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assumed the traditional editing, copy editing, indexing and related tasks that are central to the production and marketing of a book. While the e-book was a central focus of the project and the ultimate goal would be to produce an e-book that could be marketed independent of a traditional book, the agreement was that the e-book would also be produced in a paperback format. As markets expand there would also be an effort to market the e-book to selected markets independent of the print version.

All e-book designs, programming, content processing, instruction of writers on how to write to meet the specifications of an e-book were the responsibilities of the eDL. The publisher, in turn, was to produce the print version, engage the resources needed to host the e-book and develop the marketing strategies. The eDL was responsible for the design and the development of the e-book as well as for producing the first e-book via MeBA. Two researchers worked with an experienced team of graduate students from the fields of education, instructional design, computer science, and engineering to design, develop and refine a functional authoring system.

3. Content Production and Management

Central to the development of MeBA was the development and validation of the content and production processes. Both were considered critical to the creation of an authoring system that could be taken to scale. The content management and production processes are closely integrated and are designed to take content from the conception stage through the MeBA specifications to the rendering of a functional e-book. The intent is to provide users of MeBA the information and tools necessary to employ the MeBA system inclusive of managing the content development and production processes.

The MeBA is likely to be used in situations similar to the following: A) The user is the creator of the content and independently desires to produce an e-book by writing the content and inserting the content into the MeBA system. The other two circumstances are related to users that are likely to be publishers or producers of documents of which an e-book version is appropriate. These examples include: B) The publisher is responsible for production of the e-book using MeBA and the author(s) of the content are responsible for creating the content for all features ready for production; and C) The publisher has a client who produces the main content (e.g., all content with the exception of the features). In the latter arrangement the publisher will assume responsibility for creating the features for integration into MeBA.

In each case it is essential for authors to have access to guidelines for the content management and production processes. The e-Learning Design Lab has validated such processes over the years in developing online modules. These processes have been modified to meet the requirements of MeBA.

A prototype Writer's Manual has been developed that explains to the content developers the specific

requirements of writing content for each feature in the MeBA system. Samples are provided so that users can make comparisons between what they create with a standards-based model. The Writer's Manual is applicable to those who wish to independently write the content, including all features, and situations where a publisher works from the basic content and creates the features according the specifications of MeBA. Guidelines are also available for use when a publisher is working with content developers in the processing of content to ensure readiness for the production process.

These guidelines are aligned with a Content Management subsystem that incorporates online status sheets. Figure I show a portion of a status sheet for monitoring completion of content through various phases of development. In this case the Content Map was received from the author (version 1*) but it has not been copy edited (version 2**) whereas the Case Study has been received, copy edited and is now in final form (Gold) ready for posting.

	Title (Author)	Version 1*	Version 2**	Gold
Part 2	<i>Students with Mild Moderate Disabilities</i>	0. Description √1. Stimulus Q √2. Case Study √3. Content Map	0. Description √1. Stimulus Q √2. Case Study 3. Content Map	0. Description 1. Stimulus Q √2. Case Study 3. Content Map
Ch. 4	<i>Specific Learning Disabilities</i>	0. Description √1. Outline √2. Notes √3. Glossary	0. Description √1. Outline √2. Notes 3. Glossary	0. Description 1. Outline 2. Notes 3. Glossary
Jan 15	Dr. Smith	4. Research √5. Content 6. Assessment √7. Reflection Q. √8. Activities	4. Research 5. Content 6. Assessment √7. Reflection Q. √8. Activities	4. Research 5. Content 6. Assessment 7. Reflection Q. 8. Activities

Figure 1: Segment from a Content Status Sheet

Content Management Levels:

1. As content is received, it is entered into a system that is tailored to the content features in MeBA and the structure of the document. The content must be previously approved as meeting the specification requirements. This version allows for a record of what has come in and for notes to be inserted as to what is incomplete or any special notations.
2. Content is moved to Level 2 when it has been approved as complete and is ready for copy editing.
3. Content is moved to Level 3 (Gold Version) once all changes are made and it is ready for production.

The Status Sheet is a record mechanism related to the content for all features and is maintained in the development server. Summary Status Sheets are linked to the content in the server and can be generated on demand.

While a user may choose to move content to production before all feature-related content has met the requirements of the Status Sheet monitoring process, in large-scale projects we recommend that the movement to production not occur until the content for a chapter or major section is complete. When content moves to production, those responsible for production must be informed that they may access the content in the server hosting the Status System. At that point tagging and entry

of content into templates begins. Guidelines for this process are currently in prototype form (see figure 2).

