measure perceived change in preparedness over time, teachers were asked at “entry,” i.e., before participating in the ESC Workshop and at “exit”, i.e., at the end of the school year, to rate their preparedness in nine areas of ethics integration. Table 2 displays entry and exit ratings, combining “not adequately” with “somewhat” prepared, and “fairly well” with “very well” prepared. Teachers showed improvement on all items. The top three areas of change in preparedness included the following:

...
Incorporate ethics issues into a science lesson.
Guide students’ learning related to ethics in science lessons.
Modify a curriculum unit in science to include ideas about ethics.

Table 2. Preparedness to Integrate Ethics at Entry and Exit

<table>
<thead>
<tr>
<th>Item</th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop students’ scientific reasoning ability.</td>
<td>7 (1)</td>
<td>11 (2)</td>
</tr>
<tr>
<td>Use the Internet to find resources for teaching ethics in science.</td>
<td>9 (1)</td>
<td>9 (2)</td>
</tr>
<tr>
<td>Incorporate ethics issues into a science lesson.</td>
<td>13 (1)</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td>10 (1)</td>
<td>8 (2)</td>
</tr>
<tr>
<td>Guide students’ learning related to ethics in science lessons.</td>
<td>12 (1)</td>
<td>6 (2)</td>
</tr>
<tr>
<td>Help students recognize ethical dilemmas in science.</td>
<td>9 (1)</td>
<td>9 (2)</td>
</tr>
<tr>
<td>Aid students in separating fact from opinion.</td>
<td>7 (1)</td>
<td>11 (2)</td>
</tr>
<tr>
<td>Help students understand perspectives different from their own.*</td>
<td>8 (1)</td>
<td>9 (2)</td>
</tr>
<tr>
<td>Modify a curriculum unit in science to include ideas about ethics.</td>
<td>11 (1)</td>
<td>7 (2)</td>
</tr>
</tbody>
</table>

* One teacher did not respond to this item; N = 17.

We found a contrast in teachers’ entry reports in whether they were prepared to incorporate ethics issues into science lessons compared to whether they were comfortable doing so. Prior to the Workshop, about two thirds agreed or strongly agreed that they were comfortable incorporating ethics (noted in Table 3 below). At the same time, as noted in the table above, 13 of 18 (72%) said they were not adequately or somewhat adequately prepared, indicating that although they were comfortable with the idea, they were not equipped to implement lessons. But at the end of the school year, not only did teachers report feeling comfortable, they also felt prepared. Over three quarters of participants (14 of 18, or 78%) rated themselves at least fairly well prepared to incorporate ethics into science lessons, and this increase was statistically significant (p < .01).

A composite scale of the items in Table 2 was constructed to create a measure of perceived preparedness to integrate ethics into science teaching at entry and exit (see Appendix C for details of scale construction). Teachers felt significantly better prepared to integrate ethics into their science curricula (p < .001) a year after
the Workshop. They moved from the “somewhat” to “fairly well” prepared range into the “fairly well” to “very well” prepared range. Indeed, none of the teachers reported that they were “not adequately prepared” at the end of the school year. Figure 5 compares entry and exit scores from both Years 1 and 2.

Figure 5. Preparedness to Integrate Ethics

![Bar chart showing preparedness scores for Year 1 and Year 2.]

The mean scores for the Year 1 participants were nearly identical to those from Year 2, and the Year 1 increases were also statistically significant (p < .01, N = 12). Thus in both years measured, teachers reported significantly greater preparedness to integrate ethics in a variety of ways.

**Additional Readiness Indicators**

In addition to asking teachers to rate their level of preparedness, they were also asked to what extent they agreed with indicators of their comfort and abilities to integrate ethics lessons and to use available ethics-related resources. These findings are in Table 3 below. They tended to agree at the beginning of the Workshop that they felt comfortable incorporating ethics, but by the end of the academic year, they strongly agreed (this difference was statistically significant, p < .01). Teachers also reported a significant increase over time in their familiarity with classroom resources from scientific institutions such as the NIH (p < .001). Six teachers (35%) reported that they felt unfamiliar with these resources at the beginning of the Workshop. A separate survey, administered on the last day of the Workshop found that all teachers felt knowledgeable about these materials at that time. Six teachers were asked this question again at the end of the school year in order to assess the sustained effects of the Workshop, and the survey found that by year’s end, all but one teacher agreed or strongly agreed that they were familiar with those resources. These results indicate that the Workshop significantly increased teachers’ familiarity with classroom resources, and this increase was sustained by nearly everyone through the end of the school year.

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6 Note that a total of nine teachers indicated on the Entry survey a lack of familiarity with these classroom resources; and all of them indicated at the end of the Workshop that they were now familiar with these resources. However, three of them did not respond to the Exit survey at the end of the school year, and thus the Workshop may have had an impact in this area on an even larger number of teachers than reported here.
Table 3. Additional Readiness Indicators

<table>
<thead>
<tr>
<th></th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree or Disagree</td>
<td>No Opinion</td>
</tr>
<tr>
<td>I feel comfortable incorporating ethics issues into science lessons.</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>I am familiar with classroom resources available from scientific institutions such as the National Institutes of Health (NIH).*</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

* One teacher did not respond to this item; N = 17.

B. Understanding of the Relationship between Ethics and Science

Participants assessed their own understanding of the relationship between ethics and science at the beginning of the Workshop and the end of the academic year, displayed in Table 4. One question relating just to ethics knowledge independent of science learning was included as well: “I have a good understanding of ethics as a discipline.” In this case, eight of the respondents disagreed or strongly disagreed at entry, and nine agreed or strongly agreed. At the end of the school year, nearly all, seventeen of eighteen, agreed or strongly agreed. This difference was statistically significant (p < .01). This indicates that the teachers felt the training had affected their ethics understanding and sustained those effects through the following school year.
### Table 4. Understanding of the Relationship between Ethics and Science at Entry and Exit

<table>
<thead>
<tr>
<th></th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree or Disagree (1, 2)</td>
<td>No Opinion (3)</td>
</tr>
<tr>
<td>I have a good understanding of ethics as a discipline.</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Ethics is an important aspect of research in the biological sciences.</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Science instruction must include a focus on ethics.</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Discussions of ethics can enhance students’ understanding of science content.</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Scientific thinking and ethical thinking are similar in that both are based on rational arguments.</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Scientists have a responsibility to consider the ethical implications of their work.</td>
<td>1</td>
<td>17</td>
</tr>
</tbody>
</table>

A composite scale of four of these items was constructed to create a measure of teachers’ self-report of their understanding of the relationship between ethics and science, at entry and exit (see Appendix C for details of composite scale construction):

- Science instruction must include a focus on ethics.
- Discussions of ethics can enhance students’ understanding of science content.
- Scientific thinking and ethical thinking are similar in that both are based on rational arguments.
- Scientists have a responsibility to consider the ethical implications of their work.

Agreement with these items was already high on entry into the Workshop. Even so, the Year 2 teachers’ reported understanding of ethics in scientific research was significantly higher than on entry a year after the ESC Workshop (p < .001). The change in one of the scale items, “Scientific thinking and ethical thinking are similar in that both are based on rational arguments,” indicates that the teachers appreciated that both scientific and ethical thinking have a rational basis more strongly at the end of the school year compared to entry.

Figure 6 compares entry and exit scores from both Years 1 and 2: In both years, the trend is toward greater understanding at the end of the school year, though the gain was larger in Year 2.

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7 For Year 1 teachers, this change was not quite statistically significant (p = .08; N = 12).
C. Integration of Ethics into Science Curricula

A primary goal of ESC is that teachers will incorporate new information and teaching strategies into their classrooms. In order to assess what changes teachers made during the year, participants were asked to report on the number of lessons in which they used ethics discussion strategies presented in the Workshop. Table 5 displays their responses at entry and exit. The scale range was from “never” to “over 30 lessons”; please note that categories of responses for over 10 lessons have been combined into “over 10 lessons.”
Table 5. Frequency of Integration of Ethics into Science Curricula

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are confronted with an ethical dilemma in a scientific context.</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Students respectfully disagree with others’ opinions during discussions.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Students discuss a case study related to the content.</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Students engage in role play scenarios (e.g. mock congressional hearings) to discuss a scientific or ethical issue.*</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Students analyze the scientific or ethical issues in a movie.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH).</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I modify lessons to include ethical issues.</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

Note: Two teachers did not respond to this set of items on either the Entry or Exit Survey; N = 16.

* This item was shortened on the Exit Survey by omitting the examples, “moot court, panel discussions.”

A composite scale of five of these items was constructed to create a measure of reported frequency of integration of ethics into science curricula at entry and exit (details of scale construction are in Appendix C):

- Students are confronted with an ethical dilemma in a scientific context.
- Students are asked to make reasoned judgments about issues with no clear right answer.
- Students respectfully disagree with others’ opinions during discussions.
- Students engage in role play scenarios (e.g. mock congressional hearings) to discuss a scientific or ethical issue.
- Students analyze the scientific or ethical issues in a movie.

Teachers reported slightly greater integration of ethics into their science curricula (approaching statistical significance at p = .08) a year after participating in the summer Workshop. The mean response at exit was just under the range of six to ten lessons during the year for each of the five behaviors measured in the scale, as shown in Figure 7:
For comparison purposes, we asked the program’s Teacher Leaders—the Curriculum Design Team members and Lead Teachers—the same questions about frequency of integration of ethics into their own lessons. The scale mean for the Workshop leaders was slightly higher, 1.98, indicating that they had used each of the strategies in six to ten lessons on average during the year.

A survey of Year 1 participants (Sustained Effects of Workshop Participation Survey, see Appendix D) administered one year and nine months after they participated in the Workshop also found similar rates of integration. Asked the same questions, most Year 1 teachers responded that they used identified pedagogical strategies to engage students in ethics discussions in one to five lessons per year (there were no comparable baseline measures for these teachers\(^8\)). These results should be interpreted with caution because they may not be representative of most Year 1 participants’ experiences, given that just six of twenty responded. But together, the two surveys suggest that although teachers clearly report increased preparedness to integrate ethics, they register small increases in their actual use of these strategies during the first year or two after the Workshop. It is possible that full integration of ethics materials and perspectives requires a longer period of time or that teachers need additional professional development training or support during the school year as they begin to practice implementing the units and discussion strategies.

A related set of questions probed the number of times (class periods) that 2005 Workshop participants used specific Workshop materials during the academic year, as reported in Table 6. Teachers reported that they used Workshop materials most frequently in biology (13), environmental science (9), health (5) and life science (5). Appendix C contains a detailed breakdown of subject areas where materials were used.

- Of the seventeen respondents, fourteen used the Primer at least twice and eight used it six or more times.
- The Genetics and Race (BiDil) case study was the most used curriculum unit, used two or more times by thirteen teachers. In addition, the Animals in Research unit was used by ten, with an additional two planning to use it before the end of the school year. The Stem Cell Resources unit was used twice or more by eleven teachers.

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\(^8\) Year 1 participants responded to similar, but not strictly comparable, items; therefore, no statistical comparisons were possible.
• The least used units were the Genetics Science Learning Center Unit and HIV Research Curriculum. Teachers also reported little use of lessons posted by other teachers on the NWABR website. Interestingly, there was little utilization of the lessons the teachers developed for their own use, with twelve of the teachers reporting that they used them once or not at all. We do not know why teachers were not able or chose not to implement the lesson they developed themselves; however, in 2006, the Education Director revised this session so that teachers are asked to bring an existing lesson that they wish to modify, and to work on that. The program can assess the value of this change by following up with these teachers in the 2006-07 school year.

Table 6. Frequency of Use of Workshop Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>None</th>
<th>1 time</th>
<th>2 to 5 times</th>
<th>6-10 times</th>
<th>Over 10 times</th>
<th>Have not used but plan to do so this year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethics Primer</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Genetics and Race (BiDil case study)</td>
<td>3</td>
<td>11</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>NIH Curriculum Unit*</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Animals in Research Unit</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stem Cell Resources</td>
<td>4</td>
<td>2</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genetics Science Learning Center Unit</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HIV Research Curriculum</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Consumer Awareness Curriculum</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Lesson you developed at the Workshop</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Lessons posted by other teachers on the NWABR Web site</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Other Workshop materials</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Note: One teacher did not respond to any of these items; N = 17.
* Two teachers did not respond to this item; N = 16.

In addition to the survey findings for Year 2 teachers above, the Year 1 teachers were asked to describe which lessons from the 2004 Workshop they used in the 2005-06 school year (Sustained Effects of Participation Survey). In this case, we were looking to see what, if any, materials they were still using in schools two years after their training. Of the six respondents, three had used the Ethics Primer two or more times during the most recent academic year. The following were used two or more times by one teacher each: the NIH curriculum unit, Animals in Research unit, Genetic Testing of Newborns unit, the lesson they had planned, and other Workshop materials. The Tuskegee case study had not been used in the most recent year. A table of findings is in Appendix D.
D. Open-Ended Responses: Classroom Application of ESC Knowledge and Materials

In addition to the closed-ended responses reported above, teachers from both Years 1 and 2 were asked to describe how they transferred the knowledge gained in the ESC Workshop to their classrooms. The question specifically asked: For example, did you modify particular lessons, try new teaching approaches, or use new materials? Please describe. Their responses indicate that an important piece of the story of how and to what extent the Workshop affects classroom practice is yet to be explored. As noted in the comments below, teachers are taking the materials and personalizing and using them in a myriad of ways. We found that teachers are using their new knowledge to integrate lessons across both academic subject and grade levels, and to create new activities. They are weaving in the ethical discussion strategies from the Primer as well as incorporating curriculum materials which they learned about at the Workshop. Selections of their responses are presented below, grouped by comments on integration across academic subjects and grade levels, use of curriculum resources and teaching strategies, and challenges faced.

Please note that these brief examples of classroom use are supplemented by the classroom observation descriptions found in both the following section (Site Observation Notes) and the Interim Report (Appendix A).

Integration across academic subjects/grade levels

This Workshop allowed me to constantly rethink, revise all my lessons. I was also able to use this strategy in my Language Arts, Future City Competition and whenever I am working/teaching students. I also try to encourage the parents to think about ethics and try to encourage discussions with their children.

I was able to approach this topic with Kindergarten to 8th grade staff members. I became aware that even though they teach generic topics, the teachers felt ill equipped or have had very little training, to teach ethics. I have shared my materials and the workshop with any teacher that I encounter especially if they teach science.

I've used the materials generally in my Environmental Science class (Wetlands Study) and more specifically in a new religion course built with knowledge and resources from the 2005 Summer Workshop. I've used a textbook on Ethics written by a German theologian and adapted material, concepts and worksheets from the Ethics Primer and selected NIH curricula. I've also used several DVD as case studies as well as prepared case studies from several additional textbooks. I've used current events and issues (such as immigration policies and the situation in Darfur) to develop case studies to examine ethical issues and context.

I have since started to co-teach with a science teacher. I am a special ed. teacher and my students are in the classroom with the reg. ed. students and I modify the curriculum and assignments as needed.

Use of Curriculum Resources/Teaching Strategies

First, the primer has been my primary resource. I have taken lessons directly from the primer and used them. For example, I use the intro. to ethics (lifeboat activity, general ethical perspectives, etc.) directly from the primer. I copy them off and give them right to the students. It is very well organized, clear, and concise. I have also adapted lessons from the primer to fit my needs. I took the mock congressional hearing, first developed by Paula Fraser, and adapted it to my own classroom expectations and students.

I often use the organization of stakeholders for discussion of issues and to encourage students to explore other points of view.

These questions were asked of Year 1 teachers in the Sustained Effects of Participation Survey (3/06) and of Year 2 teachers in the Exit Survey (5/06).
I did create an activity in my genetics unit that looked at genetic discrimination and the ethical implications of being genetically tested and who has access to this information. I hadn't done it before this year. It wasn't an activity I got at the NWABR workshop but the workshop gave me the skills and confidence to find an article for my students and create an activity with it.

I frequently called upon new knowledge I had gained in my lessons. I also found several segments of the NIH curriculums especially helpful for different units, including their segments on ethics-- i.e. the brain and addiction and the disease unit for 9-12. I also used parts of the Primer at the beginning of the year to introduce vocabulary and perspectives that I wanted the students to use throughout the year in discussing ethical issues.

I used the primer on several occasions to teach my students the fundamentals of ethical inquiry, to identify ethical issues and to support an ethical perspective. I used the film Gattacca to work through ethical issues in my Genetics unit. My students are now engaged in writing a research paper about a specific bioethical issue, in which they must give background information about the science and technology involved, the ethical dilemmas that are raised by this issue, the possible options to these ethical dilemmas and their reasoned opinion of the best ethical approach.

I have completely modified my cell division unit to focus on cancer using the NIH unit. I also have students complete a bioethics research/debate project during the biotechnology unit. But I would say the most value have come from my ability to introduce and discuss topics when the issues may come up unexpectedly.

Challenges

I incorporated these ethics topics as motivators to my lessons. Unfortunately with NCLB, we have no free time to explore things.

The workshop has not affected my lessons.

Unfortunately, I only had all chemistry courses first semester and only one biology second semester. I struggled with how to implement these ideas into chemistry, and I just didn't have the energy to modify my biology curriculum for only one section of it the second half of the year.
Evaluation Feedback on Measuring Participant Impact

The analysis of Entry/Exit Survey findings for Year 1 and 2 teachers, in combination with the findings from the survey administered to participants nearly two years after Workshop participation (Sustained Effects) indicate that participating in the summer Workshop does have long term outcomes. While these findings are based on self-report, they do indicate a participation effect on levels of knowledge, comfort with materials presented, and classroom use that is sustained through at least the following school year. However, the reported increase in the number of times ethics lessons were used was somewhat lower than the program hoped for. We feel that a better measure of implementation is needed. Specifically, our survey question asking how many times various ethics lessons were used should be rephrased to standardize what defines a lesson. In addition, NWABR’s Education Director suggested changing the question’s scale to capture finer changes in the number of lessons implemented. It might also be useful for the program to identify and share with participants the optimal number of lessons they hope they will incorporate, and make this explicit in the training.

Although the closed-ended responses do not seem to indicate that teachers increased their integration of ethics lessons as much as hoped, the open-ended comments indicate an array of impacts on teaching practice. In these responses, teachers provide several examples of how they used what they learned in the Workshop, and it is unclear whether they “counted” all of these when responding to the closed-ended question. What might be most useful in expanding and disseminating this program, is to document and share the varied strategies used as well as successes and barriers to implementation. The site visits described in the following section and the Interim Report provide an initial basis for this documentation. The program could present these descriptions in formats appropriate to its future training and dissemination activities.

In the same way, future evaluation should also follow up on the implementation, successes and barriers in using the three curriculum units (HIV/AIDS Vaccine, Stem Cell Research and Genetics and Smoking Cessation) produced by the teachers serving as Curriculum Developers.

SECTION 4: SITE OBSERVATION NOTES

Over the course of the 2005-06 school year, we conducted observations in six classrooms, at five different schools. Two of these site visits were described in the Interim Report (Appendix A), and notes on the remaining four are below. In addition, we observed and report on two of the program’s professional development activities: the “Ethics Short Course”, and the annual ESC Teacher Reunion, held respectively in April and May, 2006.

A. Classroom Observations

The following summary of four classrooms, along with the summary of two additional classrooms presented in the Interim Report is meant to provide a flavor of the different ways and settings in which teachers apply their ESC experience in developing and teaching science lessons. They supplement the teachers’ own self-reports on how ethics lessons were integrated into science classrooms.
Kentlake High School
January 26, 2006

**Background.** Kentlake High School is located in Kent, Washington, an exurban site about 40 miles southeast of Seattle. This large comprehensive high school houses about 1,900 students. Two “regular” biology classes were observed. In both cases, the teachers had attended the 2005 Summer Workshop. Their classes are located some distance from each other, on different sides of the building, and on different floors, which teachers said impeded their ability to work closely together. Both had introduced ethics concepts from the Primer earlier in the school year.

On the day of the observation, the classes were on a special schedule, so each class was two hours long. The teachers had planned the ethics lesson for this special extended class period. The first class had twenty-three students, fifteen boys and eight girls, in attendance. There were twenty students in attendance, eight females and twelve males, in the second class. Most, but not all of the students were 10th graders.

**Class 1 Lesson.** The entire two hour session was observed for this class. The class time was spent on discussions, worksheets and activities. The session began with a review of class norms developed at beginning of year, such as “agree to disagree,” and “don’t put people down.” This was followed by a short reminder of ethics discussions held earlier in the year such as the lifeboat exercise. One student described a similar exercise from a different class where a decision had to be made about which of four deserving people to pick up at a bus stop.

The instructor reminded students that they had previously reviewed definitions for the following terms: morals, values, consequences, principles, not harming, and care. She emphasized that there may not be a “right” answer, and solutions won’t end up in “nice neat package.” This led to completing the first worksheet, Practice Sheet 1: Distinguishing Ethical Questions from Other Kinds of Questions (in the Ethics Primer). Students were given ten minutes to complete it independently. The worksheet guides students to determine if a question is ethical, religious, cultural, legal, scientific, or any combination of these. An example of such a question is: Under what conditions should people be kept artificially alive? After completing individually, the students sat with one partner and discussed for several minutes, then shared their discussion as a group.

This exercise established a context for the next worksheet, which was a modification of the Primer’s Practice Sheet 2: Distinguishing Ethical Questions Within a Scenario. Students worked on this first with a partner. The two teachers had worked together to modify the scenarios on the worksheet for this lesson. An example of a scenario is: “Your wife is dying and needs medication you cannot afford, so you steal it.” Then students are to complete questions on type of issue (ethics, law, sociology, religion) and whether they agree or disagree.

The teacher gave students a clear directive to first focus on the question. Then, she selected a few of the ten scenarios for the next exercise, and employed the “range of perspectives—four corners” strategy (in Ethics Primer). She had posted four signs in different corners of the room: agree, completely agree, disagree, completely disagree. She first asked students to consider one of the scenarios, which dealt with employer access to employee medical records (the students kept asking to do the one on drinking but she ignored their suggestion). They were told to move to the corner with the sign that represented their views, and to discuss their argument with those in their group. Next, one spokesperson was asked to present the argument to the whole class. This exercise was repeated with three different scenarios.

The teacher reported that she had the video described in Class 2 below available in case it was needed, but in the end did not use it—she also felt it was a bit above the student’s level.

**Class 2 Lesson.** The observation began an hour into the two-hour class, just as the students were finishing watching a twenty-eight minute video, “Ethics in Biomedical Research” on a small screen in the corner of the room. Prior to the screening, the teacher reported that she had reviewed ethics material from the Primer defining
morals, ethics, law, religion, and sociology (Practice Sheet #1, described above). After the video the teacher led a short ten minute discussion. She then passed out the second worksheet and asked the students to complete it working in groups—they had about twenty minutes to complete the task.

The second worksheet, which was the one modified by the two teachers, had ten scenarios and students were asked to address the first five. The final thirty minutes of class time was allocated to this part of the lesson. The five topics included end of life care, minors and drinking, employer access to employee medical records, stealing unaffordable but necessary medication, and convincing a prisoner to provide an organ transplant. The students were asked to vote their views first. The teacher encouraged students to listen to opposing viewpoints by having them alternate stating pros and cons. She used the second topic as an opportunity to lead a discussion about teenage drinking, and as a result this item took up a large proportion of the thirty minute discussion time.

The teacher reported that this was the last day of the semester, and the exercise was designed to fit in with the culmination of the genetics unit. She also noted that the students will be required to write a research paper on a biomedical issue in the next semester, so the exercise served as a lead-in to that task.

Mercer Island High School
March 17, 2006

Background. The observed class, Science Research and Ethics, is a new course, which was developed and taught by an ESC Lead Teacher. The school catalogue describes it as a course for “students who seek to combine scientific research and laboratory exploration and discussion of ethics.” It is offered as a science elective to juniors and seniors who have taken biology. On the day of the observation there were twenty-two students, eleven female, eleven male. The classroom walls displayed several posters presumably from prior projects, with topics ranging from genetically modified food and animal testing, to genetic engineering.

Lesson. On the day of the observation, students were presenting their final reports on genetic testing of newborns. They had been working in groups, using a “task force” strategy, and were making their final policy recommendations on which of these tests should be state mandated. The first twenty minutes were spent putting their presentations on laptops and organizing themselves, so only one group presented in this class period. During this time, we asked a few students why they chose this course. The responses included: liking the opportunity to express opinions, found it is easier than other science courses, and course doesn’t require much homework. However, the comments represented only a few of the students.

The group that presented reviewed two disorders, sickle cell anemia and maple syrup urine disease. For each of these disorders they first described the disease and then addressed the following: how it is diagnosed, treatment protocol, cost of treatment, and rate of incidence. They then made their policy recommendations. For both disorders, they concluded that those who are most at risk should be encouraged to be tested, the government should pay for the testing, and that insurance company access to results should be by parental consent only.

Teacher Feedback and Dissemination. The teacher reported on the course structure. At the beginning of each unit, he reviews the basic science concepts involved. Class activities have included speakers, debates, and writing letters to policymakers. He uses a significant amount of material from the Primer (lifeboat exercise, overview of the ethical theories), as well as specific curriculum units (animal testing and stem cell research). He uses units from the Genetic Science Learning Center in Utah, an organization he connected with through his work with NWABR. He also uses lessons developed by ESC teachers that are posted on the website, modifying them for his use as needed.

In terms of disseminating materials, he reported that he has shared the Primer with some colleagues who have used materials such as the ethics framework in their classes. For example, he assisted a Physics instructor with using Primer materials for a lesson on data reporting, and a Chemistry teacher with using it for a lesson on blood
doping. He has invited fellow faculty members to other NWABR workshops such as the one on stem cell research, and the Ethics Short Course.

