



**General
Education
Leadership
Network**

a MAISA Collaborative

**Essential Instructional Practices for Disciplinary
Literacy in the Secondary Classroom**

This document was developed by the **Disciplinary Literacy Task Force**, a subcommittee of the Michigan Association of Intermediate School Administrators (MAISA) General Education Leadership Network (GELN), which represents Michigan’s 56 Intermediate School Districts.

Deliberate,
research-supported
efforts to motivate,
engage, and
support reading
and writing



Purpose

The purpose of this document is to increase Michigan’s capacity to improve adolescents’ literacies by identifying a focused set of research-supported instructional practices that have been shown to increase student achievement and/or engagement with academic literacies. These identified practices can be the focus of professional learning experiences throughout the state. The focus of the document is on classroom practices, rather than on school or system level practices. Research suggests that each of the sets of ten practices, if implemented in every secondary core content classroom (English Language Arts, Science, Social Studies, Mathematics) at the unit and course

This document is intended to be read in concert with the Essential School-Wide Practices in Disciplinary Literacy: Grades 6 to 12, along with the suite of documents found at www.LiteracyEssentials.org.

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level, could make a measurable positive difference in the literacy development and achievement of secondary students in the state.

These recommended practices should be integrated into instruction for all students, not just for those who are already high achieving or doing advanced coursework. Furthermore, these instructional practices should not be approached as an add-on to teaching content, but rather as a means to teach content and engage students in deeper learning. Students will need scaffolding as well as differentiated instruction as they are apprenticed into disciplinary literacy and learning practices. In addition, educators will need to pay careful attention to learning progressions and vertical alignment across grade levels when considering how to implement these practices systemically.

These practices should be viewed as essential components of all core course instruction at the secondary level. However, this document is not a list of instructional standards, nor is it meant to be an evaluation tool or checklist, but rather a resource for planning and implementing teacher professional learning opportunities that promote research supported teaching practices. Teachers will need time, opportunities to collaborate, and differentiated professional learning to implement these practices.

When implemented well, these instructional practices will help teachers engage their students with the content and skills outlined by the Michigan academic standards for English Language Arts, Science, Social Studies, and Mathematics at the Secondary level. Thus, they should not be presented or understood as being in competition with the learning of content, but rather in the service of content learning.

Choosing to enact the practices on this list does not lock individual districts, schools, and teachers into any particular curriculum or approach and allows for considerable autonomy and choice for educators. Disciplinary literacy instruction can and should be incorporated with instructional approaches and systems such as Project Based Learning, Culturally Sustaining Pedagogies, or Cultures of Thinking. The practices listed can be used with a wide range of instructional resources and within many different structures of the school day; the document does not specify one particular program or approach to literacy instruction. We limited this list to ten practices; there are other literacy instruction practices that may be worthy of attention. In addition, new literacy research could alter or add to the instructional practices recommended here.

1. Problem-based instruction

Develop and implement interactive problem-based units of instruction that frame authentic problems to help establish purposes for students to read, write, and communicate beyond being assigned or expected to do so (e.g. for their enjoyment/interest, to ask and answer abstract and authentic questions about their community and individual lives, to address needs in their community or beyond, and to communicate with a specific audience).

The teacher:

- engages students in developing and asking questions, as well as planning inquiries;
- engages students in disciplinary-specific thinking;
- helps students make sense of problems at different scales, persevere in solving them, or make conjectures about solutions;
- helps students see connections to their lives and identities by reading and engaging in diverse real-world and issue-based investigations;
- creates opportunities for students to enact literate identities connected to their learning by attending to issues of equity, power, and justice;
- provides regular opportunities for students to make choices in their reading, writing, and communication;
- offers regular opportunities for students to collaborate with peers in reading and writing, such as through small-group discussion of texts on questions of interest, and opportunities to write within group projects; and
- differentiates instructional processes and product expectations based on frequent, formative, growth-oriented feedback that affirms high academic expectations and support for all students.

Goldman, S.R., Britt, M.A., Brown, W., Cribb, G., George, M., Greenleaf, C., Lee, C.D., Shanahan, C., & Project READI. (2016). Disciplinary literacies and learning to read for understanding: A conceptual framework for disciplinary literacy. *Educational Psychologist, 51*(2), 219-246. doi:10.1080/00461520.2016.1168741

Greenleaf, C., Schoenbach, R., Cziko, C., & Mueller, F. L. (2001). Apprenticing adolescent readers to academic literacy. *Harvard Educational Review, 71*(1), 79-129.

Mergendoller, J. R. , Maxwell, N. L. , & Bellisimo, Y. (2006). The Effectiveness of Problem-Based Instruction: A Comparative Study of Instructional Methods and Student Characteristics. *Interdisciplinary Journal of Problem-Based Learning, 1*(2).

Moje, E.B. (2015) Doing and Teaching Disciplinary Literacy with Adolescent Learners: A Social and Cultural Enterprise. *Harvard Educational Review, June 2015, Vol. 85, No. 2*, pp. 254-278.

Sungur, S., & Tekkaya, C. (2006). Effects of Problem-Based Learning and Traditional Instruction on Self-Regulated Learning. *The Journal of Educational Research, 99*(5), 307-320 doi:10.3200/JOER.99.5.307-320

2. Diverse texts and abundant reading opportunities in the school

The teacher:

- engages students with texts that provide entry way into concepts, themes, and/or investigations of compelling issues;
- provides access and regular opportunities to work with a wide range of diverse texts (e.g. culture, race, gender, etc.) and diverse formats (e.g. print, audio, digital, etc.); authentic to the disciplines of varying complexity, structure, and genre; and
- engages students with online texts, databases, and tools in the service of investigations.

notes

Moje, E. B., Dillon, D. R., & O'Brien, D. G. (2000). Re-examining the roles of the learner, the text, and the context in secondary literacy. *Journal of Educational Research*, 93, 165-180.

Walker, N.T. & Bean, T. W. (2005). Sociocultural influences in content area teachers' selection and use of multiple texts. *Reading Research and Instruction* 44(4): 61- 77.

3. Intentional and standards-aligned instruction in disciplinary reading

The teacher:

- establishes compelling reasons for reading;
- teaches students to apply disciplinary tools and concepts when working with text;
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of the discipline;
- models through think-alouds how to ask questions of texts;
- teaches students to evaluate, gather, and use evidence from multiple sources (including multimodal and digital texts);
- helps students learn to identify and critique the claims of others, considering both their own perspective and the possible perspectives of the author/source (perspective may be disciplinary, cultural, gendered, racial, ethnic, etc.);
- regularly models and coaches students in critical reading practices relevant to the discipline;
- models how to discern data patterns, cause and effect relationships, and determine significance and provides students with supported opportunities to do so themselves;
- engages students in authentic investigations about their communities and world using a range of texts; and
- models how to draw and present conclusions in oral and written language.

Biancarosa, G., & Snow, C. E. (2006). *Reading next: A vision for action and research in middle and high school literacy*. A report to the Carnegie Corporation of New York. Washington, DC: Alliance for Excellent Education.

Carnegie Corporation Adolescent Literacy Council. (2010). *Time to act: An agenda for advancing literacy for college and career success*. New York, NY: Carnegie Corporation of New York.

Conley, M. (2008). Cognitive Strategy Instruction for Adolescents: What we know about the promise, what we don't know about the potential. *Harvard Educational Review* 78(1): 84-106.

Deshler, D. D., Schumaker, J. B., Lenz, B. K., Bulgren, J. A., Hock, M. F., Knight, J., & Ehren, B. J. (2001). Ensuring Content-Area Learning by Secondary Students with Learning Disabilities. *Learning Disabilities Research & Practice*, 16(2), 96-108. doi: 10.1111/0938-8982.00011

Fang, Z., & Schleppegrell, M. J. (2010). Disciplinary literacies across content areas: Supporting secondary reading through functional language analysis. *Journal of Adolescent & Adult Literacy*, 53(7), 587-597.

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Learned, J., Stockdill, D., & Moje, E.B. (2011). Integrating reading strategies and knowledge building in adolescent literacy instruction. In A.E. Farstrup & J. Samuels (Ed.s), *What Reading Research Has to Say*. Newark, DE: International Reading Association.

Lee, C. D., & Spratley, A. (2010). Reading in the disciplines and the challenges of adolescent literacy. New York City: Carnegie Corporation of New York.

Rainey, E. C., & Moje, E. B. (2012). Building insider knowledge: Teaching students to read, write and think in ELA and across the disciplines. *English Education*, 45(1), 71-90.

Schoenbach, R., & Greenleaf, C. (2012). *Reading for understanding: How Reading Apprenticeship improves disciplinary learning in secondary and college classrooms* San Francisco, CA: Jossey-Bass.

Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review*, 78(1), 40-61.

Spires, H. A., Kerkhoff, S. N., Graham, A. C., Thompson, I., & Lee, J. K. (2018). Operationalizing and validating disciplinary literacy in secondary education. *Reading and Writing*, 31(6), 1401-1434. <https://doi.org/10.1007/s11145-018-9839-4>

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4. Intentional and standards-aligned instruction in disciplinary writing

The teacher:

- establishes compelling reasons for writing and communicating;
- engages students in writing to process and analyze texts;
- teaches students to apply disciplinary tools and concepts when producing text;
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of the discipline;
- provides opportunities to study models and write a variety of texts for a variety of purposes and audiences;
- provides instruction in discipline-specific writing processes, strategies, and conventions;
- teaches students to gather and organize evidence to support and communicate;
- provides explicit instruction as needed in text features, writing mechanics and other standards-aligned content;
- helps students learn to develop and communicate evidence-based claims, considering both their own

perspectives and the possible perspectives of their audience (perspectives may be disciplinary, cultural, gendered, racial, ethnic, etc.);

- provides regular time for students to write, both formally and informally; for a variety of purposes and audiences;
- engages students in using both paper/pencil and digital media tools to research; and
- scaffolds writing activities as appropriate, and moves students to independent levels of research, reading, and writing.

