

Lessons Learned in E-Publishing for Technician Education in Vacuum Technology



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Workforce Demands

National interest to invest in semiconductor manufacturing in the U.S. is **growing**:

- **Legislation** to fund U.S. growth of the semiconductor industry is introduced (CHIPS for America Act & FABS Act).
- **Intel Corporation** is already building new facilities in Columbus, Ohio.

Semiconductor manufacturers hire technicians to maintain and repair their process equipment. A key part of a technician's skill set is a working knowledge of vacuum systems.

Education Challenges

- A technician training curriculum in vacuum technology requires **instructional materials**, e.g. **textbook** and lab exercises.
- No technician-level textbooks are currently being published; *Intro to Vacuum Technology* by D. Hata went out-of-print.
- No comprehensive laboratory manual suitable for vacuum technician education is available.
- No instructional resources for teaching suitable technician-level lab courses in vacuum technology are available.

Opportunity

Project: Developing an E-Book and Other Interactive Instructional Materials for Technician Education in Vacuum Technology (DUE #2000454)

Goal: Produce more well-trained technicians in rough vacuum systems technology by creating:

- Online accessible **E-Book** adaptation of Hata's textbook
- Online ancillary materials such as **Student Lab Manual** and **Instructor's Guide**.

Lessons Learned

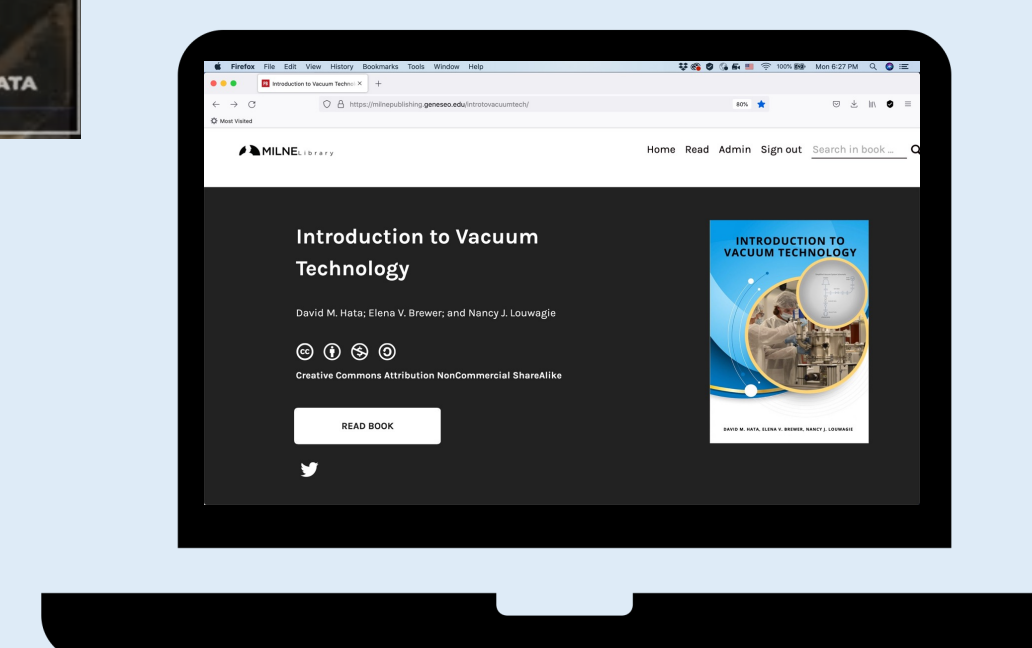
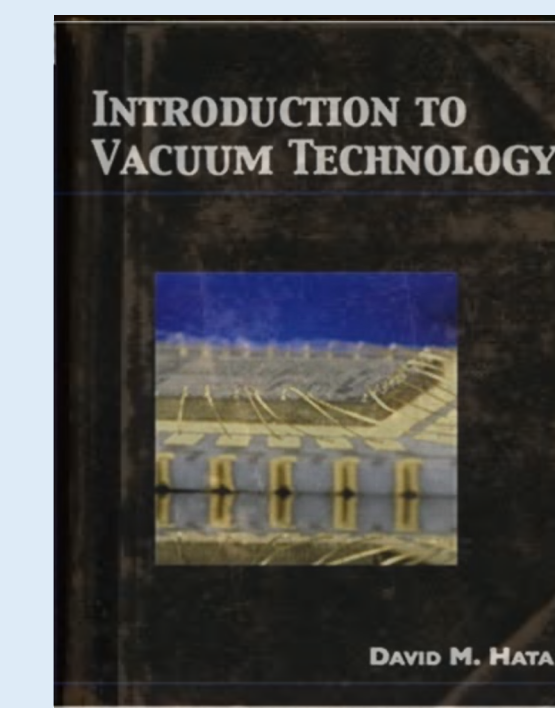
1. Criteria for Selecting the E-Book Platform