Seattle Lutheran High School
January 18, 2006

Background. Seattle Lutheran High School is a small private school located in West Seattle with thirteen faculty members and 130-140 students. Each faculty member may teach several different courses spanning departments, including electives based on their own interests and expertise. For this activity only, this teacher’s two biology classes were combined for two periods, the first time they had all met together. There were sixteen females and fourteen male students, double the usual number in the class at one time.

This is the teacher’s first teaching position. He started in 2001 with no teaching background and almost no materials and no curriculum; he has built the biology curriculum virtually from scratch, including regular biology and enrichment for honors biology students (who are part of the two regular biology classes). The teacher had introduced ethics in the fall, and this was the second activity this year incorporating ethics.

Lesson. The lesson was devoted entirely to a mock Congressional hearing on embryonic stem cells in research. The main question being debated was whether research involving embryonic stem cells should be permitted, and whether the federal government should provide funding. A subcommittee had recommended prior to the hearing that the federal government should fund this type of research.

Students had prepared for the activity by researching the issues on the Internet and writing up notes that the teacher reviewed ahead of time. All students in the class assumed roles. They were allowed to choose the roles they wanted to play and the positions they took. The room was arranged so that six “senators” holding the hearing were seated in a row facing the rest of the room. Facing the senators (and with their backs to the rest of the class) in a row were eight students representing various interests and giving testimony. The rest of the students were seated in groups around the room facing the hearing: senators-at-large, media, secretaries, general public. The media students filmed the proceedings.

Students overall appeared quite engaged in the activity. Some of the young men had dressed up in ties as they would for a real hearing. The fourteen students on the two panels (senators, witnesses) did all of the speaking, but for most of the lesson, all the other students were quiet and attentive. Each of the eight witnesses giving testimony had up to two minutes to advocate for their position, representing the perspectives of a disabled person paralyzed from the waist down and representatives from the insurance industry, a taxpayer/citizen’s group, a religious group, a drug company, the American Medical Association, etc. The six senators on the panel also took up to two minutes to ask questions of the witnesses. They then collected the written testimony and spent ten minutes in conference in another room. They returned with their decision, against federal funding of embryonic stem cell research.

The teacher asked students for feedback, and there were only a few suggestions for improvement, such as making sure that it was very clear whom students were representing. A few students commented that they enjoyed the activity, should do it again, and one said that he would like to participate in a real hearing.

Teacher Feedback and Dissemination. This teacher commented that the flexibility of the materials was a strength: he was able to infuse pieces at will into his curriculum without having to cover an entire module. He planned to incorporate more materials the rest of the year and to reinforce prior learning about ethical reasoning, which students did not refer to explicitly during their testimony, although they made ethical arguments. The teacher felt that some of his students had become more engaged in science content as a result of this activity, and some had taken on active roles that were uncharacteristic for them.
The small and collaborative faculty at the school, combined with the flexibility of the private school curriculum, make an ideal environment for the use of these materials. This teacher indicated little knowledge of ethics before the Summer Workshop, and he was enthusiastic about introducing ethics into his teaching. Though he had not shared ESC materials with anyone else, the other teachers (including the one other science teacher) were aware and supportive of this teacher’s activities. This teacher had been taking advantage of other opportunities for professional development in this area. He requested more resources to help students understand the kinds of positions that interested parties would advocate, such as taxpayer or insurance industry groups.

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**Evaluation Feedback on Classroom Observations**

As noted above, the evaluators observed six classrooms over the course of the school year. We have two areas of comment, one on use of the Ethics Primer, and the other on the ability of teachers to incorporate the discussion strategies into their curricula.

**Use of Ethics Primer.** The observations underscore the versatility of the Ethics Primer. We observed teachers using materials from the Primer with students across the academic spectrum from low to high achieving students, and in diverse classroom settings. Program staff might want to consider an effort to document and share, perhaps in a “how to” format, the creative ways that teachers are employing Primer materials.

**Incorporating Discussion Strategies.** In observing these six classrooms, it became apparent that incorporating ethics discussions, and in particular, employing the various discussion strategies such as small and large group discussions, stakeholder sessions, mock task forces, and Congressional hearings requires a very special skill set for both teachers and students. At the student end, the ability to effectively engage in these activities may depend on their own prior experiences with academic discussion of controversial issues and whether the school culture as whole fosters this kind of experience. In other words, have they been exposed to or developed the skills needed for this learning approach in their other courses, and do many or most of the teachers in their school employ these instructional methods? Are they already used to the norms and the various discussion modalities, or do the teachers have to introduce them anew for each class? We observed a range of student behaviors, from full engaged attention to tuning out and listening to IPods or chatting to each other during discussion time.

At the teacher end, there may be much to learn about how to effectively group students for discussion purposes, ensuring that all students, including the reticent ones, are called on to express opinions during class discussion, and keeping students on task and engaged during the various activities. In addition, just correctly planning the right amount of time for various stages of an exercise such as a Congressional hearing can be tricky. In the future the program might consider various means to provide further training, and perhaps school year mentoring as teachers experiment with implementing these learning activities. In addition, a video with a few examples of the most exemplary of these exercises as well as brief comments from teachers discussing how they addressed the challenges they ran into in using these strategies in their classes might be useful for further training, especially as part of the dissemination activities in Phase Two.

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**B. Program Activities Observations**

In addition to the ESC Workshop, CAUSE offers several other professional development activities during the school year. We observed two of these. The Ethics Short Course piloted offering an abbreviated version of the ESC Workshop on a Friday evening and Saturday during the school year. The ESC reunion is held every May.
for all past attendees of the ESC Workshop and offers continuing education credit; participants from the immediate past ESC Workshop are particularly encouraged to attend.

Ethics in the Science Classroom Short Course
Observation, April 2006

The Ethics in the Science Classroom Short Course took place March 31-April 1, 2006 with approximately fifteen new teachers and five staff, including lead teachers, and curriculum developers (Jamie Cooke, Elise Cooksley, Carla Calogero). The two sessions observed included “Tips from the Classroom” and “Treatment vs. Enhancement.”

The one-hour “Tips from the Classroom” session consisted of small group discussions in which the five program staff, lead teachers, and curriculum developers rotated through three groups. Cooke and Cooksley, who both have developed bioethics courses in their schools, discussed curriculum resources and modules. Jacob Dahlke discussed his experiences integrating ethics this year, his first year in the program, and as a fairly new teacher. Chowning and Calogero highlighted resources and activities in the binder that all attendees received. The ethical perspectives handout was recommended as a useful tool for any subject, not just science, that involves analyzing and explaining the rationale for arguments. The format was conducive to allowing the participants to have their pressing concerns addressed in an informal but efficient way.

The "Treatment vs. Enhancement" session engaged participants in a structured discussion of the ethics regarding medical treatments and products for therapeutic vs. non-therapeutic purposes. Calogero modeled leading an ethics discussion by engaging the participants in a dialogue in which more questions were raised than answers given.

The lead teachers encouraged Workshop participants to utilize NWABR materials and staff as resources: "Whatever you need, Jeanne will get it for you." Teachers appreciated that materials were available on NWABR's web site, could be used for free, and many/most were in Word format, allowing them to modify as needed. Overall, participants were highly engaged in both activities observed.

Evaluation Feedback on the Short Course
Some questions about the short course that may merit further examination for project dissemination follow:

- What is the impact of participating in the Short Course? Is the Short Course enough to give teachers some tools to try integrating ethics themselves? Has the program been able to follow up and verify what participants have been able to use?
- To what extent does the Short Course function as a way of recruiting for the Summer Workshop? How many Short Course teachers end up in the Summer Workshop?

Site Observation: ESC Reunion

The annual ESC reunion was held in May 2006 with all teachers who participated in ESC over the last five years invited, as well as Lead Teachers and Curriculum Developers. About fifteen teachers from the 2005 Workshop attended. The Education Director reports that the other 2006 participants were either in other states, not currently teaching, or completed an alternative reflection assignment. Other attendees included the project Principle Investigator and NWABR staff.
**Genetics: Counseling, Testing and Ethics.** The presentation on genetic counseling by Mercy Laurino was well received, and participants had many questions for her. She provided insights into what genetic counselors do, ethical dilemmas they face, how decisions are made, the type of advice they give. She also described work life and workplace issues, for example, how they handle their personal views if they conflict with client decisions. The handout packets included several examples of available online lessons and resources.

**Dilemmas of Practice: Breakout Sessions.** Participants broke into small groups for facilitated discussion on dilemmas of practice. It seemed to be challenging for facilitators to keep the discussions on track and also to get participants to describe how they had addressed these dilemmas. Issues raised included:

- Too much time investment to develop a lesson, especially if they only have one biology prep
- Hard to assess student background knowledge in areas of discussion. A science teacher knows their science background, but not their social science knowledge level. For example, if talking about Chernobyl—science teachers don’t know students’ knowledge level in history, political issues, even geography, so it is unclear how much nonscience learning will need to take place in order to have a fruitful discussion.
- When in the school year should a teacher try an ethics lesson? Some are saving it for after the WASL.

There are tensions in how to implement ethics lessons if the whole science department is not engaged with integrating ethics. Examples raised included the following:

- How do you implement ethics lessons and still keep in step with other teachers in the department who are not doing them?
- Some classes change at the semester, with considerable turnover in students. Then, teachers need to repeat the whole ethics framework, even though this is repetitious for the students who did not change teachers at the semester.

**Teacher practices and feedback on experiences**

Some participants shared how they worked ethics into lessons. One said that she does a “warm up” exercise every day and tries to squeeze ethics into that. They also gave several examples of benefits they found from integrating ethics into science curricula:

- Ties into science standards because it shows how discussions need to be evidence based and draw on data. Helps students see how to use evidence.
- Connects science to their world
- Shows them that these are their issues
- Teaches how to use data in decision making.
- Instills scientific literacy and helps students see value in others’ viewpoints. “Teens are so adamant about their views, so there is great value in having them take on a role as a stakeholder.”

**Assessing Student Learning.** In the afternoon, Jeanne Chowning used an Open Space Technology exercise to identify topics teachers wanted to discuss with each other. The selected topics were: To what extent can we talk about legalizing drugs, planning the Summer Workshop—ideas for topics and structure, Assessment and Culminating activities, ESC for the chemistry classes, Stem Cell Research/Planaria.

The following ideas were noted at the observed session on assessing student learning:

- Have students do research projects where they pick their own topic, for example, biological warfare, GMO foods, cloning of endangered animals. Present as PowerPoint, work in groups of two. Required to describe what scientists are doing and say where they stand on the issue. Teacher gives list of topics to the librarian, who put together a list of web resources.
- Give students a news article, ask them to assess it through the lens of the four different principles from the Primer.
- Teachers are looking for new strategies to conduct pre and post assessment, especially the “pre.” Some suggested checking with researchers such as Mark Windschitl who have done work in this area. Related
questions were raised around developing rubrics for assessment, how to assess ethical decision-making skills, and considering how to assess whether students understand the concept of the decision-making model.

**Evaluation Feedback on the ESC Reunion**

The program might consider following up on findings from two of its Reunion activities in order to facilitate development of ongoing teacher support: the identification of teachers’ “dilemmas of practice,” and the written reflection pieces. In each case, teachers provided suggestions that can inform program decision-making.

One teacher suggested holding the Reunion earlier in the school year. Perhaps convening the Reunion just before the start of the second semester would serve as a time for teachers to discuss and brainstorm solutions to barriers they are facing in integrating ethics discussions. This might give teachers a “boost” in implementing a greater number of ethics lessons.

**SECTION 5: EXPLORING STUDENT OUTCOMES**

*My students seem to see science more as a process than facts because of the relevant questions I now try to include in nearly every lesson*

*I feel that teaching ethics in science greatly increases a student's critical thinking skills, and helps them to develop a way to analyze new and different situations. They are also beginning to recognize the tremendous power of science, as well as the significant need for a strong ethical perspective in science to guide decisions.*

Although the evaluation was not charged with assessing student outcomes, we hope to contribute to the project’s understanding of how teacher participation in ESC may have affected students, and lay a foundation for further exploration of that issue. Each participating teacher differed from the others in types of discussion strategies employed, selection of topics used to integrate ethics and science, and amount of classroom time dedicated to ethics integration. Also, teachers represented different science disciplines, grade levels taught, and ability level of student. As a result, it would have been difficult to quantify student impact in a meaningful way. Instead, survey participants were asked to comment on impacts they observed for their own students. The remarks below are drawn from the surveys of 2003-04 (Appendix D) and 2005-06 Workshop participants (Appendix C), Lead Teachers (Appendix E), Curriculum Developers (Appendix F), as well as comments made in group discussion at the annual reunion in May, 2006. The survey questions were similar, but not identical: in particular, the 2005-06 teachers were asked to comment on impact on students’ academic or civic skills, while the others were asked more generally in what ways students were affected.

Many of the insights related either to science learning or to academic skills in general. In terms of science learning, teachers noted the following: an improved understanding of “what science is about”; an increased awareness of connections between science issues and public policy decisions that affect the students and their families; and enhanced engagement with the science curriculum as a result of greater interest in the issues. In some cases, teachers reported that the discussion format encouraged students who don’t usually participate to speak up.
In terms of general academic skills, it was interesting to note that the program’s emphasis on ethics integration dovetails with a new emphasis in many high schools of integrating subject matter across the disciplines. For example, in one school district, all students begin work on a research paper in 10th grade Biology, and continue working on the paper in English and Social Studies classes as part of their culminating project graduation requirement. The guiding question for the paper is: “Just because we can, should we?” The ethics curriculum serves as fodder for this process. Many of the ethics integration strategies involve some kind of oral and written report. Through this, students gain presentation and writing skills, while increasing their knowledge of science subject matter. Teachers noted an effect on students’ critical thinking skills, in particular learning to use evidence and not just relying on their opinions, and beginning to understand different perspectives.

The following quotes from the surveys are provided to demonstrate the range of insights across all of the program participants—Teacher Leaders and ESC attendees. They are included to amplify the science learning and academic skills impacts reported above. In general, respondents noted positive effects on students’ engagement with curriculum, understanding of why science is important, development of decision-making skills, and ability to make connections between classroom learning and application outside of school.

The students seem to be more involved in the lessons when they are presented the ethical issues and asked to discuss them. (Curriculum Developer)

For some, it was the first time “ethics” was presented and discussed with them. For all, it was an enlightening experience--made them realize that “science” is more than just labs and test tubes. (Curriculum Developer)

Several of my special ed. students were in the science class that I co-taught and it gave them an opportunity to be in a classroom where they had access to a real lab and could interact with typically developing peers. Some of them had a hard time with the abstract concepts in the ethics lessons but did contribute as much as they were able. (Curriculum Developer)

The students gained a greater interest in the subjects that I integrated ethics with. They have tend to get more involved in the ethics activities and have more questions for me. The ethical pieces allow the students to see how science affects them and society (Lead Teacher)

Students who have been less engaged have a new passion for learning the science behind some of the controversial topics in class, and students who have been excited about science always now see a whole new window of thought and study (Lead Teacher)

….Teachers report that students become more involved with current issues in science, better decision makers, and better writers. From my own experience, my students learned how to work within a diverse group and analyze difficult situations. They became aware of how important facts were in making a decision as well as how emotions can cloud the process…. (Lead Teacher)

Students were interested and interactive for the most part. They liked the fact that there were articles in the newspaper and news programs on TV about the current debate over stem cell research and they had some engaging discussions on the subject. They especially liked the articles we read about how this affected real people and their families. (2004-05 Participant)

They may not remember the five steps of mitosis, but they do understand the connection to cancer. (Reunion Participant)

…Ethical issues, I have found, act as a great motivation point for students. It gets the students more personally engaged in the material and allows them the opportunity to see that their peers have a variety of ideas outside of their own. PLUS, it helps students, who acknowledge those other ideas, also see the
merit in other people's thoughts and teaches them that to learn more about an opposing viewpoint is to be able to argue against that viewpoint more effectively later… (2005-06 Participant)

Students have often verbalized that ethics seemed hard at first. Most were not comfortable in sharing their thoughts, but when I set up a debate session, even the most reticent student was wanting to share their thoughts. (2005-06 Participant)

As for civic skills, newspaper reading, internet research, local community happenings were a great springboard for thinking, discussion and journaling civic skills. Parents were often surprised at what their kids would verbalize. So in many instances, the issues that students wrestled with (academics - more information at hand, civic skills - local, regional, national issues were constantly being practiced) were verbalized, discussed, challenged or written. (2005-06 Participant)

I have noticed that my students pay attention to the news more! They understand that different perspectives exist outside of their own. My goal, that which I teach and try to model, is that I don't have to agree with a different perspective, but I do need to try and understand it. I feel that teaching ethics in science greatly increases a student's critical thinking skills, and helps them to develop a way to analyze new and different situations. They are also beginning to recognize the tremendous power of science, as well as the significant need for a strong ethical perspective in science to guide decisions. (2005-06 Participant)

Through integration students can agree to disagree while discussing topics and use evidence to base their arguments. Academically, I believe that students retain more due to empowerment and can articulate information about different perspectives. (2005-06 Participant)

Most students will not pursue scientific careers, but can and will utilize skills and methods learned in their science classes. By introducing students to ethics, developing their abilities to think critically, logically and with empathy towards others, students can develop lifetime skills which will enable them to become better prepared citizens…. While I strove to develop some of these skills in the past, I feel that the training received through this program have helped me to develop stronger teaching skills and have given me a wealth of material to utilize as both background material and as fully developed lesson plans. (2005-06 Participant)

I've basically challenged the students to think more deeply about historical as well as current situations….I've also required them to read more challenging written material and to explain their understanding of that material in both written and oral formats (both individually and in small groups). In general, all of my students have responded well and display good writing and speaking skills...they still need to work more on listening…. (2005-06 Participant)

I know that makes science come alive for them, and dignifies their own thoughts. (2005-06 Participant)

I have seen my students struggling to understand the ethical issues involved in their research topic and the various points of view surrounding the topic. It's great to see that struggle. So much of my curriculum does not challenge students in that way. I have also had students come in to class with stories from the newspaper or evening news in which they are making the connections between science and society and the debate that is going on concerning some of the issues we have addressed. (2005-06 Participant)

The students seem to be more interested when discussing bioethical issues. As a result, their assessment scores increase. I also notice the students trying to be more aware of what they're saying before they say it and to really listen to other arguments. (2005-06 Participant)
Although many of the comments were glowingly positive, it is important to note that some teachers were not sure of the level of impact.

Some students began to use the vocabulary developed, but I can't say I noticed many effects in academics or civic skills. (2005-06 Participant)

….Academically, they seemed to find it very challenging to go to this next level of cognitive reasoning. This may be because of my lack of comfort with presenting the information as well, however, so time will tell more in this area. Ethical discussions and awareness dramatically increased the students interest in science, however, and caused them to respond passionately about the decisions they believe society should make in regard to genetic research, in particular. (2005-06 Participant)

Evaluation Feedback on Student Outcomes

The program hopes to explore student impacts in the future. Phase 1 findings, in conjunction with the research study noted below, may be useful in informing that proposed work. For example, it may be worthwhile to review and code the full set of collected insights on student outcomes as a basis for developing instruments targeted towards measuring student learning outcomes. It would also be useful to investigate whether, and in what ways, incorporating ethics discussion strategies affects students’ science knowledge.

As a separate CAUSE project component, a research study on student effects was conducted by Professor Mark Windschitl at the University of Washington (*The Missing Face of Inquiry in School Science: Ethical Investigation*, A Report on Classroom Studies of Ethical Discourse). This important piece of research should be incorporated into further explorations of student impact.

SECTION 6: PROGRAM EFFECT ON TEACHER LEADERS

*Working with NWABR has given me an opportunity to dialogue with other strong teachers about “best practices” when incorporating ethics into classroom curriculum. Working with scientists/mentors has increased my content/process expertise in the area of the life sciences.*

One of the CAUSE program goals is to develop a cadre of teacher leaders who train their peers, share program information, and develop specific curriculum units. The Teacher Leaders serve in one of two roles: Lead Teacher and Curriculum Developer. Lead Teachers take responsibility for developing the ESC Workshop, preparing resource materials and training exercises, and leading many of the Workshop sessions. They have other roles as well, including planning and leading the Ethics Short Course. Curriculum Developers prepare specific units and pilot them in their own classrooms, to date these have included one unit each on “HIV AIDS Vaccine,” “Stem Cell Research”, and Smoking Behavior—Genetics and Ethics.”

Over the course of Year 2, the evaluation conducted interviews and focus groups with the Teacher Leaders, which were discussed in the Interim Report. Two of the classroom observations were conducted with members of this leadership team. At the end of Year 2, Teacher Leader participants representing both years were asked to complete a short survey. The surveys questions varied slightly in order to align with the different tasks of each group. The survey asked them to address the following:

- What aspects of ESC did they share, and with whom did they share them
• In what ways, if any, they thought their participation in ESC affected their own students
• How often they incorporated various ethical decision-making strategies into their lessons
• The impact of their participation on their own professional development and on their classroom activities

This section summarizes the feedback derived from open-ended questions, relating to how serving as a Teacher Leader affected professional development and classroom activities. The feedback on dissemination, frequency of incorporating ethics lessons, and student outcomes are incorporated into the respective sections of this report.

Impact on Professional Development
Teacher Leaders were: In what ways, if any, has serving as an ESC Lead Teacher/Curriculum Developer affected your own professional development? One or more of the respondents reported the following effects: improved their pedagogical strategies; learned more about specific science subject matter; benefited from connecting with other teachers—both in collaborating with other Teacher Leader members and in working with teachers in their own schools or other institutions; and developed a new course or lessons for their own students. Representative quotes are included below:

Serving as a lead teacher has allowed me to work more effectively with adult learners who are also peers and colleagues. It has also helped me develop more collaborative skills as I work with my fellow lead teachers. Finally, it has pushed me to reinvent and improve everything I do, as there is no ceiling on how to do anything well.

I have had the opportunity to work collaboratively with other science teachers, with scientists, and other professionals that I never would have met. I’ve learned a lot about the subject of stem cell research, and have also been able to use that to come up with topics for a research paper. The paper will be an integrated unit between science class, English class and advisory.

It helps me integrate more ethics into the curriculum because I already have it ready to go instead of having to develop brand new curriculum during the school year. I also love the interaction with other teachers I work with designing curriculum. I always learn new ways to incorporate ethics into my classes and get new ideas.

This experience has given me more credibility and competence not only within my own classroom and school community, but it has also given me more credibility and competence within the greater educational community as I do “outreach” related to my experience as a lead teacher with NWABR. I have done workshops and presentations where I have shared the NWABR Ethics Primer and philosophy with mostly secondary teachers at various science and social studies conferences in the past three years. I have also shared the primer and philosophy at workshops for the WA State Office of Superintendent of Public Instruction Winter and Summer Institutes. I am in constant communication with leaders at the WA State OSPI level in areas of both science and social studies classroom-based assessments to assure that the methodology within the PRIMER is used in this area, to provide more “authentic” assessment of student learning in both science and social studies.

I have shared what I have learned to other teachers and it has become a part of our curriculum that all students experience.
Impact on Classroom Activities
Teacher Leader Team members were asked: In what ways, if any, has serving as an ESC Lead Teacher/Curriculum Developer affected your classroom activities? The comments centered primarily around an increased comfort with presenting the material and also familiarity with various structured academic controversial discussion strategies.

I incorporate more into the classroom when I have designated time to work on planning curriculum instead of having to develop it as the school year is going.

I find I am more likely to critique other activities and rewrite them, using ideas I gleaned from my work with NWABR.

The experience has given me more confidence in developing my own materials, and encouraged me to do so more frequently when I'm not satisfied with various activities.

In the classroom, I am using the materials I've help design. My students enjoy the “change of pace” because the unit uses different methods than I normally would do. We have role playing, games, etc... in the unit.

Several of my special ed. students were in the science class that I co-taught and it gave them an opportunity to be in a classroom where they had access to a real lab and could interact with typically developing peers. Some of them had a hard time with the abstract concepts in the ethics lessons but did contribute as much as they were able.

It has brought in different ways of presenting ethical materials such as congressional hearings and role playing.

As with anything, teaching something is the best way to learn something. My comfort level with ethics as a discipline and as classroom practice has become so comfortable and near second nature. I incorporate the classroom practices and ethics modules to anything I teach whether the specific content is science or not.

Finally, Teacher Leaders were asked: What suggestions do you have for improving the experience of serving as an ESC Lead Teacher? 10

.... The only suggestion that I would make is to consider working toward a more “interdisciplinary” approach. This direction is authentic and “real life.” Not all students will become scientists; however, they will need the basic knowledge, skills, and dispositions necessary to make informed and ethical decisions in their personal and public lives as future citizens within a pluralistic, democratic society within the context of a complex, interdependent world. I would like to see more intentional connection with the social studies.

Provide more opportunities for course work on bioethics either online or during the summer.

I am quite thrilled with the Lead Teacher experience. If anything, I would love to help develop a training FOR lead teachers so that more experienced teachers can transition into lead teachers.

Over the years, the Ethics in the Classroom program has utilized the Lead Teachers in a greater capacity. This has helped develop them as resources for the attendees. While I would have answered this question differently a year ago, the increased use of them throughout the program has been positive.

10 Question not asked of Curriculum Developers as their role is not continuing in Phase 2
Evaluation Feedback on Teacher Leader Development

In the future, the program might further explore how to increase the visibility and recognition of the Teacher Leaders in their schools and districts. This year, these teachers were responsible both for recruiting participants for the Ethics Short Course as well as teaching the sessions. These two roles—recruitment and teaching—might be further expanded by asking the Teacher Leaders to seek out training opportunities in their home schools and districts during in-service days, or as part of school wide or departmental presentations.