Graham, S. and Perin, D. (2007). *Writing next: Effective strategies to improve writing of adolescents in middle and high school*. New York: Carnegie Corporation of New York.

Rainey, E. C., & Moje, E. B. (2012). Building insider knowledge: Teaching students to read, write and think in ELA and across the disciplines. *English Education, 45*(1), 71-90.

Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review, 78*(1), 40-61.

Spires, H. A., Kerkhoff, S. N., Graham, A. C., Thompson, I., & Lee, J. K. (2018). Operationalizing and validating disciplinary literacy in secondary education. *Reading and Writing, 31*(6), 1401-1434. <https://doi.org/10.1007/s11145-018-9839-4>

5. Higher-order discussion of increasingly complex text across varying participation structures

The teacher:

- establishes compelling reasons and allocates time for whole-group, small-group, and paired discussion of text, using a range of discussion and grouping strategies;
- teaches students how to engage in productive discussions, including through digital tools;
- develops discussions that surface in productive ways students' misconceptions about topics, concepts, or issues, and engages students in communicating and critiquing conclusions;
- poses questions that foster textual understanding and higher-order engagement with text;
- provides modeling and instruction to teach students how to generate their own higher-level questions about texts;

- engages students in discussion of text genres, structures, and discursive practices of the discipline;
- supports students in using artifacts and data to build arguments;
- helps students learn to situate facts and events in larger schemes and concepts in their talk and discussion; and
- supports students in explaining or connecting real world events and trends from various cultural and disciplinary perspectives.

Applebee, A. N., Langer, J. A., Nystrand, M., & Gamoran, A. (2003). Discussion-Based Approaches to Developing Understanding: Classroom Instruction and Student Performance in Middle and High School English. *American Educational Research Journal, 40*(3), 685-730. doi:10.3102/00028312040003685.

Lee, C. & Smagorinsky, P. (2000). Introduction: Constructing meaning through collaborative inquiry. In C. Lee & P. Smagorinsky (Eds.), *Vygotskian Perspectives on Literacy Research*. New York, NY: Cambridge University Press.

6. Opportunities for and instruction in speaking and listening

The teacher:

- establishes compelling reasons for presenting and listening to presentations;
- provides regular opportunities for students to listen and respond to oral presentations, including those that incorporate visual and quantitative information

to make students' conclusions public (e.g., debates, reports, presentations to external audiences);

- models and teaches strategies for effective oral communication in academic disciplines; and
- teaches students strategies for listening and responding to presentations.

7. Intentional efforts to build vocabulary and conceptual knowledge

The teacher:

- presents vocabulary as language in use (as opposed to words from decontextualized lists);
- teaches multiple meanings or nuanced meanings of a word across different contexts and encourages students to use new words in meaningful contexts (e.g., discussion of texts, discussions of content area learning, semantic maps);
- provides repeated opportunities for students to review and use new vocabulary over time, including discussing ways that new vocabulary relates to one another and to students' existing conceptual knowledge;
- explicitly teaches words that build necessary knowledge for reading and writing texts of instruction;
- engages students in morphemic analysis (i.e., analysis of the meaning of word parts) of unfamiliar vocabulary;
- selects Tier 2 and Tier 3 vocabulary words to teach using disciplinary texts of instruction;
- encourages talk about vocabulary among students, particularly during disciplinary learning and students' discussions of print or digital texts; and
- encourages students to identify and explore new vocabulary independently and provides instruction to support this process.

Beck, I. L., McKeown, M. G., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction*. Guilford Press.

Nagy, W., & Hiebert, E. (2011). Toward a theory of word selection. In M. L. Kamil, P. D. Pearson, P. Afferbach, & E. B. Moje (Eds.), *Handbook of reading research* (Vol. 4). New York: Routledge.

8. Ongoing observation and assessment of students' academic language and literacy development that informs their education

The teacher:

- engages in observation and assessment guided by:
 - ❖ an understanding of language and literacy development;
 - ❖ an understanding of assessment as an opportunity to identify and build upon student strengths, as well as to address areas of improvement;
 - ❖ an understanding of, and respect for, the student as a member of cultural and linguistic communities;
 - ❖ recognition of students' socioemotional needs;
 - ❖ relevant standards documents;
- prioritizes observation and assessment that is closest to actual reading and writing (e.g. prioritizing student work/writing as data for making instructional decisions as opposed to relying on standardized test scores which can mask proficiencies and areas in need of development);
- administers assessments as one source of information to determine which students may need additional instructional supports;
- employs formative and diagnostic assessment tools as needed to inform specific instructional targets (e.g., assessing knowledge of specific vocabulary words taught, reading and writing strategies being used and not used) and engage in the instructional practices described in this document;
- engages students in the development of learning goals, as well as in supported, productive self- and peer-assessment and feedback;
- provides timely and specific formative feedback to students to guide learning and literacy development;
- develops assessments that analyze how students apply disciplinary tools, concepts, and literacy practices across relevant domains; and
- assesses students' ability to evaluate sources, use evidence, and make evidence-based claims.

Afferbach, P. (2007). *Understanding and using reading assessment, K-12*. Newark, DE: International Reading Association.

Johnston, P., & Costello, P. (2005). Principles for literacy assessment. *Reading Research Quarterly*, 40(2), 256-267. doi:10.1598/RRQ.40.2.6

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9. Community networking to tap into available funds of knowledge in support of developing students' content knowledge and identities

The teacher provides learning activities that:

- help students connect and build on in-school and out-of-school literacy practices and identities;
 - ❖ connect learning to family, cultural, and community histories; and
 - ❖ connect to youth and popular cultural activities and concerns.
- address community activities, issues, or concerns and engage students in communication and problem solving about them;
- leverage students' literacies, learning, and knowledge to benefit their school, district, and/or community (e.g., peer education, research fairs, concerts, demonstrations and exhibitions, student-to-student mentoring, service learning);
- invite people representing a variety of occupations into the classroom (either face-to-face or via digital tools) to work with and engage in conversation with students;
- enable students to communicate conclusions to authentic audiences; and
- connect to and engage with discipline-related activities and spaces in local communities (e.g., local music groups, hobby groups, museums, universities, libraries).

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Moje, E. B., & Hinchman, K. (2004). Culturally responsive practices for youth literacy learning. In J. Dole & T. Jetton (Eds.), *Adolescent literacy research and practice* (pp. 331-350). New York : Guilford Press.

Moll, L. C., C. Amanti, et al. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory into Practice* 31(2): 132.

Moje, E.B. (2015) Doing and Teaching Disciplinary Literacy with Adolescent Learners: A Social and Cultural Enterprise. *Harvard Educational Review*: June 2015, Vol. 85, No. 2, pp. 254-278.

10. Metadiscursive awareness within and across academic and cultural domains (attention to language use at the “meta” level, e.g. talking about talk)

The teacher:

- supports students to connect and build on in-school and out-of-school literacy practices and ways with words by identifying language processes and discussing how language is used based on different purposes, audiences, and cultural perspectives;
- engages students in metalanguage discussion about ways with words within and across the disciplines; and
- provides learning activities that teach students to evaluate how language is used in powerful and effective ways in the discipline based on the purpose, audience, context, and genre of the text.

Fang, Z. (2012). Language correlates of disciplinary literacy. *Topics in Language Disorders* 32(1), 19-34.

Fang, Z., & Schleppegrell, M. J. (2010). Disciplinary literacies across content areas: Supporting secondary reading through functional language analysis. *Journal of Adolescent & Adult Literacy*, 53(7), 587-597.

Moje, E. B. (2007). Developing socially just subject-matter instruction: A review of the literature on disciplinary literacy. In L. Parker (Ed.), *Review of research in education*, (pp. 1-44). Washington, DC: American Educational Research Association.

Moje, E.B. (2015) Doing and Teaching Disciplinary Literacy with Adolescent Learners: A Social and Cultural Enterprise. *Harvard Educational Review*: June 2015, Vol. 85, No. 2, pp. 254-278.



GRADES 6 TO 12

Essential Practices for Literacy Instruction in the Secondary ELA Classroom

Deliberate, research-supported efforts to motivate, engage, and support reading, writing, speaking, listening, and viewing in English Language Arts

INTRODUCTION

ENGLISH LANGUAGE ARTS

MATHEMATICS

SOCIAL STUDIES

SCIENCE

GLOSSARY

1. Problem-based instruction

Develop and implement interactive units of instruction that frame important problems or questions in order to provide authentic purposes for students to read and write beyond being assigned or expected to do so (e.g. for their enjoyment/interest, to ask and answer questions about humanity, society, their community and/or individual lives, to address needs in their community or beyond, or to communicate with a specific audience).

Within these problem-based units, the teacher:

- engages students in asking questions, both literal and conceptual, about the world around them to develop generative thinkers.
 - engages students in abstract and disciplinary-specific thinking and reasoning (e.g. analyzing literature, composing texts in a rhetorically-appropriate manner, participating in effective communication).
 - helps students make sense of texts from different time periods, cultures, and regions.
 - aids students in seeing themes from literature in their everyday lives and identities (i.e., cultural, racial, ethnic, gendered).
 - supports students to develop critical literacy and critical viewing practices across different text genres and formats.
 - helps students understand the text features of different genres, and how different genres function in the world outside of school.
- creates opportunities for students to enact literate identities, drawing from both within and outside of school literacy practices and funds of knowledge (e.g. providing opportunities for students to see themselves as authors by publishing and sharing their work in the school community).
 - presents regular opportunities for students to choose materials, products, and processes in their reading, writing, and communication.
 - offers regular opportunities for students to engage in independent, sustained reading and writing activities as well as collaborate with peers, such as through small-group discussion of texts of interest and opportunities to write within group projects.
 - provides scaffolded support to students as needed to assist them in developing their literacy proficiencies, removing supports over time to generate more independence.
 - differentiates instructional processes and product expectations based on frequent, formative, growth-oriented feedback that affirms high academic expectations and support for all students.

