Getting Started With EDUPUB

A guide for understanding the EDUPUB Profile of EPUB 3

July 2015

Compiled by the BISG Content Structure Committee’s EDUPUB Working Group

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Getting Started With EDUPUB

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Getting Started With EDUPUB was written and compiled for the Book Industry Study Group, Inc. (BISG) by members of the BISG Content Structure Committee's EDUPUB Working Group.

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Introduction

Today’s educational landscape provides a wealth of tools and technologies that are making the learning experience ever richer and the teaching experience ever more effective. Students increasingly have the choice of print or digital content that can be accessed online or offline using e-readers, smartphones, and tablets. That content can include videos of demonstrations, audio of interviews or oral histories, interactive tools like exercises, quizzes, and other resources that make the learning experience come alive. Teachers are no longer limited to a primarily print-based set of resources; they have the entire Web at their disposal—and they can get information about how each student is progressing, in order to tailor the learning experience for each individual.

While this landscape is powerful and exciting, it is also complex and rapidly evolving. Standards help make the various tools and technologies in the educational ecosystem work together. In order to ensure effective collaboration and interoperability among existing standards, the EDUPUB Alliance was created as a confederation of organizations, each of which governs a key suite of standards that provide the infrastructure of today’s digital education environment. The goal of the EDUPUB Alliance is not to create “yet another standard,” but instead to ensure that existing standards evolve in ways that make them ever more compatible and interoperable with each other in order to enable richer, more adaptive educational materials and measure their effectiveness and learners’ interactions with them.

The core initiative of the EDUPUB Alliance is the development of the EDUPUB Profile of EPUB 3. This is an activity of the International Digital Publishing Forum (IDPF), the governing body of the EPUB standard, the distribution and interchange format standard for digital publications and documents based on Open Web Standards. The EDUPUB Profile of EPUB is not a new standard or file format; documents conforming to it are, by definition, conformant EPUB 3 documents. What the EDUPUB Profile adds are specifications that optimize an EPUB 3 for educational content, making it interoperable with other standards.
within the EDUPUB Alliance, such as the standards developed by the IMS Global Learning Consortium for quizzes, learning tools, and metrics.

The purpose of this “Getting Started with EDUPUB” publication is to provide background on EDUPUB, to help you understand its role in the educational ecosystem, and to familiarize you with the EDUPUB Profile of EPUB, along with the business case for its use. It’s intended to help publishers of all types to begin implementing EDUPUB, from the largest educational textbook publishers and platform providers to a publisher who may have only one or two publications used in education, and anyone who publishes educational content, including trade and corporate publishers.

*Getting Started with EDUPUB* is not intended as a one-stop technical implementation guide; instead, it is written for the general reader—the publishing executive who needs to understand how EDUPUB can improve her publishing program, the creators and editors of educational content, the production staff who create the products and platforms, and those who manage the vendors to whom such work is outsourced. Because the mission of EDUPUB is to optimize the educational experience end to end, it’s important that everyone involved has a good basic understanding of the EDUPUB profile.

This publication is designed as a starting point in developing that understanding. The following sections describe the EDUPUB Alliance in more detail; discuss how EDUPUB can be of benefit to publishers, platform developers, educators, and learners; assess the evolution and status of EDUPUB, including what is yet to be done and addressing perceived obstacles to its implementation; provide a thorough basic overview of the EDUPUB Profile for EPUB 3 and a guide to how to start realizing its benefits; and point to resources where further information on all the related specifications and organizations can be found.

We hope it spurs you to take action. Because EDUPUB is an alignment of already existing and widely used standards, you are probably much closer to being able to implement it than you realize. In fact, many aspects of EDUPUB will make your job easier, by providing
open, interoperable ways of doing what you need to do without requiring you to acquire expensive proprietary technology or invest in in-house development.

EDUPUB is here to help. This guide is here to help get you started.
What Is EDUPUB?

Since its official announcement in October 2013, EDUPUB has grown through the work of various individuals and organizations. Originally contributed as a best practices example to the International Digital Publishing Forum (IDPF), EDUPUB started as an EPUB 3 file containing HTML markup and metadata specific to reusable learning content. Since then, the term “EDUPUB” has evolved to refer to much more than a sample file with recommended markup. So what is EDUPUB today? To answer this question in full, let’s explore three different aspects of EDUPUB.

The EDUPUB Initiative

The EDUPUB Alliance’s focus is a single mission: to create a comprehensive model for the interchange and deployment of educational content—a interoperable, accessible, open ecosystem. Despite the clear benefits of digitally delivered educational content, the absence of a single standard approach to content architecture and required metadata has stymied publishers’ efforts to streamline production and focus on learner experiences, and has complicated platform providers’ efforts to support the richest and most effective features in digital learning.

Without a common way of creating and displaying rich learning content, the amount of content from publishers is limited by lack of feature support by reading systems and platforms. The resulting limited content variability and lack of rich content creates business risks for reading systems developers. In response to this logjam, a discussion started around developing a standard output form for EPUB 3 for educational content, rather than creating more file formats. The rationale for this approach is firmly grounded in a list of guiding principles, including the following:

- Leverage existing open standards, including HTML5, CSS3, EPUB 3, and best practices of the Open Web.
- Create content that is semantically structured and relevant for education.
- Give equal weight to metadata and structural standards.
- Create content that is highly accessible.
- Support structured authoring and assembly ecosystems.
- Support collection of meaningful and useful learning data.

Taking this approach, Pearson formally submitted a proposal to create an EPUB 3 profile specifically for educational content, based in part on Pearson’s baseline EPUB 3 output specification for semantically tagged learning content. In addition to Pearson’s profile, O’Reilly Media submitted a separate profile, based on their work on an HTML5 specification for book authoring and production. Finally, content architects at John Wiley & Sons submitted markup patterns designed around professional learning content for inclusion in a template developed in early 2013.

However, the EDUPUB initiative is not exclusive to publishers. The challenge of developing and delivering rich, effective digital learning experiences is common to publishers, platform developers, educators, and learners alike.