SECTION 7: RECOMMENDATIONS AND PLANNING FOR CAUSE PHASE TWO

The project’s initial funding phase, consisting of developing new curriculum units and providing professional development training, is now completed and CAUSE is moving into Phase Two (Years 3, 4). In this second phase, staff will develop new curricula and expand professional development delivery strategies. In order to inform these planned activities, the Phase One evaluation explored how participants are already sharing project information, their interest in future training, and their suggestions for improvements. This section reports on the findings derived from the following evaluation instruments:

- Questions relating to dissemination, included in surveys sent to Years 1 and 2 ESC Workshop participants, and the members of the Teacher Leader team, i.e., the Lead Teachers (LTs) and Curriculum Developers (CDs).
- Questions relating to interest in future training, included in the surveys sent to Years 1 and 2 ESC Workshop participants.
- An open-ended question asking about suggestions for ways that NWABR could facilitate the use of ESC in their classroom, included in the Year 2 Exit Survey.

A. Dissemination Activities

ESC participant teachers are not asked to disseminate information about the program content, or to recruit teachers to the ESC Workshop, although of course they are free to do so. LTs and CDs are asked to recruit future Workshop participants, but are not asked to share curriculum resources. Measuring whether either of these groups has recruited future participants or shared materials is one way to look at perceived usefulness of the project components. It is also helpful in order to see to what extent materials and resources have already been shared by word of mouth with those who have not participated in training, but may be interested in doing so in the future.

Year 2 participants, Lead Teachers, and Curriculum Developers were all asked in their respective exit surveys to report on how they voluntarily disseminated program information. Year 1 participants were asked this question in the Sustained Effects of Workshop Participation Survey administered in March, 2006. In Table 7 below, findings for Year 2 ESC Workshop participants are compared with findings from the Teacher Leader team members (LTs and CDs). In comparing the results across the groups, it is important to keep in mind that Year 2
participants have had less time than Year 1 participants or LTs and CDs to disseminate the information. At the same time, Year 2 participants may have better recollection of doing so than the others.

It is clear from Table 7 that CDs, LTs, and participant teachers engaged in fairly widespread dissemination of information about both the ESC Workshop and other NWABR sponsored education opportunities, not only in their own schools but with teachers in other schools as well. ESC participants reported several categories of colleagues with whom they had shared materials and information about the Workshop. Types of information included the Ethics Primer, Workshop notebook materials, curriculum units, other ethics resources, as well as information about participation in the Workshop and other NWABR opportunities.

Over half of the program leaders (CDs and LTs) as well as the ESC participants shared each type of information with science teachers at their own schools, and almost as many shared with teachers at other schools. Non-science teachers at the same school were the third most common group receiving information. Sharing was least common with school department heads and administrators. CDs and LTs as a group were generally more likely to share information than ESC participants with every type of school personnel except for school administrators, where both groups (CDs/LTs and participant teachers) shared information about equally.

Year 1 participants are not included in the table although the findings are in Appendix D. We note that of the six who responded, four or five shared each type of information with teachers at their own school, and three shared information about the ESC Workshop with their department head.

**Evaluation Feedback on Dissemination Activities**

In the future, dissemination strategies might be tied even more strongly to the program’s goal of “building a community of learners.” While participants do appear to be disseminating program information and content, it might be worthwhile for the program to be more deliberate in encouraging, documenting, and following up on these activities. The program should be able to take advantage of the excitement that participants express towards the training and classroom impact and parlay that into their dissemination strategy. To date, the program has received about the same number of applicants as there are slots—so the application process has not been competitive. However, as more teachers hear about the program, certain requirements could be added as part of the application process, including asking prospective attendees to document how they will share program information and strategies in their department, building, and with their principal. In a competitive application process, points could be awarded for an applicant’s dissemination plan, for example awarding points for plans to share information with department heads, since that does not seem to be currently happening to a full extent. Also, after participating in the program participants might be asked to identify specific teachers that they think would benefit from this program, and the program could send application materials to those potential candidates.
Table 7. Sharing Information about the Workshop: Curriculum Design Team and Lead Teachers (CD/LT) and Participant Teachers (ESC PT) (%)

<table>
<thead>
<tr>
<th>Information Shared</th>
<th>Science teachers at my school</th>
<th>Teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CD/LT</td>
<td>ESC PT</td>
<td>CD/LT</td>
<td>ESC PT</td>
<td>CD/LT</td>
</tr>
<tr>
<td>Shared Ethics Primer with...</td>
<td>80</td>
<td>72</td>
<td>50</td>
<td>39</td>
<td>30</td>
</tr>
<tr>
<td>Shared materials from the Workshop notebook with...</td>
<td>70</td>
<td>55</td>
<td>50</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Shared specific ESC curriculum units (e.g., animal testing) with...*</td>
<td>80</td>
<td>39</td>
<td>30</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>Shared information about ethics resources (e.g., websites) with...</td>
<td>70</td>
<td>61</td>
<td>50</td>
<td>44</td>
<td>10</td>
</tr>
<tr>
<td>Shared information about how to participate in the Summer Workshop with...</td>
<td>90</td>
<td>61</td>
<td>50</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Shared information about other educational opportunities sponsored by NWABR with...</td>
<td>30</td>
<td>67</td>
<td>40</td>
<td>28</td>
<td>30</td>
</tr>
</tbody>
</table>

Note: For CDs/LTs, N = 10; there were seven LTs and three CDs. For ESC PTs, N = 18.

* This question was asked of Curriculum Design Team members and teacher participants in two ways: “the unit I developed” and “other ESC curriculum units.” Responses from these two items are combined.
B. Interest In Future Training

ESC Workshop participants from Years 1 and 2 were asked about their interest in future training, in particular, the delivery options the program is considering in Phase Two. Their responses may be of use as staff assess how to best provide continuing education to previous Workshop participants. In addition to the responses in Table 8 below, specific suggestions were offered in an open-ended question about improving ESC, and are included in Section C. Please note that we cannot assume that the stated preferences of past participants are the same as those who have not participated in the ESC Workshop. For example, distance learning, while not a particularly popular option with this group, may appeal to teachers who were not able to enroll in the onsite Workshop. Conducting a needs assessment of a target audience composed of those who have not participated to date may be useful in determining what delivery methods would work best for them.

Table 8. Likelihood of Participation in Future NWABR Training: Year 1 and Year 2 Participants

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online/ distance learning course*</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>4</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Leadership Institute so that I could train others and disseminate materials (week-long)*</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Advanced level summer Workshop (week-long)</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>11</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Workshop on specific issues/curriculum, e.g. HIV vaccine trials (day-long, held in a central location)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>12</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Training/presentation provided at my district (day-long)</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Note: For Year 1, N = 6; for Year 2, N = 18, except as noted. Row totals within each year may not sum to 100 due to rounding.

* One teacher in Year 2 did not respond to this item; N = 17.

C. Other Recommendations for Improving ESC

Continue to provide training in the explanation and application of ethics with real life curriculum examples so the comfort level of applying it in the classroom will increase. I also really enjoyed the discussions and presentations at the May reunion day.

In order to identify participant suggestions for future improvements, ESC participants from both years were asked: Please describe how NWABR could facilitate your use of ESC. Several participants called for various ways to continue expanding lessons and provide follow up training opportunities. Most responses are listed below: we excluded several along the lines of “keep up the good work.”

I think it would be helpful to see what districts, regions, local communities are using and drafting lessons with simple, easy to obtain materials. This would help teachers, who are often limited with funding, time, etc. and help facilitate teaching this material.
It would help to have these same lessons critiqued by teachers, students, parents, administrators to give lessons and a stamp of approval. Administrators look for these labels, as well as teachers and parents.

I use the website as a first reference when I am building a new lesson. Continuing to regularly update the website will facilitate me in that regard. I would love to attend any workshop that they provide, so the more the better!....

…I believe that NWABR should reach out to teachers outside the science community, particularly those teaching social studies, civics, economics, history and government.

I think small follow up sessions would be helpful. I loved our reunion in May, but it's so late in the year. I know people come from all over to do this program, but maybe a January or November workshop would keep the enthusiasm up from the summer workshop. It's so easy to get swept away when the school year starts and I think a little follow up would be good.

Continued sharing of information about upcoming events or new resource materials and certainly sponsoring events like our recent reunion; to bring us together for discussions and work sessions will help to keep our involvement and momentum going forward!

I find what they are already doing more than sufficient. There's a lot of material that I have that I still haven't, but want to incorporate into my teaching at this point. Time is what is lacking....

Follow up workshops and trainings on ethics in general and specific bioethical issues.

Unless NWABR can give me more time with my students, I don't think there is anything else that they can do. I highly praise NWABR with their approach to professional development and with the experiences that I have had at the summer workshop and spring reunion!

Send updates, additional classes to take, seminars, etc... via e-mail to participants. Of course, you already do that now to some extent, but I feel that there must be more opportunities to energize teachers and motivate them along these paths.

I very much would like to work with some of the film clips we were introduced to, however some are very hard to come by and are on a lease which has to be renewed every two years for $25. Would there be a way to exempt schools from this lease?

Possible meeting more often with groups in my area that have attended past workshops.

Add new areas of ethical issue into other topics like chemistry or physics. Talk about the ethics of nuclear energy for chemistry for example.
APPENDIX A

ETHICS IN THE SCIENCE CLASSROOM
INTERIM EVALUATION REPORT

PLEASE NOTE:

THE PAGINATION OF THE INTERIM EVALUATION REPORT INCLUDED HERE HAS BEEN RETAINED AS IN THE ORIGINAL.
ETHICS IN THE SCIENCE CLASSROOM

INTERIM EVALUATION REPORT

Prepared for
Northwest Association for Biomedical Research

by
Carolyn Cohen
Lead Evaluator

and

Davis Patterson PhD
Evaluator

January 17, 2006
EXECUTIVE SUMMARY

Evaluation Background

This Interim Report summarizes evaluation findings for the period July-December, 2005. Findings are drawn from the Ethics in the Science Classroom Participant Entry Survey, Summer Workshop Survey, site observations, and interviews and focus groups. The final report will contain substantial additional data, including the results of a mid-year questionnaire, the Participant End of Year Survey, and further site observations and interviews.

Summer Workshop Impact

The 2005 Summer Workshop attracted 21 participants. As a group, they were engaged and enthusiastic, and took advantage of every learning opportunity. They attended the optional evening sessions, attended day sessions on time, and worked in the computer lab in the evenings. Each participant completed an entry survey prior to the first session. In addition, at the close of the five-day workshop all participants completed a survey which measured participant satisfaction and perceptions of how useful the training would be for them when they returned to the classroom. The end of year survey will provide an additional important measure of program impact. Selected findings from the entry and post-workshop surveys follow.

Not surprisingly, the vast majority (86%) of participants agreed that science instruction must include a focus on ethics. Interestingly, before the workshop a large majority (67%) felt comfortable incorporating ethics into science lessons, and at the same time, 76% said that they were “inadequately” or only “somewhat prepared” to “incorporate ethics issues into a science lesson.” This suggests that their primary objective in attending was to acquire practical tools to help them do so. Regardless of their entering level of comfort with incorporating ethics, all participants (100%) reported that the workshop helped them “feel more comfortable with incorporating ethics into my science units.”

The participants gave high rankings for the workshop’s overall organization, preparedness of presenters and quality of take home materials. There were many comments expressing appreciation for the plethora of materials, and for being exposed to online resources. In particular, the Ethics Primer was highly noted. When asked, “Please rate the likelihood that you will use the following materials in your classroom,” the Ethics Primer was selected as “very likely” by more teachers (71%) than any other material.

Participation had a significant impact on the teachers’ familiarity with relevant material. They entered the workshop with greatly varying degrees of familiarity with classroom resources available from scientific institutions such as the NIH—some feeling very familiar and others not at all. The workshop helped everyone—the nine teachers (43%) who felt unfamiliar with these resources, and even the one third of teachers who felt most familiar at the beginning— become more knowledgeable about these materials by the end of the workshop. An important change was noted in familiarity with NIH materials. At the start of the week, just seven of the teachers (33%) agreed or strongly agreed with the following statement: “I am familiar with classroom resources available from scientific institutions such as the National Institutes of Health (NIH).” At the end of the week, every participant (100%) agreed with this statement.
The Summer Workshop survey specifically addresses impact on teaching skills, including both how the training affected participant understanding of science and ethics knowledge, and how well the sessions developed teaching skills and strategies for incorporating ethics discussions. When asked about the workshop impact on their own understanding of science and ethics, teachers were most likely to agree with the following statements:

- I have a better understanding of the role of ethics in scientific research.
- I have a better understanding of strategies to incorporate ethics into science lessons.
- I feel more comfortable incorporating ethics into my science units.

Since the questions relating to developing the skills to incorporate ethics into classroom work were asked at the end of the workshop, but before trying them out in the classroom, the responses reflect early perceptions of usefulness. It will be important to examine end of the year responses as well. After completing the summer workshop, the two highest rated skill-related items were “Incorporate ethics issues into a science lesson” and “Modify a curriculum unit in science to include ideas about ethics,” which were considered “very useful” by 86% and 81% of the participants respectively. These two items align with the program goals, and the strong findings appear to validate that the workshop is meeting its intended purpose. The other top items, rated “very useful” by 76% of the participants, were:

- Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments
- Guide students’ learning related to ethics in science lessons
- Help students recognize ethical dilemmas in science
- Help students understand perspectives different from their own

Prior to engaging in the Summer Workshop, participants were fairly evenly divided between those who felt they already had a good understanding of ethics and those who did not. However, regardless of their entering experience, by the end of the workshop, nearly everyone (94%) strongly agreed or agreed that their understanding in this area had improved as a result of the workshop.

Initial Conclusions

Interim findings are intended to guide future development of the 2006 Summer Workshop and future efforts to expand and disseminate this work. As noted above, a thorough analysis of findings for all three years will be conducted at the project close.

The workshop as a whole seems to be meeting its goals. Participants entered stating they were interested, but not prepared, to incorporate ethics discussions into their curriculum. They gave high ratings to the workshop for helping them develop skills in incorporating ethics into a science lesson. Overall, presenters received high marks. However, the findings raise some questions about the program structure. Some participants were overwhelmed by the amount of material presented, and ratings for the sessions led by lead teachers were somewhat lower than those of other presentations.

The workshop appears to serve a diverse group of science educators. The participants worked in diverse settings. For example, their instructional areas spanned a wide range of science disciplines, and attracted teachers from both public and parochial schools. Participants were
distributed across a fairly wide spectrum in terms of their previous experience and strategies relating to incorporating ethics into a science curriculum.

They also teach a diverse group ranging from students enrolled in accelerated courses to those in Special Education. The training and materials appear to be useful for teachers and students across the continuum. The two classes observed by the evaluation this fall included an International Baccalaureate class for accelerated and highly motivated students, and a class for students who have not succeeded in traditional settings and are served in an alternative program. In both cases, the teachers successfully used materials presented in the workshop.

However, it is important to note that with such a wide range of teaching situations, it is impossible to meet each teacher’s needs and interests. Participants noted that some of the sessions and curriculum units were not relevant to their course load, and that some of the teaching strategies were not of interest to them.

**Recommendations**

A full set of recommendations will be developed at the end of the Phase 1 grant period. Based on evaluation activities conducted thus far, the following initial suggestions are offered.

**Document and share how teachers are using this training in the classroom.** Teachers are using a variety of strategies in incorporating the lessons and primer. We suggest that the program document as many of these as possible, share them at next summer’s session, and incorporate them into program materials.

**Review workshop feedback to modify Summer 2006 Workshop.** The survey findings and extensive comments provide several specific suggestions for program improvement. It may be worthwhile to explore strategies to strengthen the training and roles for the Lead Teachers.

**Show teachers how to make time to incorporate ethics lessons.** When asked what barriers they anticipated in incorporating ethics lessons, many teachers stated concerns about having the time to add these lessons into their lesson plan. However, many workshop participants have figured out how to do this. The program can collect, document, and disseminate these strategies. The evaluation will ask teachers for examples of how they are making time for the ethics components as part of the upcoming mid-year survey.

**Follow up on Dissemination Ideas.** The Lead Teachers and Curriculum Design Team provided several suggestions for disseminating and expanding this work. Many of these ideas can be incorporated into the proposed dissemination grant. They suggested increased dissemination through teacher professional associations, working with principals to promote the course, offering mini-courses on teacher professional development days, offering the workshop in different locales, and using Lead Teachers to travel to different schools and model lessons.
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SECTION 1: BACKGROUND

The Collaborations to Advance Understandings of Science and Ethics (CAUSE) program is in its third grant year. This Interim Report covers the period July 1, through December 31, 2005. The Interim Report primarily serves a formative purpose. It includes findings from the Summer Workshop, which can be used to improve the session for next year. It also includes informal notes on program observations to date, which the program can use to further refine teacher support, and to plan for further effective dissemination. Much of this data has already been shared informally with the project director, in order to facilitate making improvements in a timely manner.

The final report, due in August, 2006, will be primarily summative, and include a multi-year analysis of teacher entry and year-end survey findings for Years 1, 2 and 3. It will also report on evaluation tasks to be completed in the first half of 2006 including: additional site observations, interviews with advisory board members, and the results of additional questionnaires that will be disseminated to summer workshop participants, Lead Teachers, and curriculum developers this spring. The evaluation timeline can be found in the Appendix.

Year 3 Evaluation Activities to Date
- Review of program materials and evaluation reports to date
- Review and revision of Year 1 baseline and end of year Participating Teacher surveys
- Review and revision of Year 1 Summer Workshop Survey
- Administration of Entry and Summer Workshop surveys
- Initial analysis of Summer Workshop survey
- Observation of five-day Summer Workshop
- Focus groups with Lead Teachers and Curriculum Writers
- Informal interviews with teacher participants
- Site observations of two classrooms, one each in Seattle and North Bend, Washington
- Initial development of mid-year questionnaire
SECTION 2: YEAR 3 EVALUATION PLAN

Background and Purpose

This evaluation plan for the Collaboration to Advance Understanding of Science and Ethics (CAUSE) covers the period of July 1, 2005 through August 31, 2006. The evaluation will focus on capturing the effects of the CAUSE program, with a particular focus on assessing the impacts of the Ethics in the Science Classroom Summer Workshop.

Evaluation Questions

The evaluation will consider the following questions:

What are the impacts of participating in the Ethics in the Science Classroom Summer Workshop?
• In what ways did the workshop affect participants’ knowledge and understanding of science and of ethics?
• In what ways has participation affected teaching strategies, curriculum content, and classroom practice?
• What other impacts has the workshop experience had on participants?
• In what ways, if any, do teachers perceive that their participation in the workshop has affected their students’ outcomes?
• What challenges do teachers face in implementing lessons from the Summer Workshop? This includes lesson plans they developed themselves and lessons provided to them as part of the curriculum.
• What is the quality of the workshop as a professional development experience? What is the quality of program materials?
• What improvements or changes should be made to the workshop?

How effective are the lead teacher/curriculum developer professional development activities?
• What are the activities and support offered to Lead Teachers and Curriculum Developers?
• What are the impacts of participating as a Lead Teacher or a Curriculum Developer?
• In what ways have Lead Teachers and Curriculum Developers furthered project goals? For example, to what extent have they disseminated information or mentored other teachers?

In what ways does CAUSE contribute to enhancing the teaching of bioethics in the classroom?
• To what extent has the program been able to disseminate curricular materials to date?
• What other information and support has been developed that enables teachers to incorporate bioethics lessons? What is the quality of this support?
• How has the ethics primer been received and utilized?
Evaluation Methodology

The evaluation will employ a mixed methods approach, using interviews, observations, focus groups, and surveys to collect information on project outcomes.

Interviews and Focus Groups. Formal and informal interviews and focus groups will be conducted with participants and Lead Teachers at the Summer Workshop (2005). Informal interviews will be conducted at the May, 2006 reunion. In addition, interviews will be conducted with the project director and selected advisory board members or other key project leaders.

Site Observations. Observations include the Summer Workshop (2005), and if time allows, part of the 2006 summer session. In addition, to the extent possible, classroom observations will be conducted with participating teachers. Finally, the evaluators plan to observe program events such as the May 2006 reunion and the 2006 Curriculum Advisory Board meeting.

Surveys. In Year 2, participants will complete three surveys: program entry, end-of year, and workshop satisfaction. Year 3 participants will complete summer workshop satisfaction surveys. Selected Year 1 and 2 participants will be sent an informal questionnaire via email, in order to collect information on how they are using Ethics in the Science Classroom curriculum.

Transition from Year 2 Evaluation Plan
The program transitioned to a new evaluation team in July, 2005. The current evaluation team worked with program staff to review the existing entry and post workshop questionnaires. In order to ensure that data could be compared across the years, as many as possible of the survey items from the previous year were kept intact. However, some modifications were made in order to reflect changes in curriculum between Years 2 and 3. The previous evaluation firm, Horizon Research Inc., generously gave permission to the current evaluation to use existing survey items, and shared all previously collected data so that year to year comparisons can be conducted in Summer, 2006.

Reporting

Reporting is designed to meet program needs and will take place both formally and informally. The evaluation will deliver an interim report in January, 2006, and a final report on August 31, 2006. The evaluation will also submit a report and/or attend and present to the Professional Development Advisory Board meeting. In addition, the lead evaluator will conduct informal, monthly phone check-ins with the project director.

The Final Report will include the following:
- Analysis of Summer Workshop satisfaction surveys including Year 1, 2, and 3 findings,
- Analysis of pre-and post-program survey data for Year 2, and a comparison of selected question items for Years 1 and 2,
- Findings from the informal questionnaire relating to classroom use of curriculum,
- Results from the Lead Teacher and Curriculum Developer questionnaire,
- The Interim Report, which will be included as an Appendix,
- Information gathered from observations, focus groups and interviews will be used to provide a context for both the final and the interim reports.
SECTION 3: FINDINGS

The Interim Report findings section includes an analysis of the CAUSE Summer Workshop survey, the initial findings from the Year 3 Entry Survey, and site notes from focus groups and interviews.

Survey Findings: Background

Evaluation Activities

As part of the evaluation, the entire five-day Ethics in the Science Classroom Summer Workshop was observed. This allowed the evaluators to better understand the training program, and to meet and informally interview participants. It also gave workshop participants an opportunity to hear about the evaluation goals and plan, and to make a personal connection with the evaluators who would be contacting them later in the year.

The evaluators administered two surveys at the workshop. Participants completed an entry survey on the first morning as part of the opening exercise. Then, as part of the closing activities of the five day workshop, they completed a workshop satisfaction survey. All 21 participants completed both surveys. The instruments used in both cases were developed for the Year 2 evaluation, and generously shared by Horizon Research Inc., although they were somewhat modified by the current evaluators for use in Year 3.

Workshop Attendance

This year, 21 teachers participated: 19 from the state of Washington, one from Alaska, and one from Ohio. Four of the participants teach in private parochial schools. They represented a combination of middle/junior high and high school teachers. Many of the participants teach more than one course, and some teach both science and non-science courses. Participants were asked to identify all the courses they teach. The most common courses taught were biology (15), Life Science (10), Environmental Science (8), and Chemistry (6). In addition to the sciences, teachers also taught English/Language Arts, art and psychology. One participant taught math and English but did not teach any science courses. A full listing of the teacher background can be found in the Appendix. Most were high school teachers who teach at more than one grade level.

There were 13 female and eight male participants. In terms of ethnicity, one each identified as Hispanic, Native Hawaiian/Pacific Islander, Asian, and Native American/Alaska Native; seventeen were Caucasian, and one participant did not answer the ethnicity question.
Program Entry Surveys

PreWorkshop Expectations

On the first day of the workshop, teachers were asked in the entry survey, “What do you hope to gain by participating in this program?” Participants wrote that they wanted the following: to learn more about ethics; learn how to incorporate ethics into their curriculum; to leave with specific ethics lesson plans, instructional materials, and curriculum ideas; new resource materials; and to learn new strategies to help students think about ethical issues. The following comments represent typical responses:

- I hope to learn more about ethics and how to incorporate ethics into my class while still hitting all the content targets that I need to. I also hope to walk away with at least one lesson plan for my class and a lot of resources to create more lesson plans.

- First and foremost, I am hoping to gain an understanding of the formal field of ethics as a discipline. Second, I would like to gain a practical knowledge of how to incorporate this into my classroom lessons (including learning how to assess student knowledge). Finally, I am looking forward to learning what resources are available for me to use to assist in implementing ethics into my curriculum.

Entry Survey Findings

The following results are based on ratings of teachers who “agree” or “strongly agree” compared to those who “disagree” or “disagree strongly” with statements reflecting their understanding of the role of ethics in science and their comfort and familiarity incorporating ethics into science teaching. Detailed tabulations of survey items are in the Appendix.

- This group of teachers was evenly divided (10 respondents each) between those who felt they had a good understanding of ethics and those who did not. Note that nearly everyone (20 of 21, or 94%) agreed or strongly agreed that their understanding in this area had improved as a result of the workshop.

- The vast majority (20 or 94%) agreed that ethics is important in bioscience research, and that science instruction must include a focus on ethics (18 or 86%). This is not surprising: according to their comments, the reason they went to the workshop was to learn how to incorporate ethics into their science teaching.

- A substantial minority (8 or 38%) felt that students had to understand science content fully before ethics could be addressed, but the majority (11 or 52%) disagreed.

