

Brecksville-Broadview Heights City Schools  
**Teacher Technology Grant Application**  
*Spring, 2008*

This form should be completed and submitted electronically via email to John Schinker (schinkerj@bbhcsd.org) prior to the application deadline. One form is required per project proposal. Please see the *Teacher Technology Grant Guidelines* for details. The application deadline is **6:00 PM on Friday, February 15, 2008**. Applications cannot be accepted after the deadline.

**Please Note:**

This form requires macros to be enabled on your computer. To see if they are, click on the button on the right. You should get a dialog box indicating that the macros are fine. **If you don't see this dialog box after clicking the button**, go up to the menu and click on Tools, Macro, Security, and set the Security Level to LOW. Then, **close this document and re-open it** and test again to make sure it's working. If you do not have macros enabled, you will not be able to complete this application properly.

Test Macros

**General Information**

Project Title:	Molecular Genetics And Gel Electrophoresis Biotechnology		
Primary Applicant:	Robert Berg		
Co-Applicants:	Mike Glaser, Karen Horvath, Dan Reynolds, Lou Rundo, Mike Schmidt		
Project Location:	Brecksville-Broadview Heights High School		
Affected Students:	Number:	426	Description: General, Honors, Academic, and AP Biology students.
Project Summary:	Every student who is enrolled in any level of high school biology will use this equipment to explore molecular genetics by using state-of-the-art gel electrophoresis equipment. Students will utilize real-world laboratory techniques to study and manipulate DNA. Results of experimentation will be documented with digital photography, allowing students to download results for in-depth analysis. Students will explore the impact DNA manipulation has had on science and society and focus on emerging issues associated with DNA science. All students will actively be involved with equipment use.		

**Goals & Objectives**

Please list the goals of this project:	
	Students will master the content standards in science associated with biotechnology, molecular genetics, genetic engineering, and the manipulation of genetic information.
	Students will safely undertake classroom experimentation using the latest technologic tools associated with DNA science.
	After exploring molecular genetics, students will describe how biotechnology relates to prospective careers (e.g., medicine, disease diagnosis, genetic counseling, forensics, etc.).
	Students will successfully collect laboratory results digitally, transfer the data electronically to a computer system in order to analyze biotechnologic data.
Which Technology Academic Content Standards are met by your project?	
	Standard 7: Designed World; Benchmark F-9.5 Investigate emerging (state-of-the-art) and innovative applications of medical technologies.

	Standard 7: Designed World; Benchmark G-11.1 List biotechnology applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment and genetic engineering.
	Standard 7: Designed World; Benchmark F-10.1 Describe how technology has impacted medicine in the areas of prevention, diagnostic, therapeutic treatment and forensics.
	Standard 3: Technology for Productivity Applications; Benchmark B-10.2 Use equipment related to computer and multimedia technology imaging (e.g., digitalization, optical character recognition, scanning, computerized microscopes).
How will this project improve students' 21 <sup>st</sup> century skills?	
	Student participants will increase scientific literacy regarding molecular genetics and biotechnology. By directly manipulating DNA and utilizing the various techniques associated with gel electrophoresis, our students will acquire a unique knowledge base which was not available to secondary students of the 20th century. Staff members will enhance the student experience by providing examples of how this newly gained knowledge may be used within a global society for positively impacting human welfare (e.g., development of new medicines, gene therapies, forensics, a different work force impacting a new economy, etc.). Critical thinking skills will be enhanced as students analyze and interpret their results using this equipment. Students will directly experience the scientific and technical skills needed to undertake these biotechnological activities. Career opportunities within the field will be discussed; careers that until recently were not available. Throughout the academic year, teachers will continually reinforce molecular genetic contributions by referring to newsworthy current events which are published on a regular basis.

