

Bull, G. & Garofalo, J. (2002). Proceedings of the Fourth National Technology Leadership Summit: Open Resources in Education. *Contemporary Issues in Technology and Teacher Education*, 2(4), 530-555.

## Proceedings of the Fourth National Technology Leadership Summit: Open Resources in Education

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### PREFACE: RATIONALE FOR BUILDING AN EDUCATIONAL SOURCE FORGE

The underpinnings of computer science were developed in university research centers. University researchers often shared and exchanged code as a way of learning new programming techniques. During that era, the majority of software was what might be termed “open source” today.

As software development became a for-profit commercial enterprise, the code was treated as a business asset. Commercial firms reasoned that their competitors at other firms might gain an advantage if they were allowed to see the underlying source code. Until 1992, commercial code was almost always treated as a proprietary asset.

Two seminal events altered this perspective. Tim Berners-Lee developed the World Wide Web through the efforts of volunteer programmers around the world collaborating via the Internet. At about the same time, a student in Finland, Linus Torvalds, collaborated with volunteer programmers around the world to develop an open source version of Unix now known as Linux. The Linux operating system and the World Wide Web itself are examples of “open source” software.

The source code in open source software is openly available for the world to review and improve. By making the source code available, a “million pairs of eyes on the code” can identify and fix bugs faster than a tightly controlled team of proprietary programmers. The Linux operating system is so stable that the world’s largest computing company, IBM, has adopted it across its

entire line of servers, from the largest mainframe to the smallest PC-based server ([www.ibm.com/linux](http://www.ibm.com/linux)). Tim Berners-Lee and Linus Torvalds provided what mathematicians term an “existence proof,” demonstrating that the Internet could be used for large-scale collaborative programming projects in an open source environment.

An M.I.T. programmer, Richard Stallman, received a MacArthur Fellowship (often known as a “genius award”) for a third important contribution. Stallman developed the concept of a General Public License (GPL) for software. A GPL employs copyright law to establish certain commonsense rights. These include the right to copy underlying source code, modify the software, and redistribute it, with appropriate attribution of authorship of the original code.

Academic researchers had shared code from the very beginnings of programming, but Stallman’s concept of a GPL used the copyright law itself to establish this as a legal right and not just an ad hoc tradition. The open source tradition underlies the wellsprings of intellectual creativity that gave rise to the Internet and the World Wide Web. It is responsible for the technological infrastructure that has transformed both universities and many businesses. Until now K-12 education has had an informal tradition of sharing resources, but has not made use of GPL to protect shared or collaboratively developed resources.

In Fall 2002 a group of educational leaders met in the fourth in a series of National Technology Leadership Summits (NTLS IV). The first three summits were undertaken with funding from the U.S. Department of Education. These leadership retreats proved so useful that a mix of corporate support and funding from private, non-profit foundations was made available to underwrite a fourth summit.

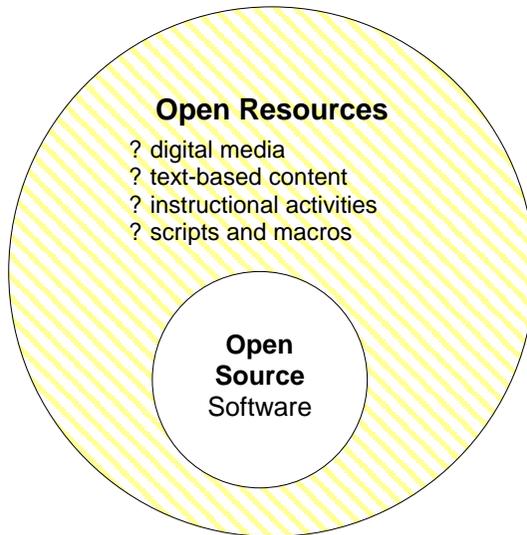
The topic of open source software in education was selected as the issue for consideration at NTLS IV. The two dozen leaders participating in NTLS IV included presidents and representatives from national teacher educator associations, editors of educational technology journals, executives from the corporate world, and directors of educational foundations. These leaders were asked to consider how the benefits of open source software that have already proven invaluable in higher education and business might be extended to K-12 education. These leaders formed four task forces: an Enterprise task force, a Teacher Education task force, a Collaboration and