- There was substantial agreement that not only do scientists have a responsibility to consider the ethical implications of their work (20 or 94%), but that they are also the ones best suited to address ethical questions (17 or 85% disagreed or strongly disagreed: this item was phrased in the negative).

- Four teachers, or 19%, responded that they did not feel comfortable incorporating ethics into science lessons, but interestingly, a large majority (14 or 67%) did feel comfortable,
which suggests that their primary objective was to get practical tools to help them do so. Nevertheless, the workshop still helped everyone (21 or 100%) feel even more comfortable incorporating ethics (according to the post-workshop satisfaction survey). Last year’s Entry Survey revealed only a slightly different pattern in that more teachers (19 or 90%) already felt comfortable integrating ethics into science lessons before the workshop, while just two (10%) did not. Like the 2005 teachers, all of the 2004 group who responded to their Post-Workshop Survey (17 teachers; four did not respond) reported feeling even more comfortable as a result of the workshop.

- As Table 1 shows, teachers entered the workshop with greatly varying degrees of familiarity with classroom resources available from scientific institutions such as NIH—some feeling very familiar and others not at all. The workshop helped everyone—the nine teachers (43%) who felt unfamiliar with these resources, and even the one third of teachers who felt most familiar at the beginning of the workshop—become more familiar by the end of the workshop. Thus the workshop was successful in addressing a group of teachers with diverse backgrounds in their resource knowledge.

### Table 1: Familiarity with NIH Resources

<table>
<thead>
<tr>
<th>I am familiar with classroom resources available from scientific institutions such as the National Institutes of Health (NIH).</th>
<th>Disagree/Strongly Disagree</th>
<th>No Opinion</th>
<th>Agree/Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Survey</td>
<td>9</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Post-Workshop Survey: “As a result of this workshop…”</td>
<td>0</td>
<td>0</td>
<td>21</td>
</tr>
</tbody>
</table>

Table 2 shows that between eight and 16 teachers (38% to 76%)—felt inadequately or only somewhat prepared to accomplish every item related to integrating ethics into their curricula and raising students’ levels of ethical awareness and ability to engage in ethical reasoning related to science. The largest number felt least prepared to:

- modify a curriculum unit in science to include ideas about ethics,
- guide students’ learning related to ethics in science lessons, and
- incorporate ethics issues into a science lesson.
Table 2. Entry Survey: Preparedness for Ethics Lessons

<table>
<thead>
<tr>
<th><strong>Please indicate how well prepared you feel to do each of the following:</strong></th>
<th>Not Adequately/ Somewhat Prepared</th>
<th>Fairly/ Very Well Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help students understand perspectives different from their own.</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Aid students in separating fact from opinion.</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Develop students’ scientific reasoning ability.</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Help students recognize ethical dilemmas in science.</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Use the Internet to find resources for teaching ethics in science.</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Modify a curriculum unit in science to include ideas about ethics.</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Guide students’ learning related to ethics in science lessons.</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Incorporate ethics issues into a science lesson.</td>
<td>16</td>
<td>5</td>
</tr>
</tbody>
</table>

The fact that three quarters of teachers felt inadequately or somewhat prepared to incorporate ethics issues into a science lesson stands in stark contrast to the fact that two thirds agreed or strongly agreed that they “feel comfortable” incorporating ethics issues into science lessons on the same survey. Clearly some teachers who said they felt comfortable nevertheless did not feel very prepared. This seeming contradiction may point to a difference between being feeling comfortable—perhaps with the idea of integrating ethics, or in a very general way—versus actually feeling prepared to do so.

The largest numbers of teachers (13 or 62%) felt most prepared to do the following:
- help students understand perspectives different from their own,
- aid students in separating fact from opinion, and
- develop students’ scientific reasoning ability.

Intriguingly, these are three skill items that did not mention ethics explicitly. Although these skills provide a foundation for infusing science with ethics content, teachers may already have had practice in these areas from their past teaching of science (particularly the last two items).

Eighty-five percent to 100% of the teachers reported that the workshop was useful in developing their skills as measured on every one of these nine items. Once again, we see that the workshop successfully met the needs of teachers who came to it with varying levels of preparedness.

The Entry Survey also assessed baselines in science and ethics teaching activities by asking teachers how many of their lessons during the school year included 12 different teacher strategies and student behaviors, ranging from “never” to “over 30 lessons.” Twenty of the 21 teachers taking the survey responded to these items, displayed in Table 3.
Table 3. Entry Survey: How Often Teachers Incorporate Ethics/Discussion Strategies

In thinking of your science lessons over the course of the school year, how often do the following things happen?

<table>
<thead>
<tr>
<th>Behavior</th>
<th>0 to 5 lessons</th>
<th>6 to over 30 lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students give their opinions during discussions.</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Students respectfully disagree with others’ opinions during discussions.</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Students reflect on their learning through journals.</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>I refer to resources developed by scientific institutions when modifying lessons.</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Students discuss a case study related to the content.</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Students are confronted with an ethical dilemma in a scientific context.</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH) when planning lessons.</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>I modify lessons to include ethical issues.</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Students use evidence to back up their arguments during discussions about ethics.</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Students engage in role play scenarios (e.g. moot court, panel discussions, or mock congressional hearings) to discuss a scientific or ethical issue.</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Students analyze the scientific or ethical issues in a movie.</td>
<td>19</td>
<td>1</td>
</tr>
</tbody>
</table>

On most items, the largest number of teachers reported that the strategy or behavior occurred in zero to five lessons during the year. Seventeen to 19 teachers (85% to 95%) reported that the following, all student behaviors, were least likely to occur in their classrooms:

- Students use evidence to back up their arguments during discussions about ethics.
- Students engage in role play scenarios to discuss a scientific or ethical issue.
- Students analyze the scientific or ethical issues in a movie.

In addition, 25% of teachers also reported that they had never drawn on resources developed by scientific institutions such as the NIH when planning lessons and that students had never discussed a case study related to the content.

The top three behaviors occurred in the classrooms of 12 to 19 teachers (60% to 95%) in six or more lessons during the year:

- Students give their opinions during discussions.
- Students respectfully disagree with others’ opinions during discussions.
- Students reflect on their learning through journals.

Overall, on many items teachers and students in their classrooms were distributed across a fairly wide spectrum in terms of how often they engaged in the various behaviors related to science and
ethics teaching and learning. The evaluation will analyze any reported changes, looking for increases in these behaviors on the post-survey at the end of the school year.

**Ethics in the Science Classroom**

**Summer Workshop**

The Summer Workshop survey asks questions in five general areas. Close-ended scales were used to capture participant feedback on the following five areas:

6. Overall quality of the workshop structure and program materials
7. Impact of the workshop on knowledge relating to science and ethics
8. Usefulness of the workshop in developing skills in working with students to incorporate ethics
9. Usefulness of each of the 25 workshop activities and presentations
10. Likelihood that participants would use the nine specific curriculum units/lessons presented during the week.

In addition, they were asked several open-ended questions, so that the evaluation could further identify workshop impacts, strengths and weaknesses.

1. **Quality of Workshop Structure and Materials**

The first set of questions asked for feedback on the workshop structure and program materials. The highest areas of “strong” agreement (see Table 4) were:

- The workshop reflected careful planning and organization
- The presenters were well prepared
- The take-home materials were appropriate for the program
- The take-home materials will be helpful to me in the classroom
Table 4: Post Workshop Survey: Overall Feedback

Please indicate your extent of agreement with each of the following statements about the summer workshop:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Advance information provided a realistic description of the workshop.</td>
<td></td>
<td></td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>b. The workshop reflected careful planning and organization.</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>c. The workshop included activities appropriate for participants with a variety of learning styles.</td>
<td>1</td>
<td></td>
<td>8</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>d. The presenters were well prepared.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>e. The subject matter was clearly presented.</td>
<td>5</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>f. Participants’ questions and concerns were addressed effectively.</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>g. Lead teachers were a valuable resource for learning during the workshop.</td>
<td></td>
<td></td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>h. Sharing ideas with colleagues during the workshop was valuable.</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>i. Adequate time was allowed for participants to reflect on and relate material to their experiences and needs.</td>
<td>5</td>
<td></td>
<td>1</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>j. The take-home materials were appropriate for the program.</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>k. The take-home materials will be helpful to me in the classroom.</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>18</td>
</tr>
</tbody>
</table>

Many of the open-ended comments elaborate on the ratings in these areas:

**Planning and organization**
- I very much liked the way Jeanne Chowning organized the workshop. She was always according to schedule every speaker stayed in the allowed time frame. All speakers were excellent, there is so much to think about now. Thank you!

**Presenters**
- The presenters gave great information which gave better perspectives on issues and taught more about the topic than you get from written materials.
- The guest speakers were fabulous. Very good and interesting presentation.
- I found the presentations on stem cell research, gene therapies, GMO’s, animal research, etc. from experts in the field were excellent. Each gave me enough background information to feel comfortable to address the ethical dilemmas surrounding these issues in the classroom.

**Take home materials**
- I could not believe the number of curriculum materials that we were exposed to...and then we were able to take home with us. I have a whole box of resource materials to take home with me at the end of the workshop.
- The curriculum handbooks/manuals (e.g. HIV curriculum) and the ethics primer—all have ready made worksheets etc. that I can use without needing to “reinvent” the wheel.
- Teaching material, it allows me to incorporate new lesson material. Since it has already fabulous hands on activities I will be able to use most of the material.
Overall, the ratings for this section were high, and numerous comments support the other positive ratings relating to quality and materials:

- Hands-on (brains-on) learning doing the activities—great way for us to learn the process.
- I liked the schedule; I was able to work on the materials, but I was also able to reflect about the material, which was vital to my better understanding.

Although comparisons between the years will be conducted at the end of the Phase 1 grant period, initial analysis showed an increase of over a half point in the mean satisfaction rate with take home materials between 2004 and 2005.

Concerns. One area of concern is with the amount of material presented compared to the time to digest it. The survey item: “Adequate time was allowed for participants to reflect on and relate material to their experiences and needs” had the lowest number of “strongly agree” and the highest number of “disagree” ratings. Related comments noting concerns or suggesting changes included:

- “I think people’s questions were answered in too much detail sometimes about factual content information. As a result, we had less time for the more important ethical, social, and political aspects. Perhaps send a ‘glossary’ next time with the homework assignment so we spend less time on the content.”
- All of the activities were useful, but with not the time to think and reflect on the topics as we worked with them decreased my overall learning and motivation. (It became overwhelming.)
- We would have liked more time to reflect on all these wonderful exercises.
- Many of the lecture based items became too much… My personal background knowledge on some of these topics was too small so I felt overwhelmed on points. Normally, this might not have been a problem but the pace of the class didn’t allow for much questioning, small group discussion, etc… that could have lead to a better understanding of my topic.

The question relating to the value of the Lead Teachers did not receive a high “strongly agree” response. Also, as noted later in this report (Table), the session on the Primer led by the Lead Teachers was not particularly highly rated. This may warrant further investigation as the Lead Teachers play a key role in the workshop, and because the program hopes to expand Lead Teacher training in the future. The only related open-ended comment was, “The presenters were exceptional – understandable and I learned a lot. The short presentations by Lead Teachers I did not find as useful – maybe because they were so brief.” There were no other comments to further explicate the Lead Teacher rating, but this issue could be further explored by both the program and the evaluation.

Finally, the open-ended questions did reflect a few other concerns that did not seem to be an issue for most participants, but were noted by one or more:

- The primary presentation style was lecture, we really only had one hands-on activity. Personally, for me, it was fine. But as teachers we are very much discouraged from only presenting info. through a lecture format.
2. Impact on knowledge relating to science and ethics
The next two sets of questions specifically addressed the workshop impact on teaching skills. In the first set, displayed in Table 5, the participants were asked to rate how the workshop affected their own understanding of ethics and science. In the following question set (Table 6), teachers were asked to rate the usefulness of the workshop in developing the skills to further their students’ understandings of science and ethics.

When asked about the workshop impact on their own understanding of science and ethics, teachers were most likely to agree with the following statements:
- I have a better understanding of the role of ethics in scientific research.
- I have a better understanding of strategies to incorporate ethics into science lessons.
- I feel more comfortable incorporating ethics into my science units.

**Concerns.** Participants were least likely to strongly agree with the statement: “I have a better understanding of the nature and processes of science.” They may well feel that they already had this understanding before coming to the workshop. The other items which were rated less highly than the others were:
- I made connections with other teachers who are interested in ethical issues in science.
- I feel more prepared to develop students’ ethical reasoning ability.
Table 5. Post Workshop Survey: Participation Impact on Ethics and Science Understandings

Please indicate the extent to which you agree with each of the following statements concerning the impact of this workshop.

<table>
<thead>
<tr>
<th>As a result of this workshop…</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I have a better understanding of the nature and processes of science.</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>b. I have a better understanding of ethics as a discipline.</td>
<td>1</td>
<td></td>
<td>4</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>c. I have a better understanding of the role of ethics in scientific research.</td>
<td>1</td>
<td></td>
<td>3</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>d. I have a better understanding of the role of ethics in the secondary life science curriculum.</td>
<td></td>
<td></td>
<td>6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>e. I have a better understanding of strategies to incorporate ethics into science lessons.</td>
<td></td>
<td></td>
<td>4</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>f. I made connections with other teachers who are interested in ethical issues in science.</td>
<td>1</td>
<td></td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>g. I feel more comfortable incorporating ethics into my science units.</td>
<td></td>
<td></td>
<td>4</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>h. I feel more prepared to develop students’ ethical reasoning ability.</td>
<td></td>
<td></td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>i. I am familiar with classroom resources (e.g. curriculum units) available from scientific institutions such as the NIH.</td>
<td></td>
<td></td>
<td>6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>j. I am familiar with classroom resources (e.g. curriculum units) available via the Internet, such as the Genetic Science Learning Center.</td>
<td></td>
<td></td>
<td>6</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

3. Perceived Workshop Usefulness in Working with Students

In the next question set, participants were asked how useful the workshop was in developing their skills to work with students. Since they had not yet applied any of these skills to the classroom, this reflects their perceptions of usefulness.

The two highest rated items were: “Incorporate ethics issues into a science lesson,” and “Modify a curriculum unit in science to include ideas about ethics,” which were considered “very useful” by 18 and 17 participants respectively. These two items align with the program goals, and the strong positive findings appear to validate that the workshop is meeting its intended purpose.

The other top rated items, rated “very useful” by 16 participants were:
- Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments
- Guide students’ learning related to ethics in science lessons
- Help students recognize ethical dilemmas in science
- Help students understand perspectives different from their own

Related comments include the following:
- Learning about “teaching” strategies. I like exploring and implementing new ways to help students learn—keep them interested.
- Now having an understanding of what the principles of ethics are and having a model for the steps needed to expose students to the concept.
- I am determined to find ways to integrate it because I believe it is critically important as most students will use their science education as non-scientist voters.

**Concerns:** Two items which, while still rated quite useful, stand out as not being rated as highly as the others were, “Aid students in separating fact from opinion” and “Develop students’ scientific reasoning ability.” Although the curriculum addressed how to discuss ethical issues, it did not seem to emphasize either of these two areas. These may not be expected program outcomes.

**Table 6. Post Workshop Survey: Participation Impact on Skills**

<table>
<thead>
<tr>
<th>How useful was the workshop in further developing your skills to do the following:</th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Develop students’ scientific reasoning ability.</td>
<td></td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>b. Modify a curriculum unit in science to include ideas about ethics.</td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>c. Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td></td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>d. Guide students’ learning related to ethics in science lessons.</td>
<td></td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>e. Help students recognize ethical dilemmas in science.</td>
<td></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>f. Aid students in separating fact from opinion.</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>g. Help students understand perspectives different from their own.</td>
<td></td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>h. Use the Internet to find resources for teaching ethics in science.</td>
<td></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>i. Incorporate ethics issues into a science lesson.</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**4. Ratings of Individual Workshop Activities**

The final two question sets asked for feedback on specific workshop topics, presentations, and lessons. In the first set (Table 7), participants were asked to rate how useful they found each of the workshop activities. In the second set (Table 8) they were asked how likely they were to use specific curriculum or lessons in their classroom. When thinking about these findings, it is important to note that participants represent different science disciplines, so they may not have the opportunity to teach some of these units even if they are interested in them. As one teacher noted, “I found many things very useful. Anything less useful was solely due to content and how specific it is to what I teach.” So, both the “usefulness” and the “likely to use” ratings are tied to whether the topic aligns with a subject they teach. Also, it is important to note that two of the activities (Animal Research Curriculum and HIV Research Curriculum) were held concurrently, so a number did not attend each. The highest rated activities were:

- Consumer Awareness Curriculum
- Resource Breakout Sessions
- Stem Cell Science and Politics
Table 7. Post Workshop Survey: Usefulness of Workshop Activities

*Please rate how useful you feel the following workshop activities will be in helping you integrate ethics into your curriculum. Please circle the number of the appropriate response. If you did not attend, please circle “X”.*

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Did not attend</th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Pre-workshop homework articles and Web site</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>b. Norm Setting (LueRachelle Brim-Atkins)</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>c. BiDil Case example (Jeanne Chowning, Lola Szobota)</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>d. Overview of Ethical Theory (Tom McCormick)</td>
<td>1</td>
<td>11</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>e. Learning Model (LueRachelle Brim-Atkins)</td>
<td>2</td>
<td>12</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>f. Primer: Key Elements (Lead teachers)</td>
<td>2</td>
<td>11</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>g. Film: GATTACA, Narrative Ethics</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>h. Resource Breakout Sessions</td>
<td>1</td>
<td>6</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>i. Integrating ethics – (Lead teachers)</td>
<td>7</td>
<td>4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>j. GMOs (Dr. Anne Radcliffe)</td>
<td>1</td>
<td>9</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>k. Genetic Modification in Humans (Dr. Louisa Stark)</td>
<td>1</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>l. Primer: Decision-Making Model (Carla Calogero)</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>m. Stem Cell Science and Politics (Dr. Steven Gilbert)</td>
<td></td>
<td></td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>n. Primer: Structured Academic Controversy (Jeanne Chowning)</td>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>o. Primer: Congressional Hearing Model (Paula Fraser)</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>p. Stem Cell Ethics (Dr. Suzanne Holland)</td>
<td>2</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>q. Film: Short vignettes (Laura Bishop)</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>r. Animal Research (Dr. Susanna Cunningham)</td>
<td>1</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>s. Human Research Issues (Helen McGough)</td>
<td></td>
<td></td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>t. Animal Research Curriculum (Jeanne Chowning)</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>u. HIV Research Curriculum (Elise Cooksley)</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>v. Consumer Awareness Curriculum (Reitha Weeks)</td>
<td></td>
<td></td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>w. Individual Lesson Planning Time</td>
<td></td>
<td></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>x. Group Feedback Time</td>
<td>1</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
The following comments explicate the ratings for these items:

**Consumer Awareness Curriculum**
- Loved Consumer Science lesson/lab -- Great!
- Consumer awareness curriculum: it had several components that students would enjoy. Making the lotion, really made the difference.
- Least useful (in terms of ethic) – making lotion. It was really fun and interesting but only somewhat connected to ethics.
- I found her presentation not only interesting but immediately applicable to my classroom! Excellent.

**Resource Breakout Sessions**
- Resource Breakout Sessions were very useful because we were given/shown a variety of resources that we could use in our class. Individual planning time was sufficient for us to design our lesson; it was also nice to be able to design a lesson to use in my class.
- Resource Breakout sessions: the ratio of leaders to teachers was good. Lots of resources and a chance to look at them at the time they were introduced.

**Stem Cell Science and Politics**
- I found the presentations on stem cell research, gene therapies, GMO’s, animal research, etc. from experts in the field were excellent. Each gave me enough background information to feel comfortable to address the ethical dilemmas surrounding these issues in the classroom.

In some cases, the same presentation received strong positive and negative comments. There was one highly positive comment and the following three negative comments about the Stem Cell Ethics presentation.
- Stem Cell Ethics – this could have been very useful, but the presentation was very biased.
- Stem cell ethicist was not very ethical—way too slanted. --which may have been useful on second thought—letting us see a biased presentation should prevent us from doing the same.
- Dr. Suzanne Holland’s talk – I found rather biased and offensive in some ways due to the obvious position she had on the subject.

As another example, one person wrote about the norm setting lesson: “Most useful (Rachelle Brim Atkins) – Really did a good job explaining and giving visual for how people acquire their background/opinions,” while another, under the category “least useful,” wrote, “Norm Setting – very politically correct bias; mostly common sense info.”

Even though the teachers may have been more interested in some topic items and not others, in general, the items rated less useful compared to the others were the “programmatic” not the content items. They included:
- Pre-workshop homework articles and Web site
- Norm Setting
- Integrating ethics
- Group Feedback Time

Also, the film GATTACA was rated low, with some teachers noting that this was not new material.
5. Feedback on Specific Curriculum Units
Participants were asked how likely they would be to use nine specific units, materials or lessons presented during the course of the workshop (Table 8). The Ethics Primer, a cornerstone of the program as a whole, which is being distributed through other venues as a stand-alone product, is discussed separately below. Once again, this is a case where presenting these materials may have served participants well by furthering their own understandings in important ways, and at the same time the subject matter might not fit into their lesson plans.

- Developing the curriculum unit (lesson) was most helpful because a synthesis of the material presented and an integration into the present curriculum occurs. I already know I will do the consumer awareness in October and my own lesson at the end of meiosis. I believe that I will weave ethical perspectives into my class throughout the year.
- Developing our GMO unit. I’m tied to it, invested time in it and will certainly use it.
- Time to actually develop a plan to integrate into the class, that is very valuable and better insures a true integration.

Table 8. Post Workshop Survey: Usefulness of Program Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Did not attend</th>
<th>Not at all likely</th>
<th>Somewhat likely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. BiDil Case Study</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>b. Ethics Primer</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>c. Gene Therapy Resources</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>d. NIH Curriculum Unit</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>e. Stem Cell Resources</td>
<td></td>
<td></td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>f. Animals in Research Unit</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>g. HIV Research Curriculum</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>h. Consumer Awareness Curriculum</td>
<td></td>
<td></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>i. The lesson YOU worked on</td>
<td></td>
<td></td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>
Feedback on the Ethics Primer

When asked, “Please rate the likelihood that you will use the following materials in your classroom,” the ethics primer was selected as “very likely” by more teachers (15) than any other material. There were several open-ended comments attesting to its perceived usefulness:

- Primer is excellent—make sure we cover all of it. It is a great intro to the ethics concept for kids!
- The ethics primer—I can think of a half dozen worksheets I will use on a regular basis.
- The primer is an excellent tool to work with, this I felt when we were putting together our lesson plan.
- Liked the primer—especially the frameworks you can use with class. These tools give us concrete ways to integrate that feel less “risky.”

The individual workshop activities relating to the primer (Table 9), while highly rated, were not rated “very useful” by as many respondents as some of the other workshop activities. It is not clear why this is, and this issue should be further explored before the next workshop. Some of the strategies may be ones that teachers are already familiar with, or that do not fit into their classroom model.

<table>
<thead>
<tr>
<th>Table 9. Post Workshop Survey: Feedback on Ethics Primer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please rate how useful you feel the following workshop activities will be in helping you integrate ethics into your curriculum.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>f. Primer: Key Elements (Lead teachers)</td>
</tr>
<tr>
<td>l. Primer: Decision-Making Model (Carla Calogero)</td>
</tr>
<tr>
<td>n. Primer: Structured Academic Controversy (Jeanne Chowning)</td>
</tr>
<tr>
<td>o. Primer: Congressional Hearing Model (Paula Fraser)</td>
</tr>
</tbody>
</table>

Interviews and Observations

During the Summer Workshop, the evaluation conducted focus groups and interviews with members of the CAUSE Curriculum Design Team and the Lead Teachers. Interview notes can be found in the Appendix.

Two site visits were conducted in this period, one in a large urban school with an International Baccalaureate (IB) class, and the other in a small rural alternative high school, serving at-risk students. In each case, a brief interview was conducted with the teacher following the observation.

These two observations underscore evaluation findings that the curriculum, ethics primer and program resources in general are of use across science disciplines and the range of low to high achieving students. Further comments on this finding are below in the Recommendations sections. Site observation notes follow.
Lesson Plan
The lesson observed was on the ethical issues surrounding facial transplants. The teacher, a participant in the 2005 Summer Workshop, used a protocol from the Ethics Primer. There were 12 students, nine girls and three boys in the class. The lesson followed the following structure.

1. At the start of the lesson, students were given several minutes to read a newspaper article, “Possibility of Face Transplants raises moral, ethical questions” (Pittsburgh Post Gazette, 1-11-05).
2. The students then were invited to ask the teachers biology-related questions, most questions were about the mechanics of face transplants.
3. Students, as a class, listed types of stakeholders: patient, donor, donor’s family, patient’s family, doctors, the scientific community.
4. Students then chose which stakeholder they wanted to “be” and then sat with others who were taking that role, in order to list pros and cons from their stakeholder viewpoints.
5. Then they regrouped so that each table had a representative from each stakeholder group. Each table then discussed the issue and worked to reach a consensus.
6. After debriefing as a class, each student wrote about the exercise in their journal.

Strategies to Integrate Ethics Curricula
The students had previously been introduced to the stakeholder exercise and received copies and worked with the following practice sheets: Distinguishing an Ethical Question from Other Kinds of Questions, Distinguishing Ethical Questions within a Scenario, and Asking Ethical Questions (Ethics Primer, pp. 40-43). The teacher noted that although it is difficult to integrate this type of exercise into IB curriculum, which is very rigorous and somewhat prescribed, she has been able to use lessons and strategies from the Ethics Primer about every 3-4 weeks, usually for 30-40 minutes each time.

