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# Beyond the microscope: integrating inclusion, diversity, equity, and accessibility principles in immunology education through the IDE-A rubric

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Textbooks are essential resources for developing immunological literacy. This article emphasizes expanding educational focus beyond traditional technical content to more broadly encompass inclusion and equity in the classroom. Equitable and inclusive teaching requires thoughtful selection of course materials by applying principles of inclusion, diversity, equity, and accessibility (IDE-A), yet clear guidance using these principles for course design, especially in textbook selection, is limited. To address this gap, the authors developed and tested the IDE-A rubric and assessed a sample of immunology textbooks, widely used at both undergraduate and graduate levels, to evaluate the rubric's utility. Each textbook was rated on the overall commitment to the principles of the IDE-A framework, assessing the extent to which the textbook authors and publishers make a concerted effort to address these principles in the introduction, preface, and/or overall framing of the content. Inclusion and diversity were evaluated by examining evidence of stereotype threat, including the use of names in case studies and questions, the selection of textbook imagery, and how diverse representations, perspectives, and voices were acknowledged and incorporated into descriptions of concepts and historical context. Equity and accessibility were assessed by evaluating availability of textbooks and ancillary materials at no cost or reduced price, availability of multiple textbook formats, and publisher's provision of accessible versions. Furthermore, the rubric could help instructors maintain diversity within STEM fields. This study is one of the first structured evaluations that *apply* IDE-A principles in textbook selection, demonstrating how looking "beyond the microscope" creates more inclusive learning environments.

## KEYWORDS

immunology, textbook, rubric, science education, curriculum, pedagogy, higher education, immune literacy

## Introduction

Inclusion, diversity, equity, and accessibility (IDE-A) principles are pedagogical imperatives in higher education. In response, institutions have increasingly developed tools to assess how IDE-A principles are integrated into strategic plans, including curriculum and teaching. The PULSE (Partnership for Undergraduate Life Sciences Education) DEI Rubric, created by a national community of life sciences educators, supports departmental evaluation of DEI integration across curriculum, assessment, faculty practices and support, infrastructure, and institutional climate (Brancaccio-Taras et al., 2022). Similarly, the Protocol for Advancing Inclusive Teaching Efforts (PAITE), developed at Lafayette College, provides a structured approach to course-level evaluation through self-assessment and facilitated dialog (Addy et al., 2022). These tools reflect a broader recognition within higher education of the need for inclusive curriculum design, and underscore the relevance of applying similar evaluative frameworks in specific disciplines such as immunology.

In immunology education, where scientific knowledge intersects with health disparities and systemic inequities, integrating IDE-A principles into curriculum design is critical, cultivating both scientific literacy and social consciousness and ethical frameworks among students. Research consistently demonstrates that students from underrepresented groups experience deeper engagement, stronger belonging, and improved academic outcomes when curricula reflect their identities and experiences (Tedesco 2001 in Smedley et al., 2001; Bowen et al., 2009; Museus and Jayakumar, 2012; Hurtado et al., 2012; Bowman and Denson, 2022). Despite this evidence, higher education continues to struggle with representation and equity issues, significantly impacting learning outcomes for minoritized students (Newfield, 2008 cited in NASEM, 2011; Kim et al., 2024), particularly in science and technology fields (Fry et al., 2021).

Recent analyses reveal concerning patterns in health science educational materials. Beresheim et al. (2024) assessed 5,001 images across 11 anatomy textbooks, finding that 81.2% depicted light skin tones, with only 14.3% intermediate and 4.5% dark skin tones. Males were overrepresented at 61.6%, with this bias persisting across all body regions. Similarly, Ajmal et al. (2024) examined 556 images from four major surgery textbooks and found 96.9% depicted light skin tones, with 86.1% showing the lightest tone. These misalignments with actual population distributions may contribute to healthcare disparities by creating knowledge gaps regarding the diversity that exists within the communities medical professionals serve.

These disparities extend beyond imagery. Pusey-Reid et al. (2024) analyzed nursing textbooks, identifying 642 instances of exclusivity, including normalizing whiteness, using stigmatizing descriptors, and perpetuating cisgenderism. While they found 118 instances of inclusivity with respect to equity language and race-based prevalence, the predominance of exclusive language underscores systemic issues in educational materials. Disparity is also observed in the representation of scientists whose contributions are acknowledged. A demographic analysis of common biology textbooks found that despite an increase in representation of women and people of color, the most common representation was of white men (Wood et al., 2020), perpetuating this bias.

