

THE VTIE COLLABORATIVE WRITING ENVIRONMENT

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Abstract: This paper discusses the design of the VTIE Collaborative Writing Environment (CWE) and the functionality of the various components that make up this environment. The advantages of supporting collaborative writing are also discussed as well as different organizational schemes that can be used when structuring collaborative writing exercises. The paper also contains technical details on the implementation of the VTIE CWE.

1 INTRODUCTION

As broadband internet access becomes more widespread in schools more and more resources become available to teachers and students. Some great examples of such resources are the Telescopes in Education Project (telescopesineducation.com, 2005), Faulkes Telescope Project (faulkes-telescope.com, 2005) and Bug Scope (Thakkar et al., 2000). These projects allow students to do real science from their classroom with state of the art equipment, this was simply not possible in the past. The VTIE Portal was initially designed to provide teachers and students with the tools they need to get the most out of internet-based telescopes. As such some of the tools developed as part of the VTIE project are specifically targeted at Astronomy, however, other tools are much more general and are perfectly at home away from telescopes and astronomy. The VTIE CWE (Collaborative Writing Environment) described in this paper is one of these general tools.

A central aim of the VTIE project was to provide all the tools developed to schools in such a way as to make the tools as easy as possible to integrate into the school environment. It was considered important that schools not have to spend any money on software in order to be able to use the VTIE tools. This means that the VTIE tools themselves should be free but also that the tools cannot depend on any other software that is not free. The VTIE tools should also not be tied to any particular operating system so that all schools can participate. Finally, as schools do not tend to have dedi-

cated computer technicians the VTIE tools should not require complicated installation in the schools. By creating all the VTIE tools in a web environment all these aims can be easily met. Hence, the entire VTIE portal is web-based and all schools need to take part is an internet connection and the FireFox web browser (getfirefox.com, 2005) which is available on all major platforms (Windows, Mac, Linux and many Unixes).

The current VTIE CWE is the direct result of a rapid prototyping model including formative evaluations with students over a three-year period and a year of consultation with teachers from local primary and secondary level schools. Our initial prototype did not support collaborative writing but all our evaluations showed a need for the software to properly support group working and collaboration.

2 COLLABORATION

Collaboration is a very broad term, Erkens, *et al.* give the following definition; “A collaborative learning situation may be defined as one in which two or more students work together to fulfil an assigned task within a particular domain of learning in order to achieve a joint goal” (Erkens et al., 2005). Given this definition, it is possible that a wide variety of learning tasks can be envisaged as involving a degree of collaboration, ranging from those which are extremely practical, such as cultivating a garden and carrying out scientific experiments, to the group writing of a

novel. The focus of the VTIE CWE is on the development and usage of collaboration both within the research process (in the form of the sharing of information gained) and in the production of a written report on the work.

Collaborative working can be seen as having a vital role in the development of students for their future lives as part of the knowledge society as “*Knowledge work is characterised by systematic knowledge advancement, sharing of expertise, and collaborative elaboration of knowledge products*” (Lakkala et al., 2005, p. 338). It has also been suggested that collaborative learning experiences can:

- Improve motivation some students find working with others encourages them to complete a task. This has been found to apply more to male students than females, for example a study by Hidi *et al* revealed that after receiving the same instructional programme, improvement in performance was improved more for male students than for female ones if the subsequent task involved collaboration with others (Hidi et al., 2002).
- Facilitate the construction of knowledge and the development of understanding, as the instant feedback from others encourages students to explore their current knowledge and exposes flaws or limitations and to review their ideas.
- Encourage the development of metacognition and reflection in thinking.
- Facilitate student-centred learning.

It is because of these wide ranging justifications for the use of collaboration in learning that Collaborative Learning Environments (CLEs) using ICT, including the present project, have been developed. The main areas of collaboration involve the sharing of resources/information between small groups of students and the production of a combined report on the project.

Writing is one area where “*co-operative work may be problematic as it was originally designed for individual learning*” (Klein et al., 1994). However, it has also been suggested that it is an area where collaboration is likely to improve the end product for many students and so various strategies have been explored to facilitate it. While there are, doubtless, a very wide range of possibilities for this, including e-mail exchanges and Wikipedia-type approaches, the present project, focussing on younger children was considered to require a more structured and less wide-ranging approach to collaboration, so that the students would feel more comfortable in participating.