**The EDUPUB Alliance**

Through conversations between the IDPF and Pearson, the concept of a global EDUPUB Alliance emerged, and it quickly became obvious that feedback and support from other stakeholder organizations in the educational standards and publishing universes would be critical to the success of the initiative. To this end, three organizations gathered to form the initial EDUPUB Alliance: the International Digital Publishing Forum (IDPF), the governing body of the EPUB standard; the IMS Global Learning Consortium (IMS GLC), developers of interoperability and adoption practice standards for distributed learning (e.g., LTI, QTI/APIP, et al.); and the World Wide Web Consortium (W3C), the predominant international standards organization for the Web (e.g., HTML, XHTML, CSS, et al.).

Since the initial core group was formed, additional organizations, including the BISG and the DAISY Consortium, have joined the EDUPUB Alliance, and the list continues to grow.
Through their varying member bases, these organizations together bring a wide range of perspectives to the EDUPUB initiative, including publishers, authors, reading system developers, educational institutions, educational technology (edtech) services, government and nonprofit organizations, and individuals. It is through the participation of these organizations and their members that the EDUPUB Alliance is able to ensure the comprehensiveness of this open ecosystem.

Internationally, the IDPF EDUPUB working group consists of participants from across Asia, Europe, and North and South America. Several EDUPUB workshops have taken place across the globe in cities like Boston, Salt Lake City, Oslo, Tokyo, and Phoenix, with work focusing on standard content architecture and metadata specifications, integration of existing education and assessment standards, and improvements needed to better facilitate international production (e.g., vertical vs. horizontal text).

The EDUPUB Profile

The bulk of ongoing work for EDUPUB to date has been on specifying the EPUB 3 EDUPUB profile. While this may sound like the creation of another format, the EDUPUB profile is considered both a subset and an extension of EPUB 3, and not a separate or replacement format. In other words, an EDUPUB file is an EPUB 3 file, with the same file extension and validating to the same specification. EPUB 3 is itself a broad and flexible format, and EDUPUB is a formally defined implementation profile of EPUB 3 that is designed to meet the specific requirements for creation and delivery of educational content.

Like EPUB 3, EDUPUB is designed to accommodate the broadest possible range of educational content needed by providers and users. Publishers may adopt all of the different sections of the EDUPUB profile or just those most relevant to their content—including, for example, scriptable objects—allowing them to build configurations that best fit their unique business requirements. This approach is mirrored in the work of the IDPF EDUPUB working group, which has delivered incremental draft specs using an agile approach. As with any open standard, broader adoption of EDUPUB and real-world use will
likely lead to the future discovery of more complex use cases. Over the long term, EDUPUB will continue to evolve; the first release is envisioned as a strong starting point, not a final destination, ensuring the viability of a comprehensive standard for educational content across the globe.

For a more in-depth look at the EDUPUB profile for EPUB 3, see IDPF EDUPUB Profile Specification: The Basics.
Why EDUPUB, and Who Is It For?

As was mentioned in the What Is EDUPUB? section, EDUPUB is a profile of EPUB 3. This means that an EDUPUB file is a valid EPUB 3 file that also complies with the additional requirements found in the EDUPUB profile. The decision to base EDUPUB on the EPUB 3 standard is important because (1) it does not require publishers to develop separate workflows to create a completely different ebook format for their educational content, and (2) a retailer that supports EPUB 3 but does not specifically support EDUPUB will still be able to sell the file because it is a valid EPUB 3 document and should have “graceful fallbacks” to present content effectively even if the reader doesn’t support the more advanced features. Reducing production pain points and retailer limitations is imperative to the success of ebook sales, and even more so in the realm of education, where differing standards and technologies can present huge barriers to entry for educators, learners, publishers, and platform providers.

Because the needs of students and teachers continue to grow and change, the digital textbook of tomorrow will require coordination across all content development and delivery players in order for them to provide the rich learning experience students are asking for. Educational resources don’t just come neatly packaged in textbooks anymore. Students and teachers use a multitude of resources—books, chapters, articles, media, quizzes, exercises, models, data, and more. And they need to use them online and offline, alone and collaboratively, wherever and on whatever device they want.

EDUPUB aims to remove friction to enable educational content of all types to be reliably distributed and interchanged across a wide variety of devices and platforms. So it is no surprise that there are many stakeholders involved in this process, from creators of educational content (publishers), to distributors (platform developers), to the audiences (educators and learners) that consume these resources. Let’s look at the benefits of EDUPUB for each of these groups.
Publishers:

- **Economies of scale**: EDUPUB is intended to enable economies of scale in relation to design, development, and distribution of digital content in EPUB format.

- **Flexible sourcing and staffing**: Industry standard formats allow selection of vendors based on performance/cost versus dependence on proprietary technology, and the ability to shift production when needed. Standard workflows and shared tools allow in-house resources to be deployed based on greatest production needs versus expertise in esoteric workflows.

- **Consistent presentation across devices**: Consistent markup means reading platforms can work to provide consistent, high-quality display and predictable functionality of the same elements to the readers—providing a more seamless experience when reading multiple digital learning materials from multiple sources.

- **Elimination of variant products for different platforms**: Having standards-based content means publishers won’t be locked into proprietary formats.

- **Real innovation, not reinventing wheels**: EDUPUB provides a foundation for innovation and the production of high-quality products, so that publishers can feel secure that the experiences they create will maintain themselves across multiple platforms.

Platform providers:

- **Faster development based on a known, consistent format**: Knowing that there is a common format that publishers will be providing them gives platform developers greater certainty on which to base design and development work for features for their customers.

- **Easier to support**: Consistent formats, features, and functionality lowers overhead for technical support to publishers and readers.

- **Advanced features and functions**: A known and consistent content format will allow developers to focus resources on creating rich feature support and advanced functionality instead of focusing on how to support multiple content variants.
• **Increased volume from publishers:** As production tools mature and become more robust, it will be easier and less expensive for publishers to create more content, resulting in increased volume of content coming to platform providers.