Community task force, and an Editorial Directions and Dissemination task force:

- The Enterprise task force brought together CEOs and other leaders from the academic and corporate worlds to determine how the public and private sectors might work together most effectively to support and enhance K-12 teaching and learning. Allen Glenn, dean emeritus at the University of Washington, led this group. Dean Glenn served as president of the American Association of Colleges for Teacher Education (AACTE) and is a recipient of the AACTE lifetime achievement award. He also served as a consultant to the Minnesota Educational Computing Corporation and on the board of directors of the Edmark Corporation, providing a unique perspective on the corporate and academic worlds.
- The Teacher Education task force had the assignment of identifying promising directions for implementation of open source applications in the core content areas of science, mathematics, English, and social studies. This group was led by John Mergendoller, executive director of the Buck Institute of Education. His research includes landmark studies of exemplary preservice and inservice technology training for the Congressional Office of Technology Assessment, providing an effective vantage point to synthesize the deliberations of this task force.
- The Collaboration and Community task force was asked to identify steps leading to successful establishment of a web site for exchange of open source resources in education. This task force was led by Judi Harris, Pavey Professor of Educational Technology at the College of William and Mary. Professor Harris established the Electronic Emisary, currently the longest running educational telementoring program of its kind and is a recipient of the ISTE Educational Telecomputing Outstanding Achievement Award. This background provides a unique perspective on prerequisites for effective electronic collaboration in K-12 education.
- The Editorial Directions and Dissemination task force was assigned the task of identifying ways in which an international dialog on use of open source software in K-12 education should be structured. Ann Thompson, editor of the *Journal of Computers in Teacher Education*, served as chair of this group.

The initial findings and recommendations of each task force are summarized in the pages that follow. However, two important results emerged as a consensus across all four task forces.

The first result was a general consensus that discussion of shared resources in education should be extended to encompass the full range of educational resources and not just software. Teachers and K-12 educators use a variety of resources – software, educational macros and scripts, text-based content, digital media, lesson plans, overheads and electronic slides, instructional activities, etc. – and there was agreement that a broad term is needed to encompass all this. The term “open resources” was chosen to represent the full range of shared resources employed in K-12 education.



**Figure 1.** Open resources in education encompass text-based content, lesson plans, electronic slides, and other media, as well as open source educational software.

The second important result to emerge from the summit was agreement that a General Public License for teachers could be useful to facilitate and encourage use of Open Resources in K-12 education. A GPL provides language for protecting materials so that others can use them provided that proper attribution is given. A variety of GPLs have been developed for different applications, audiences, and uses, including the original GNU

General Public License, an Academic Free License for higher education, the Online Computer Library Center OCLC Research Public License, and the World Wide Web Consortium W3C License, and an Artistic License for artists. The language employed for each of these licensees can be found at the Open Source Foundation (<http://www.opensource.org/>).

Niki Davis, president of SITE, and Don Knezek, CEO of ISTE, agreed to collaborate on development of language for a General Public License for Teachers (GPL\*T). (SITE is a professional association of teacher education faculty at universities, the majority of whom are also members of ISTE.) Development of language for a GPL\*T will involve school-university partnerships represented by the memberships of SITE and ISTE, respectively.

For generations teachers have informally shared, modified, and revised each other's instructional materials and activities, both through oral conversation and discussion and through exchange of written materials and documents. However, attribution of the authorship of shared resources is less commonly practiced.

Just as Richard Stallman found it necessary to employ copyright law to codify and protect a longstanding tradition in the software community, a general public license will encourage a similar practice in the educational community. As a beneficial side effect, GPL\*T will also encourage teachers to model appropriate attribution of authorship for their K-12 students.

The task assigned to the leaders participating in NTLS IV was to identify the issues and questions to be addressed rather than solutions. The summary of their deliberations that follows is intended to be a starting point for discussion and deliberation in the wider educational community. The hope is that it will serve as a stimulus for an international dialog on open resources in education in the year to come.