It was decided that for each section of the report a draft should be produced which would then be revised based on comments from the other students in working on the report and rewritten to produce the

final report. Zammuner identified three basic organizational approaches, some relating to pairs of collaborators, while others involved larger groups (Zammuner, 1995). Three basic variations were identified, as shown in Table 1:

Table 1: Organisational Approaches to Collaboration.

Initial Draft	Revision	Final Version
Group/pair A	Group/pair B	Group/pair A
Group/pair A	Group/pair A	Group/pair A
Individual	Group/Pair	Individual *

The scheme adopted in our project is equivalent to the third organizational approach in Table 1. While there are arguments in favor of the adoption of all of the above strategies, Zammuner contrasted success in producing written work by students working individually, with those working in collaboration patterns 2 and 3, reporting that “*The most significant changes (usually improvements) in the quality of revision operations occurred when the revision was carried out cooperatively rather than individually*” (Zammuner, 1995, p. 122). He suggests that this was because the ‘outsider’ would provide immediate feedback, similar to that provided by another person in a conversation, unlike in the usual, solitary process of writing. As noted by Erkens, *et al.* (Erkens et al., 2005, p. 3), “*Collaborative writers need to test their hypotheses, justify their propositions and clarify their goals. This may lead to increased awareness of and more conscious control over the writing and learning process*”. It was, therefore, decided that this method of individual writing, followed by feed back from the rest of the group feeding back into revisions of the text would be adopted for the VTIE Collaborative Writing Environment.

Working successfully with CLEs can be extremely demanding on both students and teachers, particularly in relation to the need for students to develop the social skills and thinking skills necessary for collaboration simultaneously with the technical/ ICT skills. Many teachers express concerns that their role may become that of ‘technician’ if the CLE is technically demanding and the teacher is critical in determining the success or failure of the collaboration, as his/her role must be in “*organising the community’s activities and establishing the underlying conditions of the learning environment, and building up appropriate infrastructures for collective effort*” (Lakkala et al., 2005, p. 338 - 339). This makes it essential that the environment produced be as simple to setup and use as possible and that the environment provide suf-

ficient support and resources for the teacher and students. Ideally the technology would become transparent to the users and they would be free to concentrate entirely on the task at hand. This was one of the driving factors towards adopting a web based interface as this removed the need for complex software installation and allows users to transfer their existing knowledge and experience of using the internet to our environment.

3 THE VTIE COLLABORATIVE WRITING ENVIRONMENT

The VTIE CWE provides an interfaces to support both teachers and students throughout the writing process from project design right through to publication of the students' work. Our CWE can be considered to consist of three components:

1. The Project Design and management Interfaces
2. The VTIE ScrapBook
3. The Writing Interfaces

Our CWE is built around a model which has developed throughout our formative evaluations and our discussions with teachers and is in agreement with the research discussed in Section 2. Although our tools were designed around this process it should be noted that the environment does not force teachers or students to stick rigidly to this process, this makes the environment more flexible. The process starts with the teacher designing the structure of the projects that the students will complete. We envisage this design phase being completed in class with the teacher showing the students the evolving structure with a data projector and the students having an input into the design. The design of the project is represented in a graphical way and as it is manipulated the visual representation changes. This same visual representation of the project is used throughout the rest of the process both in the teacher and student views. Once the structure is defined it is referred to as a Project Template and can be saved for re-use in the future. From this template the mentor can then create project instances and assign students to these instances. The teacher breaks the group/class into teams and assigns one team to each project instance. Within each project instance each section is assigned to a single student who then writes that section. The rest of the students in the team and the teacher can see the current state of each section and a messaging system is provided to allow them to provide advice and help as the student works from an initial draft towards a final version. This is consistent with Zammuner's third model shown in Table 1. It is envisaged that the students will use the internet to gather information for their project. The VTIE

ScrapBook was developed to provide the students and the teacher with a means of gathering and sharing information and images they find on the web. Finally, when the teacher is happy with the project instance it is published to a digital library in both HTML and PDF format. This allows future students to use the work of past students as part of their research on a topic.