• **Expanded market:** The development of higher-quality educational content and products provides opportunities for platform providers to expand into markets yet untapped. As the volume, variety, and richness of content increases, more customers will want to acquire it, and the modularity and customization capabilities will open up additional markets—for example, corporate training, global growth markets, etc.

**Educators:**

• **Easy LMS integration:** Standard formats for content and metadata allow content from multiple sources to be easily integrated with Learning Management Systems (LMS), providing assessments and tracking outcomes and social interaction between the learner and the LMS.

• **Improved assessments, analytics, and outcomes:** EDUPUB provides rich data on how a school’s investments in different systems and content result in improved learner outcomes.

• **Easily repurposeable content:** A further benefit is maximum flexibility in collecting and using content from different sources (including the educator’s own content). As content sources diversify, the need for incorporating common standards within authoring tools will lead to a variety of applications for easily authoring educational content that is output to EDUPUB. That content can then be easily combined with content from other sources into customized course modules.

• **Facilitated adaptive learning:** By assessing students’ knowledge based on questions they’ve answered (or other interactions with the content), the software can then deliver targeted instruction on topics students are ready to learn next or need to review again. This data can also be used by the educator to tailor individual lesson plans so that students can maximize their study time.

• **Ease of retrieving and deploying content from multiple sources:** Flexibility is a key driver when providing additional resources to aid a student’s study plan. It is
important that educators be able to discover complementary educational content through rich search criteria in order to identify and provide the best resources to their students.

**Learners:**

- **Richer learning experiences:** The use of EDUPUB makes sure learners can experience multiple sources of content and interactivity from different systems or content creators and still have a seamless experience.
- **Responsiveness to learning style and preferences:** EDUPUB allows educators to adapt and respond to particular students’ needs based on real data on how they are progressing through their learning objectives, where they need additional help, and, when they excel, how to continually provide them with challenging content.
- **Accessibility:** This benefit is nonnegotiable and completely embedded within the content structuring in EDUPUB. Rich semantics, logical reading order, and use of WAI-ARIA markup and package-level accessibility metadata allow assistive technologies to present content in ways that are optimized to different learning styles and abilities/disabilities.
- **Online or offline, laptop, tablet, phone:** Content will be modular and portable, giving learners access to their content on whatever device and at whatever time they desire, whether they are studying at home, at school, or on the go.
- **Improved learning outcomes:** Learners get access to richer and more interactive content that has higher accessibility and is responsive to their progress, access preferences, and learning preferences. Success here will lead to improved learning outcomes.
- **Affordability:** All of these innovations, if deployed properly, will drive down the cost to produce educational resources, resulting in lower costs for the consumer.

The goal of EDUPUB is for rich, high-quality content to be persistent, discoverable, manageable, reproducible, scalable, accessible, immediately available, and unbound from particular platforms. By standardizing educational semantics and reducing the number of
variable formats for similar content, publishers, vendors, and content distributors can
devote more of their resources to improving content, authoring and assembly tools,
services, and end user experience and less of their resources on creating redundant output
formats that provide no competitive advantage—truly a win-win for all involved.
An Overview of the IDPF EDUPUB Profile for EPUB

The IDPF EDUPUB Profile, as mentioned above, is a set of specifications that optimize the EPUB 3 standard for educational content, with particular attention to enabling an EPUB to include features that conform to the specifications from the W3C and the IMS Global Learning Consortium.

The EDUPUB Profile specification itself, published at http://www.idpf.org/epub/profiles/edu/spec/, provides few requirements that make an EPUB an EDUPUB. It also recommends many ways that an EPUB may be optimized for education. The intention is to provide publishers with guidance and to encourage consistency and interoperability, without setting strict or extensive requirements that would become obstacles to implementation. These recommendations are described below.

In addition, the development of the EDUPUB Profile revealed that some of the features initially conceived of in the context of an EPUB devoted to educational content—for example, Distributable Objects (“chunks”) and Scriptable Components (“widgets”)—are actually useful to an EPUB of any of type. These therefore became separate IDPF specifications, but they can still be considered generically part of the EDUPUB Profile, and are referenced in the Profile specification. These, too, are discussed below.

Here’s how the EDUPUB Profile specification describes what EDUPUB further specifies to EPUB:

- It adds semantics for common educational publishing components and structures.
- It defines how to include content that may be created external to the narrative text workflow, such as interactives and assessments (e.g., QTI).
- It includes accessibility features to enable compliance with educational standards.
- It enables the identification of discrete content entities.
- It allows the embedding of shared educational scriptable components.
- It incorporates support for annotations.
- It defines guidelines for the production and inclusion of images.

**EDUPUB Is “Pure EPUB”**

The most important thing to remember about the EDUPUB Profile is that it fundamentally does not prevent a publisher from using any features of the EPUB specification, and it doesn’t lead to the creation of a publication that is rejected by EPUBCheck as nonconformant. An EDUPUB publication is intended to work in any EPUB-conformant Reading System. As the EPUB specification evolves, EDUPUB will evolve in sync with it, so that a publication that conforms to the EDUPUB Profile will by definition conform to the current EPUB spec. It should be noted, however, that because EDUPUB adds requirements to basic EPUB, while every valid EDUPUB is a valid EPUB, not every EPUB will be a valid EDUPUB.

Nevertheless, every aspect of the EPUB spec (EPUB 3.0.1, as of this writing) is fundamentally a part of the EDUPUB Profile, and does not need to be addressed in detail here. The content documents are HTML5 (expressed as XHTML) or SVG; the `<package>`, with its `<metadata>`, `<manifest>`, `<spine>`, and so forth are exactly as specified by EPUB; media and other resources, including the Core Media Types, are all those specified in EPUB. Because of its commitment to the Open Web Platform, all of the accessibility features provided by EPUB via W3C’s WAI-ARIA are part of EDUPUB; semantic enrichment is done via schema.org, just as it is done in EPUB and HTML5. While in some cases (discussed below) EDUPUB adds required or recommended ways to use those EPUB features, it doesn’t change those features. An EDUPUB is an EPUB.