She spoke of different ways to incorporate ethics into her curriculum. For example, if she needs a substitute teacher, she felt this was ideal because once the students have been introduced to some of the Ethics Primer protocols, she can just give the topic to the substitute teacher. And the kids become so engaged in it, they don’t need much “instruction.” She said, “The trick is, it is like cooking, you have to have the right recipe.”

Future Plans to Use
The teacher will be introducing topics relating to stem cells in February and March and would like to pilot some of the new CAUSE curriculum developed by the design team in Summer, 2005. She will also be using the Ethics Primer with her non-IB students this spring, which the evaluation hopes to observe as well.

Dissemination
She plans to share the primer with other biology teachers in the school, and says that they will use it as well.
North Bend Site Visit
Two Rivers Alternative High School Bioethics Course
Observation Conducted November 8, 2005

This small alternative public school serves students who have not succeeded in a conventional high school setting. Each faculty member carries a varied teaching load; in addition to biology, this faculty member also teaches all science classes in the school—bioethics, biology, environmental science, integrated science—as well as current events and U.S. History.

Background
• This is the third year this class has been taught. The teacher was inspired to develop it after attending the Summer Workshop; she is now a curriculum writer for the program. This alternative school has an unusual schedule. Students can be in the class for between 1-8 months. So, she teaches the ethics framework at the beginning, but doesn’t repeat it, and the students who are there the most, get the most out of it.
• Students may take the class for either elective science or SS credit.
• There were about 10 students in the class.

Lesson
The students completed worksheets which the teacher had downloaded from the Human Genome Website. In a previous lesson, the students had considered three ethical issues: Should genetic information be shared with potential employers; Should police be given access to research DNA; and Should people be tested for diseases that don’t have cures?

The observed lesson was about employer access to medical data. The case story was about a top candidate for a research science job whose genetic profile showed that he would develop Huntington’s Chorea. His young son carried the gene as well. The candidate was the best person for the job, and would be in a position to conduct research that would save lives, but the insurance costs to the company, for both him and his son, would be huge. The students discussed whether it made sense for the company to invest in him as an employee.

Students worked in pairs to complete a worksheet, where they had to list pros and cons from the employer viewpoint. The following day, they were scheduled to write and present good arguments for both the potential employee and employers sides. Many of the students didn’t seem fully engaged, but it was clear that this was more due to their affect rather than the subject matter, and it may be the case that they were more engaged in this class than in their other classes. During the observation, the evaluator was able to read their papers; most seemed to repeat what was said in the class discussion. However, students did see that there were at least two sides to this complex problem, which is an important step. Several said that this kind of lesson made them interested in science, and that usually they were not interested in science.

Other Impact/Dissemination
• As a result of this teacher’s work, the Ethics Primer is being used by others in the school. For example, the English teacher/school counselor, and math/social studies teachers have asked for copies of the Primer and were using it.
• This faculty member is also active in disseminating CAUSE materials nationally, and had recently presented on the HIV vaccine unit at the American Biology Teacher Association Annual Meeting.
APPENDICES

Program Entry Survey Findings

Summer Workshop Survey Findings

Interview Notes: Curriculum Design Team, Lead Teachers

Year 3 Evaluation Timeline
CAUSE
Entry Survey 2005

1. Please indicate the degree to which you agree or disagree with each of the following statements:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I have a good understanding of the scientific research process.</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>b. I have a good understanding of ethics as a discipline.</td>
<td>10</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>c. Ethics is an important aspect of research in the biological sciences.</td>
<td>1</td>
<td>7</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Science instruction must include a focus on ethics.</td>
<td>3</td>
<td>13</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Discussions of ethics can enhance students’ understanding of science content.</td>
<td>2</td>
<td>12</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Students must fully understand scientific content before addressing ethical questions.</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>g. Scientific thinking and ethical thinking are similar in that both are based on rational arguments.</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>h. Because science is an objective endeavor, scientists are not the professionals best suited to address ethical questions.</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>i. Scientists have a responsibility to consider the ethical implications of their work.</td>
<td>1</td>
<td>9</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. I feel comfortable incorporating ethics issues into science lessons.</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>k. I am familiar with classroom resources available from scientific institutions such as the National Institutes of Health (NIH).</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Please indicate how well prepared you feel to do each of the following:

<table>
<thead>
<tr>
<th></th>
<th>Not adequately prepared</th>
<th>Somewhat prepared</th>
<th>Fairly well prepared</th>
<th>Very well prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Develop students’ scientific reasoning ability.</td>
<td>8</td>
<td>11</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>b. Use the Internet to find resources for teaching ethics in science.</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>c. Incorporate ethics issues into a science lesson.</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>d. Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>e. Guide students’ learning related to ethics in science lessons.</td>
<td>4</td>
<td>11</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>f. Help students recognize ethical dilemmas in science.</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>g. Aid students in separating fact from opinion.</td>
<td></td>
<td>8</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>h. Help students understand perspectives different from their own.</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>i. Modify a curriculum unit in science to include ideas about ethics.</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>
3. In thinking of your science lessons over the course of the school year, how often do the following things happen?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1 to 5 lessons</th>
<th>6 to 10 lessons</th>
<th>11 to 20 lessons</th>
<th>21-30 lessons</th>
<th>Over 30 lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Students are confronted with an ethical dilemma in a scientific context.</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b. Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td>9</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Students give their opinions during discussions.</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>d. Students respectfully disagree with others’ opinions during discussions.</td>
<td>2</td>
<td>13</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Students discuss a case study related to the content.</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Students engage in role play scenarios (e.g. moot court, panel discussions, or mock congressional hearings) to discuss a scientific or ethical issue.</td>
<td>8</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Students reflect on their learning through journals.</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>h. Students analyze the scientific or ethical issues in a movie.</td>
<td>4</td>
<td>15</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Students use evidence to back up their arguments during discussions about ethics.</td>
<td>5</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH) when planning lessons.</td>
<td>5</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. I refer to resources developed by scientific institutions when modifying lessons.</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>l. I modify lessons to include ethical issues.</td>
<td>4</td>
<td>12</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Which subjects do you teach? Please check all that apply:

- Mathematics 3  
- AP Biology 1  
- English/Language Arts 3  
- Biology (non-AP) 15  
- Social Studies 0  
- AP Chemistry 0  
- Physical Education 0  
- Chemistry (non-AP) 6  
- Health 3  
- AP Physics 0  
- Life Science 10  
- Biotechnology 1  
- Anatomy 4  
- Environmental Science 8
5. Which grades do you teach? **Please check all that apply:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2</td>
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<tr>
<td>7</td>
<td>6</td>
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<tr>
<td>8</td>
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<td>17</td>
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<td>11</td>
<td>14</td>
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<tr>
<td>12</td>
<td>14</td>
</tr>
</tbody>
</table>

**What are you hoping to gain by participating in this program?**

I hope to learn more about ethics and how to incorporate ethics into my class while still hitting all the content targets that I need to. I also hope to walk away with at least one lesson plan for my class and a lot of resources to create more lesson plans.

The ability to incorporate ethics into my lessons. Knowledge to teach students an ethical approach to science while still presenting content.

I would like to incorporate an ethics unit into my grade ten biology and grade eleven and twelve earth science classes. I feel it is increasingly important for students to be able to effectively evaluate scientific (and social) issues, and I think this could be a very good place to get tools to do this.

I hope to engage students in role play scenarios to tackle ethical questions.

Our curriculum contains a small amount on ethical issues, but it is not well developed. I would like to incorporate an expanded unit on ethics in science as part of my curriculum. My hope is that this unit will be integrated with my students English and Social Studies classes and culminate in a research project and/or paper that could potentially become part of their graduation culminating project.
My ultimate goal is simply to gain energy, momentum and excitement that will help me charge into this new year. What I hope will also happen is I will find ways to integrate various ideas/topics into my classes. Develop topics that allow students to express their opinions and, in general, develop materials and ideas that will expand my classroom concepts!

I’m not integrating ethics as much as I should. I especially want to develop ideas for chemistry class (not biology) which for me are harder to come up with. How do you positively facilitate a discussion without starting arguments? I have to admit—time is of the essence—and I want ways to incorporate into existing teaching instead of creating a new unit. Science doesn’t have all the answers and it never will. I want my student to know this.

Instructional materials/guide for teaching ethics in the classroom. Network, resources.

Networking. Resources. Curriculum ideas for science issues course. Professional development. I would like to augment my present curriculum to include more work with ethics. I would like to be more personally prepared to lead students through ethical discussions and maintain a safe/secure classroom setting.

Topics: ways to incorporate them on a regular basis in high school classes. And to start introducing the thought process in 7th grade classes.

First and foremost, I am hoping to gain an understanding of the formal field of ethics as a discipline. Second, I would like to gain a practical knowledge of how to incorporate this into my classroom lessons (including learning how to assess student knowledge). Finally, I am looking forward to learning what resources are available for me to use to assist in implementing ethics into my curriculum.

I want to learn how to structure ethical discussions with students using methods that are realistic when considering time constraints, large class sizes, and multiple preps.

I had not really considered teaching ethics. I knew people who came last year and felt this was a great conference. I thought I would check it out.

I hope to be able to integrate bioethics more smoothly into the biology curriculum. It would be nice to have models and lesson plans that work with students.

I am trying to develop integrated science, work with our middle school team, plan lessons that complement concepts, include parents in the learning, develop a summer science and field trips that are integrated. My long range goal is to develop life long learns that can research a topic, check out sources for expertise, validity, etc., make informed decisions. In the end, learners may be able to see how science affects their decisions and their lives.

Perspectives on developing student independent studies related to science, ethics, and religion. I am hoping to gain a better understanding of ethics—its instruction in particular. As students learn from the contact it is important for them to think critically about that material—to understand that there are ethical dilemmas that need to be addressed—my desire is to make students gain responsibility for their own decision-making to be able to view material from various angles and (illegible) …develop the abilities to formulate well thought arguments—to support them with facts and to be able to respectfully (illegible)…
Will probably be teaching science after this year so it will help. Always use ethical issues in LA papers to increase critical thinking. More info and (illegible) ideas and more knowledge in various areas, more people resources and awareness for self and classroom.
I would most like to be able to learn strategies that will track students to think rationally about ethics issues and be prepared to back up their opinions with solid evidence.
Summer Workshop Findings
August, 2005
Post-Workshop Questionnaire

1. Please indicate your extent of agreement with each of the following statements about the summer workshop:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Advance information provided a realistic description of the workshop.</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. The workshop reflected careful planning and organization.</td>
<td>2</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. The workshop included activities appropriate for participants with a variety of learning styles.</td>
<td>1</td>
<td>8</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. The presenters were well prepared.</td>
<td>2</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. The subject matter was clearly presented.</td>
<td>5</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Participants’ questions and concerns were addressed effectively.</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>g. Lead teachers were a valuable resource for learning during the workshop.</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Sharing ideas with colleagues during the workshop was valuable.</td>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Adequate time was allowed for participants to reflect on and relate material to their experiences and needs.</td>
<td>5</td>
<td>1</td>
<td>12</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>j. The take-home materials were appropriate for the program.</td>
<td>2</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. The take-home materials will be helpful to me in the classroom.</td>
<td>3</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. If you responded “Strongly Disagree” or “Disagree” to any items in Question 1, please explain why.

- Not a lot of the information changed; I knew exactly what to expect.
- We would have liked more time to reflect on all these wonderful exercises.
- f) I think people’s questions were answered in too much detail sometimes about factual content information. As a result, we had less time for the more important ethical, social, and political aspects. Perhaps send a “glossary” next time with the homework assignment so we spend less time on the content.
- c) The primary presentation style was lecture, we really only had one hands-on activity. Personally, for me, it was fine. But as teachers we are very much discouraged from only presenting info. through a lecture format.
- Each day had a reflection time scheduled, but often it was “directed” (i.e.) and not really a personal reflection time. The end of the day @ 5:30 was our only chance to “personally reflect” – very difficult to do this effectively after 9 hrs of class work.
3. Please rate how useful you feel the following workshop activities will be in helping you integrate ethics into your curriculum. Please circle the number of the appropriate response. If you did not attend, please circle “X”.

<table>
<thead>
<tr>
<th></th>
<th>Did not attend</th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Pre-workshop homework articles and Web site</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>b. Norm Setting (LueRachelle Brim-Atkins)</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>c. BiDil Case example (Jeanne Chowning, Lola Szobota)</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>d. Overview of Ethical Theory (Tom McCormick)</td>
<td>1</td>
<td>11</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>e. Learning Model (LueRachelle Brim-Atkins)</td>
<td>2</td>
<td>12</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>f. Primer: Key Elements (Lead teachers)</td>
<td>2</td>
<td>11</td>
<td>8</td>
<td></td>
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<tr>
<td>g. Film: GATTACA, Narrative Ethics</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>h. Resource Breakout Sessions</td>
<td>1</td>
<td>6</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>i. Integrating ethics – (Lead teachers)</td>
<td>7</td>
<td>4</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>j. GMOs (Dr. Anne Radcliffe)</td>
<td>1</td>
<td>9</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>k. Genetic Modification in Humans (Dr. Louisa Stark)</td>
<td>1</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>l. Primer: Decision-Making Model (Carla Calogero)</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>m. Stem Cell Science and Politics (Dr. Steven Gilbert)</td>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. Primer: Structured Academic Controversy (Jeanne Chowning)</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
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<tr>
<td>o. Primer: Congressional Hearing Model (Paula Fraser)</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>p. Stem Cell Ethics (Dr. Suzanne Holland)</td>
<td>2</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>q. Film: Short vignettes (Laura Bishop)</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>r. Animal Research (Dr. Susanna Cunningham)</td>
<td>1</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>s. Human Research Issues (Helen McGough)</td>
<td>11</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t. Animal Research Curriculum (Jeanne Chowning)</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>u. HIV Research Curriculum (Elise Cooksley)</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>v. Consumer Awareness Curriculum (Reitha Weeks)</td>
<td>3</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w. Individual Lesson Planning Time</td>
<td>3</td>
<td>5</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>x. Group Feedback Time</td>
<td>1</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
4. Please comment further on any of the activities in Question 3 you found most and least useful, and in what ways.

- Resource Breakout Sessions were very useful because we were given/shown a variety of resources that we could use in our class. Individual planning time was sufficient for us to design our lesson; it was also nice to be able to design a lesson to use in my class.
- one of the article -- the Utilitarian/Kant/etc. – was a little too dense, too much energy was spent deciphering the author’s language, not on theories.
- Not enough time
- Primer is excellent—make sure we cover all of it. It is a great intro to the ethics concept for kids!
- Huge wealth of information!
- The primer and Dr. Holland’s presentation as well as Jeanne Chowning’s leadership are excellent.
- I appreciate the thorough presentations on the science behind the issues. I believe it is crucial to have the understanding before considering the ethical questions.
- All of the activities were useful, but with not the time to think and reflect on the topics as we worked with them decreased my overall learning and motivation. (It became overwhelming.)
- Presentation were excellent. Animal research was so detailed on how its regulated, I didn’t feel we got into the bigger issues. Loved Consumer Science lesson/lab -- Great!
- Most useful (Rachelle Brim Atkins) – Really did a good job explaining and giving visual for how people acquire their background/opinions.
- Least useful (in terms of ethic) – making lotion. It was really fun and interesting but only somewhat connected to ethics.
- Consumer awareness curriculum: it had several components that students would enjoy. Making the lotion, really made the difference.
- Resource Breakout sessions: the ratio of leaders to teachers was good. Lots of resources and a chance to look at them at the time they were introduced.
- The guest speakers were fabulous. Very good and interesting presentation.
- Dr. Suzanne Holland’s talk -- I found rather biased and offensive in some ways due to the obvious position she had on the subject.
- Dr. Reitha Weeks – I found her presentation not only interesting but immediately applicable to my classroom! Excellent.
- I found many things very useful. Anything less useful was solely due to content and how specific it is to what I teach.
- The absolutely most useful in writing our curriculums was the group feedback.
- Very pleased with balance and blend of presenters and subject matter…well done!
- The presenters were exceptional – understandable and I learned a lot. The short presentations by Lead Teachers I did not find as useful – maybe because they were so brief.
5. How useful was the workshop in further developing your skills to do the following:

<table>
<thead>
<tr>
<th></th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Develop students’ scientific reasoning ability.</td>
<td>1</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>b. Modify a curriculum unit in science to include ideas about ethics.</td>
<td>1</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>c. Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td>5</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>d. Guide students’ learning related to ethics in science lessons.</td>
<td>5</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>e. Help students recognize ethical dilemmas in science.</td>
<td>1</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>f. Aid students in separating fact from opinion.</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>g. Help students understand perspectives different from their own.</td>
<td>5</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>h. Use the Internet to find resources for teaching ethics in science.</td>
<td>3</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>i. Incorporate ethics issues into a science lesson.</td>
<td>1</td>
<td>2</td>
<td>18</td>
</tr>
</tbody>
</table>

6. Please indicate the extent to which you agree with each of the following statements concerning the impact of this workshop.

<table>
<thead>
<tr>
<th>As a result of this workshop…</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I have a better understanding of the nature and processes of science.</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>b. I have a better understanding of ethics as a discipline.</td>
<td>1</td>
<td>4</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I have a better understanding of the role of ethics in scientific research.</td>
<td>1</td>
<td>3</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I have a better understanding of the role of ethics in the secondary life science curriculum.</td>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I have a better understanding of strategies to incorporate ethics into science lessons.</td>
<td>4</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. I made connections with other teachers who are interested in ethical issues in science.</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. I feel more comfortable incorporating ethics into my science units.</td>
<td>4</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. I feel more prepared to develop students’ ethical reasoning ability.</td>
<td>10</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. I am familiar with classroom resources (e.g. curriculum units) available from scientific institutions such as the NIH.</td>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. I am familiar with classroom resources (e.g. curriculum units) available via the Internet, such as the Genetic Science Learning Center.</td>
<td>6</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Please rate the likelihood that you will use the following materials in your classroom:

<table>
<thead>
<tr>
<th></th>
<th>Did not attend</th>
<th>Not at all likely</th>
<th>Somewhat likely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. BiDil Case Study</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>b. Ethics Primer</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>c. Gene Therapy Resources</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>d. NIH Curriculum Unit</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>e. Stem Cell Resources</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>f. Animals in Research Unit</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>g. HIV Research Curriculum</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>h. Consumer Awareness Curriculum</td>
<td></td>
<td></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>i. The lesson YOU worked on</td>
<td></td>
<td></td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

8. Thinking back on the weeklong workshop as a whole, what aspects of the workshop were most useful to you and why?

- We were given a combination of information about ethics and ethical issues and how to use such issues in our classroom. It was very helpful to receive both knowledge on the topic and knowledge on how to incorporate the topic into classroom curriculum.
- The one hour intro to the different issues and examples of how that can be incorporated into class.
- Hands-on (brains-on) learning doing the activities—great way for us to learn the process.
- I liked the schedule; I was able to work on the materials, but I was also able to reflect about the material, which was vital to my better understanding.
- Teaching material, it allows me to incorporate new lesson material. Since it has already fabulous hands on activities I will be able to use most of the material. I very much liked the way Jeanne Chowning organized the workshop. She was always according to schedule every speaker stayed in the allowed time frame. All speakers were excellent, there is so much to think about now. Thank you!
- Background science information on each issue. Norm setting, learning models, primer. Classroom activities.
- The actual labs, small group discussion and activities where we had an opportunity to interact more. It provided me with the chance to play and better master many of the topics presented while also giving me a better idea of how I could adapt or use that lesson in my class.
- Presenters gave me background knowledge and context for current ethical issues. This makes me more comfortable to cover these in class (and they were fascinating). Liked the primer—especially the frameworks you can use with class. These tools give us concrete ways to integrate that feel less “risky.” Liked the lessons we did (Bi Dil, Consumer, Academic Controv., etc.) because then we know exactly how to implement these in class.
- Learning about “teaching” strategies. I like exploring and implementing new ways to help students learn—keep them interested.
I could not believe the number of curriculum materials that we were exposed to…and then we were able to take home with us. I have a whole box of resource materials to take home with me at the end of the workshop.

Developing the curriculum unit (lesson) was most helpful because a synthesis of the material presented and an integration into the present curriculum occurs. I already know I will do the consumer awareness in October and my own lesson at the end of meiosis. I believe that I will weave ethical perspectives into my class throughout the year.

The presenters gave great information which gave better perspectives on issues and taught more about the topic than you get from written materials. Then the lessons done as group using decision making models, articles etc. were excellent at showing how to implement ethics into any class.

The “resource round robin”—these are the things that I will ultimately need access to integrate ideas into my curriculum. The curriculum handbooks/manuals (e.g. HIV curriculum) and the ethics primer—all have ready made worksheets etc. that I can use without needing to “reinvent” the wheel.

Developing our GMO unit. I’m tied to it, invested time in it and will certainly use it.

I think it was the primer and other curricular materials—they certainly help me to get organized. I really appreciated the speakers, activities and other teacher also.

I found the presentations on stem cell research, gene therapies, GMO’s, animal research, etc. from experts in the field were excellent. Each gave me enough background information to feel comfortable to address the ethical dilemmas surrounding these issues in the classroom.

I have read about ethics but never formally. This week gave me a better grasp on what I need to think about in planning lessons. The resources I received gave me materials as I lacked resources. Coupled with modeled strategies, I was able to start brainstorming for my lessons. Interacting with other teachers made me focus on my objectives as I was lacking a solid, basic background.

The opportunities to meet participants and presenters without normal daily (work/wife) distractions!

Most useful were the small group discussion sessions held in conjunction with Lead Teachers as well as the consumer awareness curriculum, the NIH and web resources break out session and especially the film session.

It was all a great learning experience. To meet other individuals, the excellent staff, enchanting environment and came together to make a fine end product.

Most useful were all the materials and working through the decision making process. Actually having practiced, I am better able to use it.

9. Thinking back on the weeklong workshop as a whole, what aspects of the workshop were least useful to you and why?

I can’t really think of anything that was least useful.

The presentation that were the most unorganized. More quality of presentation, not different type.

Stem cell ethicist was not very ethical—way too slanted, --which may have been useful on second thought—letting us see a biased presentation should prevent us from doing the same.

I honestly cannot think of a negative aspect!

I guess this is boring, but all was fabulous. I would not change a thing!
• I can’t think of anything I would classify as least useful, but perhaps a bit more time for questions, dialogue between presenters and participants and more time to connect with participants would have been nice.
• Many of the lecture based items became to much… My personal background knowledge on some of these topics was to small so I felt overwhelmed on points. Normally, this might not have been a problem but the pace of the class didn’t allow for must questioning, small group discussion, etc… that could have lead to a better understanding of my topic.
• I didn’t do evening events but it was a unique situation for me. I have many other professional responsibilities right now that I had to do in the evenings – didn’t reflect my interest.
• Someone giving a presentation and the dialogue is one-way – Just like kids, I like interaction (keeps me stimulated/ thinking/awake) and “doing” something.
• Not having enough time to explore the Internet with the resource people.
• All the aspects were helpful. It is difficult to determine when a concept that was presented actually infiltrated through mental processing. I enjoyed certain activities better likely because they incorporated a collaborative or kinesthetic aspect.
• I cannot find anything that wasn’t useful.
• Norm Setting – very politically correct bias; mostly common sense info.
• Stem Cell Ethics – this could have been very useful, but the presentation was very biased.
• Gattica was probably least useful because I’ve seen it a few times.
• Can’t honestly think of one.
• Not enough time to reflect and work on some personal projects…I wanted to help my teammates on our curriculum project and I was not able to work on my own.
• All of it either presented new knowledge or different perspectives.
• Least useful were the short presentations that did not include any practice working w/an idea.

10. Specifically, what aspects of the workshop (if any) do you think will be most useful in helping you integrate ethics issues into your science lessons?

• All.
• The primer, NIH units, HIV unit
• Primer—great intro! HIV lessons—fantastic job.
• The ethics primer—I can think of a half dozen worksheets I will use on a regular basis.
• The primer is an excellent tool to work with, this I felt when we were putting together our lesson plan.
• Regarding the nuts and bolts of incorporating ethics issues into my classroom, I feel that the norm setting activities ant the primer will be the most helpful.
• The graphic organizer, lesson frame works and personal stories are all tools that I can easily integrate and adapt into my curriculum.
• See #8 – The lessons/activities that we did in the role of the student. When you have been the student and seen it facilitated, you know exactly how to manage and facilitate it in your own class. You also get to experience what went well and did not so you already have ideas on how you want to modify before you’ve ever taught it.
• Lesson teaching strategies
• Actually looking at the Ethic Primer resource sheets and (seeing/and with) the case studies that I might actually incorporate into the curriculum.
• All of the resource materials that were provided will help make sure that I have a basic ethics resource library for my classroom.
The resources provided and introduced through the workshop allows many opportunities for integrating ethics into lessons. Being provided the opportunity to examine a multitude of resources, discussing with peers, and Lead Teachers available to assist or clarify has provided a clear framework to develop and integrate ethics into the lessons.

The walk through of lessons -- showing us how to use them. And the lesson plans developed that were given to us.

Now having an understanding of what the principles of ethics are and having a model for the steps needed to expose students to the concept.

The resources that have ethics discussion built into the curriculum.

Consumer Awareness and GMO ideas. They relate more to students interests than anything else.

My own writing of curriculum – It was hard to do it in such a short time – that required discipline! Yet, every time I do it I get better at it!

I think that it is important to know ethical frameworks (models) that you can easily apply and use in the classroom for any ethical topic. Also, I think the background information from the key speakers was essential.

The Ethics Primer, the Ethics in the Sci. Classroom as I can refer to them. Also, I now have a lot of data I can share w/our team

The curriculum material and handouts (i.e. the ethics primer).