In textbooks, diversity assessment varies by subject. Representation of diverse skin tones is crucial in dermatology education (Louie and Wilkes, 2018; Reilley-Luther et al., 2020; Ajmal et al., 2024; Massie et al., 2021; Alvarado and Feng, 2021; Gruver et al., 2024), while gender and sex representation are vital in anatomy education. Studies of anatomy textbooks (Parker et al., 2017; Ray King et al., 2021) have found that many maintain heteronormative and gender binary descriptions, with limited representation of intersex anatomy or LGBTQIA+ perspectives. Parker et al. (2017) found that in over 6,000 anatomy textbook images, only five depicted intersex individuals, with the majority showing male anatomy.

Accessibility of textbooks has been studied through the lenses of usability and affordability, with large publishers moving toward best practices in usability due to the need to comply with the recently updated Web Content Accessibility Guidelines (WCAG 2.2) (Henry, 2024). Affordability of textbooks, the various publishing models, and incentive programs used to mitigate costs have also been studied (Lierman, 2020). Adoption of open-source educational resources and institutional programs aimed at lowering course material costs can help (Mullens and Hoffman, 2023), but textbook expense remains a significant barrier to student success.

These findings highlight how educational materials can inadvertently reinforce biases that undermine the student experience in the classroom and hinder understanding of the interplay between intersectionality, social justice, and social determinants of health. If larger structural initiatives are not supported, tools are needed to assist individual educators in assessing IDE-A values when selecting teaching materials, particularly in STEM fields such as immunology.

## Significance and rationale of the rubric

Immune literacy directly impacts communities across lines of race, ethnicity, gender, socioeconomic status, and other social factors. Gaps in equitable teaching practices within this field are particularly concerning. Due to its biomedical and societal relevance, immunology instructors are uniquely positioned to disrupt harmful stereotypes by reimagining course materials through an IDE-A lens. Without deliberate attention to IDE-A principles, immunology education risks perpetuating rather than challenging biases that contribute to health disparities.

While often treated as objective, teaching materials - including textbooks - reflect the values and perspectives of their authors and the contexts in which they are produced. Research has shown that content omissions and representational choices can unintentionally reinforce structural inequities in education (Apple, 2004). For example, teaching materials that overlook the ways race intersects with health or that rely on stereotypical imagery in case studies may contribute to biased clinical reasoning and diagnoses (Metzl and Hansen, 2014) and can negatively affect students' sense of belonging, particularly those from historically excluded groups (Acosta and Ackerman-Barger, 2017).

The Inclusive Excellence framework (AACU, 2015) provides a foundation for integrating inclusivity and equity into immunology education. The framework posits that institutional and academic excellence are inseparable from a commitment to inclusion, and that

meaningful learning environments are those in which all students, not just the historically privileged, can thrive. This framework can inform the tools and approaches for curriculum and course design, which includes textbook selection. Even so, while tools and resources exist to evaluate course design through an IDE-A lens, rubrics to assess immunology textbooks are currently absent from the literature.

This gap in textbook evaluation tools reveals a critical need at the individual teaching level. By developing a rubric specifically for evaluating immunology textbooks through an IDE-A lens, our work fills this gap - expanding the tools available to educators and supporting stronger alignment between course content and broader institutional equity goals. To address this need for textbook evaluation using IDE-A principles, the IDE-A rubric assessment focused on four key areas, defined based on curated resources (Table 1) as:

- **Inclusion:** Creating environments where all individuals, especially those from historically excluded groups, feel welcomed, respected, supported, and able to participate fully
- **Diversity:** Recognizing the collective mixture of differences, similarities, and complexities based on social and cultural factors
- **Equity:** Seeking fair treatment and access to opportunities for all by providing necessary resources while dismantling systems of oppression that impede equal participation
- **Accessibility:** Ensuring equal and equitable access to resources (e.g., cost burden), services, and institutions for all, especially those who have been marginalized or disadvantaged due to socioeconomic factors or the presence of any disability