The initial EDUPUB Profile focuses on reflowable EPUBs; and it should be emphasized that for maximum flexibility, interoperability, and accessibility, a reflowable EDUPUB is recommended. But in keeping with its mandate not to depart from EPUB, even a fixed-layout EPUB, as long as it conforms to all the EDUPUB specifications and is accessible, can be a conformant EDUPUB.
So What Makes an EPUB an EDUPUB?

The first and most obvious thing that makes an EPUB an EDUPUB is that it has to say it’s an EDUPUB. One of the few requirements of EDUPUB is that the `<metadata>` element must include a `<dc:type>` element with the value “edupub”:

```
<dc:type>edupub</dc:type>
```

Another fundamental requirement of EDUPUB is that it must identify the accessibility features it contains. This reflects the critical importance of accessibility to educational content, and the need to clearly identify—to a reading system, to an educator, or to a learner—exactly what accessibility features an EDUPUB includes. It should not be left for them to be discovered when encountered. Worse, it should not require a user to discover, to her dismay, that the features she needs are not included. The EDUPUB must specify them up front.

This is done via the repeatable schema.org “accessibilityFeature” property, at least one of which is required in EDUPUB metadata. The W3C Web Schemas Wiki provides a list of recommended values for this property (from easy-to-comply ones like “tableOfContents”, “readingOrder”, and “structuralNavigation”, to obviously beneficial ones like “alternativeText” and “printPageNumbers”, to more sophisticated accessibility features like “ttsMarkup” and “braille”). These recommended values should be used, though this is not a requirement.

Likewise, EDUPUB uses schema.org to provide information about the educational features of a publication, using schema.org’s educational metadata properties. While these are not required, they are highly recommended because, as with accessibility, an EDUPUB becomes much more useful if its features can be known up front, rather than simply being discovered when they’re encountered (or noted as missing when they’re not). Such information includes a selection of useful properties like “educationalUse” (with 60-some
recommended values), “typicalAgeRange”, “interactivityType”, “learningResourceType” (with 27 recommended values, from “Activity”, “Assessment”, and “Audio” to “Video”, “Wiki”, and “Worksheet”), and others.

EDUPUB also makes the distinction between a teacher’s and student edition clear. A teacher’s edition—which is defined as a superset of the student edition, containing teacher-only content in addition to everything in the student edition—must be identified with a <dc:type>teacher-edition</dc:type> element in the <metadata>. It should also identify the student edition that it’s based on with the dc:source element in the <metadata>: e.g., <dc:source>urn:isbn:9780000000001</dc:source>. A teacher’s guide—which is defined as providing information and resources for a teacher but does not include the student edition content—must be identified with a <dc:type>teacher-guide</dc:type> element in the <metadata>.

**Structure and Navigation**

Unlike basic EPUB, which recommends that publications have proper structure and navigational features but is actually quite tolerant of suboptimal markup, EDUPUB tightens up these requirements. This means that in an EDUPUB, the <section> element must be used to structure the narrative flow in XHTML, and each <section> should have either one of the HTML5 heading elements (<h1>-<h6>) that properly reflects the hierarchy of the <section> or an aria-label attribute that describes it. Likewise, when an <article> or <aside> occurs in a <section>, its heading level must reflect its hierarchy: if the <section> has an <h3> heading, then the <aside> it contains must have an <h4> heading.

In addition, a complete guide to the navigation of this structure is critical in educational contexts. Therefore, EDUPUB requires that a “toc nav”—the <nav> that includes the complete structural hierarchy of the publication—must be provided in an EDUPUB. Plus, EDUPUB provides for the addition of an optional “toc-brief nav”: another <nav> that provides a shortened version of the hierarchy, eliminating the deeper levels of subheads.
and nesting. In addition to being provided in the EPUB Navigation Document, a “toc-brief nav” may be included at the beginnings of certain sections—for example, to serve as a chapter TOC.

EDUPUB also encourages the inclusion of lists of illustrations, tables, videos, and audios, each in a `<nav>` identified by the appropriate value of the `epub:type` attribute—for example, “loi” for “list of illustrations” and “lot” for “list of tables.”

Finally, if page break markers (typically `<span>`s that identify the points at which each page in the print edition starts) are included, then EDUPUB requires that a page-list nav must be included. These are highly recommended to enable users of digital versions of textbooks to have the same ability to navigate a book as the users of the print book—for example, when a teacher refers to “page 52.”

**Structural Semantics**

One of the most obviously “educational” aspects of EDUPUB is the Structural Semantics Vocabulary. While EPUB 3 defined a basic set of structural semantics—distinguishing, for example, between a sidebar and a footnote; delineating common types of front matter and back matter, such as a dedication or a glossary; and providing other semantic distinctions, particularly in order to enable users of assistive technology to distinguish types of content that a sighted user distinguishes visually—EDUPUB has added a host of new terms that are particularly useful in educational contexts.

In keeping with the principle of aligning EPUB and EDUPUB, the terms that have been developed so far for EDUPUB have been incorporated into the EPUB 3 Structural Semantics Vocabulary with version 3.0.1. These currently focus on terms for learning objectives and for testing—for example, “question”, “answer”, “true-false-problem”, “multiple-choice-problem”, and many more. Additional Structural Semantic terms are expected to be added as EDUPUB (and thus EPUB) evolves.
While the use of these terms is not mandated, it is highly recommended because it enables educational content to be both managed more effectively and used more effectively by students and teachers.

**Images**

In order to facilitate better use of images in educational systems, EDUPUB has provided some recommendations regarding how they should best be handled. These recommendations include using the sRGB color space for digital media; using the PNG or SVG formats for vector images (line art, image fallbacks of equations, bitmap images that include text, etc.); and using JPEG with 80% quality for photographs and other bitmap images. And it recommends not exceeding 2,000 pixels on the longest dimension of block-level art.