E-Book Platform must support required functionality:

- automatically-built table of contents,
- embedded videos, animations, and simulations,
- mathematical formulas engine,
- embedded interactive quizzes,
- different publication formats (that is, on-line, PDF, HTML, EPUB, XML).

Sustainability: on-going availability of resources (free or low cost) after project ends

Learning Curve: must be manageable if new to e-publishing.



2. Process to Incorporate SMEs Reviews

10 Subject Matter Experts (SMEs) Reviewed E-Book for:

- relevance to job requirements,
- alignment to course objectives,
- quality of content and visualization elements,
- support of modern principles of learning,
- gaps in technical content.

Feedback from SMEs was positive and provided suggestions for improving E-book. However, it took longer than planned to incorporate all feedback.

3. Cost-Reducing Strategies in Content Creation

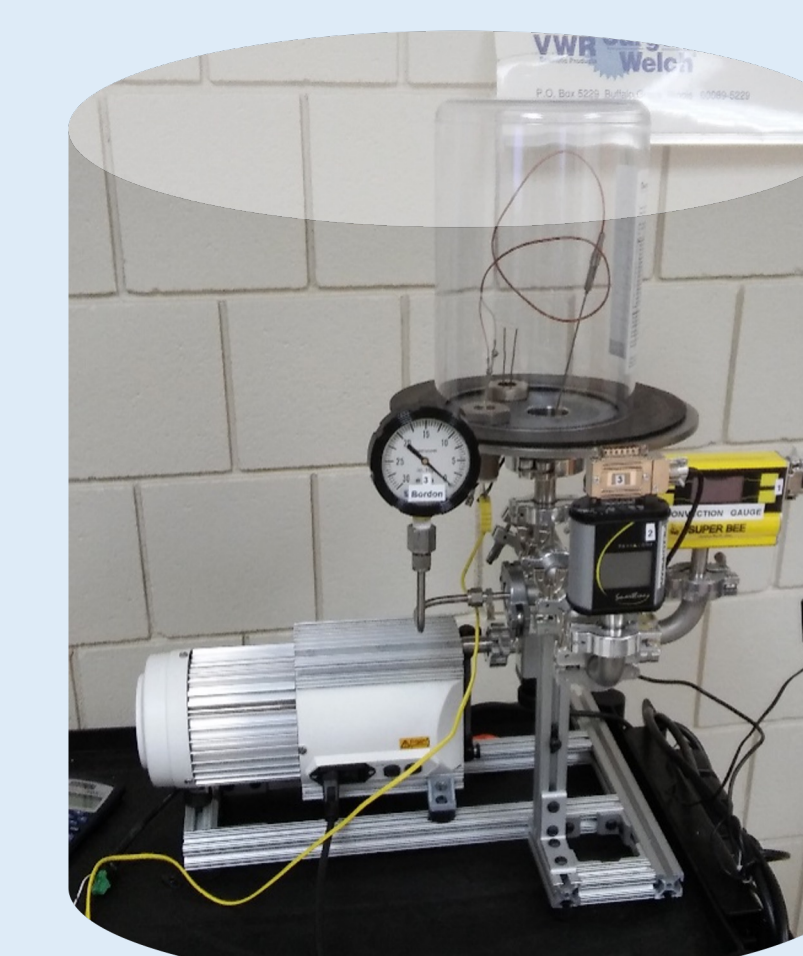
Strategies for reducing costs of the visual and interactive content development:

- employ student-artist for creating figures and animations,
- utilize available faculty/staff talent in video production,
- take advantage of educational discounts on video editing software (Vegas Pro 19),
- seek permission to use resources previously developed by industry (Busch Vacuum Solutions and Kurt J. Lesker Co) and ATE community (MATEC).