# Rubric development

## Identifying and defining key principles: IDE-A

The IDE-A rubric was conceived as a pedagogically grounded tool to support the evaluation and selection of

immunology textbooks using the principles of inclusion, diversity, equity, and accessibility. Each of the IDE-A principles were operationalized to help educators recognize how these values are represented within a textbook's content, structure, and features. *Inclusion* refers to the textbook's commitment to meaningful representation of all students, particularly those from underrepresented and marginalized groups, throughout its content. This means integrating diverse perspectives, reflecting varied identities, and avoiding stereotype threats within examples, problems, or case studies. *Diversity* emphasizes the intentional reflection of students' varied identities, bodies, and ethnicities, particularly in imagery and narratives, with attention to intersectionality and avoidance of stereotype threat. Where diversity of identities is absent, historical context is provided for representation gaps. *Equity* involves ensuring all students see themselves reflected in the content and have equitable access to the textbook through cost-burden considerations, multiple access options, and inclusion of accessibility features. *Accessibility* includes both access and usability, ensuring that the textbook meets current accessibility standards, offering content in multiple formats (e.g., hardcover, softcover, ebook, or loose-leaf editions), and addressing barriers that may arise from cost or format limitations.

Along with the four core IDE-A principles, stereotype threat and intersectionality were interwoven into the rubric, as they provide important context for evaluating how inclusive a textbook may be. Considering stereotype threat - the psychological pressure experienced when individuals fear being judged through the lens of negative stereotypes associated with their social group (Spencer et al., 2016) - helps reviewers be mindful of materials that may unintentionally reinforce bias. Likewise, attention to intersectionality, as first described by Crenshaw (1989), encourages evaluators to recognize how multiple, overlapping social identities (such as race, gender, disability, and class) shape representation and experiences of privilege and oppression within textbook content. Together, these

TABLE 1 List of references for IDE-A related terms.

Title	Description	Citation/Link
United Nations DEI Glossary	Developed by the United Nations system, and provides internationally recognized DEI definitions for the use of agencies within the UN system	United Nations. (2023). Diversity, Equity and Inclusion Glossary. Available at: <a href="https://unsceb.org/sites/default/files/2024-01/DEI%20Glossary.pdf">https://unsceb.org/sites/default/files/2024-01/DEI%20Glossary.pdf</a> (Accessed 1 May 2025).
Oxford Review DEI Dictionary	Comprehensive and growing dictionary/encyclopedia of definitions and explanations of terms used in the DEI discourse	Oxford Review. (n.d.). The Oxford Review DEI Dictionary. Available at: <a href="https://oxford-review.com/the-oxford-review-dei-diversity-equity-and-inclusion-dictionary/">https://oxford-review.com/the-oxford-review-dei-diversity-equity-and-inclusion-dictionary/</a> (Accessed 1 May 2025).
Harvard DIB Glossary	A glossary of terms related to diversity, inclusion, and belonging was developed by the Human Resources Department of Harvard University	Harvard University. (n.d.). Glossary of Diversity, Inclusion and Belonging (DIB) Terms. Available at: <a href="https://edib.harvard.edu/files/dib/files/dib_glossary.pdf">https://edib.harvard.edu/files/dib/files/dib_glossary.pdf</a> (Accessed 1 May 2025).
Institute for Diversity Certification DEIA Dictionary	An introductory list of key terms and definitions found in and applied to conversations around diversity, inclusion, and equity in the workplace, in education, and everyday life	Institute for Diversity Certification. (n.d.). DEIA Dictionary. Available at: <a href="https://www.diversitycertification.org/deia-matters/what-is-deia/deia-dictionary">https://www.diversitycertification.org/deia-matters/what-is-deia/deia-dictionary</a> (Accessed 1 May 2025).
Bastyr University Lexicon of DEI Terms	A glossary/lexicon curated by the Office of DEI at Bastyr University, curated from multiple sources on diversity, inclusion, equity, and accessibility topics	Bastyr University Library. (n.d.). Diversity, Equity, and Inclusion Resources. Available at: <a href="https://bastyr.libguides.com/c.php?g=1286491&amp;p=9446936">https://bastyr.libguides.com/c.php?g=1286491&amp;p=9446936</a> (Accessed 1 May 2025).