Figure 2 Show the interface that is used during production to enter and manage content before rendering the display version of the e-book that users interact with. The initial structure of the e-book is determined by the editors and forms the foundation for this entry page. During the production process the developer may review multiple version of each page including the page identifiers, the creator files (typically MS Word) and the HTML display page. Because the system totally isolates the content from the design elements the interface "Look and Feel" for each e-book may be unique.

Structure	Module ID	Look&Feel	Short Title
Book	B1001	Norm 1	Exceptiona 1 Children
<input type="radio"/> HTML Build <input type="radio"/> Update SYS <input type="radio"/> Add Alias			
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Home <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Getting Started <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Publisher Information <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> eBook Design <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Authors <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Credits			

Figure 2: Content Production Interface

4. The E-book User Interface Rendering

The Modular e-Book Authoring (MeBA) System is designed to support the rapid development of content structures, instructional features and user interfaces for e-books. By separating content from design, the system facilitates rapid global refinements to the user interface while maintaining reliability in large e-book efforts [5, 6].

The user interface elements include (a) multiple navigation strategies with pagination and position

indicators, (b) a main table of contents, (c) a pull-down menu bar, and (d) sub-menus that support usability features so that the instructional components can be easily used independently [7]. Interactive features consist of multiple-choice and open-ended assessments with tailored remediation and hyper-reference links to context-sensitive glossaries and other instructional features. This authoring system is a new tool that incorporates some features of prior work of the e-Learning Design Lab in the development of online instruction and adopts a more modular, learning objects approach [8]. The software has been designed to accommodate complex renderings of diverse content using customized mark-up tags similar to the approach used in Wiki authoring tools (see figure 3).

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Custom Tags
<storyboard>
<scene number="1" imageType="jpg">
<a href="javascript:popup("<link page ="2255_1__1_1">")">