The case studies. The resource breakout. The film breakout. The prim. The group unit planning session.

Time to actually develop a plan to integrate into the class, that is very valuable and better insures a true integration.

Actually working through the decision-making process and becoming more familiar with the vocabulary myself will be most useful.

11. What barriers do you anticipate facing while integrating ethics issues into your curriculum?

I’m worried about not being able to find the time to incorporate as many ethical issues as I’d like.

Time

Time. Students, or more importantly parents, understanding of ethics vs. morals.

The vocabulary…but not a large concern.

It all depends on my prep time. I will want it to work and at first it always takes more time to add new material to the curriculum. Aside from that I think students will welcome ethical guide lines. In the end, it will help them to be less frustrated.

Time constraints with the amount of curriculum I have to cover (and I don’t manage to completely cover without including ethics issues) will be the biggest barrier. However, I am determined to find ways to integrate it because I believe it is critically important as most students will use their science education as non-scientist voters.

The barriers I anticipate won’t come as much from the administration as from the students. My concern involves the social norms students use to “express their opinion” and I am simply worried that some students will go for shock value rather than after what they believe.

Time! Not much you can do but lobby state gov. for less pressure to pass a test and learn facts in order to leave time to learn something they’ll take with them for the rest of their life.

Time

Time
• The main barrier to integrating ethics into the curriculum is the pace of the required content. Experienced teachers are more likely able to weave ethics into their curriculum more readily, but time constraints are huge for the material that must be taught by grade 10.
• Finding time in some classes to fit ethics in, but I will!
• Time! to do this topic justice a great deal of background info. should be addressed. But, I do understand how I can do it even at a lower level to begin with.
• Time to plan, though some of that is already taken care of from developing our project here.
• I feel that the barriers have been lifted – my biggest barrier was my own lack of understanding.
• The only barriers that I may face would be from my school administration. They seem to come from one perspective and are not tolerant of others.
• Parents who may object to this topic, so I’ll have to carefully present my rationale, and lessons.
• Involving other faculty in development and implementation…conflicting perspectives and priorities will be challenging!
• Resistance of students to confront ethical issues – to be open to other points of view. Resistance of parents to topic. Resistance of administrators to types of topics and time away from core WASL requirements.
• None!
• Making time – it will add to an already full curriculum. Perhaps also parental objections to some controversial aspects.
DEMOGRAPHICS

13. Are you Hispanic?

1 Yes
19 No

14. Are you: (check all that apply)

1 American Indian or Alaska Native
1 Asian
0 Black or African-American
1 Native Hawaiian or other Pacific Islander
17 White
0 Some other race (please specify) ________________________________

15. Are you:

8 Male
12 Female

Note: One person did not answer 13, 14, and 15.
Notes

Focus Group with Curriculum Design Team
7-20-05

The focus group with the Design Team members was intended to capture their reflections and suggestions on CAUSE. These members represent various geographic locations in Washington state and also come from varied high school environments.

Focus Group Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>School</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan Wier</td>
<td>Prosper High School, Prosper</td>
<td></td>
</tr>
<tr>
<td>Deborah Di Michele</td>
<td>Ingraham HS, Seattle</td>
<td>Special Ed</td>
</tr>
<tr>
<td>Kim Mullin</td>
<td>Center School, Seattle (alternative)</td>
<td>Science and health</td>
</tr>
<tr>
<td>Jody Mathwig</td>
<td>Kent Meridian, Kent</td>
<td>Biology, AP biology</td>
</tr>
<tr>
<td>Diane Massey</td>
<td>Kent Meridian, Kent</td>
<td>Bio, chem</td>
</tr>
<tr>
<td>Elise Cooksley</td>
<td>Two Rivers Alternative High School, North Bend</td>
<td>biology, environmental science, integrated science, current events and US History</td>
</tr>
</tbody>
</table>

Why do you participate on the design team?
- Appreciate opportunity to develop curriculum.
- Only opportunity to work this way with other teachers.
- Like to work collaboratively and feel that the teachers who come here are really interesting people who want to collaborate.
- Have done other activities sponsored by NWABR and respect what they do.
- Gravitate towards ethics.
- Use NWABR curriculum and like it.
- It is better than anything we could do by ourselves.
- Didn’t have a stem cell curriculum myself, and I wanted one.
- Had a stem cell unit in my class and wanted to improve it.

How will you share these lessons with teachers at your school?
- Will send memo to other department heads about what we did here.
- Other teachers often “pick my brain” about science lesson ideas
- Plan to share with the “social humanities” teacher, a required course at her school.
- Tell others informally. (For example, two of the teachers participated in the same genetics class at UW and one mentioned this opportunity to the other).
- As a special Ed teacher, will mainstream students into a regular science class for an ethics unit, and will teach that unit.
- Will share this unit with all of the school’s integrated science teachers, and they will all teach the stem cell unit.
How might information about the Summer Workshop best be disseminated?

- Should disseminate through professional organizations such as NSTA and Washington State Association of Science teachers
- It would be good to have principals email teachers about the Summer Workshop. Teachers pay attention to emails from principals.
- At the district level, curriculum directors and professional development staff should promote this.
- Should have presentations at teacher professional development days. Lots of times there isn’t something at your school that you want to do and teachers are casting around for something good. For example, in my district the first three days before school starts are professional development days, and there are never any science classes offered. Or any ethics. NWABR should come in and do this for the district.
- There used to be a quarterly publication called the math and science bulletin, it was funded by the Eisenhower Institute. It is no longer available, but it had all of the classes, workshops, grants available. Perhaps NWABR could help get that started again.
- Ask teachers who have done the program to do more in promoting it within their schools and districts.
- Will order films and then share them with teachers in close proximity.
- Will work with the English and Social Studies teachers to integrate this unit.

How to improve for next year

- Provide whiteboards, pens, a laptop and an LCD for design team use the whole time.

How did serving on the Design Team impact your own professional development?
Many impacts over course of week. They get to work with scientists over the course of the week. Susannah Cunningham (PI), showed them how to write a grant for NIH, they worked with Steve Gilbert. Had several presentations on the weekend, and feel that they can contact these people during the year.

Lead Teachers Interview Notes

At the time of the interviews, there were two Lead Teachers in attendance who were high school teachers, and they were interviewed together.

One of the teachers took the workshop in 2001, and has been a lead teacher starting in 2002; the other took the workshop in 2003 and has been a lead since 2004.

The Lead Teachers also participate in other NWABR activities, such as using the speakers bureau and attending workshops during the year. They reported that they meet with each other about three times a year, and also communicate throughout the year via email.

How serving as Lead Teacher affects their own professional development

- Gives me more curriculum ideas for my classroom
- Makes me more self-reflective
- Facilitating these groups helps me in my work of teaming back in my school
- Help me in my work with a nonprofit that brings speakers to middle school girls, especially the NWABR “teaching 101 for scientists” helps me prepare speakers for that event
• As a result of this experience, I went to the Genetic Science Learning Center at the University of Utah and worked with scientists to develop a curriculum on molecular evolution that was put up on their website.
• The summer experience has made me more interested in attending other workshops such as the one on stem cells.
• Made me more confident as a leader. I took on a student teacher who had a PHD in microbiology and came from the biotech industry. Because of this, I saw that I could teach her about teaching … I could mentor her.
• I presented what I learned to the entire science dept at my high school.

Rosetta—am helping apply ethics to all classes, have given every grade level team the ethics primer.
Jamie, also did starnet?? Teamed up with a researcher in a lab at UW in an area related to brain research. Found out about that opportunity from an email from Jeanne.

Dissemination
• This is one of the biggest things I talk about at open house. Have strong parent support
• Rosetta said she went to a biomaterials workshop at UW that has a lesson on ethics and cochlear implants, she used NWABR materials made it into a whole unit for them.
• Each of the teachers had experiences with others using this curriculum in religious settings. In one case, a teacher took the ethics primer and shared it with his church community. In another, a parent asked to take it to share with her synagogue,

R also sees a tie in to the work she does on social justice and diversity.

Ideas for dissemination
• Offer the workshop in different regions in the NW
• Make it a 2-3 day session focusing on the using the primer.
• Have a LT familiar with the primer to do selected activities, mostly model how to do this in the classroom.
• Do more workshops on specific topics such as the stem cell workshop.
• Encourage those who did workshop to bring colleagues to the one time events.

Jamie presented this to his colleagues, and then on teacher used it to set up debates
The teacher he brought to the stem cell workshop had students do chose a bioethical topic and do a PP about it.

Jamie is now going to teach a “research ethics” science course. It is a lab course, year long, science elective that will include a research opportunity.
<table>
<thead>
<tr>
<th>Task</th>
<th>Purpose</th>
<th>To be conducted during this period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finalize Year 2 evaluation design</td>
<td>Improve assessment</td>
<td>Finalize 11-4-05</td>
</tr>
<tr>
<td>Review background materials, program documentation, teacher applications, and reports</td>
<td>Improve understanding of connection between program activities, goals, outcomes</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Review and revise program entry and post workshop surveys</td>
<td>Update surveys to better reflect program goals</td>
<td>July, 2005</td>
</tr>
<tr>
<td>Administer program entry surveys</td>
<td>Set baseline for measuring program effect</td>
<td>July, 2005</td>
</tr>
<tr>
<td>Administer and analyze post-workshop surveys. Report to program.</td>
<td>Provide feedback for program improvement. Understand impact of summer workshop.</td>
<td>Sept., 2005</td>
</tr>
<tr>
<td>Observe Summer Workshop</td>
<td>Improve understanding of program activities and potential outcomes</td>
<td>July, 2005</td>
</tr>
<tr>
<td>Conduct interviews and focus groups with selected Lead Teachers and Curriculum Developers</td>
<td>Assess program implementation and impact</td>
<td>July, 2005</td>
</tr>
<tr>
<td>Check in with project director</td>
<td>Reporting, update on program activities</td>
<td>Monthly</td>
</tr>
<tr>
<td>Prepare interim report</td>
<td>Reporting</td>
<td>January 15, 2006</td>
</tr>
<tr>
<td>Observe 1-4 classrooms</td>
<td>Gain understanding of and document how teachers are able to use workshop learnings in the classroom.</td>
<td>Nov 2005-May, 2006</td>
</tr>
<tr>
<td>Develop Summer Workshop mid-year questionnaire (informal, email)</td>
<td>Collect information on how teachers are using summer workshop information in their classrooms. Collect feedback on ethics primer. Inform dissemination grant application. Check in on implementation of curricular units. Collect insights to incorporate into year-end survey and possible focus group at May reunion</td>
<td>January, 2006</td>
</tr>
<tr>
<td>Administer mid-year questionnaire to selected Year 1 and 2 participants. Analyze results.</td>
<td>See above</td>
<td>Jan-Feb, 2006</td>
</tr>
<tr>
<td>Observe Professional Development Advisory Committee meeting</td>
<td>Gain understanding of any fine tuning of program goals and activities</td>
<td>April, 2006</td>
</tr>
<tr>
<td>Report to Professional Development Advisory Committee</td>
<td>Reporting</td>
<td>April, 2006</td>
</tr>
<tr>
<td>Interview project director and 2-3 advisory board members</td>
<td>Collect insights on program impact, new uses for materials, dissemination</td>
<td>Feb-April, 2006</td>
</tr>
<tr>
<td>Develop Lead Teacher/Curriculum Developer questionnaire</td>
<td>Assess lead teacher training and support, and participation impact</td>
<td>April, 2006</td>
</tr>
<tr>
<td>Observe May reunion</td>
<td>Collect information on program impact, usefulness of materials, support used and/needed</td>
<td>May, 2006</td>
</tr>
<tr>
<td>Task</td>
<td>Purpose</td>
<td>To be conducted during this period</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Conduct end of year survey with Year 2 participants (online format).</td>
<td>Measure program impact</td>
<td>May, 2006</td>
</tr>
<tr>
<td>Observe part of Year 3 Summer Workshop *</td>
<td>Assess change in workshop curriculum, program impact</td>
<td>July, 2006</td>
</tr>
<tr>
<td>Conduct post workshop survey with Year 3 participants</td>
<td>Assess summer workshop satisfaction.</td>
<td>July, 2006</td>
</tr>
<tr>
<td>Analyze workshop satisfaction surveys, Years 1, 2, 3</td>
<td>Compare change in participant satisfaction with workshop</td>
<td>August, 2006</td>
</tr>
<tr>
<td>Analyze Year 2 program entry and end-of-year surveys. Conduct comparison with Year 1 findings where feasible.</td>
<td>Measure program impact, and any change in impact from Year 1 to Year 2.</td>
<td>July, 2006</td>
</tr>
<tr>
<td>Prepare final report</td>
<td>Reporting</td>
<td>August 31, 2006</td>
</tr>
</tbody>
</table>

*Possible activity, if time remaining in budget.
APPENDIX B

Ethics in the Science Classroom
2006 Workshop Satisfaction Survey

A total of 25 teachers responded to the survey. All 25 teachers responded to all but a few of the items.

1. Please indicate your extent of agreement with each of the following statements about the summer workshop:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Advance information provided a realistic description of the workshop.*</td>
<td></td>
<td></td>
<td>11</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>b. The workshop reflected careful planning and organization.</td>
<td>1</td>
<td></td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. The workshop included activities appropriate for participants with a variety of learning styles.</td>
<td>9</td>
<td></td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. The presenters were well prepared.</td>
<td>4</td>
<td></td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. The subject matter was clearly presented.</td>
<td>5</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Participants’ questions and concerns were addressed effectively.</td>
<td>7</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Lead teachers were a valuable resource for learning during the workshop.</td>
<td>7</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Sharing ideas with colleagues during the workshop was valuable.*</td>
<td></td>
<td></td>
<td>1</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>i. Adequate time was allowed for participants to reflect on and relate material to their experiences and needs.</td>
<td>5</td>
<td></td>
<td>1</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>j. The take-home materials were appropriate for the program.</td>
<td>2</td>
<td></td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. The take-home materials will be helpful to me in the classroom.</td>
<td>3</td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* One teacher did not respond to this item.

2. If you responded “Strongly Disagree” or “Disagree” to any items in Question 1, please explain why.

Might want to consider an “updated” pack list—more info about accommodations maybe a template or more information about “lesson” expectations

Would have liked more organized time to —connect with other teachers and share ideas (meal times aren’t enough! And when we have breaks, we need breaks)
—organize and reflect on the material we were receiving and think about how they’ll be specifically useful in the classroom. The form to fill out as the start of binder was a great tool for doing this on the fly…but need more time planned in to stop, think, organize, reflect in whatever way we each need to.

For “a” – I actually didn’t expect the workshop to have this much info and be this good.

I think more time to process info “i” and read info presented—in a daily matter would have been nice. Data overload leads to an overwhelming feeling—stalling my brain assimilation process?!?

As always, it is difficult to provide enough time for these things. I would have used a small time slot everyday to organize, reflect and “schedule” materials (for future class lessons)

More time would have been helpful, however, I did not feel overly pressured or rushed.

A lot of information and everything flowed smoothly

Jeanne is a super organizer
3. Please rate how useful you feel the following workshop activities will be in helping you integrate ethics into your curriculum. **Please circle the number of the appropriate response. If you did not attend, please circle “X”**.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Did not attend</th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Pre-workshop homework articles and Website</td>
<td></td>
<td>1</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>b. Ethics, Values, and Diversity (LueRachelle Brim-Atkins)</td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>c. Case example (Jeanne Chowning, Lead Teachers)</td>
<td></td>
<td>1</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>d. Lifeboat (Lead Teachers)</td>
<td></td>
<td>2</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>e. Overview of Ethical Theory (Jeanne Chowning)</td>
<td></td>
<td>2</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>f. Skits (Lead Teachers)</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>g. Films</td>
<td></td>
<td></td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>h. Primer Breakout Sessions*</td>
<td></td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>i. Ethical Principles and Case Studies (Dr. Doug Diekema)</td>
<td></td>
<td></td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>j. Genetic Science Learning Center materials (Dr. Louisa Stark)</td>
<td></td>
<td></td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>k. Genetic Counseling (Mercy Laurino)</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>l. Stem Cell Science (Dr. Jonathan Golob)*</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>m. Planaria Lab</td>
<td></td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>n. Resource Breakout Sessions*</td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>o. Stem Cell Ethics (Carla Calogero)</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>p. Animal Research Issues (Dr. Susanna Cunningham)</td>
<td></td>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>q. Human Research Issues (Sharon Smith Elsayed)</td>
<td></td>
<td></td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>r. HIV Vaccine Testing Curriculum</td>
<td></td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>s. Consumer Awareness and Product Safety (Dr. Reitha Weeks)</td>
<td></td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>t. Individual Lesson Planning Time</td>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>u. Learning Community Groups</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

* One teacher did not respond to this item.
4. Please comment further on any of the activities in Question 3 you found most and least useful, and in what ways.

Lifeboat—can be used “as is” right now—applicable to all levels of students.
—values auction and values worksheets—useable form

All the GSCS stuff
Some of the NIH stuff—need to go through this [unclear] and choose.

I found lessons in the primer my ‘Pot-of-Gold’
I will be using most all of the lessons. I have a student teacher and it will be fun to meet before school and provide her with some to execute herself or give to her after I have modeled them.

Most: The combination of direct info that has been carefully pulled together at the appropriate level for the audience. The flow of the week really built an incredible framework, time to think of integration.

Least: Can’t think of any

I felt we only touched on the most challenging aspects of the ethical issues related to stem cell research and use of animals in research. Learning how to facilitate discussion in the classroom where students disagree on when an embryo has moral status or whether or not animals should be used at all for research is critical. This workshop only touched upon these fundamental issues. I see value in going into these issues more deeply.

Resources session was exceptional—not long enough!
Least useful—primer session (some of them) could be because they were too short

Loved the stem cell science lesson—very clear and good level of depth. Getting to look at online resources and individual work time was great…

Playdo lab. Planaria, lotion labs were great!

I really enjoyed Dr. Weeks and the lotion lab! Everyone was wonderful and I had a great experience here!

Thanks

All of the guest speakers (experts) were invaluable. I loved having the opportunity to ask questions to someone who know the answer firsthand. Also, all the curriculum resources we received were great too… a little overwhelming because of so many, but it will give me something to do the rest of the summer!

I really find the hands on labs useful and suggestions on how to implement bioethical approaches with students. Guest speakers were excellent!

Everything was great! We just needed more time. Another week would allow more time for reflection and absorption of material.

The Planaria lab was somewhat useful (not more) only because I’ve been exposed to that before. I really appreciate all the take-home materials—they will be extremely useful in my classroom.

The speakers were top-notch!

Not enough planning time

As a pre-service teacher, the resource breakout session was incredibly valuable and will help me immensely.
5. How useful was the workshop in further developing your skills to do the following:

<table>
<thead>
<tr>
<th></th>
<th>Not at all useful</th>
<th>Somewhat useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Develop students’ scientific reasoning ability.</td>
<td>5</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>b. Modify a curriculum unit in science to include ideas about ethics.</td>
<td>2</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>c. Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td>1</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>d. Guide students’ learning related to ethics in science lessons.</td>
<td>1</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>e. Help students recognize ethical dilemmas in science.</td>
<td>1</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>f. Aid students in separating fact from opinion.</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>g. Help students understand perspectives different from their own.</td>
<td>1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>h. Use the Internet to find resources for teaching ethics in science.</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>i. Incorporate ethics issues into a science lesson.</td>
<td>1</td>
<td>7</td>
<td>17</td>
</tr>
</tbody>
</table>

6. Please indicate the extent to which you agree with each of the following statements concerning the impact of this workshop.

**As a result of this workshop…**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I have a better understanding of the nature and processes of science.</td>
<td>5</td>
<td>15</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I have a better understanding of ethics as a discipline.</td>
<td>1</td>
<td>8</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I have a better understanding of the role of ethics in scientific research.</td>
<td>2</td>
<td>10</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I have a better understanding of the role of ethics in the secondary life science curriculum.</td>
<td>12</td>
<td></td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I have a better understanding of strategies to incorporate ethics into science lessons.</td>
<td>5</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. I made connections with other teachers who are interested in ethical issues in science.</td>
<td>1</td>
<td>8</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. I feel more comfortable incorporating ethics into my science units.</td>
<td>8</td>
<td></td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. I feel more prepared to develop students’ ethical reasoning ability.</td>
<td>10</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. I am familiar with classroom resources (e.g. curriculum units) available from scientific institutions such as the NIH.</td>
<td>1</td>
<td>6</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. I am familiar with classroom resources (e.g. curriculum units) available via the Internet, such as the Genetic Science Learning Center.</td>
<td>1</td>
<td>6</td>
<td>18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Please rate the likelihood that you will use the following materials in your classroom:

<table>
<thead>
<tr>
<th>Material</th>
<th>Did not attend</th>
<th>Not at all likely</th>
<th>Somewhat likely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Case Studies</td>
<td>1</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>b. Ethics Primer</td>
<td>2</td>
<td>4</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>c. Genetic Science Learning Center</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>d. NIH Curriculum Units</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>e. Stem Cell Resources</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>f. HIV Research Curriculum</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>g. Consumer Awareness Curriculum</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>h. The lesson YOU worked on</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Thinking back on the weeklong workshop as a whole, what aspects of the workshop were most useful to you and why?

The hands-on ideas and prepared worksheets

Variety of resources
—good thing we had such a great computer lab and accommodations

- The hands on activities—skits and identifying ethical perspectives
- Planaria Lab
- Case study(s)
- Background lectures—Animal research, Genetics, Stem cell
- Primer—“sweet” stuff

The flow
The immersion experience that took me below the water of the ice berg in learning about others.
The safe environment—I learned so much about myself and others and ethics and science

Several, including presentation by experts, on-line resources, the [unclear].
Most useful will be the intro. to ethics, the ethical analysis of issues and the decision making framework.

Working through the activities in the units were the most enlightening. Need to be able to do it at least once to teach it with any understanding.

—specific classroom activities >>> direct useable ideas.
—resources online and in print >>> in form my own planning.
—stem cell sci. background.

All—really—all of them! It was great!
Honestly I enjoyed the entire workshop! I really liked the presenters and curriculum given to us to use!

The Ethics Primer
It puts everything I need at my immediate disposal.

Learning how to apply the info. I learned to the classroom. Hearing techniques/activities that have been proven effective ways to teach this info.
And, actually experiencing the activities as a student would. I’m much more likely to use an activity that I’ve seen in action and participated in.

One of the most useful parts of the week was just spending time with teachers with a passion for teaching science. The activities and speakers gave a good base for out work, but the most useful part pf the week was the time spent working on the specific project for my curriculum

As I said before, guest speakers and the multitude of resources we received.

Guest speakers—memory info—how we remember info; labs—forcing me to try it myself will make it more probable I’ll be comfortable enough to use it in classroom.

Oral presentations were excellent
The 2 binders are an excellent resource.
This was one of the best workshops I have ever attended
Everything was well thought-out and organized

All of it. This has been a true workshop I can use. I will need to take a few days to review and organize the materials. I want to weave these materials throughout my curriculum. My thinking and planning have been shifted and I gave a better perspective on teaching science and ethics in the classroom.

- Talking to lead teachers
- Getting the primers
- Being introduced to resources
- Creating my own lesson

All of it was very useful. Developing a lesson to actually use was very helpful. More time to develop that lesson fully and to develop others would have been useful, but I would not want to shorten or cut out any of the other activities we did.

Learning what ethics is.
Strategies for teaching it
Guest speakers for my own knowledge
Hands-on activities
Resources
Time to work

The guest speakers

The opportunity to meet with other teachers was probably most useful—sharing ideas is great and now I have some new thing to try.
I have always believed that the core objective of teaching science was to create scientifically literate students who know how to question and think. I am now far better prepared to do this!

Being able to work together and develop a unit that I will actually use with my students

Listening to the presenters and working on sections of the primer.

The resources that were handed out; the opportunity to network and exchange ideas with other teachers; the examples of various decision making frameworks.

9. Thinking back on the weeklong workshop as a whole, what aspects of the workshop were least useful to you and why?

The movies—only because I can preview them on my own—but they were optimal

I really tried to think about this and I could not think of anything. Seriously

—Just not getting enough sleep...too much chatting, fun, and bed was small...sound like camp...and of course was a big part of the fun.
—Just read need more experience (and time) which I guess is what this next year is for.

Carl’s presentation on ethics of atom cell research—choppy and not enough depth.

Consumer Awareness would have been great last year, won’t work in this year’s curriculum.

The inability to print from my Mac in the P.F. computer room. When contacted the UW SysAdmins were not interested in being of assistance.
Thanks for providing us with a Mac compat. printer.

The Planaria lab was fun but not really necessary to convey the idea that it’s a great way to connect stem cells to an animal. Perhaps if it were combined with the ethical use/care of animals it would feel more connected to the theme of the week.

Internet resource tours—I like to explore sites on my own at a much slower pace. Having the URL and description of the site would accomplish much of what I need.

The least useful part of the workshop was probably the consumer awareness curriculum; primarily because I don’t see how it would fit into my curriculum.

Ethics, values, and diversity because it is not likely something I would be able to fit into my curriculum, although I did see the importance of setting norms (so everything else was least useful).

I’d like to see some Cliff videos—[?] Oil, Bioethics Forum Role Play, Race a Case of [unclear]; Historical bioethical Cases featured on documentaries.

Some materials stand out more useful than others but I can’t think of anything that is not useful at the moment. (sorry).
HIV info—just because I know I won’t use it. But I may give it to another teacher—such as the Health Department.

None, I cannot think of anything I would change.

Consumer Awareness—more “chemistry-focused”—hard to fit in, but fun!