4. Plan Dissemination Workshop Early

Teaching Rough Vacuum Technology and Laboratory Design and Implementation (On-Site, Hands-On Professional Development Workshop):

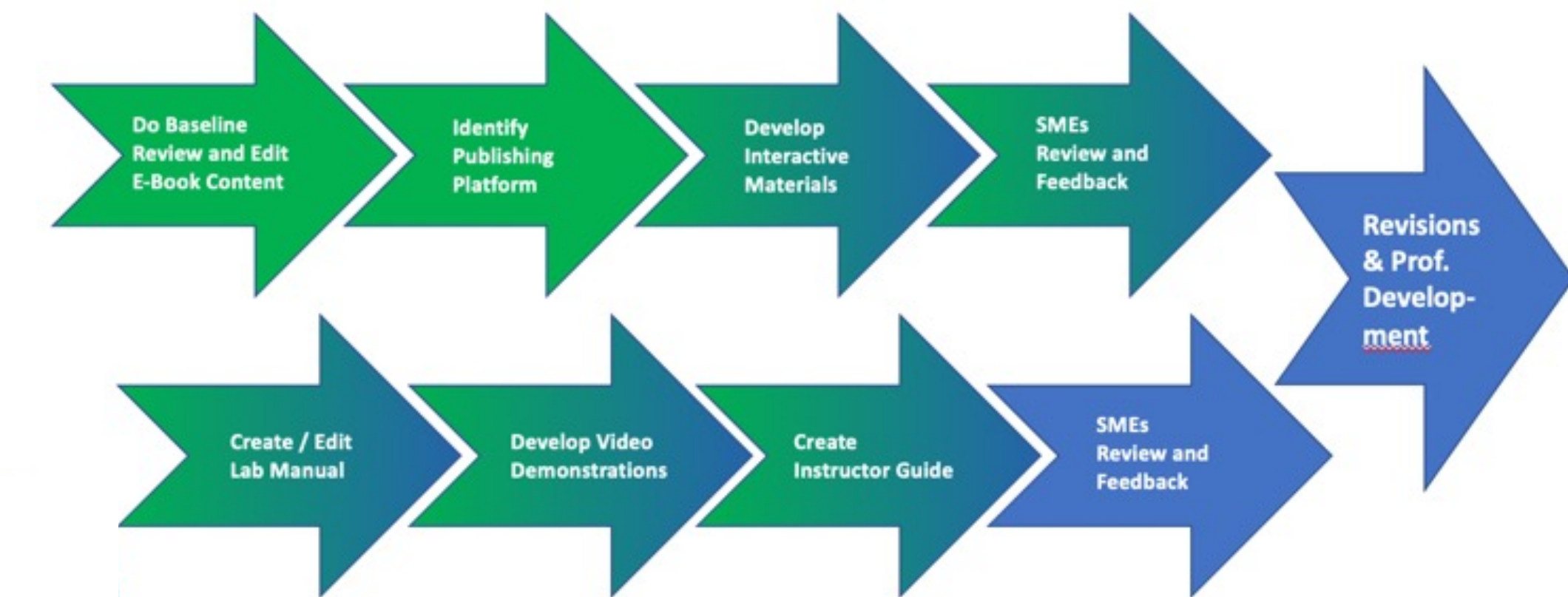
- **WHEN:** May 23 or May 24, 2023 – Zoom kick-off meeting
June 21-23, 2023 - on-site
- **WHERE:** Normandale Community College, Bloomington, MN
- **WHO:** for community college faculty
- **WHAT:** provides valuable hands-on experience with rough vacuum systems.



Rough Vacuum Equipment Training System

Project Status to Date

Project Timeline



Created an **E-Book** version of Hata's textbook with interactive quizzes, animations, simulations and video demonstrations.

Conducted **Subject Matter Experts** review of the E-Book and incorporated their feedback.

Creating **Student Lab Manual** and **Instructor's Guide**. First version will be ready for testing in the ECC and NCC classroom in Fall 2022.

Hands-On **Professional Development Workshop** planned for June 21-23, 2023

Learn More

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<https://ate.is/vacuum-tech>

<https://www.ecc.edu/academics/electrical-engineering-technology.html>

Project Website: <https://ate.is/vacuum-tech>

Acknowledgements



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