**Distributable Objects, Scriptable Components, and Annotations**

As mentioned above, there are three specifications that are not technically part of the EDUPUB Profile because they apply to any type of EPUB, but that are referenced by the specification and can be used in conjunction with these files.

“**Distributable Objects**” specifies how to identify the “discrete entities” within an EDUPUB—content documents, fonts, stylesheets, metadata, media resources, etc.—that are intended to comprise a “distributable object” like a chapter, a video demonstration, an exercise, or any other subset of an EDUPUB that is to be sent separately to a destination like an LMS.

“**Scriptable Components**” specifies how to create interactive “widgets” that can be incorporated into EDUPUB publications and exchanged as Distributable Objects.

“**Open Annotations in EPUB**” specifies how to handle annotations.

The technical details of these specs are beyond the scope of this “Getting Started” guide, but it’s important to understand that EDUPUB has addressed these things because they are increasingly important in our complex digital educational ecosystem.
Assessments, Outcomes, and Analytics

Finally, as part of the larger EDUPUB Alliance, the EDUPUB Profile is designed to enable the use of key technologies provided by the IMS Global Learning Consortium:

- LTI (Learning Tools Interoperability)
- The Caliper Analytics Framework
- QTI (Question and Test Interoperability)

The initial release of the EDUPUB Profile published at the time this “Getting Started” guide was written simply references the [guide](#) published by IMS as to the use of QTI, LTI, and Caliper Analytics in EDUPUB. Phase one of the IMS implementation will focus on LTI, since establishing interoperability is so fundamental. Further work is planned in subsequent phases of EDUPUB’s rollout and implementation.
Getting Started with EDUPUB

In many ways, building EDUPUB books is not that dissimilar from traditional print publishing. The main skills used in print publishing—authoring, editing, designing, managing, and so on—are still needed. Also, just as print publishing uses many different kinds of tools and workflows, EDUPUB publishing is equally flexible. What sets EDUPUB publishing apart from print publishing is extending the capabilities of the book, the ability to create modular content, the importance of content modeling, and the possibilities for more efficient authoring and delivery.

Ideation/Instructional Design

It is important when planning an EDUPUB book to consider:

- how traditional book features translate digitally
- what new features can be added
- what features can be deferred to later

Print books come full of features. They have indexes and page numbers that let readers quickly find content. They have content features like sidebars that provide readers with related material. A helpful exercise when planning an EDUPUB book is to map these print features to their digital equivalents. For example, hyperlinks may be a more effective navigation tool than page number references. Likewise, it may be better to link to related content than to place it next to the main narrative text.

Not every part of a traditional book needs to translate to a digital version. Careful thought should be given to what was done traditionally because it was best practice versus what was done because of restrictions in the print medium or for purely aesthetic reasons.

Additionally, traditional books favored a single start-to-finish reading path. With EDUPUB, it is possible to create more modular content. With modular content it is possible, for
example, to create a history book with multiple tables of contents. One TOC can be organized chronologically, another thematically, and a third by geographic region. The same book now suits the teaching methods used in three different classrooms.

Once the basics of mapping print features to their digital equivalents are out of the way, the exciting part can begin. Many new features can be added to an EDUPUB book. Video, audio, interactives, and other rich media are all possible. When planning for these new features, it is important to consider:

- Should they be in addition to, or instead of, narrative text?
- If they are in addition to the text, are they there to enrich the narrative, or to provide alternatives for different learning styles/learner preferences?
- Where and how should they be accessed, and how does that affect the reading order?

Finally, when planning, it may make sense to defer some features for later. Because digital delivery in general is still young, it is important to plan to learn from readers. Instead of building everything for a single release at once, it can be helpful to release a smaller-scoped book first to study what readers really need for the next release. Publishing iteratively is much simpler with EDUPUB because there is no need for an expensive print run with each new release.

**Content Modeling**

Content models describe the book’s structure. For example, a chapter is a commonly used structure. It is also a complex structure as it is composed of more basic structures such as paragraphs and figures. A tricky problem is coming up with all of these structures in a way that is consistent across publications. Knowing which level of granularity to use when defining a structure, and even just coming up with good name for it, can take a considerable amount of time. This, however, is a problem EDUPUB explicitly sets out to solve for educational publishers.
With EDUPUB, structures used in educational publishing are already specified with names, tagging practices, and use cases. Complex structures, like chapters and figures, also have rules about which other structures can compose them. For example, a figure cannot be composed of a chapter, but a chapter can be composed of figures.

These structures are semantic structures—that is, they describe the meaning or purpose of the content rather than the look and feel of the content. For example, keywords are explicitly tagged as keywords; they are not tagged boldface even if they always appear boldface.

Because these structures are already specified, publishers only need to identify how the parts that make up their specific book map to them. For example, a book may have a biography feature. This feature could be an aside from the narrative text that is composed of an image, caption, and several paragraphs. The content model for the biography feature might look like:

```
Biography
  └──aside
      ├── figure
      │   ├── image
      │   └── caption
      └── paragraphs
```

Aside, figure, image, caption, and paragraph are all structures specified in EDUPUB. The biography feature, a structure that is meaningful for the book but is not meaningful across all books, is defined in terms of those existing structures.

**Presentational Design**

With EDUPUB, the presentational design of the book is accomplished using Cascading Style Sheets (CSS). CSS is an Open Web Platform industry standard. It lets designers build a set of
rules to control how the different elements on a page appear. Because CSS is rule-based, each instance of an element does not need to be individually styled.

As mentioned earlier, EDUPUB structures are semantic, and generally do not have an inherent appearance. Therefore, the CSS should specify how those structures should appear. For example, the CSS can specify that all keywords appear boldface. More complex rules are also possible. The CSS could specify that all keywords appear boldface, and also blue if they are in a biography section.