Lotion making—fun but forgettable

I don’t really have an answer for this one.

I probably won’t use the consumer science component, but I still very much enjoyed it

Things seemed to move a little fast and jump around a bit for my more linear learning style

Nothing I can really think of.

Overall I found the workshop very helpful. I could have eaten less!

10. Specifically, what aspects of the workshop (if any) do you think will be most useful in helping you integrate ethics issues into your science lessons?

Ethics primer and basics ethics stuff

• Emersing me into the lessons the way I should do it as a teacher was crucial to long term transfer!
• Providing the resources internet/hardcopy resources—as well as—the primer full of lessons, activities. Keep this up!!

The final project, the primer! the speakers!...all of it.

Exercises related to strategies in the primer.

Clarification of concepts and practice with those concepts

—Lesson 1 designed
—The primer!
—Models from lead teachers and other participants on successful integration…

—Website NWABR
—Primer
—Other binder
—Hiv binder
—[unclear] website

—The ethics primer!
—CD of lessons other teachers develop!!!
—The practice using the decision making framework on different case studies was very helpful!
I will use the Primer and the Ethics in the Classroom materials to change the way I present many aspects of life science. I will now present life science within increased viewpoint of research. It will help with the occasional “why are we learning this?”

I learned that I needed to spend much more time up front with the foundations of ethics/values. I think if I do this, then the later discussions will be much more rich.

1. Ethical frameworks and terminology into. Whether or not I teach these, it gives me more conceptual structure and when teaching ethics.
2. Generic lesson formats for debating ethical questions, including adopting points of view not necessarily one’s own.

I have a broader and deeper understanding of the ethical perspectives from the initial sessions which gives me more confidence in presenting this material. The exposure to a variety of options for how to integrate this material helped me to realize that it doesn’t always have to be a huge project.

1. The information from the guest speakers (content knowledge), 2. the ethics framework worksheets, 3. the work time for our units/lessons.

Template suggestions developing norms, lifeboat, Q of values

The examples of lesson! Plans and the resources available from the binder

I will use the genetics learning website a lot. Additionally, I will use materials for both binders

—Background info. on ethics: Primer
—Resources I have ordered from Amazon after reviewing them here
—My own lesson.

All of it. Nothing should be changed.

—Info. on stem cells, gene therapy, plus HIV/AIDS
—Resource lists
—Contact info. of other teachers (e-collaboration)

Time spent looking thru the primer
The break-out groups

Having the ethics primer to use I think, in the end, will be most helpful.

Ethics principals and thinking skills

The Primer lessons and Ethical Theory’s

The case studies will be particularly useful. I really believe the lesson plans will be helpful as with guiding me through the initial steps of teaching ethics in the classroom.

The prepared case studies and formal and informal assessment ideas.
11. What barriers do you anticipate facing while integrating ethics issues into your curriculum?

Time constraints—aligning to standards

Some students forgetting to allow for others’ opinions and they may be different. I find town mentality a stumbling block.

I just to use see how the classroom management works. And response of parents…

Teaching sensitive issues in a conservative school/community

Pretty conservative area—may have parent/student issues???

—Time! (even though I have total control of the curriculum, there’s never enough time in any classroom.
—without further advanced planning, I know I will tend toward what I am more familiar and comfortable teaching…

Parents?

Not sure yet. Probably my knowledge of ethics. I am not totally confident yet about ethics…

I will have to integrate it with care. Early on I make the point that in science we learn ways of thinking no one is supposed to tell you what to think. You have given me a heavy-duty systematic approach to things already to and I appreciate the enhancement.

Time! and the constant pull of content versus issues

TIME—There are so many competing curricular priorities, that to incorporate ethics more than minimally, will require that other important learning objectives will be discarded

—Mainly finding the time to finish the development of my unit.

Time…I teach biology, which already has a set curriculum, so the best opportunity for me to incorporate these activities is after the WASL (spring), or if I make a new, elective class.

—Resistance by staff to new approach
—Time to organize case studies
—Time within curriculum with WASL content demands

Parents and administration initial reaction. I will plan to explain what I will and won’t be covering.

None, I already do it, now I can do it better and feel more confidence about my knowledge and skills.

Disagreements among students over strongly held values. Parental misunderstanding.

Time!

My own experience. Time to develop my units. Full curriculum, where and how to “squeeze” it in.
The barriers I anticipate are from parents and possibly administration. I’m not too worried though—once it’s explained why ethics are being included I think no one would object.

Time

Time and the WASL

Time (always an issue) and how to fit more in on an already plateful of material. It will fit in though.

The WASL and having too much material to cover in too little time. But I am convinced that I can do both simultaneously.

12. Do you have any suggestions for improving the workshop in the future?

I have an icebreaker name-game to get familiar with each others first name. The icebreaker can be used to identify values for individuals in class or science vocabulary. ‘Mojo’ the game. I will forward the instructions for the game.

This is one of the best workshops I have EVER been to!

Go into more depth regarding the fundamental disagreements and controversies regarding stem cell research and use of animals in research. It felt like we shied away from grappling [unclear] theses issues.

More free time! Beautiful locale, but would have liked to feel less time pressure and like I had more private thinking, processing, and planning time…

—Maybe attempt to put the binder in a more sequential order. It seemed as if we were always referring to different binders and different pages, etc.
—Go to the lake!

I would have liked to start working on my project earlier—I [unclear] we had to get it finished in the allotted time!!!

It was totally great

It was a fabulous week—the best workshop I’ve ever attended. It was just what I expected and needed.

• The workshop was extremely well organize.
• The lead teachers and organizers were tireless and energetic in conveying their enthusiasm and knowledge.
• The food and setting were luxurious.
• In recommending to a colleague, I would note that the content is highly oriented to life science, though not exclusively.
• I would also note that there will be long stretches of ‘talking head’ style instruction between opportunities to interact or create.
• I would encourage lead teachers to give participants a little more space during group interaction, to deliberate and come to their own conclusions even if not every angle is explored.
It would have been helpful to work through the ethical decision-making framework with more case studies. I would have liked more time to work on the projects earlier in the week and perhaps in the morning rather than the end of the day when I was ready to get outside.

Not, this was the best workshop I’ve ever been to! I can tell everything has been carefully selected and evaluated in the past.

—video offering at night—see earlier suggestions
—more time to process and discuss with other teachers of same age level and content—where we’d use this info

Just an excellent workshop keep doing what you’re doing.

Again, very useful format and materials. I could only want a reflection/organization time slot in the schedule.

Make it longer.

More time earlier in the workshop to work on projects

We didn’t get enough to eat! (Not!) I think this was very well organized and very helpful. I don’t feel as if organizing anything was missing

No—I thought this workshop was very well done

This was an incredible experience! I have no suggestions at all, except for a tiny thing—putting towns and states on name-tags.

Add a few days to have more time digest info and develop lessons

Maybe an email reminder since we syned [sic] up so early. (you might have already done that?) I really enjoyed myself. Thank you.
Demographics

<table>
<thead>
<tr>
<th>Ethnic Categories</th>
<th>Females</th>
<th>Males</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic or Latino</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>17</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td><strong>Ethnic Categories: Total of all subjects</strong></td>
<td>17</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Racial Categories</th>
<th>Females</th>
<th>Males</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian/Alaska Native</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>0</td>
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</tr>
<tr>
<td>Native Hawaiian or other Pacific Islander</td>
<td>0</td>
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</tr>
<tr>
<td>Black or African-American</td>
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</tr>
<tr>
<td>White</td>
<td>15</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>More than one race</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Unknown or not reported</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Racial Categories: Total of all subjects</strong></td>
<td>17</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>
APPENDIX C

Ethics in the Science Classroom
2006 Entry and Exit Survey Results

The following tables provided detailed responses comparing Exit to Entry survey responses wherever possible. Note that these tables include all 21 responses to the Entry Survey (100% of participants, not only those who completed both Entry and Exit surveys) and 18 responses to the Exit Survey (86%).

1. Please indicate the degree to which you agree or disagree with each of the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Entry Strongly Disagree</th>
<th>Entry Disagree</th>
<th>Entry No Opinion</th>
<th>Entry Agree</th>
<th>Entry Strongly Agree</th>
<th>Exit Strongly Disagree</th>
<th>Exit Disagree</th>
<th>Exit No Opinion</th>
<th>Exit Agree</th>
<th>Exit Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I have a good understanding of the scientific research process.*</td>
<td>--</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I have a good understanding of ethics as a discipline.</td>
<td></td>
<td></td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Ethics is an important aspect of research in the biological sciences.</td>
<td></td>
<td></td>
<td>7</td>
<td>2</td>
<td>13</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Science instruction must include a focus on ethics.</td>
<td></td>
<td>1</td>
<td>13</td>
<td>5</td>
<td>5</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Discussions of ethics can enhance students’ understanding of science content.</td>
<td></td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>7</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Students must fully understand scientific content before addressing ethical questions.*</td>
<td>--</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Scientific thinking and ethical thinking are similar in that both are based on rational arguments.</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>11</td>
<td>11</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Because science is an objective endeavor, scientists are not the professionals best suited to address ethical questions.*</td>
<td>7</td>
<td>--</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Scientists have a responsibility to consider the ethical implications of their work.</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td>11</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. I feel comfortable incorporating ethics issues into science lessons.</td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>k. I am familiar with classroom resources available from scientific institutions such as the National Institutes of Health (NIH).</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Not asked on the Exit Survey.

The composite scale of measuring understanding of ethics in scientific research consisted of these four items:

C-1
Science instruction must include a focus on ethics. Discussions of ethics can enhance students’ understanding of science content. Scientific thinking and ethical thinking are similar in that both are based on rational arguments. Scientists have a responsibility to consider the ethical implications of their work.

Other items were not included in the scale because their inclusion decreased scale reliabilities. Responses of “no opinion” were included in the analysis and coded as “3” because leaving these respondents out would have significantly decreased sample, even though it was not clear that the midpoint of the scale was a true representation of these teachers’ attitudes (the survey instrument placed this response in the middle of the scale). Cronbach’s *alpha* for the Entry scale was less than desirable at .60; the Exit scale *alpha* was more acceptable at .66.

2. Please indicate how well prepared you feel to do each of the following:

<table>
<thead>
<tr>
<th></th>
<th>Entry</th>
<th>Exit</th>
<th>Entry</th>
<th>Exit</th>
<th>Entry</th>
<th>Exit</th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Develop students’ scientific reasoning ability.</td>
<td>Not adequately prepared (1)</td>
<td>8</td>
<td>2</td>
<td>11</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Somewhat prepared (2)</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Fairly well prepared (3)</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Very well prepared (4)</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>b. Use the Internet to find resources for teaching ethics in science.</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>c. Incorporate ethics issues into a science lesson.</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>d. Facilitate a discussion in which students use evidence rather than opinions to make ethical arguments.</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>e. Guide students’ learning related to ethics in science lessons.</td>
<td>4</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Help students recognize ethical dilemmas in science.</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>g. Aid students in separating fact from opinion.</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Help students understand perspectives different from their own.*</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>i. Modify a curriculum unit in science to include ideas about ethics.</td>
<td>5</td>
<td>7</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

* One teacher did not respond to this item; N = 17.

Cronbach’s *alphas* for the scales consisting of all but item “h” were .89 (Entry) and .91 (Exit).
3. In thinking of your **science** lessons over the course of the school year, how often do the following things happen?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1 to 5 lessons</th>
<th>6 to 10 lessons</th>
<th>11 to 20 lessons</th>
<th>21-30 lessons</th>
<th>Over 30 lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td><strong>Entry</strong></td>
<td>Entry</td>
<td>Entry</td>
<td>Exit</td>
<td>Entry</td>
<td>Exit</td>
<td>Exit</td>
</tr>
<tr>
<td>a. Students are confronted with an ethical dilemma in a scientific context.</td>
<td>1</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>b. Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td>9</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>c. Students give their opinions during discussions.*</td>
<td>--</td>
<td>1</td>
<td>--</td>
<td>5</td>
<td>--</td>
<td>8</td>
</tr>
<tr>
<td>d. Students respectfully disagree with others’ opinions during discussions.</td>
<td>2</td>
<td>2</td>
<td>13</td>
<td>10</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>e. Students discuss a case study related to the content.</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>f. Students engage in role play scenarios (e.g. mock congressional hearings¹) to discuss a scientific or ethical issue.</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>g. Students reflect on their learning through journals.*</td>
<td>2</td>
<td>--</td>
<td>6</td>
<td>--</td>
<td>5</td>
<td>--</td>
</tr>
<tr>
<td>h. Students analyze the scientific or ethical issues in a movie.</td>
<td>4</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>i. Students use evidence to back up their arguments during discussions about ethics.*</td>
<td>5</td>
<td>--</td>
<td>12</td>
<td>--</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>j. I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH).²</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>k. I refer to resources developed by scientific institutions when modifying lessons.*</td>
<td>3</td>
<td>--</td>
<td>7</td>
<td>--</td>
<td>3</td>
<td>--</td>
</tr>
<tr>
<td>l. I modify lessons to include ethical issues.</td>
<td>4</td>
<td>12</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: One teacher did not respond to these items on the Entry Survey (thus N = 20) and likewise for the Exit Survey (N = 17).

* Not asked on the Exit Survey.

¹ This item was shortened on the Exit Survey by omitting the examples, “moot court, panel discussions.”

² This item was shortened on the Exit Survey by omitting the language “when planning lessons.”
The composite scale measuring reported frequency of integration of ethics into science curriculum at entry and exit consisted of these items:

Students are confronted with an ethical dilemma in a scientific context.
Students are asked to make reasoned judgments about issues with no clear right answer.
Students respectfully disagree with others’ opinions during discussions.
Students engage in role play scenarios (e.g. mock congressional hearings\(^1\)) to discuss a scientific or ethical issue.
Students analyze the scientific or ethical issues in a movie.

Other items were not included in the scale because their inclusion led to undesirable levels of scale reliability. Cronbach’s \(\alpha\)s for these scales were .69 (Entry) and .84 (Exit).

4. In which subjects did you use materials that you obtained or learned about through the Ethics in the Science Classroom Workshop or other NWABR-sponsored activity? \textit{Please check all that apply:}

\begin{itemize}
  \item 3 Anatomy
  \item 13 Biology
  \item 4 Biotechnology
  \item 3 Chemistry
  \item 9 Environmental Science
  \item 5 Health
  \item 2 Language Arts/Social Studies
  \item 5 Life Science
  \item 0 Mathematics
  \item 0 Physics
  \item 4 Other (please specify): Advanced Biology, Marine Science, Religion/Philosophy, science issues
\end{itemize}
5. Please tell us whether, and how many times, you used any of the materials from the Workshop this academic year (Please estimate for how many periods during the year you used these resources):

<table>
<thead>
<tr>
<th>Material</th>
<th>None</th>
<th>1 time</th>
<th>2 to 5 times</th>
<th>6-10 times</th>
<th>Over 10 times</th>
<th>Have not used but plan to do so this year</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Ethics Primer</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>b. Genetics and Race (BiDil case study)</td>
<td>3</td>
<td>11</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. NIH Curriculum Unit*</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>d. Animals in Research Unit</td>
<td>2</td>
<td>3</td>
<td>10</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>e. Stem Cell Resources</td>
<td>4</td>
<td>2</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Genetics Science Learning Center Unit</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>g. HIV Research Curriculum</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>h. Consumer Awareness Curriculum</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>i. Lesson you developed at the Workshop</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>j. Lessons posted by other teachers on the NWABR Web site</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>k. Other Workshop materials</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Note: One teacher did not respond to any of these items; N = 17.

* Two teachers did not respond to this item; N = 16.

6. In what ways have you been able to transfer the knowledge you gained from the Ethics in the Science Classroom Summer Workshop into your curriculum? For example, did you modify particular lessons, try new teaching approaches, or use new materials? Please describe.

This Workshop allowed me to constantly rethink, revise all my lessons. I was also able to use this strategy in my Language Arts, Future City Competition and whenever I am working/teaching students. I also try to encourage the parents to think about ethics and try to encourage discussions with their children. I was able to approach this topic with Kindergarten to 8th grade staff members. I became aware that even though they teach generic topics, the teachers felt ill equipped or have had very little training, to teach ethics. I have shared my materials and the workshop with any teacher that I encounter especially if they teach Science.

Keep up the good work.

First, the primer has been my primary resource. I have taken lessons directly from the primer and used them. For example, I use the intro. to ethics (lifeboat activity, general ethical perspectives, etc.) directly from the primer. I copy them off and give them right to the students. It is very well organized, clear, and concise. I have also adapted lessons from the primer to fit my needs. I took the mock congressional hearing, first developed by Paula Fraser, and adapted it to my own classroom expectations and students.

I used the Ethics Primer in conducting a lesson on “what is ethical”.

C-5
I have modified at least three lessons that include ethics.
With the stem cell work students wrote a collaborative essay based on individual research and discussion within their teams.
I used ethics during a comparative anatomy unit.
I used the consumer product materials and made some adjustments

While I have not been teaching this year, I fully intend to return to teaching and as such am constantly rethinking and redesigning existing lessons to incorporate ethics. I intend to utilize both resources made available through the workshop, as well as expanding just in time lessons to focus on breaking scientific news/discoveries. I feel that it is extremely important to utilize classroom discussions, guided controversy and socratic seminars to focus student attention on ethical dilemmas, scientific reasoning and scientific literacy.

I did create an activity in my genetics unit that looked at genetic discrimination and the ethical implications of being genetically tested and who has access to this information. I hadn't done it before this year. It wasn't an activity I got at the NWABR workshop but the workshop gave me the skills and confidence to find an article for my students and create an activity with it. Unfortunately, I only had all chemistry courses first semester and only one biology second semester. I struggled with how to implement these ideas into chemistry, and I just didn't have the energy to modify my biology curriculum for only one section of it the second half of the year.

I've used the materials generally in my Environmental Science class (Wetlands Study) and more specifically in a new religion course built with knowledge and resources from the 2005 Summer Workshop. I've used a textbook on Ethics written by a German theologian and adapted material, concepts and worksheets from the Ethics Primer and selected NIH curricula. I've also used several DVD as case studies as well as prepared case studies from several additional textbooks. I've used current events and issues (such as immigration policies and the situation in Darfur) to develop case studies to examine ethical issues and context.

I frequently called upon new knowledge I had gained in my lessons. I also found several segments of the NIH curriculums especially helpful for different units, including their segments on ethics-- i.e. the brain and addiction and the disease unit for 9-12. I also used parts of the Primer at the beginning of the year to introduce vocabulary and perspectives that I wanted the students to use throughout the year in discussing ethical issues.

I enjoy discussing ethics and now we use it more than ever additionally, we continue and stress not to use one's opinion but to stick to facts for the point of argument. The workshop was great and I really did learn a lot and thought that it was very well put together. The best part was allowing one to adapt it for the classroom. this is new and novel since often times one learns a lot but never actually has the time to figure out how and when to use it in the room.

I often use the organization of stakeholders for discussion of issues and to encourage students to explore other points of view.

I used the primer on several occasions to teach my students the fundamentals of ethical inquiry, to identify ethical issues and to support an ethical perspective. I used the film Gattacca to work through ethical issues in my Genetics unit. My students are now engaged in writing a research paper about a specific bioethical issue, in which they must give background information about the science and technology involved, the ethical dilemmas that are raised by this issue, the possible options to these ethical dilemmas and their reasoned opinion of the best ethical approach. The input I have received from the ethics workshop and the resources and materials provided have been invaluable to me. I most likely would not have ventured into this subject.
matter without this input and support. I truly feel that the connections that my students are making in regard to ethics and science are the most important learning they will receive from me this year. Most of my students will not become scientists, but they will become citizens who have been given some of the analytical tools necessary to bring their scientific and ethical knowledge to bear on contemporary issues that will impact them as individuals and the society they are a part of.

I have completely modified my cell division unit to focus on cancer using the NIH unit. I also have students complete a bioethics research/debate project during the biotechnology unit. But I would say the most value have come from my ability to introduce and discuss topics when the issues may come up unexpectedly.

REally, what I use ethics for is as a precursor to talking/debating about evolution. Ethical issues, I have found, act as a great motivation point for students. It gets the student's more personally engaged in the material and allows them the opportunity to see that their peers have a variety of ideas outside of their own. PLUS, it helps students, who acknowledge those other ideas, also see the merit in other people's thoughts and teaches them that to learn more about an opposing viewpoint is to be able to argue against that viewpoint more effectively later.

I have used several New York Times articles on ethics in the class room, using knowledge, gained from the Ethics in Science workshop.

It was nice to have the primers and resources this year to help me integrate ethics into already existing units. I used many of the internet sites and topics given at the workshop. I felt a lot more comfortable addressing stem cell research after the summer workshop. Presentations at the workshop were excellent and gave me a better understanding of the ethical aspects of many issues I teach in biology.

I used almost the entire consumer awareness curriculum and incorporated it into my unit on environmental health. I also used several of the NIH curriculum materials that I learned about at the workshop. Also, I had my students do group projects on various topics in genetics (gene therapy, DNA profiling, stem cells, etc.) and then discuss their topic from various viewpoints (scientist, family member, ethicist, clergy, etc.) I referred the students many of the web-based resources that I learned about at the workshop to use during their research. There were so many resources to incorporate that it will take me several years to make use of it all!

I used the curriculum from last summer's workshop in a number of different ways when I returned to the classroom. I did modify some of my lessons, I did try a couple of new approaches to previously taught lessons and some new topics.

7. We are interested in your observations of how integrating ethics into science lessons might affect students. Please describe any effects you observed on your students' academic or civic skills.

Students have often verbalized that ethics seemed hard at first. Most were not comfortable in sharing their thoughts, but when I set up a debate session, even the most reticent student was wanting to share their thoughts. It was fun and hope to get more of these debate sessions going. Students would often ask to debate and this process became a popular task. As for civic skills, newspaper reading, internet research, local community happenings were a great spring board for thinking, discussion and journaling civic skills. Parents were often surprised at what their kids would verbalize. So in many instances, the issues that students wrestled with (academics - more information at hand, civic skills - local, regional, national issues were constantly being practiced) were verbalized, discussed, challenged or written.
I have noticed that my students pay attention to the news more! They understand that different perspectives exist outside of their own. My goal, that which I teach and try to model, is that I don't have to agree with a different perspective, but I do need to try and understand it. I feel that teaching ethics in science greatly increases a student's critical thinking skills, and helps them to develop a way to analyze new and different situations. They are also beginning to recognize the tremendous power of science, as well as the significant need for a strong ethical perspective in science to guide decisions.

Students are not very educated in ethics but doing the lessons provides them with opportunities to expand their horizons.

Through integration students can agree to disagree while discussing topics and use evidence to base their arguments. Academically, I believe that students retain more due to empowerment and can articulate information about different perspectives.

Most students will not pursue scientific careers, but can and will utilize skills and methods learned in their science classes. By introducing students to ethics, developing their abilities to think critically, logically and with empathy towards others, students can develop lifetime skills which will enable them to become better prepared citizens. Citizens face a daily barrage of propaganda, both commercial and political, which they must learn to digest with a developed mind, to truly make their own decisions based on fact rather than instinct. While I strove to develop some of these skills in the past, I feel that the training received through this program have helped me to develop stronger teaching skills and have given me a wealth of material to utilize as both background material and as fully developed lesson plans.

I think students were much more aware of the government's role, and how maybe they shouldn't have access to everything (basically a privacy rights issue)

I've basically challenged the students to think more deeply about historical as well as current situations. This creates a broader awareness of how events are connected and impact on the decisions of issues that concern us as individuals, groups or as society as a whole (including the global relationships in today's world). I've also required them to read more challenging written material and to explain their understanding of that material in both written and oral formats (both individually and in small groups). In general, all of my students have responded well and display good writing and speaking skills...they still need to work more on listening. I believe that introducing and discussing ethical issues and perspectives also creates a more relevant context for the students (they are more interested and engaged in the discussions and work).

Some students began to use the vocabulary developed, but I can't say I noticed many effects in academics or civic skills.

Most students come with opinions that are from there home. they often do not think deeply about any issue or other arguments that could ensue. To keep students on track without letting them get overly emotional and forget that they are trying to persuade others with logic. the other question that I have is I wonder how many people that you really do change their minds, that is the hard part.

Students are pleased to explore their own opinions and to role play during discussion. I know that makes science come alive for them, and dignifies their own thoughts. Students learn to discuss, disagree, listen, and understand reasons behind opposing opinions.

I have seen my students struggling to understand the ethical issues involved in their research topic and the various points of view surrounding the topic. It's great to see that struggle. So much of my curriculum does
not challenge students in that way. I have also had students come in to class with stories from the newspaper or evening news in which they are making the connections between science and society and the debate that is going on concerning some of the issues we have addressed.

The students seem to be more interested when discussing bioethical issues. As a result, their assessment scores increase. I also notice the students trying to be more aware of what they're saying before they say it and to really listen to other arguments.

As I stated before, certain ethical issues, if presented appropriately, helps to intrinsically motivate more student. The addition of case studies also helps students to see the potential real-world impacts of what they are learning on their own life as well (pedigrees for example).

There is a twofold learning curve, teaching students about ethics increases their awareness of ethical issues. Repeatedly students have shown me articles that are of ethical nature. The other point I want to make that students are more sensitive as to how a discussion should be run, they listen carefully and reply in a sensitive manner, they use their words carefully. So altogether I think they become sensitized to various topics.

Students were more connected and interested in the topics we covered in class when ethics was integrated.