A RUBRIC TO SCORE IMMUNOLOGY TEXTBOOKS PER IDE-A PRINCIPLES				
TEXTBOOK'S KEY FEATURES	Exemplary (3 points)	Present (2 points)	Developing (1 point)	Absent (0 points)
 Overall commitment to IDE-A principles	<b>3 of 3 criteria met:</b> <ul style="list-style-type: none"><li>The textbook explicitly mentions author's or publisher's commitment to the IDE-A principles</li><li>Relevant terms around IDE-A are defined</li><li>Textbook's application of the framework is clear, consistent, and intentional with imagery, content and examples</li></ul>	<b>2 of 3 criteria met:</b> <ul style="list-style-type: none"><li>The textbook explicitly mentions author's or publisher's commitment to the IDE-A principles</li><li>Relevant terms around IDE-A are defined</li><li>Textbook's application of the framework is clear, consistent, and intentional with imagery, content and examples</li></ul>	<b>1 of 3 criteria met:</b> <ul style="list-style-type: none"><li>The textbook explicitly mentions author's or publisher's commitment to the IDE-A principles</li><li>Relevant terms around IDE-A are defined</li><li>Textbook's application of the framework is clear, consistent, and intentional with imagery, content and examples</li></ul>	<b>0 of 3 criteria met:</b> <ul style="list-style-type: none"><li>The textbook explicitly mentions author's or publisher's commitment to the IDE-A principles</li><li>Relevant terms around IDE-A are defined</li><li>Textbook's application of the framework is clear, consistent, and intentional with imagery, content and examples</li></ul>
Application of IDE-A principles to textbook content, imagery, names and context	<b>2 of 2 criteria met:</b> <ul style="list-style-type: none"><li>The use of names, images and context consistently avoids stereotype threat. Where unavoidable, an explicit statement is included to justify its use and a word of caution is noted to avoid generalizations that promote stereotype threat</li><li>The authors intentionally reflect the diversity of student identities and cultures with attention to intersectionality</li></ul>	<b>1 of 2 criteria met:</b> <ul style="list-style-type: none"><li>The use of names, images and context consistently avoids stereotype threat. Where unavoidable, an explicit statement is included to justify its use and a word of caution is noted to avoid generalizations that promote stereotype threat</li><li>The authors intentionally reflect the diversity of student identities and cultures with attention to intersectionality</li></ul>	Some images and/or examples across the textbook attempt to avoid stereotype threat and try to reflect diverse identities and cultures, with some images and examples running counter to the framework	Images and/or examples in the textbooks do not consider the IDE-A framework, or completely do not represent diverse identities and cultures.
Discussion of historical context that led to present state of the discipline	The textbook actively and consistently highlights historical context and any historical disparities relevant to the present state of the discipline and discusses its impacts or implications.	The textbook highlights historical context and some historical disparities relevant to the present state of the discipline but does not discuss the impact/implications of this to the present state of the discipline.	The textbook provides information on the history of the discipline without any mention of disparities relevant to the present state of the discipline or issues, or its impacts on the present state of the discipline.	No evidence that the history of the discipline is mentioned and discussed so that there is no inclusion of historical context or disparities relevant to the present state of the discipline.
Cost of the textbook to the student	The textbook and the ancillary materials are available for free (fully open sourced).	The textbook or the ancillary materials (but not both) are available for free (fully open sourced) or reduced cost options are available for purchase (e.g. hardcopy versus paperback or rental options)	The textbook or the ancillary materials are available for purchase at a reduced cost (e.g. hardcopy versus paperback or rental options)	The textbook and the ancillary materials are not available for free and no reduced cost option is available for purchase.
Accessibility of materials to students	Textbook aligns to all applicable accessibility standards for electronic, audio and printed versions	Textbook broadly complies with applicable accessibility standards for electronic, audio and printed versions, with some limited accessibility issues	Textbook attempts to comply with accessibility standards but has significant non-compliance issues.	Textbook does not comply with accessibility standards.

FIGURE 1  
The IDE-A rubric. Principles of inclusion, diversity, equity and accessibility were operationalized to develop the IDE-A rubric, which lists five key textbook features, the rating scale, and indicators for each criterion. Image created by S. P. using [www.canva.com](https://www.canva.com).

considerations enhance the rubric's ability to guide more inclusive and equity-minded textbook selection.

These IDE-A definitions were applied across three domains: (1) *Overall Commitment to the IDE-A framework*, which examines the overarching extent to which IDE-A principles are embedded into the preface, framing, and structure of the textbook; (2) *Diversity and Inclusion*, such as representation in imagery, language used in case studies, and integration of diverse scientific voices in content and historical context; and (3) *Equity and Accessibility*, including textbook affordability, availability, and compatibility with Universal Design for Learning guidelines<sup>1</sup>.