Open Resources in the Core Content Areas  
John Mergendoller and Sara Kajder

An Educational Open Source Development Model  
Judi Harris and Kathy Swan

Open Resources and Public/Private Partnerships  
Allen Glenn and Steve Whitaker

Editorial Directions: Establishing a Dialog on Open Resources in Education  
Ann Thompson and Lynn Bell

# Open Resources and Teacher Education

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The Teacher Education task force undertook the assignment of identifying promising directions for implementation of open source applications in the core content areas of science, mathematics, English, and social studies, as well as teacher preparation. This task force included representatives from the Association for Education of Teachers in Science (AETS), the Association of Mathematics Teacher Educators (AMTE), the College and University Faculty Assembly (CUFA) of the National Council of the Social Studies, and the Conference on English Education (CEE) of the National Council of Teachers of English.

The practice of teaching involves a rich tradition of shared resources. For generations teachers have informally shared, modified, and revised each other's instructional materials and activities, both through oral conversation and discussion and through exchange of written materials and documents. We recognize this collaborative development and sharing under the general term, "open resources."

Establishment of open resources as a practical model for the educational community will require the following:

1. Establishment of a community of developers willing to invest time and energy in ongoing resource development
2. In the case of software resources and applications, communication channels and procedures to allow users (teachers and learners) to collaborate with software developers

3. Development of well-documented, pedagogically appropriate materials that are freely shared under an appropriate educational GPL
4. A peer review process to ensure that published materials are both accurate with respect to content and pedagogically appropriate
5. Posting of reviewed resources in a centrally accessible archive
6. Revision by other educators and developers, followed by return to the central archive with an explanation of how the derived resource has been enhanced

Use of open resources under this paradigm consists of a cycle of access, revision, and review, as outlined in Table 1.

**Table 1**  
The Open Source Cycle

<b>I. Access</b>	Teachers and/or learners access classroom-tested, peer reviewed materials made available on freely accessible Internet sites.
<b>II. Revision</b>	Some teachers adapt the resource to address a specific classroom setting or instructional objective.
<b>III. Review</b>	In the case of significant enhancements, the teacher may choose to return the adapted resource to the central archive for peer review.

The chief way in which this cycle differs from the current tradition of informal sharing is (a) through attribution of prior authorship of derived works, and (b) through a formal peer-review process to ensure that instructional resources are credible and can be used with confidence in the classroom. The variations in the steps allow teachers with different interests and backgrounds to maximize participation within a larger educational community. It is our hope that through the collaborative generation of instructional ideas that teachers and students will be empowered in new educationally effective ways.

The resources developed and made available could span the range from lesson plans to educational software. An *Educational Forge* for open resources could offer illustrative examples of open resources in different content areas, including the following:

- **English**—collaborative poetry tools

The *Poetry Forge*, an experiment in collaborative poetry generation, provides an example that both allows students to engage in shared word play and challenges teachers to modify and develop the tools offered. Some teachers will employ the software directly without modification, while others will customize the tool to address specific instructional needs or objectives.

- **Science**—digital microscopy tools

The goal of the digital microscopy project is to develop tools that utilize a digital camera to allow students to complete a wide range of imaging activities from time-lapse photography recording a butterfly emerging from the chrysalis to the close-up investigation of single-celled organisms in pond water samples. These tools will facilitate scientific inquiry and thinking by making observations more accessible and permanent and by making it easy for teachers and students to produce images that present the world in a different perspective.

- **Mathematics**—math tools

The *Math Forge* contains a variety of interactive projects and downloadable files, in a variety of macro and scripting environments such as Excel, Macromedia Flash, Logo, and the Geometer's Sketchpad. These projects span various mathematics topics that encompass fractals, probability, normal distribution, projectile motion, and geometry. The goal of these activities is to allow mathematics teachers to use technology to enhance and extend their students' learning of mathematics, altering parameters and variables to explore mathematical content dynamically.

- **Social Studies**—digital primary sources

In social studies, a pilot project centers on development of a repository of shared digital images related to oral community histories, allowing

students and teachers to share digital media and print resources that are stored in a common location. This will facilitate inquiry-based learning by students who construct and critically examine digital resources. Digital images from many regions around the globe will be used to capture students' perspectives of local history, economics, geography, and politics within their community.