</a>Most readers of this book are preparing to enter the
teaching profession with a goal of teaching students who have
exceptional learning needs. Some may have begun teaching
  
```

Figure 3: Sample of Custom Tags in MeBA

MeBA also offers a number of unique features. For example, the student has access to three options for accessing content in each chapter.

1. An illustrated text version with icons embedded in the text allows access to two kinds of assessments, case studies, activities, glossary terms, notes, outlines and handouts without leaving the text version. Immediate feedback is provided on all assessments and activities while the student remains in the text version (see figure 4). Figure 4 illustrates the key for the icons and an example of how they are embedded. When the student clicks an embedded icon the feature appears and the student is able to respond to the feature. They can do this without leaving the content page they are studying.

The screenshot displays the MeBA user interface. At the top, there is a navigation bar with three tabs: "Text Version", "Multimedia Version", and "Downloadable Media". The main content area is divided into two sections. On the left, there is a small image of a classroom scene. On the right, there is a text block with a paragraph about students with specific learning disabilities (SLD). The text reads: "Students with specific learning disabilities (SLD) comprise the largest population of students with identified disabilities. Because many students with SLD have normal to above-normal intellectual abilities, their learning disabilities often go unnoticed until they reach school age, when the demands of school begin to create difficulties for them, particularly in the area of literacy. Fortunately, for students with SLD and their families, researchers have acquired". To the right of the text, there is an "Icon Legend" box with a list of icons and their corresponding labels: Outline (list icon), Note (hand icon), Assessment (document icon), Question (question mark icon), Handout (folder icon), Case Study (two people icon), and Glossary (word icon).

Figure 4: Sample of Embedded Icon Feature

Students can also access all instructional features from a menu bar and go directly to the location of the clarifying content in the text version. All illustrations in the text version are the same as in the multimedia version for easy of use. For example, if a student clicks on one of the two types of embedded assessments, the assessment

appears. Students respond and they receive feedback on their response. The embedded features are designed to add content and to allow the student to check their understanding to the content or in the case of activities and case studies, the icon allows access to applied experiences (see figure 5).

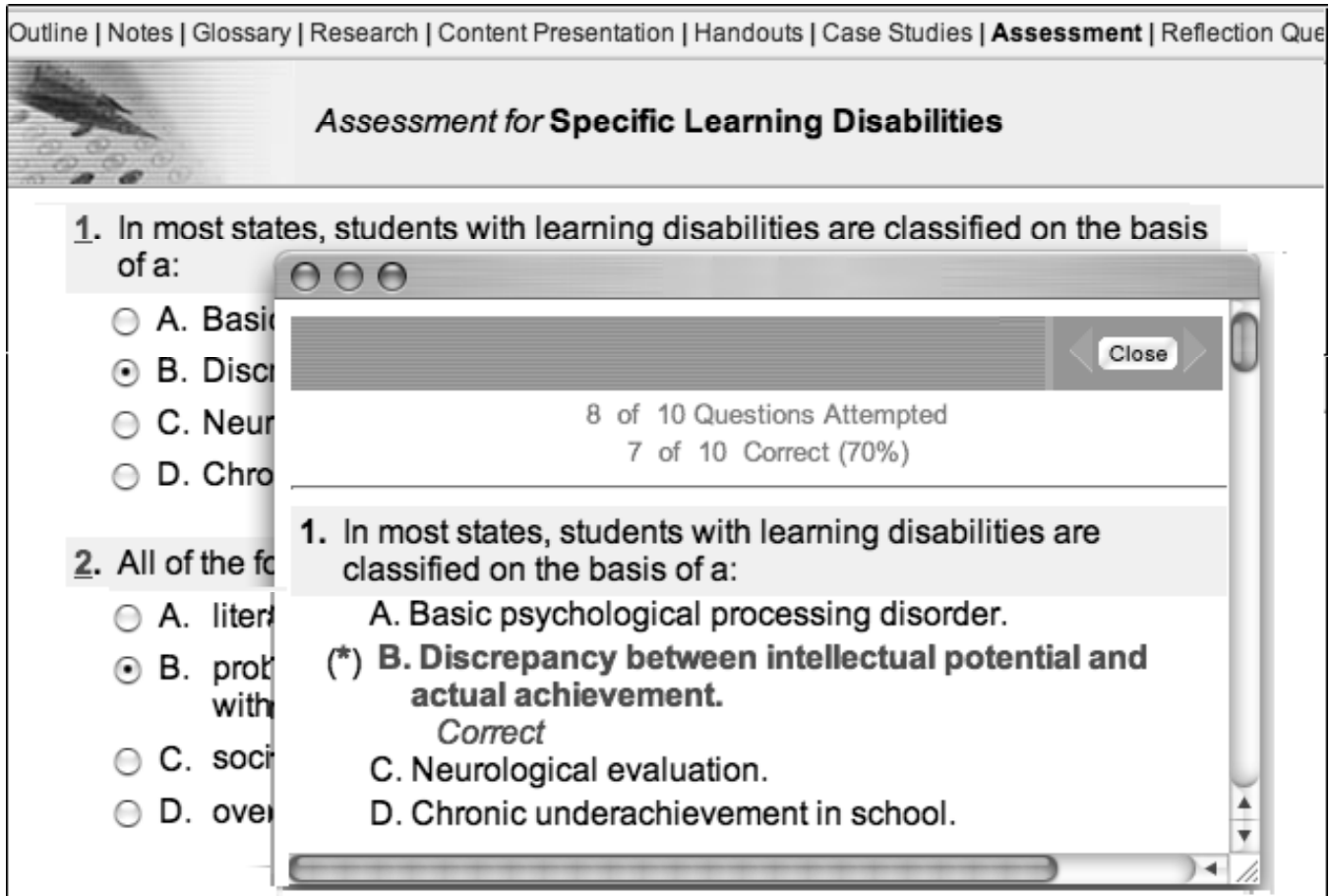


Figure 5: Sample e-book Assessment Page

2. A multimedia version enables students to access the same content in each chapter in a version that is illustrated and delivered via streaming audio that they can control. If they wish, they can also view the text version while observing the illustrations while listening to the audio. All assessments, activities, outlines, notes and glossary terms are identical for both versions.


3. Downloadable MP3 files with chapter bookmarks allow students to download each chapter to their desk top


for transfer to an MP3 player (see figure 6). Figure 6 illustrates a content page where the student elects either the text version or the multimedia version of the chapter. If they wish only to download resources such as the MP3 files they may do that by clicking the Downloadable Media. This gives them access to the MP3 file of choice or the handouts or case studies of choice. The latter also are accessible via the embedded icons.


Outline | Notes | Glossary | Research | **Content Presentation** | Handouts | Case Studies | Assessment | Reflection Questions

Content Presentation for Specific Learning Disabilities by Mary Br
Martha A. League, and Seonjin Seo

Text Version Multimedia Version  Downloadable Media



 **Play in RealPlayer**
High Bandwidth

 **Play in RealPlayer**
Low Bandwidth

Handout	Case Study
<p>Handout 1: Types of Formal and Informal Assessments See Related Content</p> <p>Handout 2: Teacher-Directed Interventions in Literacy See Related Content</p> <p>Handout 3: Teacher-Directed Interventions in Spelling and Writing</p>	<p>Case Study 1: Devin See Related Content</p>

Figure 6: Sample e-book downloadable version page

Users can also select the appendices and download the full book to their computer, a CD or an MP3 player. The MP3 version is a value-added feature for students who are accustomed to using MP3 devices for listening to music and other information sources.

Every feature in the e-book can be printed with the format of the e-book. In addition to accessing the complete book in MP3 files from the appendices, all graphics and visuals appearing in the e-book have been converted to Power Point slides that can be downloaded. This is also true of the handouts that appear at the chapter level. While this may benefit students, the power point slides may be of particular benefit to instructors.