IDE-A rubric construction and revision

After defining possible terms and concepts relevant for immunology textbook analysis, the rubric was iteratively developed to include a method for assessing each IDE-A framework concept. The criteria and format of these initial rubrics were informed by surveying existing approaches in the literature (Hogben and Waterman, 1997;

Sparks, 2016; Schinske et al., 2016; Dewsbury and Brame, 2019; Platts and Hoosier, 2020) and in online toolkits from academic institutions.<sup>2,3,4</sup> Also included is a reflection on the history of the field, adapted from the Stanford University Department of Bioengineering's "Course Design Equity and Inclusion Rubric, Version 1.0." (Ko, 2021). An initial draft rubric was used to rate one textbook by two independent raters. Based on rater feedback, revisions were made to clarify terms and criteria, resulting in the current IDE-A rubric (Figure 1).

Selection of textbooks

Via a survey, instructors of immunology courses were asked to provide the name of their adopted textbook. Of the nine textbooks

1 CAST (2024). *Universal Design for Learning Guidelines*. Available online at: <https://udlguidelines.cast.org> (Accessed May 2, 2025).

2 Peralta Community College District (2020). *Online Equity Rubric*. Available online at: <https://www.peralta.edu/distance-education/online-equity-rubric> (Accessed April 29, 2025).

3 UW IT (2024). *IT Inclusive Language Guide*. UW Information Technology. Available online at: <https://it.uw.edu/guides/identity-diversity-inclusion/inclusive-language-guide/> Accessed April 29, 2025).

4 San Francisco State University (n.d.). *Document Accessibility | Accessible Technology Initiative (ATI)*. Available online at: <https://access.sfsu.edu/ati/documentaccessibility> (Accessed April 29, 2025).



reported, the three most used were identified by comparing top Amazon sales in immunology textbooks, and the most highly selected immunology textbooks in Global Online Bibliographic Information 3 (GOBI3), the selection tool used by most academic libraries in North America. The three titles selected to test the application of the IDE-A rubric were Parham's *The Immune System, 5th Edition* (Parham, 2021); Kuby *immunology, 8th Edition*, by Punt, Stranford, Jones and Owen (Punt, et al., 2019); and *Basic immunology, 6th Edition* by Abbas, Lichtman, and Pillai (Abbas et al., 2020), textbooks widely used in undergraduate and graduate-level courses. The textbooks are randomly numbered 1, 2, and 3, as the purpose of this work is to develop and assess the rubric rather than to publish authoritative assessments of specific textbooks.

## Textbook rating process

The raters evaluated the textbooks based on the IDE-A rubric categories of:

### 1. Overall commitment to IDE-A framework

Evaluators assessed the extent to which the preface or introduction sections explicitly acknowledged how the material incorporates IDE-A content and values.

### 2. Textbook imagery and examples

The raters comprehensively evaluated the textbooks, reading through the preface and all chapters, considering each IDE-A rubric element. Each evaluator assessed the diversity of images included, considering factors such as representation of different genders, range of skin tones, and style of human form depiction, such as cartoon, silhouette, or human. Evaluators also reviewed how case studies and questions were presented, noting whether case subjects were identifiable by ethnicity or gender based on use of names.

### 3. Reflection on history of discipline

Evaluators determined whether the textbook embedded the history of the discipline to provide context for the development of immunological concepts, and who is represented in the history.

### 4. Cost burden

Cost burden was rated based on textbook price and available purchasing options, noting whether the textbook could only be obtained from the publisher at a fixed price or if lower-cost options were available. The different textbook formats available were also noted, recognizing that availability and pricing may vary across formats.

### 5. Accessibility

Accessibility was assessed using current expectations of best practice in the US in 2024–25<sup>5</sup>. Evaluators considered UDL factors, including textbook compatibility with screen readers, video captioning, and interactive simulations. Evaluators also determined whether

supplementary resources—such as study guides, self-paced quizzes, and explanatory videos—were available and accessible to support student understanding of immunological concepts.

## Results

### Inter-rater reliability testing

To assess the level of agreement among raters, Krippendorff's alpha (K-alpha) was calculated using the K-alpha calculator<sup>6</sup> (Marzi et al., 2024a). For textbook 1, K-alpha (Ordinal Scale) is 0.762, and for textbook 2, K-alpha (Ordinal Scale) is 0.733; both scores indicate moderate agreement between raters for the stated conclusions. For textbook 3, K-alpha (Ordinal Scale) is 0.880, exceeding the 0.8 threshold for a satisfactory level of agreement between raters.