The concept of open source is predicated on a cycle of ongoing enhancement and improvement undertaken by a community of volunteers to develop a growing body of materials that addresses the needs of the community. Depending on the nature of the educational content, varying degrees of technical skill may be required to modify or revise the instructional materials.

At one end of the continuum, almost any teacher with rudimentary word processing skill will be able to modify a text-based document. At the other end of the continuum, extensive programming skills may be required to modify educational software developed in C++ or Java. The next section, on educational software development, provides a possible model for collaboration between educators and a community of volunteer programmers.

**Table 2**

Levels of Technical Skill Required for Modification

- |                           |   |
|---------------------------|---|
| <b>I. Digital Content</b> | Digital content consists of text-based documents such as Word files or digital media such as still images and digital video. Skills required to modify content include word processing (in the case of text files) and multimedia editing capabilities (in the case of images and video). |
| <b>II. Scripting</b>      | Interactive materials include macros for spreadsheet tables and graphs, interactive sketches for The Geometer's Sketchpad, and scripts in authoring environments such as Macromedia Flash.  |
| <b>III. Programming</b>   | Educational tools and applications written in programming languages such as Java and C++ require extensive technical expertise to modify.   |

These examples are emergent. In the spirit of open resources, none of these examples is presented as a completed or final product. Instead, they are offered as a starting point for discussion, in the hopes that other educators will build and improve upon them, much as the programming community

has developed Web servers, electronic mail applications, and the protocol for the very Web itself through volunteer collaborative efforts. Our hope is to initiate a national dialog on this topic, exploring ways in which the potential of the Web, so well exemplified in the software development community, can be extended to the educational community.

# An Educational Open Source Development Model: From Cooperative Synchronicity to Intentional Collaboration

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As educators, we have a long tradition of sharing materials and ideas. We often make our unit plans, reproducible handouts, teaching tips, and learning activity designs available to other teachers. Before we use techniques recommended by others, though, we usually change them to suit our own and our students' learning needs, interests, and styles – and we often pass these revisions on to still other educators. In this way, the continually revised educational materials and ideas that reach us are often results of joint cooperative efforts of perhaps many teachers – though we usually do not know who most of the co-creators are.

As you read in the preface, there is another professional community that has almost as long a history of idea and materials exchange and revision: an international network of software developers connected by the Internet. Working primarily as volunteers, this community has produced and fine-tuned many pieces of software, including the popular Web server Apache and email server SendMail. The applications that these talented folks develop are available free of charge to anyone who wants to use them, and users are welcomed to change the code to suit their constituents' needs and preferences, much like teachers exchange instructional ideas and materials to fit their classrooms.

What if some of these talented software developers could work with educators to develop and customize educational software? In addition, what if a mechanism were in place to help educators share the materials that they create in this virtually collaborative manner?

Recently, a group of educational leaders gathered at the fourth National Technology Leadership Summit (NTLS IV) to consider potential implications of open source software for educators. If such “projectships” – as Mark Webbink of Red Hat, Inc., terms them – were to materialize between groups of educators and programmers, how could the development process be structured to accommodate the motivations and subcultural styles of both groups? Preliminary answers to these questions were posited by the members of the Collaboration and Community task force, and a summary of our initial “imaginings” follow.

## COMMUNITIES AND ROLES

Development of educational open source software could – and probably should – be rooted in a new kind of cross-community collaboration. The nature of this collaboration is necessitated by the dispositions and work habits of the two communities whose motivations, values, and styles must be accommodated in this collaborative process: K-12 educators and open source programmers. Fortunately, members of both communities were represented in the Collaboration and Community task force group.

It did not take long to understand that these two communities work, communicate, and are rewarded very differently – for different reasons, on different schedules, and with different subculture-specific styles. Almost immediately, we recognized the need for *liaisons* who comprehend both cultures to “translate” between them, if members of both are to work together successfully to create educational open source materials. As our discussion continued, we realized that the liaison’s work is quite complex; it expands to incorporate many roles.