In some cases, the semantic structure of the content does not provide enough hooks for the CSS to accomplish certain designs. For example, an elementary school book may give each chapter a theme color. There is nothing semantically different about each chapter, so there are no tags present that would make one chapter’s theme blue and another chapter’s theme purple. To accomplish this design, additional tagging and classes need to be added. These enhance the tagging by providing greater specificity between parts, but they do not replace or conflict with semantic structures already in place.

**Paths to EDUPUB**

There are many ways to take existing content and bring it over to EDUPUB. Common starting formats include:

- Microsoft Word manuscripts
- PDF files
- InDesign or other page composition formats
- XML
- HTML

A good first step in taking existing content to EDUPUB is defining the content model of the new product first. Once defined, the content model of the existing content can be mapped to the new model. Once the content is mapped, there are many ways to transform it to EDUPUB.
If the content is already in a structured format, such as XML, scripts can be written to programmatically transform the content. Scripting will generally offer cost savings and is more reliable than manual transcription.

Sometimes, even if the starting format is structured, there is not enough information present to fully automate the transformation with a script. In these cases, a hybrid approach of scripting and manual cleanup can work. For example, if the old content did not distinguish between keywords and boldface items, the bulk of the transformation can be done by a script, but the resulting content will need a manual fix to tag the keywords correctly.

If the content exists in an unstructured format, a fully manual conversion process might be necessary. This conversion can be analogous to the print production process of copying manuscript into page composition software. The new content model and the existing content can be handed over to production staff trained in EDUPUB or to a vendor who provides that service. They can then copy over the content into the correct structures.

**Authoring**

There are many ways to author an EDUPUB book. Generally, these approaches fall into one of two categories:

- marking up manuscript
- structured authoring

Just as unstructured legacy content can be converted to EDUPUB, new content can be authored in the same way. Manuscript can be written in a word processing program and handed off to be marked up into EDUPUB. Instead of reviewing and annotating PDFs, a Web browser can be used to review the content before final assembly into an EPUB file. Structured authoring, however, can be a more efficient approach.
Structured authoring is the use of software tools to create and edit structured content directly. These tools offer the ability to directly author and edit HTML/XML, without requiring users to know HTML/XML. There are many structured authoring programs available, including:

- Oxygen XML Authoring
- Xopus
- Inkling Habitat
- Metrodigi Chaucer
- Gutenberg Technology MyEBookFactory
- O’Reilly Atlas

These authoring tools give publishers many advantages:

- Content is worked on in its final format without requiring additional production work to transform it.
- Nontechnical users can edit the content directly without having to know HTML.
- Content is represented to users in a format similar to WYSIWYG.
- Buttons and drop-down menus may be available to insert commonly used structures or patterns.
- Previews of how content will look in its final form, or on different devices, may also be available.

Many structured authoring tools can be customized for a particular book or series. For example, a button can be added to insert a biography feature. This means that authors and editors do not have to know the content model for the biography feature; they can just click a single button to insert in all the needed EDUPUB structures for them to fill out. This reduces the amount of technical knowledge a user needs and also allows for greater consistency across the book.

Assembly

The final deliverable of an EDUPUB book is an EPUB file. An EPUB file is a collection of the
book’s XHTML files, CSS files, image files, manifest, and so on. The way these files get packaged together is specified by EPUB. An EPUB file may be structured like this:

```
Book.epub/
├── mimetype
├── META-INF/
│   └── container.xml
└── OPS/
   ├── package.opf
   └── toc.ncx
    ├── css/
    │   └── theme.css
    └── images/
       ├── cover.jpg
       ├── image_01.jpg
       │ └── image_02.jpg
       │ └── image_03.jpg
       │ └── image_04.jpg
       └── xhtml/
           ├── chapter01.xhtml
           ├── chapter02.xhtml
           ├── chapter03.xhtml
           └── chapter04.xhtml
```

Assembling the files together can be automated with a script.

Once a file is assembled, it is important to validate that it is correct. EPUBCheck, a tool released by the IDPF, can be used to programmatically ensure that the EPUB file is packaged correctly. If there are any problems, EPUBCheck provides a list of errors and warnings.
Myths, Barriers, and How to Overcome Them

The goal of the EDUPUB initiative is to collect and codify emerging best practices around the creation and delivery of educational content in digital form. However, any discussion of structured formats, new technologies, and all things digital—let alone the introduction of a new acronym—is bound to stir up all manner of questions and concerns, some well-founded and others not. With this chapter, we hope to dispel some of the more common myths that have surfaced around EDUPUB, and to address real challenges that may be encountered by would-be adopters of EDUPUB.

Myths

As the EDUPUB initiative continues its work, it may be easy to misinterpret information found in the many articles, presentations, blog posts, forum discussions, and public events that accompany that progress. Here are some of the most frequently repeated misconceptions about EDUPUB, along with responses intended to set the record straight.

*Myth: EDUPUB is a replacement for EPUB (and structured authoring formats).*

As a matter of fact, EDUPUB *is* EPUB—EDUPUB files are valid EPUB 3 files and bear the file extension .epub. The EDUPUB Alliance aims to leverage existing standards and specifications, rather than creating “yet another standard.” To that end, EDUPUB is a true profile of the EPUB 3 specification, meaning that it is less a specification and more a set of recommendations for how to optimize the EPUB 3 specification for extended use with educational content.

Similarly, EDUPUB is not a serialization of DocBook or other XML formats, and was not designed around DocBook’s content architecture. Any structured, semantic markup can be translated for EPUB/EDUPUB output, with no requirement to change existing markup strategies.
Myth: EDUPUB is only for US publishers.

EDUPUB is a global initiative, intended to be useful across educational contexts in any locale. Although the initial October 2013 meeting was held in Boston, it counted representatives from Canada, the United Kingdom, Europe, Japan, South Korea, Brazil, and the Philippines among the 100-plus attendees; the EDUPUB Alliance now consists of members from across Asia, Europe, and North America, and it is actively recruiting new members across the globe and across all players in the publishing industry. In fact, two recent EDUPUB workshops were held in Oslo, Norway, and Tokyo, Japan. In addition, in Korea the Open Digital Publishing Forum (ODPF) and Korea Education and Research Information Service (KERIS) have formed a government-corporate-academic partnership around standardization and are moving toward adoption of EDUPUB as a standard while undertaking a full translation of the EDUPUB specification into Korean. Additional work is ongoing to determine where improvements can be made to better facilitate international production requirements (e.g., vertical writing in IMS QTI).