### Rubric scores

The average scores on each rubric category for textbooks 1, 2, and 3 are depicted in Figure 2, where each dot indicates a rater. The variation in rater agreement is indicated by the vertical distance between the two dots. Example comments from the raters corresponding to low, medium, and high ratings on each rubric category are depicted in Table 2.

### Overall commitment to the IDE-A framework

The raters agreed that all three textbooks are in the developing stage regarding their overall commitment to the IDE-A framework (Figure 2), suggesting the textbooks do not clearly mention IDE-A principles, do not define IDE-A-related terms, or do not consistently apply the IDE-A framework. Reviewers noted, “*There is no mention of the intention to include diverse perspectives*,” and “*The author mentions in the Preface that the text is solely relaying immunology facts and not to be used to provide a historical context*.” With respect to accessibility, both reviewers agreed that while the textbooks were not free, they can be purchased in different formats at lower cost than hardcover versions.

### Textbook imagery and examples

Raters agreed that textbook 2 was in the developing stage of textbook imagery representation, while mixed views were expressed for textbooks 1 and 3. Textbook 3 was rated between developing and absent stages, while textbook 1 was rated at the present or exemplary stage of inclusive representation. One reviewer noted that, “*The author does show cartoon images to represent humans...with various colors used to represent different skin tones (grey, salmon, white, brown)*.”

5 San Francisco State University. *Document Accessibility | Accessible Technology Initiative (ATI)*. Available at: <https://access.sfsu.edu/ati/documentaccessibility> (Accessed April 29, 2025).

6 Marzi, G., Balzano, M., and Marchiori, D. (2024b). *Krippendorff's Alpha Calculator - K-Alpha Calculator*. Available online at: <https://www.k-alpha.org/krippendorffs-alpha-calculator-k-alpha-official-website>. (Accessed May 1, 2025).

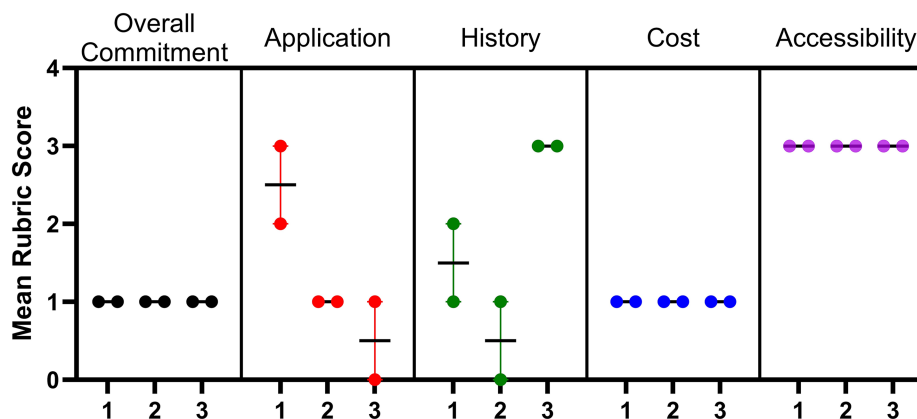


FIGURE 2

Mean scores for three immunology textbooks using the IDE-A rubric. Three immunology textbooks (1, 2, and 3) were rated on each category of the IDE-A rubric by two independent reviewers. The mean score is represented by the horizontal line, and the variation between the two independent reviewer ratings is indicated by the vertical distance between the two dots. The interrater reliability score (Krippendorff's Alpha) for the three textbooks ranged between 0.733–0.88.

The cartoon outlines are generally gender-neutral. Thus, the different skin tones represent diversity.” The other reviewer noted consistency with ethnic diversity of names used in end-of-chapter questions.

### History of the discipline

Raters were in strong agreement that textbook 3 consistently highlighted the historical significance of many discoveries, attributing several to historical figures of diverse heritage. Examples include the early practice of inducing immunity by variolation brought to the US by enslaved individuals; the pioneering work of Edward Jenner in vaccine development; elucidation of antibody structure and the stages of B and T cell development; and ground-breaking research on T cells and cancer therapy. Raters differed in their interpretation of this criterion for textbooks 1 and 2, scoring textbook 1 in the developing or present stage, and textbook 2 in the absent or developing stage. These scores suggest that historical context was lacking and inconsistently incorporated throughout these two textbooks.