At this point it is a little difficult to tell. Academically, they seemed to find it very challenging to go to this next level of cognitive reasoning. This may be because of my lack of comfort with presenting the information as well, however, so time will tell more in this area. Ethical discussions and awareness dramatically increased the students interest in science, however, and caused them to respond passionately about the decisions they believe society should make in regard to genetic research, in particular.

I feel that the students gained from having the opportunity to understand how communities regulate and decide how to incorporate laws. Students enjoyed researching topics and trying to figure out how to present the facts vs. opinions on a number of different topics.
8 and 9:

What ways, and with whom, have you shared information about the Workshop [with others in your school (question 8); who else (question 9)]? Check all that apply in each row.

<table>
<thead>
<tr>
<th>Shared Ethics Primer with...</th>
<th>Science teachers at my school</th>
<th>Teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

Shared materials from the Workshop notebook with...

<table>
<thead>
<tr>
<th>Shared the unit I developed (e.g., HIV/AIDS vaccine, Stem Cell) with...</th>
<th>Science teachers at my school</th>
<th>Teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Shared other ESC curriculum units (e.g., animal testing) with...

<table>
<thead>
<tr>
<th>Shared information about ethics resources (e.g. websites) with...</th>
<th>Science teachers at my school</th>
<th>Teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

Shared information about how to participate in the Summer Workshop with...

<table>
<thead>
<tr>
<th>Shared information about other educational opportunities sponsored by NWABR with...</th>
<th>Science teachers at my school</th>
<th>Teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
10. How likely would you be to participate in any of the following types of training or support in the future?

<table>
<thead>
<tr>
<th>Training Type</th>
<th>Not likely</th>
<th>Somewhat likely</th>
<th>Highly likely</th>
<th>Not sure at this time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online/ distance learning course*</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Leadership Institute so that I could train others and disseminate materials (week-long)*</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Advanced level summer Workshop (week-long)</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>Workshop on specific issues/curriculum, e.g. HIV vaccine trials (day-long, held in a central location)</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Training/presentation provided at my district (day-long)</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

* One teacher did not respond to this item; N = 17.

11. Please describe any ways that you feel NWABR could facilitate, or further, your use of the Ethics in the Science Classroom materials.

I think it would be helpful to see what districts, regions, local communities are using and drafting lessons with simple, easy to obtain materials. This would help teachers, who are often limited with funding, time, etc. and help facilitate teaching this material.

It would help to have these same lessons critiqued by teachers, students, parents, administrators to give lessons “a stamp of approval.” Administrators look for these labels, as well as teachers and parents.

I use the website as a first reference when I am building a new lesson. Continuing to regularly update the website will facilitate me in that regard. I would love to attend any workshop that they provide, so the more the better! NWABR has changed the way I teach science, for it gives me a significant bridge between a textbook and the outside world. It provides a way of showing the reality of the impact of science, and it makes it exciting for me to be involved with it! Just keep doing what you are doing!

I feel that the NWABR training and workshop settings have helped me in developing my abilities as a teacher and to reinforce my strong feelings that science in a classroom setting should be about more than teaching science trivia, meeting WASL requirements and preparing students for further science classes, but to prepare students for advanced and logical decision making throughout their lives. I believe that NWABR should reach out to teachers outside the science community, particularly those teaching social studies, civics, economics, history and government.

To reiterate, I have answered the questions I felt to be relevant to my situation, not having taught this school year. As I utilized the ethics primer prior to attending the summer seminar program, I felt I could truthfully answer questions regarding the primer from the viewpoint of having used it in a teaching situation. If you have any further questions please feel free to contact me. Gordon Sprinker

I think small follow up sessions would be helpful. I loved our reunion in May, but it's so late in the year. I know people come from all over to do this program, but maybe a January or November workshop would keep the enthusiasm up from the summer workshop. It's so easy to get swept away when the school year starts and...
I think a little follow up would be good. Please note that I only indicated “not likely” on the future events because I have decided to leave my teaching position and will not be teaching science again. One of the most positive experiences I have had as a public educator has been my participation in the NWABR summer workshop. I felt a level of professional support, resources, and encouragement that public schools just don't provide for science educators. I think this is a valuable program and I want to thank all of the institutions and agencies that support this program and make it possible.

Continued sharing of information about upcoming events or new resource materials and certainly sponsoring events like our recent “reunion” to bring us together for discussions and work sessions will help to keep our involvement and momentum going forward!

I find what they are already doing more than sufficient. There's a lot of material that I have that I still haven't, but want to incorporate into my teaching at this point. Time is what is lacking.

You guys are great and could not be any better if you tried

Follow up workshops and trainings on ethics in general and specific bioethical issues.

Unless NWABR can give me more time with my students, I don't think there is anything else that they can do. I highly praise NWABR with their approach to professional development and with the experiences that I have had at the summer workshop and spring reunion!

Send updates, additional classes to take, seminars, etc... via e-mail to participants. Of course, you already do that now to some extent, but I feel that there must be more opportunities to energize teachers and motivate them along these paths.

I think NWABR does a terrific job. I am so greatful that I have been introduced to Ethics in the classroom via the summer workshop, I have gained so much from this.

I very much would like to work with some of the film clips we were introduced to, however some are very hard to come by and are on a lease which has to be renewed every two years for $25.- Would there be a way to exempt schools from this lease?

Thank you so much for all you have done for us.

I enjoyed NWABR workshop and learned how to better integrate ethics into the science curriculum. The presenters, resources, and organization of the summer workshop was great.

Continue to provide training in the explanation and application of ethics with real life curriculum examples so the comfort level of applying it in the classroom will increase. I also really enjoyed the discussions and presentations at the May reunion day.

They have done a great job of providing the workshop, training, and materials for this curriculum. Everything comes down to money! Sure they could help pay airfare, but I do not see that really happening. They did a great job with the resources they have available. Thanks!!
APPENDIX D

2003-04 Ethics in the Science Classroom Participants
Sustained Effects of Workshop Participation Survey Results (March 2006)

1. Please tell us whether, and for how many class periods, you have used any of the materials from the Workshop this academic year:

<table>
<thead>
<tr>
<th>Material</th>
<th>Used more than 5 periods</th>
<th>Used 2 to 5 periods</th>
<th>Used one period</th>
<th>Have not used but plan to do so this year</th>
<th>Did not use this year</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Ethics Primer</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b. NIH Curriculum Unit</td>
<td>1</td>
<td>1</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>c. Animals in Research Unit</td>
<td>1</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>d. Tuskegee Case Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Genetic Testing of Newborns Unit</td>
<td>1</td>
<td>1</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>f. Lesson you developed at the Workshop</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Other Workshop Materials</td>
<td>1</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

2. Since participating in the 2004 Ethics in the Science Classroom Summer Workshop, in what ways have you been able to transfer the knowledge you gained into your curriculum? For example, did you modify particular lessons, try new teaching approaches, or use new materials?

The workshop has not affected my lessons.

I have added ethics components to some of the “case study” type lessons I use.

I have since started to co-teach with a science teacher. I am a special ed. teacher and my students are in the classroom with the reg. ed. students and I modify the curriculum and assignments as needed.

I incorporated these ethic topics are motivators to my lessons. Unfortunately with NCLB, we have no free time to explore things.

I developed a sixth grade “intro” to ethics lesson collection including the life boat and cheating scenarios. That was something new. I will insert the lessons that were written at the workshop into the human biology unit this year when we discuss the excretory system. When some dialogue is expected from students I remind them of the work we did with the life boat scenario to remind them of how to communicate what they want/need.

3. If you did use any of the lessons or materials from the Workshop this year, please describe one example of how you did so.
I use the primer lessons on ethical conduct, lifeboat and homework copying drills, as a double edged approach to small group discussions and also to open the door on ethics for scientists. In using the lessons early in the semester I can use that language and skill set to refer back on as we explore other aspects of our studies.

Used ideas from the Ethics Primer to ask the questions “is this good? Is this right?” in a more formal way.

I presented the curriculum I helped to design on stem cells to the science class that I am co-teaching over a period of 2 months. I’ve also worked with the reg. ed. science classrooms with my students to present the lesson on cosmetic ingredients and animal testing.

I used the ethics of kidney donations when I taught about the excretory system.

Life boat ethics--just as written
Cheating/4-corners
I asked students to justify their belief about cheating by using one of the four principles.

4. In what ways, if any, do you feel your students were affected by the lesson you described above? If students gave you feedback, please share their comments.

The gist of their replies fell into two general groups:
~Wow that was too hard to make choices like that
~I never thought about like that before we did that adventure

I THINK it makes the case studies easier to understand and more fun to discuss. Don't honestly know if this is true.

Students were interested and interactive for the most part. They liked the fact that there were articles in the newspaper and news programs on TV about the current debate over stem cell research and they had some engaging discussions on the subject. They especially liked the articles we read about how this affected real people and their families.

My students are too young to fully understand the impact of these issues. They were interested in hearing about them, but have no control over them.

The life boat ethics was truly a treat for them--they loved the discussion (arguments) they had in trying to make their point clear...that will be remembered. It's something I refer back to when we need to dialogue in class.
What ways, and with whom, have you shared information about the Workshop [with those in your school (question 5); with others (question 6)]? Check all that apply in each row.

<table>
<thead>
<tr>
<th></th>
<th>Fellow science teachers at my school</th>
<th>Fellow teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Shared Ethics Primer with...</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b. Shared materials from the Workshop notebook with...</td>
<td>5</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>c. Shared specific curriculum units (e.g., animal testing) with...</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d. Shared information about ethics resources (e.g. websites) with...</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>e. Shared information about how to participate in the Summer Workshop with...</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>f. Shared information about other educational opportunities sponsored by NWABR with...</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
7. If you shared information about the workshop or curriculum in other ways, please describe.

   Discussions of case studies from the workshop with friends.
   I shared this information with my science department and the four other schools in my district.

8. Please indicate whether or not you participated in the following NWABR-sponsored or partner activities:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Participated</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Student Biotech Expo</td>
<td>0</td>
</tr>
<tr>
<td>b. NWABR Speakers Bureau</td>
<td>0</td>
</tr>
<tr>
<td>c. Stem cell workshop (October 2004)</td>
<td>1</td>
</tr>
<tr>
<td>d. &quot;Biomedical Breakthroughs and My Life&quot; essay and poster contest (2004-5)</td>
<td>0</td>
</tr>
<tr>
<td>e. Consumer Awareness Workshop (October 2005)</td>
<td>1</td>
</tr>
<tr>
<td>f. Medicines and Your Health Workshop (November 2005)</td>
<td>0</td>
</tr>
<tr>
<td>g. BBKing—Bringing Biotechnology to King County (2005-6)</td>
<td>0</td>
</tr>
<tr>
<td>h. Science and Technology Roundtable, Spokane (2006)</td>
<td>0</td>
</tr>
<tr>
<td>i. LEAP Summit (2006)</td>
<td>0</td>
</tr>
</tbody>
</table>
9. In thinking of your science lessons over the course of the school year, how often do the following things happen?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1 to 5 lessons</th>
<th>6 to 10 lessons</th>
<th>11 to 20 lessons</th>
<th>21-30 lessons</th>
<th>Over 30 lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Students are confronted with an ethical dilemma in a scientific context.</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Students respectfully disagree with others’ opinions during discussions.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Students discuss a case study related to the content.</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Students engage in role play scenarios (e.g. mock congressional hearings) to discuss a scientific or ethical issue.</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Students analyze the scientific or ethical issues in a movie.</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH) when planning lessons.</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. I modify lessons to include ethical issues.</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. What, if any, ethics issues do you anticipate addressing in your class next year?

Genetics. GMO has become more possible with the addition of new genetics modules in our life science curriculum. I believe that the kids will be interested in taking in more of the information and decision role playing that they have been in the past. Now I just need to find ways to wedge in the time on the calendar!!

Resource use. Genetically modified foods.

I plan to present the stem cell curriculum again next year.

I would incorporate the ethics of pollution which is causing global warming. My students seem to relate to this topics especially with the movie the day after tomorrow.

Organ donation (pools/prioritizing)
11. How likely would you be to participate in any of the following types of training or support in the future?

<table>
<thead>
<tr>
<th>Type</th>
<th>Highly likely</th>
<th>Somewhat likely</th>
<th>Not likely</th>
<th>Not sure at this time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Online/distance learning course</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>b. Leadership Institute so that I could train others and disseminate materials (week-long)</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>c. Advanced level summer workshop (week-long)</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>d. Workshop on specific issues/curriculum, e.g. HIV vaccine trials (day-long, held in a central location)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>e. Training/presentation provided at my district (day-long)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

12. Please describe any ways that you feel NWABR could facilitate, or further, your use of the Ethics in the Science Classroom materials.

   Keep up the great work!
   No ideas just now!
   Possible meeting more often with groups in my area that have attended past workshops.
   Add new areas of ethical issue into other topics like chemistry or physics. Talk about the ethics of nuclear energy for chemistry for example
APPENDIX E

Ethics in the Science Classroom
Lead Teacher Survey 2006 Results

A total of five out of six Lead Teachers responded to the survey for a response rate of 83%. Numerical responses for two Lead Teachers who were not classroom teachers in 2006 are excluded from all tables. Their comments in response to open-ended questions, however, are included.

1 and 2:

What ways, and with whom, have you shared information about the Workshop [with others in your school (question 1); who else (question 2)]? Check all that apply in each row.

<table>
<thead>
<tr>
<th></th>
<th>Fellow science teachers at my school</th>
<th>Fellow teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Presented at a conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Ethics Primer with...</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Shared materials from the Workshop notebook with...</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Shared specific curriculum units (e.g., animal testing) with...</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Shared information about ethics resources (e.g., websites) with...</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Shared information about how to participate in the Summer Workshop with...</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Shared information about other educational opportunities sponsored by NWABR with...</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Question 3

In what ways, if any, do you feel your students were affected by integrating ethics discussions into science lessons? If students gave you feedback, please share their comments.

…At the first of the year I do introductory lessons about ethics so that my students and I are able to incorporate ethics into everything that we do together in our classroom “community of inquiry” for the entire school year--interpersonally, in our communities outside of school, as well as, across disciplines and curriculum areas--literature, civics, history, economics. We emphasize the “citizenship of science”--which includes the learning about and application of critical and ethical reasoning in all areas. I think this approach has a major impact on how they see and understand the complex, interdependent world that they live in

The students gained a greater interest in the subjects that I integrated ethics with. They have tend to get more involved in the ethics activities and have more questions for me. The ethical pieces allow the students to see how science affects them and society.

I feel that my students are deeper thinkers, more responsible citizens, and more open minded individuals due to the ethics curriculum. Students who have been less engaged have a new passion for learning the science behind some of the controversial topics in class, and students who have been excited about science always now see a whole new window of thought and study. What I appreciate most is how integrating ethics seeps into everyday interactions and decisions….

…From my own experience, my students learned how to work within a diverse group and analyze difficult situations. They became aware of how important facts were in making a decision as well as how emotions can cloud the process. From my own experience in the classroom, I found that students developed tolerance for different ideas and opinions. Using a decision making format with clearly defined rules for discussion helped students to accomplish group work and present a product. Students enjoyed using role play and presenting the work of the group. They felt as though they had become “experts” and learned about science in the real world.
**Question 4**

In thinking of your science lessons over the course of the school year, how often do the following things happen?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1 to 5 lessons</th>
<th>6 to 10 lessons</th>
<th>11 to 20 lessons</th>
<th>21-30 lessons</th>
<th>Over 30 lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are confronted with an ethical dilemma in a scientific context.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students respectfully disagree with others’ opinions during discussions.</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students discuss a case study related to the content.</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students engage in role play scenarios (e.g. mock congressional hearings) to discuss a scientific or ethical issue.</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students analyze the scientific or ethical issues in a movie.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH) when planning lessons.</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>I modify lessons to include ethical issues.</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Question 5**

How useful did you find the following types of assistance in supporting your work as a Lead Teacher?

<table>
<thead>
<tr>
<th>Assistance Type</th>
<th>Very useful</th>
<th>Somewhat useful</th>
<th>Not very useful</th>
<th>Not sure/Didn't use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training sessions (e.g., on leadership characteristics)</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning meetings (e.g., for Summer Workshop, Reunion, Short Course)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-on-one assistance from NWABR staff (e.g. meetings or phone conversations)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistance in accessing resource materials</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-day session, immediately prior to Summer Workshop</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Question 6**

In what ways, if any, has serving as an ESC Lead Teacher affected your own professional development?

This experience has given me more credibility and competence not only within my own classroom and school community, but it has also given me more credibility and competence within the greater educational community as I do “outreach” related to my experience as a lead teacher with NWABR. I have done workshops and presentations where I have shared the NWABR Ethics Primer and philosophy with mostly secondary teachers at various science and social studies conferences in the past three years. I have also shared the primer and philosophy at workshops for the WA State Office of Superintendent of Public Instruction Winter and Summer Institutes. I am in constant communication with leaders at the WA State OSPI level in areas of both science and social studies classroom-based assessments to assure that the methodology within the PRIMER is used in this area, to provide more “authentic” assessment of student learning in both science and social studies.

Prior to the Fall of 2004 I was a high school science teacher for seven years who taught ethics and bioethics in my classes. This June I will receive a Master's in Bioethics. Working with the NWABR staff and with current science teachers has been a very valuable and satisfying opportunity for me to combine my past and present fields.

I have shared what I have learned to other teachers and it has become a part of our curriculum that all students experience. I have also developed a year long course on the topic of research and ethics.

Serving as a lead teacher has allowed me to work more effectively with adult learners who are also peers and colleagues. It has also helped me develop more collaborative skills as I work with my fellow lead teachers. Finally, it has pushed me to reinvent and improve everything I do, as there is no ceiling on how to do anything well.

As with any professional development experience, I try to incorporate the ideas into my own supervisory duties. Working with teachers outside of New Jersey has always given a perspective on teaching science as well as the differences from state to state.

**Question 7**

In what ways, if any, has serving as an ESC Lead Teacher affected your classroom activities?

Working with NWABR has given me an opportunity to dialogue with other strong teachers about “best practices” when incorporating ethics into classroom curriculum. Working with scientists/mentors has increased my content/process expertise in the area of the life sciences. I believe that I bring to the table expertise in the area of social studies best practices; integrating science content and social studies methods and approaches has led to very strong student learning within my classroom that engages, enriches, and extends their understanding.

It has brought in different ways of presenting ethical materials such as congressional hearings and role playing.

As with anything, teaching something is the best way to learn something. My comfort level with ethics as a discipline and as classroom practice has become so comfortable and near second nature. I incorporate the classroom practices and ethics modules to anything I teach whether the specific content is science or not.

**Question 8**

What suggestions do you have for improving the experience of serving as an ESC Lead Teacher?

Keep doing the excellent job that you are doing! The only suggestion that I would make is to consider working toward a more “interdisciplinary” approach. This direction is authentic and “real life.” Not all students will become scientists; however, they will need the basic knowledge, skills, and dispositions necessary to make informed and ethical decisions in their personal and public lives as future citizens within a pluralistic, democratic
society within the context of a complex, interdependent world. I would like to see more intentional connection with the social studies.

Nothing - it has been a great experience and the NWABR staff is amazingly friendly, knowledgable and organized. PLEASE NOTE - As mentioned above, I am no longer a classroom teacher so most of the survey questions were not applicable to me. If there are any other questions that I can answer that will be helpful in your evaluation I would be happy to do so. Thanks.

Provide more opportunities for course work on bioethics either online or during the summer.

I am quite thrilled with the Lead Teacher experience. If anything, I would love to help develop a training FOR lead teachers so that more experienced teachers can transition into lead teachers.

Over the years, the Ethics in the Classroom program has utilized the Lead Teachers in a greater capacity. This has helped develop them as resources for the attendees. While I would have answered this question differently a year ago, the increased use of them throughout the program has been positive.
APPENDIX F

Ethics in the Science Classroom
Curriculum Design Team Survey 2006 Results

A total of seven out of ten Curriculum Design Team members responded to the survey for a response rate of 70%.

1 and 2:

What ways, and with whom, have you shared information about the Workshop [with others in your school (question 1); who else (question 2)]? Check all that apply in each row.

<table>
<thead>
<tr>
<th>Shared Ethics Primer with...</th>
<th>Fellow science teachers at my school</th>
<th>Fellow teachers at my school, outside of the sciences</th>
<th>Department heads at my school</th>
<th>Administrators at my school</th>
<th>Teachers at other schools</th>
<th>District level staff</th>
<th>Presented at a conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shared materials from the Workshop notebook with...</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shared the unit I developed (e.g., HIV/AIDS vaccine, Stem Cell) with...</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Shared other ESC curriculum units (e.g., animal testing) with...</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shared information about ethics resources (e.g., websites) with...</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shared information about how to participate in the Summer Workshop with...</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Shared information about other educational opportunities sponsored by NWABR with...</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
3. In what ways, if any, do you feel your students were affected by integrating ethics discussions into science lessons? If students gave you feedback, please share their comments.

I think they take more time when making decisions concerning how they feel about controversial subjects in my class. They seem to respond to the “humaness” of ethics and it helps them realize science is a human endeavor.

We have done a brief intro to ethics (one class period). The students were very engaged, and excited about the discussion. We are preparing to do a much more in depth unit as part of a research paper, and unit on stem cell research during the month of May. They will also be presenting their “stands” orally to students in their advisory classes.

The students seem to be more involved in the lessons when they are presented the ethical issues and asked to discuss them.

My students are really engaged when we bring ethics into the curriculum. They love it.

Incorporating ethics discussions into science lessons encourages students to think beyond themselves and consider the ideas and feelings of others. It forces them to realize that actions have consequences and not everyone is affected in the same way.

For some, it was the first time “ethics” was presented and discussed with them. For all, it was an enlightening experience--made them realize that “science” is more than just labs and test tubes.
4. In thinking of your science lessons over the course of the school year, how often do the following things happen?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1 to 5 lessons</th>
<th>6 to 10 lessons</th>
<th>11 to 20 lessons</th>
<th>21-30 lessons</th>
<th>Over 30 lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are confronted with an ethical dilemma in a scientific context.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students are asked to make reasoned judgments about issues with no clear right answer.</td>
<td></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students respectfully disagree with others’ opinions during discussions.</td>
<td></td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students discuss a case study related to the content.</td>
<td></td>
<td></td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Students engage in role play scenarios (e.g. mock congressional hearings) to discuss a scientific or ethical issue.</td>
<td></td>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students analyze the scientific or ethical issues in a movie.</td>
<td></td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I draw on resources developed by scientific institutions such as the National Institutes of Health (NIH) when planning lessons.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>I modify lessons to include ethical issues.</td>
<td></td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. How useful did you find the following types of assistance in supporting your work as a Curriculum Developer?

<table>
<thead>
<tr>
<th>Assistance</th>
<th>Very useful</th>
<th>Somewhat useful</th>
<th>Not very useful</th>
<th>Not sure/ Didn't use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory meeting in Spring</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-on-one assistance from NWABR staff (e.g. meetings or phone conversations)</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Assistance in accessing resource materials</td>
<td>6</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Follow up curriculum revision session (2004 group only)</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-day session, immediately prior to Summer Workshop</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. In what ways, if any, has writing ESC curriculum affected your own professional development?

I am much more careful when planning lessons to break them down into parts that are easier for my students to understand deeply. I tend to spend more time on a single subject rather than superficially on several subjects. I have a better understanding of ethical ideas and I think that transfers into all the other classes I teach …

I have had the opportunity to work collaboratively with other science teachers, with scientists, and other professionals that I never would have met. I’ve learned a lot about the subject of stem cell research, and have also been able to use that to come up with topics for a research paper. The paper will be an integrated unit between science class, english class and advisory.

I am a special education teacher and one of the best things that happened as a result of my participation in this curriculum development was that I was able to dialogue with the regular ed. science teachers in my school and one of them agreed to have me co-teach a class with her this year. I presented the curriculum to this class and the other science teachers are also interested in my presenting it in their classrooms or working with them to present it on their own. It gave me more insight into the regular ed. classrooms and how my students can perform in that setting.

It helps me integrate more ethics into the curriculum because I already have it ready to go instead of having to develop brand new curriculum during the school year. I also love the interaction with other teachers I work with designing curriculum. I always learn new ways to incorporate ethics into my classes and get new ideas.

Shown me that I am capable of doing it.

It has been a great experience in simply gaining that experience. It was much tougher than I realized it would be. It has given me a perspective that I think many teachers lack from not having been through it. I’m still not certain how it is benefiting me professionally--that is, not sure how to express how it is benefitting my professional development (maybe a confidence issue, maybe other things?).

7. In what ways, if any, has writing ESC curriculum affected your classroom activities?

I include much more ethical ideas into all classes. The decision making model has been a great resource for helping students break down the parts of a controversial question and so I use it often for pre-writes. My students seem to see science more as a process than facts because of the relevant questions I now try to include in nearly every lesson. We tend to have more discussions as a class before writing assignments which I think makes it easier for them to get started once we begin to write.

In the classroom, I am using the materials I’ve help design. My students enjoy the “change of pace” because the unit uses different methods than I normally would do. We have role playing, games, etc... in the unit.

Several of my special ed. students were in the science class that I co-taught and it gave them an opportunity to be in a classroom where they had access to a real lab and could interact with typically developing peers. Some of them had a hard time with the abstract concepts in the ethics lessons but did contribute as much as they were able.
Again, I incorporate more into the classroom when I have designated time to work on planning curriculum instead of having to develop it as the school year is going. I have always done a lot of activities in my classes, but the students particularly love the ethical issues. It really engages them.

I find I am more likely to critique other activities and rewrite them, using ideas I gleaned from my work with NWABR.

The experience has given me more confidence in developing my own materials, and encouraged me to do so more frequently when I'm not satisfied with various activities.