In Table 3, we have summarized the roles that educators, liaisons, and developers would play in the development of open source materials in our model. Please note that while we use the specific example of open source *software* development here, we see this model, with minor modifications, also describing the creation and refinement of noncomputer-based educational materials.

**Table 3**  
Open Source Development Roles

<b>Educators/Students</b>	<b>Liaisons</b>	<b>Software Developers</b>
Identify software needs	Find educators and programmers to work together at the beginning of the project.	Listen and respond with code.
Provide feedback throughout development.	Locate resources to initiate projects.	Cooperate with other developers to refine code.
Review software content for accuracy and comprehensiveness.	Facilitate “development loops”: recursive project development, testing, and tweaking.	Transfer core code to liaisons.
Generate further ideas and initiate revision cycles.	<ol style="list-style-type: none"> <li>1. Identify programmers to work on recursions of core project code.</li> <li>2. Identify next project champion when he or she leaves the project.</li> </ol>	Revise code in response to feedback.

As Table 3 indicates, the role of liaison in this collaboration is the most complex of the three. As such, it probably requires talents and prior experiences that are more rare than either of the other two roles. In essence, liaisons would serve a *bridging* function between the educational and software development communities. They would, therefore, need to be able to understand and function well in *both* groups. Technology-savvy teachers, school-based educational technology coordinators, university professors and graduate students interested in educational technology integration, and creatively/technologically gifted students are potential liaisons. Additional roles and responsibilities of these individuals include:

- Determine, in consultation with educators, which code revisions become elements of the core product and which do not (i.e., work to prevent “code forking”). Focus upon the learning that can be supported by the software rather than specifics of code.
- Build project “buy-in” and sustainability. (Rewards are key. See Table 4.)
- Translate between educator and developer subcultures (e.g., explaining open source to educators).
- Serve as project champion, manager, facilitator, and “connector.”

Development and refinement of each educational open source project will probably progress in identifiable *stages*, with the specific roles that each participant plays shifting over time as work on the project progresses. More importantly, roles played by team members collaborating on the same project are likely to shift according to individual interests, expertise, and motivations. This flexibility and fluidity of roles is crucial to the success of each project – and to the educational open source movement itself. (We suspect that the educational open source movement, or “metaproject,” will develop in stages that are similar to project-related stages.) At all times, though, all roles must be filled in a particular project for the endeavor to succeed.

## REWARDS

The work done in each of the roles described in Table 3 is primarily voluntary. Though some open source projects are funded by grants or as works for hire, the impetus for the typical open source project at present is other than financial. Any feasible and sustainable educational open source development model must, therefore, take into account the varying – and, we hope, complementary – motivations of the participants playing each of the roles with reference to a particular project. Table 4 outlines probable motivations for educational open source work.

**Table 4**

## Open Source Development Role-Related Rewards

<b>Educators</b>	<b>Liaisons</b>	<b>Software Developers</b>
Acquire and use customized educational materials that help students learn content and process in more effective ways.	Solve a problem or address an educational need for themselves and/or others whom they care about (students and other educators).	Challenge of solving an authentic problem that nobody else has solved as well. Mental stimulation.
Access to software that is more applicable and adaptable to students' learning needs than other software.	Interpersonal networking for professional development.	List on resume if others use the project widely (proof of concept).
Materials can't be taken away and can't expire.	Career advancement. Publishing.	Active participation in "something bigger than themselves." Involvement in a community effort.
Positive publicity for being involved in an innovative endeavor.	Positive publicity for being involved in an innovative endeavor.	Positive (and permanent) publicity for being involved in an innovative and successful endeavor.
Professional acknowledgement by other educators, students, and community members.	May be part (or may become part) of the regular job description.  Reduce isolation of being an educator.	"Altruism and Egoism"

The roles and corresponding rewards described in Table 4 will probably emerge as much from the nature of inspired work already extant in the educational and software development communities as from the new experiences and relationships to be found in future educational open source work.

## BEGINNINGS

At present, collaborations between educators and open source software developers are rare and rarely sustained. To shift this pattern, the first rounds of educational open source software will have to be planned and supported in strategic, somewhat preplanned ways. In a sense, we will have to create first artificially assembled collaborative teams to explore and document the as-yet undiscovered intricacies of the “bridged intercultural collaboration” we suggest.