### Access and accessibility

The raters were in strong agreement on the application of the rubric criteria for affordability and accessibility, scoring all three textbooks as a 1 in the category of cost burden. This suggests that the rating process captured the developing stage for this criterion. The raters were also in agreement that accessibility was exemplary for all three textbooks, with incorporation of many features to meet required UDL standards.

## Discussion

### Rubric efficacy

In rating the textbooks using the rubric, there were areas of high agreement, while some differences in interpretation of specific rating categories became apparent. The more quantifiable and easily definable

concepts of affordability and accessibility showed complete agreement. Criteria requiring reflection on the philosophical framing of IDE-A values, including representation of diverse imagery and acknowledgement of the history of the field, showed variation in scores. While the rubric is a grounding tool for discussion, the raters will bring a lens shaped by their own lived experiences and biases. The two raters have different ethnicities and disciplinary backgrounds, and teach immunology in different contexts (undergraduate immunology, graduate-level immunology integrated with pathology and infectious diseases, or immunology in a human anatomy and physiology undergraduate course). These dissimilarities could have contributed to the variation in ratings for the subjective categories. Post-rating discussions resulted in the recognition that nuances in assessment can be understood to reflect IDE-A “in context,” i.e., the rating of a textbook’s suitability for a specific instructor in a specific classroom will be somewhat contextual and subjective, and therefore complete agreement is not necessary across all facets of the IDE-A rubric. In its application, we recommend using a similar approach, where educators can use the rubric to assess a textbook independently or to guide a discussion with other educators. The latter can be particularly beneficial in diversifying and broadening perspectives on IDE-A-related issues.

### Impact on field

In this article, we present a shared perspective on a rubric that can be adopted to evaluate immunology textbooks through an IDE-A lens. The need for this rubric originated from the changes in classroom dynamics of the three immunology educators among the co-authors, who teach diverse student populations. To develop an informed perspective, they collaborated with social scientists and librarians who possess extensive experience with IDE-A values in various contexts. The rubric and accompanying discussion are an invitation to immunology instructors to engage in thoughtful reflection on how to best cater to all students through the choice of textbooks. Future work will entail assessing the validity and reliability of this rubric to ensure its accuracy and consistency.

TABLE 2 Example comments from textbook raters corresponding to low, medium, or high IDE-A rubric ratings.

Rubric category	Score	Example comments from the reviewers
Overall commitment to the IDE-A principles	1	There is no explicit statement in the Preface or elsewhere that the authors are purposely following the IDE-A framework constructs of inclusion, diversity, equity, and access. However, the publisher has a strong commitment to accessibility, as stated in the forward under an Accessibility header, using phrases such as “providing equal access” and “extending the power of education to all users,” with the goal of ensuring the accessibility of all content and learning platforms. The publisher is listed as globally certified accessible.
Application of IDE-A principles to textbook content, imagery, names and context	0–3	<p>Low rating: Photograph of an African child depicted with a rash typical of smallpox</p> <p>Medium rating:</p> <ul style="list-style-type: none"> <li>On the book cover, a black and white photograph of an apparent male Latino child receiving an injection from a medical professional with lighter skin which may perpetuate a stereotype threat.</li> <li>A figure shows hematopoietic cell transplantation using a body schematic with gray skin tone, which reflects a potentially effective use of neutral color.</li> </ul> <p>High rating: There are outlines of humans with various colors to represent different skin tones (grey, salmon, white, and brown), which represents diversity. Furthermore, the cartoon outlines are generally gender-neutral. Transplantation of donated organs is illustrated by a gender-neutral figure of doctors with a range of skin tones.</p>
Discussion of historical context that led to the present state of the discipline	0–3	<p>Low rating: There is no mention of the discipline’s history beyond the Preface, where the authors state that they have revised this edition to incorporate recent advances in our understanding of the immune system. No reflection on the history of the discipline is included in the Preface or throughout the chapters and appendices of the textbook. The goal of this book is noted by the authors as being focused on the current state of the immunology discipline.</p> <p>Medium rating:</p> <ul style="list-style-type: none"> <li>The history of vaccination in Western Europe and North America is described, with a focus on the development of vaccines in these regions. There is no mention of possible development efforts in other parts of the world. There is no mention of the 1774 breakthrough by Benjamin Jesty to protect against smallpox.</li> <li>Most of the researchers are white males. There are some instances where women are mentioned. For example, Phillipa Marrack worked on the chemical nature of antibodies with her husband, John Kappler. Christiane Nusslein-Volhard received the Nobel Prize in 1995 for her work on Toll receptors. Teruko Ishizaka and her husband, Kimishige Ishizaka, worked together to identify IgE. Dr. Anna Maian Hilliard (Canadian) is noted for developing a simplified version of the Pap smear in 1950. There is an image of a black person credited with introducing inoculation to Boston in the 18th century.</li> </ul> <p>High rating: The authors do a great job of weaving historical facts into the textbook. These stories are located in the text and special sections, including the Classic Experiment Box, Clinical Focus Box, and Evolution Box. For example, in the Classic Experiment boxes, students can read about the elucidation of antibody structure and the stages of B and T cell development.</p>
Cost of the textbook to the student	1	Textbook and ancillary materials are not free and are not open-source. There are no options for cost-free access. There are various low-cost options available for purchase, such as paperback and rental.
Accessibility of materials to students	3	Universal design features are included. For example, text-to-voice by highlighting text in a variety of options of voices with accents from many different countries, and the ability to choose the gender of the voice. Speed of reading aloud can also be adjusted; figures are bold and clear; students can highlight text in different colors; add notes; copy and paste text into another document; also built into the e-book is a feature where highlighted text can be further explored via a Wikipedia link; flashcards can also be made as a feature of e-book resources.