Myth: All members of the publishing industry will be required to be in compliance with the EDUPUB profile, in full.

As with EPUB 3, full EDUPUB compliance will not be an industry requirement. While the EDUPUB profile is designed to provide a standard usage of the EPUB 3 specification for educational content, that usage is ultimately determined by the individual needs and requirements of each publisher and the demands of the market. As with EPUB, each publisher may decide which areas of the EDUPUB profile best serve its specific production, business, or functional requirements, and may utilize them exclusively. And if the core profile itself does not meet any business requirements, the publisher may choose to ignore the EDUPUB profile entirely.

Challenges to Implementation

While we’ve hopefully dispelled many common misconceptions about EDUPUB, the fact remains that there are real challenges to implementing any new technology, even one that
seeks to leverage existing standards rather than create new ones. Most of the challenges involved in the adoption of EDUPUB are the same challenges that confront implementation of EPUB generally, or are issues that are a result of the kind of dynamic change that the publishing industry is currently undergoing.

In this section we will outline the major challenges in the implementation of EDUPUB and provide suggestions on ways to address them.

**Publishing Strategies**

Change is hard. Publishing is going through an unprecedented period of disruptive change driven by digital technology and customer demands for content that is more modular, flexible, and adaptive. Educational publishers have developed years of expertise in how to present content in the most effective ways within the ink on paper paradigm. New digital content creation and delivery platforms, while presenting immense opportunities for new learning paradigms, present challenges to publishers to move away from approaches that have worked well for decades and to embrace new ways of thinking about how to produce innovative, effective, accessible learning experiences using this new digital toolset.

To unleash the power of this new technology, publishers and educators need to move beyond the “tradigital.” Too many digitally delivered products today are based on content that was originally conceived for the ink on paper paradigm, then converted for digital delivery after the fact. This is a poor compromise that negates the strength of both formats. By reimagining content creation through the powerful new set of digital tools, while recognizing the constraints of this distinct medium, publishers can develop content that is flexible, reusable, and captivating to users, and delivered on platforms that are feature-rich.

In order to realize this vision, fundamental conceptual shifts must occur. Content must be viewed not as text and images to be published on two-dimensional media that can be tightly controlled, but as dynamic software powering innovative products and services that perform at the highest levels of quality and consistency on multiple platforms and devices,
both online and offline, and that offer accessible content to all students. This benchmark can only be achieved by adopting robust open standards like EDUPUB and applying them at every part of the supply chain that designs, develops, assembles, enhances, and delivers content and products. This is an ambitious set of requirements that will be challenging to meet, but once the foundation is laid and the capabilities of the new toolset are realized, all sectors of the industry will begin to reap the benefits. The creativity and expertise of instructional designers, content authors, UX/UI specialists, and software developers will produce a new generation of experiences that will improve learning outcomes and enrich the lives of learners, make educators more productive, and reduce costs for consumers.

Authoring and Production Tools

One of the greatest areas of both challenge and opportunity is the structured authoring tools space and its integration with other production and content management systems. This is where the power of technology meets content and pedagogical expertise, where standards-based structure can be inserted and validated while allowing authors the creative freedom to design rich, innovative experiences that improve learner outcomes. In order to realize this vision, however, authors must be shielded from technology that distracts them from their creative process, while enabling them to enhance their content through user-friendly tools and interfaces.

The structured authoring landscape is a nascent one, with innovative start-ups developing some impressive platforms, many of which are based on open industry standards that will allow publishers to avoid getting locked into proprietary systems and that will drive further innovation across the industry. This will also allow for greater and more seamless integration with the content management, planning, rights and permissions, distribution, and other systems that need to be brought together seamlessly to create the next-generation publishing ecosystem. By insisting on support for specifications like EDUPUB, publishers can ensure consistency and interoperability of content coming out of any of these systems, while encouraging developers to focus their design and engineering resources on creating intuitive authoring experiences that unleash the creative capital
Reading System and Device Limitations

A major challenge to the success of EDUPUB (and rich EPUB 3 publications in general) is the limited support for advanced features like rich media, interactivity, and metadata by reading systems and devices. Add to that critical features like accessibility, annotations, and MathML support and you’ve got a real obstacle to the creation of rich, interoperable content that can be distributed widely and interchanged easily across platforms. Browser and reading system platform developers would do well to follow the example being set by existing platform developers who are making strides in this area to create more applications that can support the advanced capabilities that publishers are planning to deliver and put these enhanced products and experiences in the hands of more learners. Standard formats such as EDUPUB can reduce some of the risk in developing advanced reading platforms by delivering consistency that allows developers to invest in superior features and support, instead of engineering to the lowest common denominator to compensate for variability in EPUB file formats. The other key factor will be confidence that publishers will create and deliver these next generation educational products to the market in a high enough volume to make investing in advanced feature support economically viable.

Stakeholder Buy-in

At the end of the day, the most critical factor in whether EDUPUB is a success will be stakeholder buy-in, particularly from publishers. The good news is that this also represents the greatest opportunity for success. If educational publishers can recognize the value of a standard format for distribution and interchange of educational content (which reduces the unnecessary overhead associated with creating multiple “flavors” of EPUB 3 for various distribution channels and frees up resources and capital to invest in product and service innovation), then their commitment will in turn drive innovation in and development of authoring platforms, e-reader technology, and related content management, distribution, and data-driven services.
Buy-in doesn’t mean unconditional support. It does mean a public position in support of the goals of EDUPUB and a commitment to adopting it as a standard output format, but one that may come with stated conditions, such as commercial tools to support the creation of valid EDUPUB content and e-readers that can display this rich, interactive content to meet publishers’ expectations and support all the key features they and their customers require. By clearly stating the intent to develop and deliver the next generation of learning materials in the standard EDUPUB format, stakeholders will create business certainty and trigger a competitive dynamic that will ensure that a robust ecosystem of standards and tools emerges to support the future of learning. Today, e-reader developers are forced to devote a large percentage of their resources to supporting substandard PDF-based e-text mobile experiences when they could be directing those same resources to developing advanced functionality on their EPUB players.