For the new working relationships between disparate subcultures to become organically initiated and sustained – and for the same to happen within the open source in education “metaproject” or movement – a high-quality collection of well-received educational open source products must be conceived, developed, tested, and publicized. The instructional applicability and diffusibility of this first group of projects will, to a large extent, determine the success of the movement itself. Therefore, we strongly suggest that early educational open source workers seek not only government and private funding to make this first stage of software development possible – but also choose carefully the projects to be created. This first set of software will then have the best possible chance at widespread adoption in K-12 classrooms by virtue of the applications’ inherent characteristics.

The “proof of concept” of the movement itself rests upon nothing less than our perceptiveness about educational software needs and preferences, our knowledge of the nature of the two subcultures involved, and the adoptability of a relatively small number of particular products. Our ability to operationalize these perceptions in creative, generative ways through the design, testing, and publicizing of educational software is the key to success or failure on both the individual project and metaproject levels. Will we be able to incorporate the open source community’s cooperative synchronicity in software development into a cross-cultural model of intentional, sustainable collaboration? Only time will tell us the answer.

## TIME TO BEGIN?

The programmer-based open source movement is about a dozen years old. Surely in a decade or so, we will look back at assumptions undergirding the model suggested here and both nod at their verity and smile at our naïveté. Although we believe that the best approach to this endeavor is clear sighted, strategic, and proactive, we also acknowledge that the best ways for the two communities to collaborate will necessarily emerge over time and through repeated, reflective trials. The next step, therefore, is to begin.

# Open Resources and Public/Private Partnerships

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The open source software movement represents a unique collaboration between volunteer programmers and for-profit businesses. The Enterprise task force considered how this collaboration might be extended to K-12 education through public partnerships.

Specifically, the Enterprise task force considered how best to create an environment that would foster creativity, enhance educator influence, and more actively engage students in the learning process through the development of an open-resource model of software sharing. The Enterprise task force included CEOs, general managers, and educators representing higher education, public schools, and educational organizations. The members considered how the needs, interests, and abilities of the private sector and educational institutions might be joined to create a useful and long-term partnership to support open source resources.

The corporate world and education have a long history of collaboration, cooperation, and periods of uneasy truce. Good schools are important to business – they provide well-prepared workers, educated citizens, and consumers of products and services. Businesses place a good educational system as one of their top priorities for location because of a need for educated workers and good schools for employees.

Schools are also the beneficiaries of school-corporate partnerships. Employees provide tutoring, expert knowledge, and skills for numerous school projects. Business partners also provide needed training for teachers and students and new technologies for the classroom.

Technological advances and the advent of the information economy have created new opportunities for corporate partnerships. Billions of dollars have been spent on computing hardware, the development of software for instructional use, and information access. Both corporations and schools have benefited from these relationships. But in today's educational environment, there is a growing lack of pedagogically appropriate materials accessible to classroom teachers. Can a public/private partnership that brings together programmers, educators, and business address this issue?

Before rushing to create such an alliance, it must be clear that all parties must benefit from the relationship and all participants must understand more fully the other's position, needs, and culture. For example, business must make a profit and meet the demands of investors. Educators, therefore, must expect to pay a fair market price for products and service. Educators, on the other hand, need quality instructional materials, service support, and some confidence that the business will work to sustain the relationship. Both need to believe that the other respects their work and that an honest effort will be made to sustain the partnership.

In order to better understand each other and to create a workable partnership, the Enterprise task force recommends that the following issues need to be clarified before moving forward.

- *Projects and partnerships.* Both parties are familiar with project relationships. Projects have specific goals, a set of outcomes, accountability measures, a specific budget, and a set timeline. There is usually a leader and other participants. Partnerships are different in one significant way—all parties share equally in the leadership, activities, and support. Contributions are based on expertise. Partnerships are more difficult to create and sustain. What type of organizational structure should be created that will bring all parties to the table on an equal footing?
- *Accountability.* Accountability is critical for both business and education; however, it is defined differently. Business is accountable to its owners/investors and is represented by the profit/loss column. Educators, representing a diverse group of constituents, are accountable for student learning, but outcomes are more difficult to measure. However, current trends toward standards, assessment, and accountability are changing education's stance toward accountability. What are ways that

accountability can be incorporated into a merging partnership that would meet both corporate and education needs?