3.1 Project Design Interfaces

The project design interfaces allow the teacher to manage and control their projects and project templates and manage their students. They can create classes/groups, edit classes/groups, create templates, edit templates, create projects, view the progress of their students' work.

In order to protect the anonymity of students on the system we store no information about students at all, not even their names. All Students are referred to as 'Student 1', 'Student 2' etc within each class/group. The teacher can print off a table on which the students' real names can be written.

Projects are created with a direct manipulation interface. As the teacher clicks to add and edit sections a graphic representation of the template updates in real time to show the current design of the project template. A screenshot of a template being generated in this way is shown in Figure 1. Project Templates consist of global thoughts/notes and sections. Each section has a title, optional initial content and thoughts/notes for that section. When creating a project from a template the teacher is presented with a 4 step wizard. In the first step the mentor is asked to name the project, pick the class/group that will do the project and pick the amount of teams the class/group will be split into. The second step allows the teacher to name each team. By default the teams are named 'Team 1', 'Team 2' etc but it is envisaged that the teams could decide on their own names as a first group/team building activity. The third step allows the teacher to specify which students go into which team. Finally, the fourth step presents the teacher with a graphical representation of the template chosen but with extra features to allow the teacher to assign students to the different sections. At this point the teacher can edit the design of the project by adding sections, removing sections, editing sections and thoughts and editing the title. When the teacher is happy with the design and student allocations they can then click a button to generate the project instances, one for each team.

3.2 VTIE ScrapBook

The VTIE ScrapBook provides students and teachers with a personal portfolio. It has been implemented as