Rainey, E. C. (2017). Disciplinary literacy in English language arts: Exploring the social and problem-based nature of literary reading and reasoning. *Reading Research Quarterly, 52*(1), 53-71. doi:10.1002/rrq.154

Ertmer, P. A., Glazewski, K. D., Jones, D., Ottenbreit-Leftwich, A., Goktas, Y., Collins, K., & Kocaman, A. (2009). Facilitating technology-enhanced problem-based learning (PBL) in the middle school classroom: An examination of how and why teachers adapt. *Journal of Interactive Learning Research, 20*(1), 35.

Muhammad, G., & Love, B. L. (2020). Cultivating genius: An equity framework for culturally and historically responsive literacy. *Scholastic*.

2. Diverse texts and abundant reading opportunities in the school

The teacher:

- engages students with texts that provide entry way into questions, puzzles, themes, authors, issues of equity, power, and social justice, and/or genres that can be investigated further.
- provides access and regular opportunities to work with a wide range of diverse texts (e.g. books, online texts, databases, and tools) that reflect diversity across cultures, ethnic groups, geographic locations, genders, and social roles; and of varying complexity, structure, and genre; (e.g., novels, short stories, poetry, comics, newspaper articles, magazines, journals, advertisements, websites, discussion boards, internet postings), including the following:
 - ❖ rigorous texts on grade level and beyond,
 - ❖ texts that allow students to reflect on their own interests and identities and also explore interests and identities different than their own, so that they can participate in diverse cultural and social contexts.
- engages students with online texts, databases, and tools that provide an entryway into concepts, themes, and/or investigations of compelling issues authentic to the disciplines.
- fosters a reading culture that promotes engagement with diverse texts in a variety of contexts (e.g. independent reading, online communities, reading conferences, book clubs, book talks).

Athanases, S. Z. (1998). Diverse learners, diverse texts: Exploring identity and difference through literary encounters. *Journal of Literacy Research*, 30(2), 273-296.

Lopez, A. E. (2011). Culturally relevant pedagogy and critical literacy in diverse English classrooms: A case study of a secondary English teacher's activism and agency. *English Teaching*, 10(4), 75.

Lee, C.D. (2007). *Culture, literacy & learning: Taking bloom in the midst of the whirlwind*. New York, NY: Teachers College Press.

Muhammad, G., & Love, B. L. (2020). *Cultivating genius: An equity framework for culturally and historically responsive literacy*. Scholastic.

3. Intentional and standards-aligned instruction in disciplinary reading practices

The teacher:

- establishes compelling reasons for reading, listening to, and viewing a variety of texts (see Practice #1 above).
- teaches students to apply disciplinary tools and concepts when working with text.
 - ❖ explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typically applied or used in disciplines connected to English Language Arts.
 - ❖ models through think-alouds how to ask questions of texts.
 - ❖ provides explicit instruction in vocabulary, literary elements and devices, and language skills in the context of reading.
 - ❖ in addition to reading for literary merit, also supports students as they read texts to examine author's craft in producing the text.
 - ❖ models how to evaluate texts from different perspectives and engage in critical reading or viewing practices.
- supports students to work with different literary theories to interpret texts.
 - ❖ teaches students how to synthesize concepts and ideas, as well as analyze language use, across texts, and disciplines.
- supports students to read, analyze, and critically view multimodal texts (e.g. web pages, graphic novels, and digital narrations) in a variety of genres and for a variety of purposes.
- engages students in research and argumentation about questions of interest to them.
 - ❖ connects literature and other texts to current social problems and themes.
 - ❖ provides instruction and practice in reading, analyzing, and synthesizing across multiple texts in the research process.
 - ❖ supports youth in determining the significance of examples, information, or facts they locate through different sources(digital and physical) in the context of research and inquiry.

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3. Intentional and standards-aligned instruction in disciplinary reading practices (continued)

- ❖ models how to discern patterns and relationships (e.g. cause and effect) across data, accounts, or explanations.
- ❖ teaches students to gather and evaluate evidence from multiple sources to develop evidence-based arguments.
- ❖ helps students learn to identify and critique the claims of others, considering both their own perspectives and the possible perspectives of the author/source (perspectives may be disciplinary, cultural, racial, ethnic, gendered, etc.).
- explores non-fiction and fiction texts with students to examine how words, sentence structures, and the organization of texts are used to convey concepts and messages.
- provides learning activities that develop critical digital, media, and visual literacies.
- scaffolds reading activities as appropriate using a range of strategies.

Rainey, E. C., & Moje, E. B. (2012). Building insider knowledge: Teaching students to read, write and think in ELA and across the disciplines. *English Education*, 45(1), 71-90. <http://www.jstor.org/proxy/lib.umich.edu/stable/23365001>

Lee, C.D., Goldman, S.R., Levine, S., & Magliano, J. (2016). Epistemic cognition in literary reasoning. In I. Braten, W.A. Sandoval, J.A. Greene (Eds.), *Handbook of epistemic cognition* (pp. 165-183). New York, NY: Routledge.

Reynolds, T., & Rush, L.S. (2017). Experts and novices reading literature: An analysis of disciplinary literacy in English language arts. *Literacy Research and Instruction*, 56(3), 199-216.

4. Intentional and standards-aligned instruction in disciplinary writing

The teacher:

- establishes various compelling reasons for writing in English-related disciplines (e.g. literary studies, journalism, technical writing, creative writing) (see Practice #1)
- teaches students how to analyze rhetorical context when producing text and communication, including:
 - ❖ writing for different purposes, such as analyzing a literary text, entertaining an audience, or informing an audience.
 - ❖ writing for different authentic audiences (such as peers, community members, and other public audiences).
- considering how language choices and conventions can shift depending on purpose and audience.
- provides regular time for students to write both formally and informally, acknowledging and providing opportunities for practice with different writing strategies and processes.
 - ❖ reinforcing the different recursive stages of process writing (including prewriting, planning, drafting, revising for feedback, editing, and publishing).
 - ❖ reinforcing that writing for different purposes and genres relies on different processes and strategies.
- teaches and reinforces the habits of minds of good writers (e.g., creativity, flexibility, persistence, curiosity).
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking that are typical of different genres within ELA (e.g., literary analysis, creative nonfiction, poetry, book reviews, technical documents).
 - ❖ provides students with practice in writing in different modalities, registers, voices, and rhetorical styles, using different media for different purposes and audiences.
- helps students learn to develop and communicate evidence-based claims, considering both their own perspective and the perspective of others (perspectives may be disciplinary, cultural, racial, ethnic, gendered, etc.).
- offers explicit instruction in ELA-related vocabulary, textual elements and devices, and language skills in the context of writing.
- teaches students to use digital tools to deepen and communicate content knowledge.
- scaffolds writing activities as appropriate, and moves students to independent levels of research, reading, and writing.

Rainey, E. C., & Moje, E. B. (2012). Building insider knowledge: Teaching students to read, write and think in ELA and across the disciplines. *English Education*, 45(1), 71-90. <http://www.jstor.org/proxy/lib.umich.edu/stable/23365001>

VanTassel-Baska, J., Zuo, L., Avery, L. D., & Little, C. A. (2002). A curriculum study of gifted-student learning in the language arts. *Gifted Child Quarterly*, 46(1), 30-44.

5. Higher-order discussion of increasingly complex text across varying participation structures

The teacher:

- establishes compelling reasons for engaging in discussion of text (see Practice #1 above), including texts produced by students.
- allocates time for whole-group, small-group, and paired discussions of text, and uses a range of grouping and discussion strategies (e.g. Socratic seminars, jigsaw, etc.) , including face-to-face and online formats.
- has students use appropriate evidence from the text to support claims in discussion.
- poses questions that foster textual understanding and deep engagement with text, as well as development of critical viewing and critical reading of diverse texts (including visual texts).
- provides modeling and instruction to teach students how to generate their own higher-level questions about texts (e.g. appraises, assesses, or critiques on a basis of specific standards and criteria).
- teaches students how to engage in productive discussions, including discussion moves appropriate to ELA (e.g. discussing a text from different perspectives, identifying and discussing an author's use of literary devices, identifying rhetorical moves in a model text).
- offers opportunities for dramatic interpretations of literature.
- engages students in discussions around how words, sentence structures, and the organization of texts are used to convey concepts and messages in both non-fiction and fiction texts.
- asks students to identify similar themes, characters, conflicts, linguistic features, plot structures, and text structures among different texts and seek connections, analogies, and patterns.
- supports students' knowledge and criticality of historical, social, political, and psychological issues with texts considering various disciplinary and cultural perspectives.
- engages students in discussion around digital and media literacies, and engages students in dialogue through digital tools to share and communicate ideas with text, speech, and visualization.

Applebee, A. N., Langer, J. A., Nystrand, M., & Gamoran, A. (2003). Discussion-based approaches to developing understanding: Classroom instruction and student performance in middle and high school English. *American Educational Research Journal*, 40(3), 685-730.

Nystrand, M. (2006). Research on the role of classroom discourse as it affects reading comprehension. *Research in the Teaching of English*, 392-412.

6. Opportunities for and instruction in critically viewing, speaking and listening

The teacher:

- establishes compelling reasons for presenting or performing and listening to presentations/performances.
- provides regular opportunities for students to listen and respond to oral presentations, including those that incorporate visual and quantitative information to make students' conclusions public (e.g., debate, reports, presentations to external audiences).
- models and teaches strategies for effective oral communication across different genres.
- teaches students strategies for critically viewing, as well as listening and responding to presentations or performances.
- engages students in discussion of, and practice with, norms and strategies for engaging in civil discourse around a range of issues, including potentially controversial topics.

Nystrand, M. (1997). *Opening Dialogue: Understanding the Dynamics of Language and Learning in the English Classroom. Language and Literacy Series*. Teachers College Press, PO Box 20, Williston, VT 05495-0020 (paperback: ISBN-0-8077-3573-6, \$19.95; cloth: ISBN-0-8077-3574-4, \$44).