<b>Project Plan</b>	
Please describe the project:	
	This project will enhance curricular presentation of molecular genetics principles associated with the study of deoxyribonucleic acid (DNA) for all academic levels of biology students. An equipment package will be purchased from Fotodyne Incorporated which includes all necessary materials to analyze DNA so that student understanding will be maximized by the fact that actual hands-on manipulation of the major molecular techniques can be undertaken. Purchased equipment will include six Mini Dual Cell Electrophoresis Chambers, a FOTO/Phoresis Ultraviolet Light Transilluminator, a FOTO/Analyst Digital Camera, FOTO/Force 300 Power Supply, and a FOTO/Printer with LCD imaging for use in printing student results. Students will experience that DNA can be easily cut using enzymes as “molecular scissors.” Once this DNA is cut into fragments, the fragments will be loaded into an electrophoresis gel, a process witnessed by almost everyone who has watched any current science investigation public broadcast (e.g., “CSI” or “Forensic Files”). The process of “running a gel” is quite simple and utilizes molecular concepts which students should already be familiar (atomic structure, the nature of electricity, charged particles, etc.). Vertical articulation within the existing science curriculum will be enhanced by this project. Once the bands of fragmented DNA are run, the gel will be placed on an ultraviolet light source for illumination. Students then will use digital technology to capture an image of the gel by using the digital camera which is attached to the photoilluminator. Digital images of the separated DNA bands may then be downloaded to computer systems and projected on existing smartboards for easy analysis and study. Included with the technology package is a compact photo printer so that students will be able to include hard copies of their results with assignments and lab reports. The use of all equipment will greatly enhance our 9-12 biology curriculum allowing teachers to effectively address associated

Ohio Academic Content Standards. After students experience this technology, their scientific literacy will be substantially enhanced regarding the study of DNA and molecular biology techniques associated with DNA. Students will learn reality-based relationships between science and society and will explore ways DNA science may directly impact their future. As appropriate, students may further their studies by correlating information gained with this project to other technology resources such as international data bases, the published electronic information pertaining to the Human Genome Project, how bacteria are being manipulated with gene splicing, etc. At the Advanced Placement level, students may use this equipment as part of their second semester research project.

## Budget

Please select the quantity and descriptions of items required. Refer to the hardware menu for prices and details on allowable items.

Quantity	Description	Unit Cost	Extended Cost
1	Digital UV Mini Dual Cell Workstation	4190.00	4190.00
1	Digital Photo Printer E60-1100	400.00	400.00
2	Mini Dual Cell Electrophoresis Chamber E1-1409	410	820.00
1	Shipping	40.00	40.00
0		0.00	0.00
0		0.00	0.00
0		0.00	0.00
0		0.00	0.00
0		0.00	0.00
0		0.00	0.00
0		0.00	0.00
0		0.00	0.00
<b>TOTAL:</b>			5450.00

Please provide any necessary notes or comments on the items listed above.

The equipment has a very long useful life. The project has the potential to impact thousands of biology students for many years to come.

Please describe other sources of funding, and how that money will be used.

NA

How will the project be sustained beyond the first year without additional technology funding?

Once the equipment hardware is purchased, very little additional funding will be needed. Chemicals, reagents, sources of DNA, and appropriate enzymes can be purchased from the existing district 553 fee account which currently exists for all biology offerings.

## Project Evaluation

Please describe how you will measure the success of your project in meeting the goals outlined above:

Student lab documents will be compiled by teachers and student responses will be recorded. Rubrics will be established to accompany some lab reports. These rubrics will address student understanding associated with curricular content, lab technique, procedure, and safety. Student results will be plotted on an Excel spreadsheet and extrapolated data will be compared to known standards to determine accuracy. Unit and chapter tests will include specific questions related to the technologies undertaken during this project. After the Ohio Graduation Test is administered and made available, pertinent questions will be scored using the same standard. Student

	proficiency of "C" or better earned for all evaluation documents will help verify successful acquisition of these topics. Direct teacher observation will be used also as a means of student assessment.
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<b>Procedural Assurances</b>
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Please check the boxes next to each of the following statements to indicate your acceptance to the terms and conditions of this project:
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|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Purchased equipment belongs to the school district, and may be removed or reassigned if the awardee fails to follow the procedures of the grant.   |
| <input checked="" type="checkbox"/> | Projects that target a particular school, grade, or subject may stay with the target population if the applicant's teaching assignment changes in subsequent years.  |
| <input checked="" type="checkbox"/> | All purchases related to the grant will be made directly by the district. Funds will not be dispersed to awardees.   |
| <input checked="" type="checkbox"/> | Grant decisions will be made by the district technology team whose decision will be final. The technology team may enlist the help of media specialists and administrators in first-round evaluations of grant proposals.    |
| <input checked="" type="checkbox"/> | Grant awardees may be asked to make presentations about their project at staff meetings, inservice opportunities, or conferences.  |
| <input checked="" type="checkbox"/> | An evaluation of the project, following the evaluation procedure outlined in the grant proposal, must be completed and submitted by May 31, 2009. Grant awardees will receive the procedure for completing this requirement. |
| <input checked="" type="checkbox"/> | Proposals will not be funded without the support of the building principal.  |