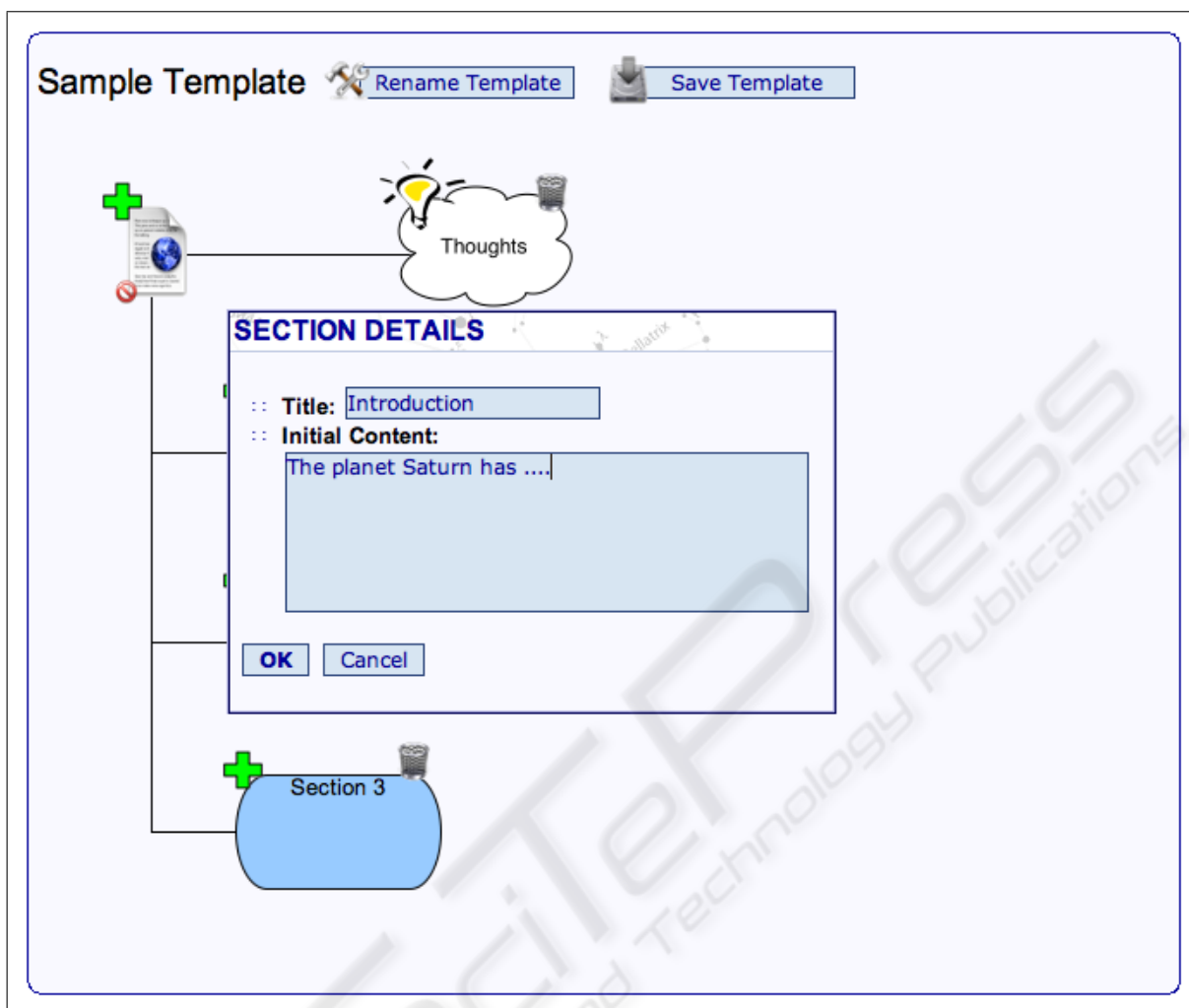


Figure 1: A screen shot of a template being generated.

a Firefox browser extension so that it is always available to the students and teachers while they are browsing the web as shown in Figure 2. At any stage they can drag and drop text, links or images onto a drop-zone to add them to their ScrapBook. The students and teachers can also create notes as they go and save those into their ScrapBook. Teachers can then make any of the information in their scrap-book available to students in one of their projects and students can share any of their information with the other students in one of the teams they belong to. All information stored in the VTIE ScrapBook is actually stored on the VTIE server rather than on the machine being used by the student/teacher at the time so as students move from one machine to another their portfolio will always be available to them.

The teacher can also see the contents of all their students' portfolios and can delete any scraps they

deem inappropriate for any reason. Each scrap also stores the URL from which it was saved so the teacher can see where the students got their information from.

The VTIE ScrapBook also interfaces directly with the Writing interface via JavaScript. This makes it as easy as possible for students to incorporate the resources they find on the internet into their reports.

3.3 Writing Interfaces

When students or teachers view a project they are first presented with the graphical representation of the project. They can then view the content of any section by clicking on it which takes them to the writing view. In this view all the sections of the paper appear as tabs across the top and the contents of the current section appears in the main area of the page below the tabs.