Langer, J. A. (2001). Beating the odds: Teaching middle and high school students to read and write well. *American Educational Research Journal*, 38(4), 837-880.

notes _____

7. Intentional efforts to build vocabulary and conceptual knowledge

The teacher:

- presents vocabulary as language in use (in context).
- teaches multiple, nuanced meanings of a word across different contexts and encourage students to use new words in meaningful ways (e.g., discussion of texts, discussions of content area learning, semantic maps).
- provides repeated opportunities for students to review and use new vocabulary over time, including discussing ways that new vocabulary relate to one another and to students' existing conceptual knowledge.
- explicitly teaches words that build necessary knowledge for reading and writing texts of instruction.
 - ❖ engages students in morphemic analysis (i.e., analysis of the meaning of word parts) of unfamiliar vocabulary encountered in texts and instruction.
- selects Tier 2 and Tier 3 vocabulary words to teach using disciplinary texts of instruction.
- encourages talk about vocabulary among students, particularly during disciplinary learning and students' discussions of print and/or digital texts (e.g. encourages talk about vocabulary among students and models how to examine and evaluate how people use language to achieve certain outcomes within systems and relations of power).
- encourages students to identify, explore, and use new vocabulary independently and provides instruction to support this process.

Smagorinsky, P., & Smith, M. W. (1992). The nature of knowledge in composition and literary understanding: The question of specificity. *Review of Educational Research*, 62(3), 279-305.

Smagorinsky, P. (1991). The writer's knowledge and the writing process: A protocol analysis. *Research in the Teaching of English*, 339-364.

8. Ongoing observation and assessment of students' academic language and literacy development that informs their education

The teacher:

- engages in observation and assessment guided by:
 - ❖ an understanding of language and adolescent literacy development (e.g. creating a range of assessment items guided by an understanding of different reading processes such as literal and inferential comprehension of text).
 - ❖ an understanding of assessment as an opportunity to build upon student strengths, as well as to address areas for improvement;
 - ❖ an understanding of, and respect for, the student as a member of multiple cultures and linguistic communities;
 - ❖ a recognition of students' socioemotional needs; and
 - ❖ relevant standards documents; for example, Michigan K-12 Standards for English Language Arts.
- prioritizes observation and assessment that is closest to authentic reading and writing
 - ❖ e.g. prioritizing student work/writing as data for making instructional decisions as opposed to standardized test scores which can mask proficiencies and areas in need of development.
- administers assessments as one source of information to determine which students may need additional instructional supports.
- employs formative and diagnostic assessment tools as needed to inform specific instructional targets (e.g., assessing knowledge of specific vocabulary words taught, reading and writing strategies being used and not used) and engage in the instructional practices described in this document.
- provides timely and specific formative feedback to guide students' learning and literacy development.
- involves students in the development of success criteria and learning goals, as well as in supported, productive self and peer assessment.
- develops assessments that analyze how students develop and use disciplinary tools, concepts, and literacy practices.

Marshall, B. (2004). Goals or horizons—the conundrum of progression in English: or a possible way of understanding formative assessment in English. *Curriculum Journal*, 15(2), 101-113.

Hodgen, J., & Marshall, B. (2005). Assessment for learning in English and mathematics: A comparison. *Curriculum journal*, 16(2), 153-176.

9. Community networking to tap into available funds of knowledge in support of developing students' knowledge and identities

The teacher:

- helps students connect and build on their in-school and out-of-school literacy practices and identities,
 - ❖ connecting learning and literacy development to family and community issues, as well as economic and political decisions.
 - ❖ engaging with community activities and audiences to address natural and social concerns.
 - ❖ connecting to youth and popular cultural production, activities, networks, and concerns.
- leverages students' literacies, learning, and knowledge to benefit their school, district, and/or community (e.g. peer education, research fairs, student to student mentoring, service learning).
- invites authors, artists, journalists, media professionals, and other speakers relevant to English Language Arts to the classroom (either face-to-face or via digital tools) to work with and engage in conversation with students.
- connects to and engages with literary experiences and spaces in local communities (libraries, bookstores, local writers, etc.).
- honors and engages with the diversity of literacy practices in the school community.
- enables students to communicate conclusions to and/or share literary work with authentic audiences.

Lee, C.D. (2007). *Culture, literacy, & learning: Taking bloom in the midst of the whirlwind*. New York, NY: Teachers College Press.

Gutiérrez, K. D. (2008). Developing a sociocritical literacy in the third space. *Reading research quarterly*, 43(2), 148-164.

10. Metadiscursive awareness within and across academic and cultural domains (attention to language use at the “meta” level, e.g. talking about talk)

The teacher:

- supports all students in navigating across multiple linguistically and culturally diverse contexts both inside and outside of schools, with a focus on helping them learn the linguistic practices of disciplinary cultures.
- understands and respects the relationship between their students' language and identities while also helping students develop new disciplinary languages and identities.
 - ❖ e.g. reading and analyzing literature that reflect a variety of languages and dialects.
- leads students in examining U.S.-based language varieties, including in their own communities, in the course of reading and analyzing literature and other text forms
 - ❖ e.g. studying the historical, cultural, and political underpinnings of language varieties such as African American English, Spanglish, etc.
- provides students with opportunities to deconstruct and investigate the intersections between language, identity, and power in the service of disciplinary problems and puzzles represented in literature and other text forms.
- supports students in making informed decisions about language and literacy practices in and across the literacy and language disciplines.
 - ❖ e.g. providing students with opportunities to sustain their language and literacy practices even as they learn new disciplinary practices.
- supports students to connect and build on their in-school and out-of-school language and literacy practices by identifying language processes and discussing how language is used based on different purposes and audiences, including disciplinary audiences and purposes.
 - ❖ e.g. discussing the role of audience and purpose with students by having them compare how they communicate with friends about an issue or problem with how they would write a critique of literature or an analysis of a text that examines the same problem.

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GRADES 6 TO 12

Essential Practices for
Literacy Instruction
in the Secondary
Mathematics Classroom

Deliberate, research-supported efforts to motivate, engage, and support reading, writing, speaking, and listening in mathematics



1. Problem-based instruction

Develop and implement interactive problem-based units of instruction that frame mathematics problems to help establish purposes for students to read, write, and communicate beyond being assigned or expected to do so (e.g. for their enjoyment/interest; to ask and answer abstract and authentic, disciplinary questions using mathematics, including questions about their community and individual lives; to address needs in their community or beyond; and to communicate with a specific audience).

**Within these problem-based units,
the teacher:**

- engages students in asking mathematical questions, both practical and theoretical. (SMP1)*
- engages students in abstract and quantitative mathematical thinking and reasoning. (SMP2)
- helps students make sense of problems at different scales and persevere in solving them. (SMP1)
- helps students see the mathematics of everyday life by reading real-world scenarios that incorporate or highlight representations of mathematical problems and concepts. (SMP1, SMP2, SMP4)
- helps students imagine the theory of mathematics, or “pure mathematics,” to help students understand that mathematics can be used to wonder about the world and that such wondering can lead to applications of mathematical concepts in the world outside of school. (SMP7, SMP8)
- creates opportunities for students to enact literate mathematics identities, drawing from both within and outside of school literacy practices (e.g. having students communicate mathematical explanations to a public audience to strengthen their identities as users and doers of math). (SMP1-8)
- provides regular opportunities for students to make choices in their reading, writing, and communication about mathematics.
- offers regular opportunities for students to collaborate with peers as a community of problem solvers through reading, writing, and communicating around mathematics.
- provides scaffolded support to students as needed to assist them in developing their literacy proficiencies, removing supports over time to generate more independence.
- differentiates instructional content, processes, and products to account for varying academic needs and skills and appropriately challenge all students.
- assists students to connect their lived experiences and cultural identities to mathematics as they: inquire about relevant issues of equity, power, and justice; make sense of varying cultural perspectives; and, leverage understanding those perspectives along with mathematics to propose possible solutions.

Boaler, J. and Selling, S. K. (2017). Psychological imprisonment or intellectual freedom? A longitudinal study of contrasting school mathematics approaches and their impact on adults' lives. *Journal for Research in Mathematics Education* 48, 1.

Draper, R. J., & Siebert, D. (2004). Different Goals, Similar Practices: Making Sense of the Mathematics and Literacy Instruction in a Standards-Based Mathematics Classroom. *American Educational Research Journal*, 41(4), 927–962. <https://doi.org/10.3102/00028312041004927>

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American educational research journal*, 27(1), 29-63.

2. Diverse texts and abundant reading opportunities in the school

The teacher:

- Provides access, supports, and regular opportunities to work with
 - ❖ mathematical text in all its forms, including (but not limited to):
 - mathematical models using multiple representations (symbolic, graphical, numeric, words/verbal forms); (SMP4)
 - symbols, expressions, inequalities, equations, and functions; (SMP2, SMP4, SMP7, SMP8)
 - diagrams, tables, graphs, sketches, maps, and physical models; (SMP4, SMP5)
 - explanations, justifications, arguments, and proofs - expressed verbally, visually, and demonstratively (e.g., a physical or animated enactment); (SMP2, SMP3, SMP6)
 - input, output, and intermediate states from a variety of tools ranging from low-tech (e.g., paper folding, number lines) to high-tech (e.g., Desmos, Excel); (SMP5)
 - photos and video, audio recordings, demonstrations, and presentations; (SMP2, SMP4, SMP5, SMP7)
 - problem scenarios stated in words, as well as via combinations of text forms; (SMP1) and
 - prose, ranging from students' own written work which includes the above text forms to prose by others, including recreational mathematics, articles, and books. (SMP1, SMP2, SMP3, SMP6)
 - ❖ a wide range of texts that help students see mathematics as connected to their own interests, including career explorations, and to their own interactions with and uses of mathematics in everyday life.
 - ❖ culturally-relevant texts that provide entry into mathematical concepts and/or investigations of compelling problems or contexts, including those texts that enable students to interrogate and make sense of historical, political, economic, and social problems from different cultural perspectives (e.g., race, gender, economic, religious, geographic, ability, and language); teachers enable students to bring mathematical thinking to bear to make, use, and evaluate conjectures in these contexts. (SMP1, SMP2, SMP3)
- engages students in recognizing how mathematics may be used within a text or set of texts to:
 - ❖ amplify, clarify, or distort interpretations of information or problem situations, and
 - ❖ analyze the purpose and/or the reasoning of the author(s) of that text(s) and of those interpreting or using that text(s). (SMP2, SMP3)

Donahue, D. (2003). Reading across the great divide: English and math teachers apprentice one another as readers and disciplinary insiders. *Journal of Adolescent & Adult Literacy*, 47(1), 24-37.