- *Pace of change.* Bill Gates discussed the notion of “business at the speed of thought.” In today’s technology environment companies that do not adjust quickly do not usually succeed. Business’s views of change shape its view of how education appears to respond to calls for innovation and change. Educational institutions, often for valid reasons, are slower to respond to change and view business’s demands as unrealistic. What are realistic expectations for the achievement of partnership goals?

While personnel changes occur in business, business partners must understand that educational environments do change in a unique way – students move through the system and educators leave the institution. These changes often create unique problems for any relationship.

Given that partners can gain an understanding of these issues, the Enterprise task force believes that the open resources concept provides a powerful concept that can bring together a select group of business and education colleagues to further the agenda. In order to advance the agenda, members believe that:

1. A general organization needs to be created to advance the agenda.
2. A mechanism for training a select group of developers interested in open source resources needs to be established.
3. A structure for creating, evaluating, and sharing open resource materials for educators needs to be created,
4. A strategy for educating both business and education colleagues about the open resource issues in education needs to be in place.

While these issues are significant, structures exist that can address each of them and provide leadership. In addressing these issues, there is ample room for both open resource materials and materials of a proprietary nature. A partnership between business and education focused on open resources is an essential element of providing the best materials for students in today’s schools.

## Editorial Directions: Establishing a Dialog on Open Resources in Education

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The Editorial Directions task force was given the charge of synthesizing the work of the other three groups and developing a plan for an international dialog on open resources in education. The task force included the editors of six educational technology journals, including

- *Computers in the Schools*
- *Contemporary Issues in Technology and Teacher Education (CITE Journal)*
- *Journal of Computers in Teacher Education (JCTE)*
- *Journal of Technology and Teacher Education (JTATE)*
- *Learning and Leading with Technology (L&L)*
- *Technology, Pedagogy, and Education.*

These periodicals span the spectrum of professional journals in educational technology, ranging from illustrations and narratives of technology use for practitioners in K-12 schools to research-based articles on the role of technology in teacher education. Hence, these editors collectively were well positioned to consider the relevance of open resources to education and how

a dialog could be constructed to advance consideration of ways such resources might best address the needs of schools and learners.

For the past half-millennium, print has been the primary medium for dissemination of scholarly work and educational materials. Invention of the World Wide Web offered another mechanism for distribution of resources. Millions have taken advantage of the opportunity that this has afforded for distribution of ideas and resources. As any school librarian can attest, this is not an unalloyed blessing. Issues ranging from creditability of sources to attribution of content must be considered by schools using these resources. These emerging issues were discussed by each of the groups at the summit, with each group taking a slightly different approach.

The Teacher Education task force found a credible rationale for establishing a website devoted to educational resources distributed under a General Public License (GPL). As their deliberations determined, there are useful educational resources across a range of content areas that would be enhanced through distribution under GPL. This copyright mechanism empowers educators to refine and enhance resources that others have created. However, an ongoing cycle of creation, refinement, and review is needed to ensure that materials are both, as the Teacher Education task force phrased it, “accurate with respect to content and pedagogically appropriate.”

The Collaboration and Community task force undertook the assignment of determining how an educational source forge might be constructed. The Open Source Development Model they identified would adapt a method that first proved successful in business and transform it for use in education. Since educators and programmers constitute different communities with different perspectives, values, and culture, a successful educational source forge would therefore, in the words of the Collaboration and Community task force, potentially “represent a new kind of cross-community collaboration.”

The Enterprise task force combined corporate executives who have already successfully implemented both open source and proprietary software models in business with educational leaders who have served in similar roles in education. This group discussed how business and education can work together to adapt an open source model established in business for use in education.

The Editorial task force has the responsibility of braiding these three strands of dialog together and combining them with other existing dialogs regarding use of open resources in education. The editors in this task force agreed to collaborate on a common article on open resources in education that would serve two objectives. It would familiarize the educational community with the issues related to open resources in education. At the same time, it would also allow the editors themselves to participate in an open resource initiative, providing them with a ground-zero perspective on the process.