When a student enters the writing view they can

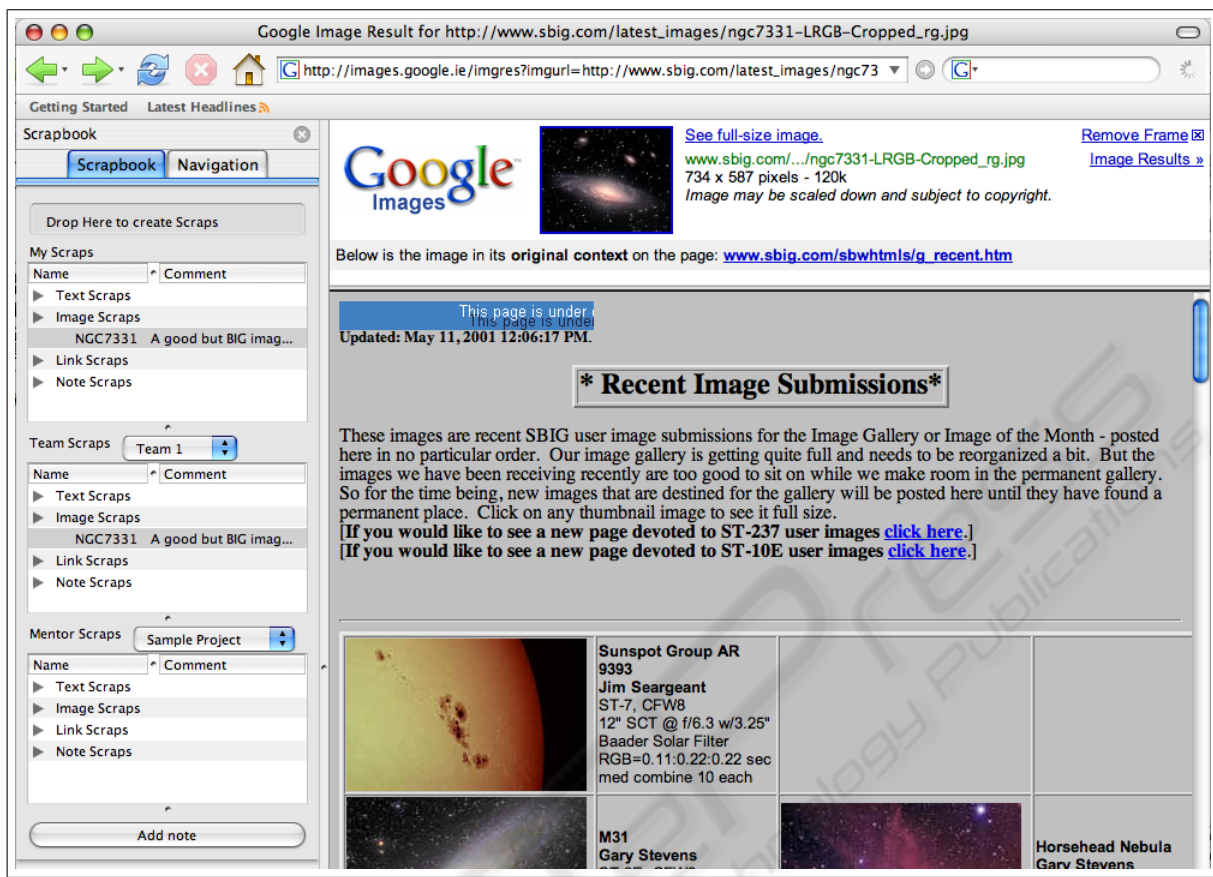


Figure 2: A screen shot of the VTIE ScrapBook in use. The ScrapBook is the sidebar on the left and is always there when surfing the web.

see the content of all the sections in the project but can only edit the sections they are assigned to. When editing a section the students are presented with a WYSIWYG (what you see is what you get) editor that allows them to generate their content. Our evaluations showed very clearly that it is important not to provide the students with more formatting tools than they need, hence the WYSIWYG editor only provides them with the tools they really need. They can make text bold and italic and they can create bulleted and numbered lists and that is all the formatting they can do. In the writing view the students can also see all comments made by the other students in their team and their teacher on the current section. They can also add a new comment. Figure 3 shows a screenshot of a student using the writing interface.

Like a student a teacher can see the contents of all sections in their projects. The teacher can also see all the comments that have been made and can add additional comments to each section to help the student.

The writing view also provides access to a simple version control system for each section. There are

always two backup versions of each section, one the student controls and one the teacher controls. Both the teacher and the student can see both backup versions. The student's backup version is automatically updated each time the section is saved, then teacher's backup must be manually updated by the teacher. The student can choose to revert to their backup version at any time. The teacher's backup version should be updated by the teacher only when the teacher feels there has been progress. This mechanism ensures that if a student accidentally makes a major mistake and loses good work in both the current and backup versions the teacher can still restore the section to the way it was the last time the teacher took a backup.

4 IMPLEMENTATION

When the decision was made to implement our software as a web application a number of decisions were also taken on standards to develop to. Our web in-



Figure 3: A screen shot of the the Writing Interface in use by a student showing the WYSIWYG interface.

interfaces are all developed to comply with the following World Wide Web Consortium (W3C) standards; XHTML1.0 and CSS2.1. In order to prevent the need for so called CSS hacks to deal with the miss-implementation of the Box Model by browsers like MicroSoft's Internet Explorer, the decision was also taken to target the FireFox browser. As well as removing the need for messy CSS hacks this also has the added bonus that it allows us to implement some of our client-side code as FireFox Browser Exten-

sions like the VTIE ScrapBook. For the schools Fire-Fox also has the added bonus that it is more secure and so less likely to bring viruses and trojans into the school's network. This is especially important as many trojans today manifest themselves by displaying pop-up windows containing explicit advertisements for pornography.