While organizational- and departmental-level DEI assessment tools like PULSE and PAITE exist, they do not evaluate teaching materials. The IDE-A rubric fills this critical gap, equipping individual instructors with a practical tool to assess immunology textbooks - and textbooks in STEM fields more broadly - through an inclusive, diverse, equitable, and accessible lens. This focused approach complements higher-level strategies, strengthening the toolkit for advancing IDE-A principles across institutional levels. By bridging the gap between systemic goals and teaching choices, the IDE-A rubric empowers educators to make course content decisions that align with values of inclusive excellence in higher education.

Building on this, the IDE-A rubric guides instructors through a reflective assessment process before textbook adoption. It asks

educators to assess representation and stereotype threat in human names, images, and case examples, even when the majority of illustrations in immunology textbooks may present cells, shapes, or line and arrow models. An example of thoughtful discussion that emerged in the process of rating the textbooks was about use of names versus initials in case studies and questions. While names may make the content relatable for students, they also risk perpetuating stereotypes. Beyond content assessment, the rubric also prompts educators to consider the impact of access and accessibility barriers, including cost. The rubric’s rating of overall commitment to the IDE-A framework acknowledges the impact of conscious engagement with these values by authors and publishers.

Textbooks have a long publication cycle, with many years elapsing between editions. We recognize that different markets, institutional policies, and evolving regulatory guidelines around ADA and IDE-A principles may need to be considered when applying this rubric. Therefore, the rubric itself is not overly prescriptive, allowing for more longevity and broader applicability as an initial framework. Given that textbook choice is only one facet of creating an inclusive learning experience, additional work is needed to incorporate other curricular elements into pedagogical practice to foster an inclusive learning environment, such as student-teacher dialog (Killpack and Melón, 2020), syllabus tone (Harnish and Bridges, 2011), course structure (Tanner, 2013) and other IDE-A informed content (Dewsbury, 2017).

The pedagogical value of the IDE-A rubric lies in its practical application: it helps instructors move from abstract commitment to inclusivity, diversity, equity, and accessibility toward tangible, informed decisions about their teaching tools. This approach of looking beyond the microscope represents a paradigm shift from focusing solely on scientific content to also examining how educational materials serve all learners. This tool supports inclusive curriculum design by offering a clear, reflective process for evaluating whether course textbooks align with the goals of the *Inclusive Excellence* framework (AACU, 2015). In doing so, the IDE-A rubric empowers educators to foster learning environments that affirm students' identities and reflect their lived experiences, promote critical thinking about the intersection of science and society, and contribute to cultivating future scientists and health professionals who consciously challenge systemic inequities and advance health justice.

## Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author/s.

## Author contributions

CPD: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. EDV: Conceptualization, Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing. SP: Conceptualization, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. Funding acquisition, Resources, Project administration. EP: Formal Analysis, Resources, Writing – review & editing. ZN: Resources, Writing – review & editing. CAW: Conceptualization, Data curation,

Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing.

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## Conflict of interest

SP serves on the editorial board for the Frontiers journal.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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