Draper, R. J., & Siebert, D. (2004). Different Goals, Similar Practices: Making Sense of the Mathematics and Literacy Instruction in a Standards -Based Mathematics Classroom. *American Educational Research Journal*, 41(4), 927-962. <https://doi.org/10.3102/00028312041004927>

Siegel, M. (1989). A Critical Review of Reading in Mathematics Instruction: The Need for a New Synthesis.

3. Intentional and standards-aligned instruction in disciplinary reading

The teacher:

- establishes compelling reasons for reading in mathematics (see Practice #1 above).
- teaches students to apply disciplinary tools and concepts when working with text.
 - ❖ explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of flexible and fluent mathematical thinkers.
 - ❖ strategically plans for which mathematical words, symbols, and phrases may need explicit definition and explanation and which are best developed through student investigation, discovery, and refinement. (SMP6)
 - for words and phrases needing explicit attention, regularly uses and explains their meanings using precise, accurate, and usable definitions.
 - for words and phrases better suited to student exploration and definition construction, provides students with supports needed to develop their own definitions through investigation, discovery, and refinement.
 - ❖ teaches students to reason abstractly and quantitatively when engaging with text-based problems. (SMP2)
 - ❖ teaches students to critically read and evaluate mathematical explanations, models, arguments, and other relevant types of mathematics texts. (SMP1, SMP3, SMP4)
 - ❖ explicitly teaches the meaning, purpose, and appropriate usage of mathematical symbols (i.e., internationally recognized shorthand for complex concepts). (SMP6)
 - ❖ models** how to read and make sense of relevant and authentic word-based mathematical problems. (SMP1)
 - ❖ teaches students how to look for and make use of structure when engaging with mathematical texts. (SMP7)
 - ❖ teaches students how and when to look for regularity in repeated reasoning when engaging with mathematics texts. (SMP8)
 - ❖ engages students in regularly translating across forms of representation (e.g., from written text to equations to tables to graphs; from words to symbols). (SMP1, SMP2)
 - ❖ models for students how to write and think metacognitively through mathematical problems. (SMP1, SMP2)

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3. Intentional and standards-aligned instruction in disciplinary reading (continued)

- ❖ helps students read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. (SMP 3)
- engages students in authentic mathematical investigations about their communities and world and supports them in using mathematics to conduct those investigations. (SMP1, SMP4)
 - ❖ develops, with students, one or more questions of interest which may be answered through collecting and analyzing data.
 - ❖ develops, with students, appropriate strategies for collecting that data.
 - ❖ teaches students how to record data observations systematically and rigorously by:
 - employing multiple forms of representation (drawings, numbers, graphs, charts, word-based descriptions, etc.). (SMP1, SMP4)
 - teaching students how to translate from one form to another. (SMP1, SMP2)
- ❖ models how to discern data patterns and determine significance. (SMP5, SMP6, SMP7, SMP8)
- ❖ models how to draw and present conclusions in oral and written language. (SMP3)
- ❖ teaches students how to strategically use and analyze digital and online mathematics texts and tools. (SMP5)
- scaffolds reading activities as appropriate using a range of strategies.

Donahue, D. (2003). Reading across the great divide: English and math teachers apprentice one another as readers and disciplinary insiders. *Journal of Adolescent & Adult Literacy*, 47(1), 24-37.

Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review*, 78(1), 40-59.

4. Intentional and standards-aligned instruction in disciplinary writing

The teacher:

- establishes compelling reasons for writing and communicating about and with mathematics (see Practice #1 above).
- teaches students to write and communicate about and with mathematics for different authentic purposes and audiences.
- engages students in writing to process and analyze mathematical texts and/or concepts. (SMP2)
- teaches students to construct viable mathematical arguments, and to critique the arguments of others from multiple perspectives (perspectives may be disciplinary, cultural, racial, ethnic, gendered, etc.). (SMP3)
 - ❖ teaches students to use data and mathematical concepts, theorems, etc. to support their arguments.
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of flexible and fluent mathematical thinkers.
 - ❖ provides instruction in discipline-specific writing processes, strategies, and conventions, and attention as to why those writing norms exist in the discipline (e.g. notation conventions). (SMP3, SMP6)
 - ❖ attends to precision in mathematical language. (SMP6)
- teaches students how to write mathematical proofs by:
 - ❖ enabling students to compare and contrast argument and mathematical proof, including their purposes. (SMP3, SMP6)
 - ❖ teaches students to construct and evaluate arguments centered on a mathematical claim and arguments. (SMP3)
- ❖ using models of well-written proofs, contrasting them with poorly-written proofs, to help students learn the features of strong proofs. (SMP3)
- ❖ practicing writing proofs in formats appropriate for the purpose and audience on a regular basis. (SMP3)
- ❖ providing explicit instruction as needed in text features, writing mechanics, and other standards-aligned content.
- provides regular time for students to write, both formally and informally, aligned with Practice #1 above.
- provides instruction in and opportunities for the use of technology tools to problem solve and communicate about mathematics.
 - ❖ engages students in using a diversity of tools to build mathematical models. (SMP1, SMP4, SMP5)
- provides opportunities for students to practice using written language (e.g., proofs, models, metacognitive writing of problem solving processes) to make their conclusions public. (SMP3)
- moves students to independent levels of research, reading, and writing in mathematics. (SMP1-8)
- scaffolds writing activities as appropriate using a range of strategies.

Brozo, W. G., & Crain, S. (2018). Writing in Math: A Disciplinary Literacy Approach. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 91(1), 7-13. <https://doi.org/10.1080/00098655.2017.1342435>

Lim, L. & Pugalee, D.K. (2004). Using journal writing to explore: "They communicate to learn mathematics and they learn to communicate mathematically." *Ontario Action Researcher* 7(2).

Pugalee, D. K. (2001). Writing, Mathematics, and Metacognition: Looking for Connections Through Students' Work in Mathematical Problem Solving. *School Science and Mathematics*, 101: 236-245.

5. Higher-order discussion of increasingly complex text across varying participation structures

The teacher:

- establishes compelling reasons for engaging in discussion of mathematical text (including student-produced text), representations, and/or problems (see Practice #1 above).
- allocates time for whole-group, small-group, and pair discussion of text, and uses a range of discussion and grouping strategies.
- poses questions, and assists students in posing their own questions, that foster textual understanding and higher-order engagement with text. (SMP1)
- develops discussions that surface in productive ways students' misconceptions about topics, concepts, or issues, and engages students in communicating and critiquing conclusions.
- engages students in discussion of text types, structures, representations, and discursive practices of the discipline (e.g. precision of language, particularly with definitions). (SMP6)
- provides modeling and instruction to teach students how to generate their own higher level questions, including questions that help them understand and critique the communities and the world around them.
- teaches students how to engage in productive discussions, including discussion moves appropriate to mathematics (e.g. analyzing and interpreting word problems, evaluating and applying definitions). (SMP1, SMP2, SMP6)
- provides learning activities in which students read, analyze, and discuss problems and proofs that mathematicians might use to build mathematical arguments. (SMP3)
- engages students in reasoning abstractly and quantitatively when talking about math. (SMP2)
- asks students to understand, interpret, and use mathematical symbol systems and notation in their classroom talk. (SMP2, SMP6)
- models for students how to use and connect multiple representations. (SMP1, SMP2, SMP4)
- asks students to identify similar problem structures among different texts and seek connections, analogies, and patterns.
 - ❖ assists students to make connections between prior and new knowledge and represent that knowledge using mathematics. (SMP7, SMP8)
- supports students to explain or connect authentic, and/or abstract phenomena from a mathematical perspective using mathematical language. (SMP1, SMP2, SMP6, SMP7, SMP8)
- engages students in discussion around digital and media literacies and tools, and engages students in dialogue through digital tools to share and communicate ideas. (SMP5)

Draper, R. J., & Siebert, D. (2004). Different Goals, Similar Practices: Making Sense of the Mathematics and Literacy Instruction in a Standards-Based Mathematics Classroom. *American Educational Research Journal*, 41(4), 927–962. <https://doi.org/10.3102/00028312041004927>

Huang, J., Normandia, B., & Greer, S. (2005). Communicating mathematically: Comparison of knowledge structures in teacher and student discourse in a secondary math classroom. *Communication Education*, 54(1), 34-51.

Tanner, M.L., & Casados, L. (1998). Promoting and studying discussions in math classes. *Journal of Adolescent & Adult Literacy*, 41(5), 342-350.

6. Opportunities for and instruction in speaking and listening

The teacher:

- establishes compelling reasons for presenting and listening to mathematical presentations or explanations. (SMP3, SMP4)
- teaches students to consider audience and purpose when preparing to speak or present. (SMP3, SMP4)
- provides regular opportunities for students to listen and respond to oral presentations, including those that incorporate visual and quantitative information to make students' conclusions public (e.g., debate, reports, presentations to external audiences). (SMP3, SMP4)
- teaches students to listen to and productively critique the reasoning of others. (SMP3)
- teaches students strategies for listening and responding to mathematical explanations and/or presentations. (SMP1, SMP3, SMP6)

Kotsopoulos, D. (2007). Mathematics discourse: "It's like hearing a foreign language." *Mathematics Teachers*, 101(4), 301-305.

Tanner, M.L., & Casados, L. (1998). Promoting and studying discussions in math classes. *Journal of Adolescent & Adult Literacy*, 41(5), 342-350.

Walshaw, M. & Anthony, G. (2017). The teacher's role in classroom discourse: A review of recent research into mathematics classrooms. *Review of Educational Research* 78(3), 516-551.