The basic architecture of the VTIE CWE is shown in Figure 4. As you can see from this figure the code is distributed over the client and server side and utilizes

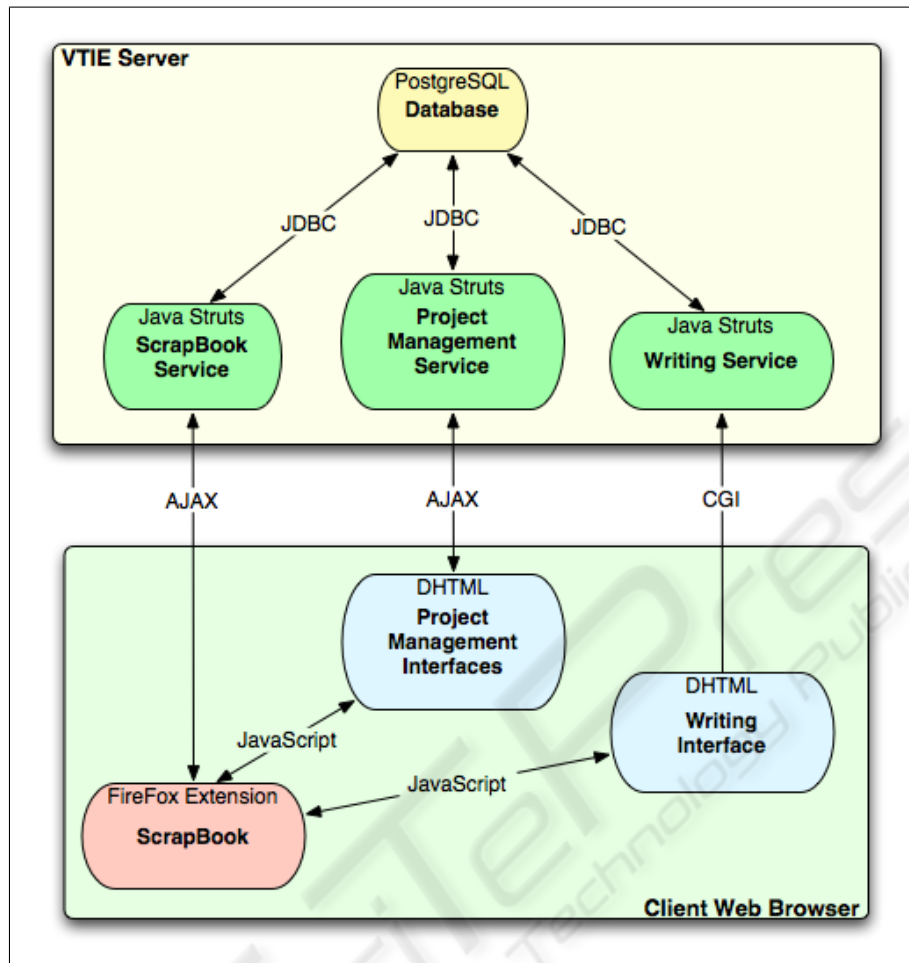


Figure 4: The basic architecture of the VTIE CWE.

many technologies.

The project management interfaces within the collaborative Writing Environment make extensive use of object-oriented JavaScript and DHTML. These interfaces communicate with the server via AJAX and make use XML to transfer the complex data involved between the client and the server.

On the server-side the decision was made to develop the code in Java. This decision was partly motivated by the number of Java packages available to help with the code and partly motivated by the skill-set of the VTIE team. The server-side code is implemented using Apache's Java Struts framework and is deployed with the Apache Tomcat Web Server.

As XML is used extensively within the VTIE system to store and transfer complex data types such as project templates and instances the initial prototypes of the VTIE Writing Environment used Apache's Xindice native XML database to store data but this technology is still very much underdevelopment and

was found not to be up to the task yet. Instead the PostgreSQL relational database is used to store the data. Much of the data is still stored as XML but within a relational structure with meta-data stored separately to speed up searching of the database.

5 CONCLUSIONS

Based on Erkens' definition of Collaboration discussed in Section 2 the VTIE Collaborative Writing Environment supports collaboration in two ways. Our system supports collaborative writing by adopting a model in which a student creates an initial draft, all members of their sections all members of their team then comment on this draft and these comments feed into a cycle of revision resulting in the end product. According to the work of Zammuner this is one of the better approaches to collaborative writing. As

well as supporting collaboration while writing the VTIE ScrapBook also supports collaboration while researching the topic the students will be reporting on by allowing them to easily share the relevant resources they find on the internet.

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