**Conclusion**

The EDUPUB Alliance has made remarkable progress since its inception. A comprehensive set of specifications has been defined with the explicit intent that it serve as a deployable model for publishers and platform developers to work with in “real life” scenarios. This model will enable them to provide feedback to the Alliance so that further agile iteration can occur based on practical use cases. In other words, EDUPUB is real and ready for use today. Looking forward, EDUPUB Alliance members are focusing on implementation. They have defined Level 1 conformance certification requirements for content (via EPUBCheck), authoring/production tools, and reading systems (via the BISG EPUB 3 Support Grid at EPUBTest.org), and LMS integration (via IMS LTI test servers). While the Level 1 conformance threshold is relatively low initially, this is by intent to avoid perceived barriers to adoption. The threshold will continue to be advanced as the EDUPUB ecosystem evolves, and the ongoing focus on implementation and certification will continuously validate that EDUPUB is a robust standard in support of the richest digital content.

While EDUPUB is ready to support the future of learning now, it will realize its full
potential only when the key stakeholders formally commit to it. This means publishers need to move from a wait-and-see posture to a more publicly supportive one, signaling their intent to produce a critical mass of rich educational content in this format. Support from government educational entities will signal added legitimacy for EDUPUB as a broadly applicable, global education content standard. These actions will in turn spur authoring/production and e-reader platform developers to invest in features and functionality that will greatly reduce the amount of unnecessary friction and overhead that currently exists in the supply chain, allowing this next generation of rich, interactive, accessible, adaptive content to fulfill its promise by providing innovative experiences that result in improved outcomes for learners of all ages.
Appendix A: Resources

EDUPUB Ecosystem Specifications

IDPF Specifications

- EPUB 3
- EPUB 3 EDUPUB Profile
- EDUPUB Structural Semantics
- Publications 3.0.1
- Content Documents 3.0.1
- Open Container Format 3.0.1
- Media Overlays 3.0.1
- EPUB Canonical Fragment Identifiers
- EPUB Structure Semantics Vocabulary
- EPUB Distributable Objects 1.0
- EPUB Scriptable Components 1.0
- EPUB Scriptable Components Packaging and Integration 1.0

IMS Global Learning Consortium Specifications

- Using IMS Caliper Analytics™, Question and Test Interoperability™ and Learning Tools Interoperability™ with EPUB3™: EDUPUB Best Practices
- IMS Global’s Learning Tools Interoperability®
- IMS Question & Test Interoperability™ Specification
- Accessible Portable Item Protocol™ (APIP™)
- IMS Global’s Accessibility Metadata Project
- IMS Common Cartridge Specification
W3C Specifications

- Open Web Platform
- HTML5 (profile)
- CSS 3 (profile)
- MathML
- SVG
- Accessible Rich Internet Applications (WAI-ARIA)
- Web Annotation Data Model

Sample Files

A GitHub repository of sample EDUPUB files can be found at:

https://github.com/IDPF/edupub/archive/master.zip

Structured Authoring Tools

The following is a list of structured authoring tools that can support the production of EDUPUB-compliant output. Note: This list is not exhaustive, and use of these authoring tools does not guarantee that a file created using the tools conforms to the EDUPUB Profile.

- Oxygen XML Authoring
- Xopus
- Inkling Habitat
- Metrodigi Chaucer
- Gutenberg Technology MyEBookFactory
- O'Reilly Atlas

Other Resources

EPUB Validator (EPUBCheck): A tool used to validate an ebook file against the latest version of the EPUB standard and create a report of errors or warnings where the file does not conform to the spec.
EPUBTest.org: The website where the BISG EPUB 3 Support Grid that tracks the conformance of popular reading systems to the EPUB 3 standard is located, and where anyone can go to systematically test a reading system’s ability to display EPUB 3 features.


EDUPUB Alliance Meeting Reports

- Inaugural EDUPUB Workshop, October 29–30, 2013
  - Agenda and Presentations
  - Workshop Report
- EDUPUB 2 Workshop, February 12–13, 2014
  - Agenda and Presentations
  - Workshop Report
- EDUPUB Europe Report, June 19, 2014
- EDUPUB Tokyo Report, September 16–18, 2014
Appendix B: Glossary

**EDUPUB Alliance**: The consortium of standards bodies leading the global EDUPUB initiative. Core members (those responsible for the standards EDUPUB conforms to) include:

- International Digital Publishing Forum (IDPF)
- World Wide Web Consortium (W3C)
- IMS Global Learning Consortium

Additional alliance members, at the time of publication, include:

- The Book Industry Study Group (BISG)
- The DAISY Consortium

**EDUPUB Profile**: EDUPUB is a profile of the IDPF EPUB 3 specification that is specifically designed to optimize an EPUB 3 file for education. As such, there are unique requirements and specifications for EDUPUB that are not present in EPUB. The profile specification can be found at [http://idpf.org/epub/profiles/edu/spec](http://idpf.org/epub/profiles/edu/spec).

**EPUB 3**: The EPUB® specification is a distribution and interchange format standard for digital publications and documents. EPUB defines a means of representing, packaging, and encoding structured and semantically enhanced Web content—including HTML5, CSS, SVG, images, and other resources—for distribution in a single-file format. Overview: [http://www.idpf.org/epub/30/spec/epub30-overview.html](http://www.idpf.org/epub/30/spec/epub30-overview.html).

**Manifest**: The manifest is a required element within an EPUB package that follows the metadata file and provides a list of all resources included in the publication, such as the content documents, style sheets, embedded fonts, images, and media files.