7. Intentional efforts to build vocabulary, symbolic, and conceptual knowledge

The teacher:

- presents vocabulary as language in use (as opposed to presenting words in decontextualized lists).
- connects mathematical symbols to language and word meanings. (SMP2, SMP6)
- attends to the need for precision in mathematical language. (SMP6)
- teaches multiple meanings or nuanced meanings of a word across different contexts and encourages students to use new words in meaningful contexts (e.g., discussion of texts, discussions of content area learning, semantic maps). (SMP6)
- provides repeated opportunities for students to review and use new vocabulary over time, including discussing ways that new vocabulary relate to one another and to students' existing conceptual knowledge. (SMP2)
- engages students in developing their own definitions of new words through investigation, discovery, and refinement.
- explicitly teaches words that build necessary knowledge for reading and writing texts of instruction and communicating key mathematics concepts. (SMP1)
- engages students in morphemic analysis (i.e., analysis of the meaning of word parts) of unfamiliar vocabulary. (SMP1)
- selects Tier 2 and Tier 3 vocabulary words to teach using disciplinary texts of instruction. (SMP1, SMP6)
- encourages talk about vocabulary among students, particularly during disciplinary learning and students' discussions of print or digital texts. (SMP2, SMP3)
- encourages students to identify and explore new vocabulary independently and provides instruction to support this process.

Draper, R. J., & Siebert, D. (2004). Different Goals, Similar Practices: Making Sense of the Mathematics and Literacy Instruction in a Standards -Based Mathematics Classroom. *American Educational Research Journal*, 41(4), 927–962. <https://doi.org/10.3102/00028312041004927>

Kotsopoulos, D. (2007). Mathematics discourse: "It's like hearing a foreign language." *Mathematics Teachers*, 101(4), 301-305.

Walshaw, M. & Anthony, G. (2017). The teacher's role in classroom discourse: A review of recent research into mathematics classrooms. *Review of Educational Research* 78(3), 516-551.

8. Ongoing observation and assessment of students' language and literacy development that informs their education

The teacher:

- engages in observation and assessment guided by:
 - ❖ an understanding of language and literacy development, as well as of mathematical learning and development.
 - e.g. understanding the difference between literal comprehension and inferential comprehension of any text, including mathematical texts like word problems, is helpful for teachers when developing and analyzing assessments.
 - ❖ an understanding of assessment as an opportunity to identify and build upon students' strengths, as well as to address areas for improvement;
 - ❖ an understanding of, and respect for, the student as a member of multiple cultures and linguistic communities. a recognition of students' socioemotional needs.
 - ❖ relevant standards documents and connected mathematical practices. (SMP1-8)
- prioritizes multiple forms of student evidence, including evidence gathered from observation, as data for making instructional decisions over standardized test scores which can mask proficiencies and areas in need of development.
- administers assessments as one source of information to determine which students may need additional instructional supports.
- employs formative and diagnostic assessment tools as needed to inform specific instructional targets (e.g., assessing knowledge of specific vocabulary words taught) and engage in the instructional practices described in this document.
- provides timely and specific formative feedback to drive student learning.
- involves students in the development of learning goals, as well as in supported, productive self and peer assessment / feedback. (SMP3)
- develops assessments that analyze how students apply disciplinary tools, concepts, and literacy practices. (SMP 1-8)

Miller, P., & Koesling, D. (2009). Mathematics teaching for understanding: Reasoning, reading, and formative assessment. In S. Plaut (Ed.), *The right to literacy in secondary schools*. (Chapter 5, pp. 65-80). New York: Teachers College Press.

Bailey, A. L., & Heritage, M. (Eds.). (2008). *Formative assessment for literacy, grades K-6: Building reading and academic language skills across the curriculum*. Corwin Press.

9. Community networking to tap into available funds of knowledge in support of developing students' mathematical knowledge and identities

The teacher provides learning activities that:

- help students connect and build on their in-school and out-of-school literacy practices and identities.
- connect mathematics learning to family, cultural, and community issues, as well as economic and political decisions. (SMP3, SMP4)
- address and communicate about natural and social concerns raised through community activities, issues, audiences, and forums by applying mathematical analysis and tools. (SMP3, SMP4, SMP5)
- connect to youth and popular cultural activities and concerns.
- leverage students' literacies, learning, and knowledge to benefit their school, district, and/or community (e.g. peer education, research fairs, student to student mentoring, service learning).
- invite people representing a variety of occupations who use mathematics in their work, such as skilled tradespeople, artisans, business professionals, natural

and social scientists, health professionals, and mathematicians, into the classroom (either face-to-face or via digital tools) to work with and engage in conversation with students.

- connect to and engage with math-oriented activities and spaces in local communities (financial institutions, government agencies such as labor departments, colleges and universities, laboratories).
- enable students to communicate conclusions about mathematical problems or contexts to authentic audiences. (SMP3, SMP4)

Boaler, J. and Selling, S. K. (2017). Psychological imprisonment or intellectual freedom? A longitudinal study of contrasting school mathematics approaches and their impact on adults' lives. *Journal for Research in Mathematics Education* 48, 1.

Brewley, D. (2013). Mathematics literacy for liberation, liberation in mathematics literacy: The Chicago Young People's Project as a community of practice. In J. Leonard & D.B. Martin (ed.s), *The Brilliance of Black Children in Mathematics* (pp. 275-296). Charlotte, NC: Information Age Publishing.

Gutstein, Eric. (2006). "The Real World As We Have Seen It": Latino/a Parents' Voices On Teaching Mathematics For Social Justice. *Mathematical Thinking and Learning* 8, 331-358.

10. Metadiscursive awareness within and across academic and cultural domains (attention to language use at the "meta" level, e.g. talking about talk)

The teacher:

- supports students to connect and build on their in-school and out-of-school literacy practices and ways with words by identifying language processes and discussing how language is used based on different purposes and audiences, and cultural perspectives. (SMP3, SMP6)
 - ❖ e.g. comparing how mathematicians report statistical data with how data is used in popular media.
 - ❖ e.g. calling attention to the multiple meanings of words like "evaluate" and "product" that have very specific meanings in mathematics.

❖ e.g. analyzing the use of modifiers, including adjectives and adverbs, in mathematics text as compared to literary texts.

- provides learning activities that teach students to evaluate how language is used in powerful and effective ways in the discipline based on the purpose, audience, and genre of the text. (SMP2, SMP3, SMP4, SMP5, SMP6)

Olson, M., & Truxaw, M. (2009). Preservice Science and Mathematics Teachers and Discursive Metaknowledge of Text. *Journal of Adolescent & Adult Literacy*, 52(5), 422-431.

Razfar, A., & Leavitt, D. R. (2011). Developing metadiscourse: Building mathematical discussions in an urban elementary classroom. *Canadian Journal of Science, Mathematics and Technology Education*, 11(2), 180-197.

Essential Practices for Literacy Instruction in the Secondary Mathematics Classroom

* SMP: Standards for Mathematical Practice from the Common Core State Standards (see: <http://www.corestandards.org/Math/Practice/>)

**Models and modeling are important terms to briefly discuss as they have different, although related, meanings in terms of general pedagogy as compared to scientific and mathematical practice.

In this document, when referring to general teaching practices, such as "teacher models how to discern data patterns," modeling is the teaching practice of demonstrating a process for students in order to show them how

it is done. Effective modeling involves breaking down complex practices into steps when helpful, questioning learners about what they are seeing, thinking out loud, and engaging learners in dialogue about the practice or process once demonstrated.

More specific to science and mathematics, modeling refers to the development of simplified representations of complex concepts or systems that help to explain a phenomenon or to make predictions about the phenomena. Models can be mental representations or other external representations that exist in diverse formats, from drawings to 3D models to physical enactments of systems.

GRADES 6 TO 12

Essential Practices for
Literacy Instruction in
the Secondary Social
Studies Classroom

Deliberate, research-supported efforts to motivate, engage, and support reading, writing, speaking, listening, and viewing in social studies



1. Inquiry-based instruction

Develop and implement interactive inquiry based units of instruction that frame social science problems or questions to help establish purposes for students to read and write beyond being assigned or expected to do so (e.g. for their enjoyment/interest, to ask and answer their questions about the social world including their community and individual lives, to address needs in their community or beyond, to communicate with a specific audience, or to explore issues of equity, social justice, and/or identity).

Within these inquiry-based units, the teacher:

- engages students in developing and asking questions, as well as planning inquiries about history, politics, economics, geography, and the social world.
 - ❖ also discusses the role of supporting questions in the inquiry process and supports students to generate new, compelling questions during an inquiry.
- engages students in disciplinary specific (e.g. historical, political, economic, sociological, or geographic) thinking.
- helps students make sense of historical, political, economic, and social problems at different scales (e.g. temporal or spatial), and make conjectures about possible solutions.
- helps students see social science connections to their lives and identities by reading and engaging in discipline specific, real-world and/or issue based investigations with attention to issues of equity, power, and justice.
- creates opportunities for students to enact literate identities connected to social science learning and communication, drawing from both within and outside of school literacy practices (e.g. gives students opportunities be social science authors by having them create historical texts and present them to younger students).
- provides regular opportunities for students to make choices in their reading, writing, and communication.
- offers regular opportunities for students to collaborate with peers in reading and writing, such as through small-group discussion of texts on questions of interest and opportunities to write within group projects.
- provides scaffolded support to students as needed to assist them in developing their literacy proficiencies, removing supports over time to generate more independence.
- differentiates instructional processes and product expectations based on frequent, formative, growth-oriented feedback that affirms high academic expectations and support for all students.

Bain, R. (2005, January). They thought the world was flat? Applying the principles of how people learn in teaching high school history. In Donovan, S. & Bransford, J. (Eds.). (2005). *How Students Learn: History, Mathematics, and Science in the Classroom*, pp.179-214. Washington, D.C.: National Academies Press.

Bain, R.. (2006). Rounding up unusual suspects: Facing the authority hidden in the history classroom. *Teachers College Record* **108**(10): 2080.

Reisman, A. (2012). Reading like a historian: A document-based history curriculum intervention in urban high schools. *Cognition and Instruction* 30(1).