We, therefore, decided to begin the dialog by writing an article in the open source format. The article will be shared across all of the journals represented, but will incorporate specific information for the audience of each journal. The article will be distributed under a General Public License that will allow the editors of other educational journals to modify and publish the common article while crediting the original source.

As is true for many resources distributed under a General Public License, many people will contribute to the development of the article, and each iteration will be slightly different from the others. We encourage the readership of this journal to participate in the process by adapting the article for distribution within your educational community and to follow its evolution as it appears in different publications and venues. We intend for this to increase awareness of open resources and begin a dialog about their role in education.

In addition to conceptualizing the open source article, the Editorial task force focused upon international issues. An intercultural dimension may prove to be an important driver for open resources in education. As the Collaboration and Community task force reminded us, good partnerships depend on the ways in which participants' goals and expertise complement one another. There are stark contrasts in affluence internationally.

Educators who have little access to educational software suited to their language and culture have much to gain if open resources could bring such development within their reach. Were open resources to work in ways that level the playing field, it could also reduce the temptation to illegally copy resources that are currently beyond their financial reach.

Programmers in countries with low incomes could potentially be motivated to participate to gain acknowledgement from the international community. Much of this energy is currently devoted to antisocial outlets such as programming of computer viruses. Open resources could provide a positive direction for talented programmers who can work collaboratively at a distance. Open resources could provide valuable challenges for their skills, as well as professional development, permitting collaboration with counterparts in other countries.

There are many other issues to be considered. The Teacher Education task force identified the importance of a review process for open resources that will allow learners to use them with assurance that the content is accurate and appropriate. The Collaboration and Community task force observed that this will require a context to define the roles of teachers, teacher educators, and technical personnel in this process. The Enterprise task force noted conditions necessary for the public/private partnerships required for a successful open resource initiative in education.

The results from all four groups suggest an agenda and a format for the beginning of the dialog. Professional organizations such as SITE and ISTE, working in concert with other teacher educator organizations (AETS, AMTE, CEE, and CUFA) can provide leadership. In the words of the Collaboration and Community task force, "The next step, therefore, is to begin."

## Reference

- Bull, G., Bell, R., Garofalo, J., & Sigmon, T. (2002). Learner-based tools: The case for open source educational software. *Learning and Leading with Technology*, 30(2), 10-17.

## APPENDIX

### NTLS IV PARTICIPANTS

#### I. Teacher Education Task Force

- John Mergendoller, Chair
- Dawn Abt-Perkins, NCTE *Conference on English Education*
- Randy Bell, *Association for Education of Teachers in Science*
- Michael Berson, NCSS *College and University Faculty Assembly*
- Joe Garofalo, *Association of Mathematics Teacher Educators*
- Terri Bucci, *Elementary Education*
- Sara Kajder, *Task Force Recorder*

#### II. Dissemination / Editorial Task Force

- Ann Thompson, Chair
- Anita McAnear, Editor, *Learning and Leading with Technology*
- Debra Sprague, Editor, *Journal of Technology and Teacher Education*
- Lynn Bell, Managing Editor, *Contemporary Issues in Technology and Teacher Education*
- LaMont Johnson, Editor, *Computers in the Schools*
- L. B. Berg, Director, *Virginia Educational Technology Alliance*
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#### III. Collaboration and Community Task Force

- Judi Harris, Chair
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- Janice Harper, Associate Dean, *North Carolina Central University*
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- Martin Messer, Technical Liaison, *Red Hat, Inc.*
- Kathy Swan, Task Force Recorder

#### IV. Enterprise Task Force

- Allen Glenn, Chair
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- Mark Webbink, General Counsel and Senior Vice President, *Red Hat, Inc.*
- Steve Rasmussen, President, *Key Curriculum Press*
- Diane Miller, Director, *XL Education Initiative*
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- Steve Whitaker, Task Force Recorder

#### Note

1. Based on reviews and comments by Steven Whitaker, Glen Bull, and Joe Garofalo.