The comprehensive MeBA tool may be used by publishers or educational institutions to produce e-books, by a company to contract with publishers to produce e-books or used in the same manner to produce any kind of document that requires a deeper understanding of a body of content. An abridged version of the tool can be created if all features were not perceived as being important.

After the cycle of beta testing, the e-book web files created by the authoring tool are bundled with the multimedia files and the publisher is notified that the final version of the ZIP file is available. The publisher retrieves the ZIP file from a password-protected web page for remote installation.

5. Accessibility and Interoperability

Throughout the process of developing systems to support the development of online educational content we strive to comply with emerging standards in content management, interoperability and accessibility. The

includes standards developed by the Center for Applied Special Technology (CAST) for Bobby compliance that are based on the principles of Universal Design for Learning (UDL). Research on UDL has shown that designs intended to increase the accessibility of content for different learning styles and abilities often results in better quality instruction for all learners [9].

A central focus of our development is on creating software tools and procedures that support content experts in the rapid development of high quality interactive online learning resources. This includes efficient instructional architectures and support systems that minimize barriers that leading experts may face when translating their expertise to online instruction. For example we often provide editing, support in developing assessment items, outlines and other ancillary resources.

Although our focus is on enriching the content development process, we also recognize and seek to comply with the standards for content management and interoperability. This includes metadata and other compliance to the Sharable Content Object Reference Model (SCORM) standards supported by the Advanced Distributed Learning (ADL) initiative. Interoperability standards helps to extend the online instruction to a broad range of audiences, allow the instruction to be adapted to a variety of contexts and enhance personalization [10].

6. Status of Modular e-Book Authoring (MeBA) System

The MeBA has been completed and beta tested. The first e-book has been produced and was released for adoption. We anticipate that it will be used in college

courses beginning in the fall of 2006. The initial application is an introductory text book for teacher education on teaching of students with exceptional learning needs. Students will receive a print copy and a password for accessing the e-book for 150 days. A feedback system will be in place to collect information on students' experiences and their suggestions. A special marketing effort will be aimed at professional development with only the e-book being available. This will test the merit and functionality of a stand alone instructional e-book rendered with MeBA.

7. Conclusion: Lessons Learned

A critical and often overlooked aspect of eLearning production is the development of software tools and operating procedures that support content authorship and content management in multi-authored contexts. In this case we chose to prototype a new suite of eLearning development tools and systems to accommodate the production of an edited text with multiple authors.

During this process we have learned that clear guidelines and support resources such as a "Writer's Manual" are particularly critical in the development of multi-authored eBooks. Content management is also aided by clear and available status records that specify current levels of production for all components and authors. Although authors may provide basic guidelines for such elements as instructional graphics, some instructional components, such as instructional graphics and assessments items, can often be developed most efficiently by experts at the production site.

There is a clear advantage in making global modifications to the user interface when the content and user interfaces are completely isolated in the production system. This approach allows for global modification of the user interface elements and the addition of new interface features while content is being developed. For example, we extended user interface features with MeBA to allow users to quickly refer to relevant instructional elements including assessment items and notes. This approach also allows for more rapid accommodation of emerging accessibility and interoperability standards advocated by CAST, SCORM, W3C and others.

While MeBA is primarily intended to support more interactive e-books for instruction use in higher education, it has other applications. It can be used to produce, technical reports, training manuals or professional development resources eBook format. Intended users include publishers, universities, professional organizations and governmental agencies.

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