2. Diverse texts and abundant reading opportunities in the school

The teacher:

- engages students with texts that provide entry way into investigations of compelling issues or social science problems with attention to matters of equity, power and justice.
- provides students access to a range of texts about a similar problem or topic within a specific investigation, but also to varying texts across the span of a school year.
- provides access and regular opportunities to work with:
 - ❖ a wide range of social studies texts authentic to the different social science disciplines (i.e. print, audio, visual, and multimodal) including primary, secondary and tertiary texts.
 - ❖ texts of varying complexity, structure, and format or genre, including both primary and secondary sources (e.g. informational texts, maps, biographies, articles, photographs, videos, charts or tables, music, oral history, historical novels, poetry and comics/cartoons).
 - ❖ a wide range of texts that help students see the social sciences as connected to their interests

and that reflect their backgrounds and cultural experiences, as well as reflecting the backgrounds and cultural identities of others.

- ❖ texts that allow students to reflect on their own identities as well as texts that engage them in exploring identities different than their own.
- ❖ online texts, databases, and tools in the service of investigations.

Afflerbach, P. & VanSledright, B. (2001, May). Hath! Doth! What? Middle graders reading innovative history text. *Journal of Adolescent and Adult Literacy*, vol. 44, no. 8, pp. 696-707.

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3. Intentional and standards-aligned instruction in disciplinary reading

The teacher:

- establishes compelling reasons for reading in social studies (see Practice #1 above).
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of the social sciences.
- teaches students to apply disciplinary tools and concepts when working with text.
 - ❖ e.g. models through think-alouds how to ask questions of texts (e.g. routinely ask students to question the author's stance, perspective, historical or social context and motives, and resulting bias).
 - ❖ e.g. teaches students to ask the following questions to determine the source of a document:
 - who produced (wrote, drew, or narrated) this text? What was their purpose and audience?(sourcing)
 - when was this text produced? (contextualization)
 - what was the historical, social, or cultural context in which this text was produced? (contextualization)
- teaches students to evaluate sources and gather and use evidence from multiple sources, including multimodal and digital texts in the context of an investigation or inquiry
 - ❖ regularly models and coaches students in critical reading practices relevant to the social studies:
 - models how to compare text-based accounts and look for similarities and differences (i.e. corroborating).
 - ❖ helps students learn to evaluate the credibility of a source by examining how experts value the source.
 - ❖ helps students learn to identify and critique the claims of others, considering both their own perspective and the possible perspectives of the author/source (perspective may be disciplinary, cultural, racial, ethnic, gendered, etc.)
 - ❖ collects data or gathers accounts with students.
 - ❖ supports youth in substantiating and determining the significance of data they locate through different sources(digital and physical).

Continued on next page

3. Intentional and standards-aligned instruction in disciplinary reading (continued)

- ❖ models how to discern patterns and relationships (e.g. cause and effect) across data, accounts, or explanations.
- ❖ teaches students how to record and organize important ideas or facts generated from analysis of data, images, textual evidence, etc. in research.
- scaffolds reading activities as appropriate using a range of strategies.

Afflerbach, P. & VanSledright, B. (2001, May). Hath! Doth! What? Middle graders reading innovative history text. *Journal of Adolescent and Adult Literacy*, vol. 44, no. 8, pp. 696-707.

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Reisman, A. (2012). Reading like a historian: A document-based history curriculum intervention in urban high schools. *Cognition and Instruction* 30(1).

4. Intentional and standards-aligned instruction in disciplinary writing

The teacher:

- establishes compelling reasons for writing and communicating in social studies (see Practice #1 above).
- engages students in writing to process and analyze primary, secondary, and tertiary texts.
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of social studies.
 - ❖ provides instruction in discipline-specific writing processes, strategies, and conventions, and attention as to why those writing norms exist in the discipline, particularly those involving researching, planning, and revising historical accounts and making social science arguments in other social science disciplines (e.g. the need to revisit and refine claims in light of new evidence encountered in an inquiry).
 - ❖ provides opportunities to study models of, and write a variety of, texts for different purposes and audiences, particularly historical accounts or arguments, other social science arguments, as well as other informative/explanatory, and narrative texts.
- teaches students to apply disciplinary tools and concepts when producing text and communication (e.g. establishing historical or political significance for an event being discussed or written about).
- teaches students to gather and organize evidence to support and communicate social science arguments.
- provides students scaffolded opportunities to explore and use different text features (e.g. headings; table of contents; glossary, etc.) and text structures (cause and effect; problem / solution; sequence of events; etc.) in their writing about social science questions and ideas.
- provides explicit instruction as needed in writing mechanics and other standards-aligned content.
- provides regular time for students to write, both formally and informally, aligned with Practice #1 above.
- engages students in using both paper/pencil and digital media tools to practice historical and other social science research.
- provides opportunities for students to practice using written language (e.g., letters to editors, document-based essays) to make their conclusions public, or to critique the claims or conclusions of others.
- helps students learn to develop and communicate evidence-based claims, considering both their own perspectives and the possible perspectives of their audience (perspectives may be disciplinary, cultural, racial, ethnic, gendered, etc.).
- provides opportunities for students to develop and share multimodal and digital communications authentic to the social studies, including as a means to take informed action around public policy and/or social justice issues.
- moves students to independent levels of research, reading, and writing about inquiry based questions chosen by themselves and/or their instructors.
- scaffolds writing activities as appropriate using a range of strategies.

De La Paz, S., Felton, M., Monte-Sano, C., et. al. (2014). Developing historical reading and writing with adolescent readers: Effects on student learning. *Theory & Research in Social Education* 42(2).

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5. Higher-order discussion of increasingly complex text across varying participation structures

The teacher:

- establishes compelling reasons for engaging in discussion of text (see Practice #1 above), including texts produced by students.
- allocates time for whole-group, small-group, and pair discussion of text, and uses a range of discussion and grouping strategies.
- poses questions that foster textual understanding and higher-order engagement with text (e.g. questions that move students beyond literal understanding into inferential and extended thinking about ideas in text).
- provides modeling and instruction to teach students how to generate their own higher level questions about texts, with attention to issues of equity, power, and justice.
- engages students in discussion of text genres, structures, and language practices of the discipline.
- teaches students how to engage in productive discussions, including discussion moves appropriate to the social sciences (e.g. routinely asking students to question the author's stance, perspective, historical or social context and motives, and resulting bias).
- supports students to read and discuss artifacts and data sources that historians and other social scientists would use to build social scientific arguments.
- has students use evidence from the past or from social science theory or research in discussions.
- has students read and discuss the findings of multiple social science accounts.
- engages students with reading secondary sources (work produced by actual social scientists) and also consult tertiary sources (textbooks, maps, and other reference materials) for chronology and spatial framing to prepare for discussions.
- helps students learn to connect facts and events to larger patterns, schemes and/or concepts in their talk and discussions.
- uses discussions to support students to produce their own social scientific arguments and narratives.
- supports students to explain or connect real world events/trends from a social science perspective using social science language, while also recognizing various disciplinary and cultural perspectives.
- develops productive discussions that surface students' misconceptions about social science topics, concepts, or issues, and that engage students in communicating and critiquing conclusions, while also attending to issues of equity, power, and justice.
- engages students in discussion around digital and media literacies, and engages students in dialogue through digital tools to share and communicate ideas and take informed action.

notes _____

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6. Opportunities for and instruction in speaking and listening

The teacher:

- establishes compelling reasons for presenting and listening to presentations about social science problems or questions.
- provides regular opportunities for students to listen and respond to oral presentations, including those that incorporate visual and quantitative information to make students' conclusions public (e.g., debates and presentations to external audiences).
- models and teaches strategies for effective oral communication in the social sciences.
- teaches students strategies for listening and responding to presentations.
- engages students in discussion of, and practice with, norms and strategies for engaging in civic discourse around a range of issues, including potentially controversial topics.

notes _____

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Bain, R. (2005, January). They thought the world was flat? Applying the principles of how people learn in teaching high school history. In Donovan, S. & Bransford, J. (Eds.). (2005). *How Students Learn: History, Mathematics, and Science in the Classroom*, pp.179-214. Washington, D.C.: National Academies Press.

7. Intentional efforts to build vocabulary and conceptual knowledge

The teacher:

- presents vocabulary as language in use (as opposed to words from decontextualized lists).
- teaches multiple meanings or nuanced meanings of a word across different contexts, including historical contexts, and encourages students to use new words in meaningful contexts (e.g., discussion of texts, discussions of content area learning, semantic maps).
- provides repeated opportunities for students to review and use new vocabulary over time, including discussing ways that new vocabulary relate to one another and to students' existing conceptual knowledge.
- explicitly teaches words that build necessary knowledge for reading and writing texts of instruction
 - ❖ engages students in morphemic analysis (i.e., analysis of the meaning of word parts) of unfamiliar vocabulary.
- selects Tier 2 and Tier 3 vocabulary words to teach using disciplinary texts of instruction.
- encourages talk about vocabulary among students and models how to examine and evaluate the functions of language to achieve certain outcomes within systems and relations of power.
- encourages students to identify and explore new vocabulary independently and provides instruction to support this process.

Vaughn, S., Martinez, L. R., Linan-Thompson, S., Reutebuch, C. K., Carlson, C. D., & Francis, D. J. (2009). Enhancing social studies vocabulary and comprehension for seventh-grade English language learners: Findings from two experimental studies. *Journal of Research on Educational Effectiveness*, 2(4), 297-324.

De La Paz, S., Felton, M., Monte-Sano, C., et. al. (2014). Developing historical reading and writing with adolescent readers: Effects on student learning. *Theory & Research in Social Education* 42(2).

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8. Ongoing observation and assessment of students' language and literacy development that informs their education

The teacher:

- engages in observation and assessment guided by:
 - ❖ an understanding of language and literacy development (e.g. creating a range of assessment items guided by an understanding of the difference between literal comprehension and inferential comprehension of texts).
 - ❖ an understanding of assessment as an opportunity to identify and build upon student strengths, as well as to address areas of improvement;
 - ❖ an understanding of, and respect for, the student as a member of multiple cultures and linguistic communities;
 - ❖ a recognition of students' socioemotional needs;
 - ❖ relevant standards documents.
- prioritizes observation and assessment that is closest to actual reading and writing.
 - ❖ e.g. prioritizing student work/writing as data for making instructional decisions as opposed to relying on standardized test scores which can mask proficiencies and areas in need of development.
- administers assessments as one source of information to determine which students may need additional instructional supports.
- employs formative and diagnostic assessment tools as needed to inform specific instructional targets (e.g., assessing knowledge of specific vocabulary words taught, reading and writing strategies being used and not used) and engage in the instructional practices described in this document.
- provides students with timely and specific formative feedback to drive learning and disciplinary literacy development.
- involves students in the development of learning goals, as well as in supported, productive self and peer assessment / feedback.
- develops assessments that analyze how students apply disciplinary tools, concepts, and literacy practices across relevant social science domains (civics, economics, geography, history).
 - ❖ assesses students ability to evaluate sources, use evidence, and make evidence-based claims.

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9. Community networking to tap into available funds of knowledge in support of developing students' social science knowledge and identities

The teacher provides learning activities that:

- help students connect and build on their in-school and out-of-school literacy practices and identities.
 - ❖ connect social science learning to family and community histories, geographic patterns or features, economic and political decisions
 - ❖ tap into community activities and audiences to address social scientific concerns, particularly at local and state levels of government when appropriate.
 - ❖ connect to youth and popular cultural activities and concerns.
- leverage students' literacies, learning, and knowledge to benefit their school, district, and/or community (e.g. peer education, research fairs, student to student mentoring, service learning).
- invite people from occupations who use the social sciences (e.g. historians, economists, geographers, local government officials, law enforcement, or political scientists) to the classroom (either face-to-face or via digital tools) to work with and engage in conversation with students.
- connect to and engage with social science activities and spaces in local communities (museums, universities, community colleges, governmental agencies, monuments/memorials, historical societies, community based organizations, etc.).
- enable students to communicate conclusions to authentic audiences and take informed action on issues of public policy and/or social justice.
- honor the diversity of literacy practices and historical narratives in the school community.

Gutiérrez, K., Rymes, B., & Larson, J. (1995). Script, counterscript, and underlife in the classroom: James Brown versus Brown v. Board of Education. *Harvard educational review*, 65(3), 445-472.

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10. Metadiscursive awareness within and across academic and cultural domains (attention to language use at the "meta" level, e.g. talking about talk)

The teacher:

- supports students to connect and build on their in-school and out-of-school literacy practices and ways with words by identifying language processes and discussing how language is used based on different purposes and audiences, and cultural perspectives.
 - ❖ e.g. discussing the role of audience and purpose with students by having them compare how they communicate with friends about an issue or problem to how they might communicate about the same topic with an authority figure like a principal, and then using this discussion to help them think about other comparisons like the differences between writing a text message and writing an academic paper. The goal is to make them aware of how language can and should shift in different contexts.
- engages students in high level discussion about ways with words within and across the disciplines.
 - ❖ e.g. discussing how and why the meaning of a word like product changes in meaning across academic contexts
 - ❖ e.g. noting how the use of first person in writing changes across academic disciplines and genres
- provides learning activities that teach students to evaluate how language is used in powerful and effective ways in the discipline based on the purpose, audience, historical and social context, and genre of the text.
 - ❖ e.g. having students analyze important, influential texts in the discipline (e.g. Martin Luther King's "I have a dream" speech) and discuss why and how that particular text made an impact, with an emphasis on the use of language
 - ❖ e.g. teaching students about the standards of evidence in the disciplines of the social sciences and using these to create powerful arguments

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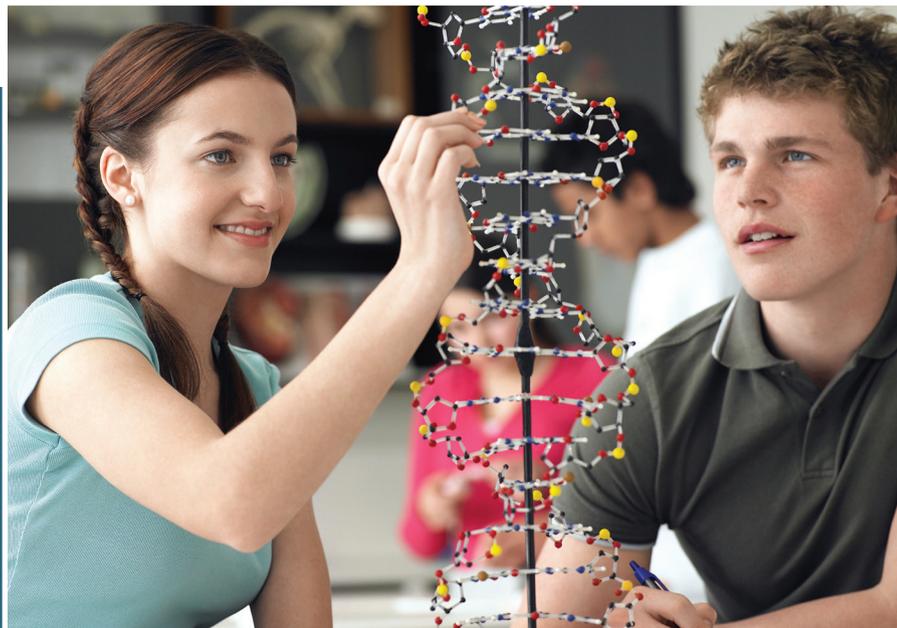
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GRADES 6 TO 12

Essential Practices for
Literacy Instruction in
the Secondary Science
Classroom

Deliberate, research-supported efforts to motivate, engage, and support reading, writing, speaking, listening, and viewing in science



1. Problem-based instruction

Develop and implement interactive, problem-based units of instruction that frame scientific problems and phenomena, as well as engineering problems, to help establish purposes for students to read and write beyond being assigned or expected to do so (e.g. for their enjoyment/interest; to ask and answer questions about the natural and physical world including questions relevant to their communities, health, and lives; to address needs or problems in their community or beyond; and to communicate with a specific audience about science and engineering).

**Within these phenomenon or
problem-based units, the teacher:**

- supports students to develop and pursue questions about the natural world inspired by their lived realities that can leverage the experiences, knowledge, and resources of their communities and families.
- engages students in abstract scientific thinking and reasoning, as well as in iterative design thinking.
- helps students see science and engineering in their everyday lives and identities by reading and engaging in authentic investigations, simulations, and/or engineering design cycles.
- helps students explore scientific theories in order to understand that science can be used to wonder about the world and that such wondering can lead to applications of scientific concepts in the world outside of school.
- creates opportunities for students to enact scientific and literate identities, drawing from both within and outside of school literacy practices (e.g. positions students as science writers and communicators by having them produce educational materials for younger students).
- provides regular opportunities for students to make choices in their reading, writing, and communication.
- offers regular opportunities for students to collaborate with peers in reading, writing, speaking, and listening, such as small-group discussion of texts on questions of interest and opportunities to write within group projects.
- provides scaffolded support to students as needed to assist them in developing their literacy proficiencies, removing supports over time to generate more independence.
- differentiates instructional processes and product expectations to account for varying academic needs to appropriately challenge all students.

Gallagher, S. A., Sher, B. T., Stepien, W. J. and Workman, D. (1995). Implementing Problem-Based Learning in Science Classrooms. *School Science and Mathematics*, 95, 136–146.

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2. Diverse texts and abundant reading opportunities in the school

The teacher:

- engages students in the exploration of compelling phenomena or problems to generate questions and set purpose for the use of texts and primary source documents, secondary source documents, students, family, and/or community generated text (or use print or digital resources) in order to make sense of complex ideas.
- provides access and regular opportunities to draw on text to support explanation of phenomena and solution of problems with
 - ❖ a wide range of texts relevant to science and engineering concepts and of varying complexities and types (i.e. print, audio, visual, and multimodal) including scientific reports, science related policy documents, research notes, newspaper articles, magazines, journals, data representations, diagrams, infographics, documentary videos, science websites, technical manuals or instructions, and/or any print or digital resources that can be read or viewed to make meaning.
- ❖ a wide range of science and engineering texts by diverse authors, including student-created text, that help students see science and engineering as connected to their lives and interests and that reflect their backgrounds, cultural experiences, and interactions with the natural and designed world, and that also reflect the backgrounds and cultural experiences of others.
- engages students with digital and/or online texts, databases, and tools in the service of scientific explanations or engineering design.

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3. Intentional and standards-aligned instruction in disciplinary reading

The teacher:

- establishes compelling reasons for reading in science and/or engineering as related to the phenomenon to be explained or problem to be solved (see recommendation #1 above).
- teaches students to recognize and analyze different purposes and audiences for science and engineering writing.
- provides opportunities for students to apply disciplinary tools and concepts when working with text.
 - ❖ explicitly names, describes, and models the dispositions, strategies, and patterns of thinking utilized by scientists and engineers.
 - ❖ models* through think-alouds how to ask reasonable scientific questions of texts.
 - ❖ teaches students how to ask testable questions of ideas in texts and define problems to be explored through experimentation, observation, design cycles, or discussion and/or writing.
 - ❖ teaches students to critically comprehend and evaluate a range of scientific explanations** of processes and phenomena.
 - ❖ teaches students to critically engage with scientific argumentation** by
 - analyzing claims found in text and evaluating the evidence provided and considering a range of perspectives (perspectives may be disciplinary, cultural, gendered, etc.).
- modeling the analysis and interpretation of data to produce evidence to support claims, and providing students supported opportunities to do so as well.
- modeling the questioning of evidence for possible challenges or rebuttals to claims, and providing students supported opportunities to do so as well.
- ❖ models how to draw and present claims based on evidence in oral and written language.
- ❖ models for students how to comprehend and evaluate texts to interpret results of investigations.
- ❖ teaches students to read, analyze, and interpret artifacts and data that scientists might use to build scientific arguments.
- ❖ models how to interpret and use data gathered in the process of engineering design cycles in order to explore and/or optimize possible solutions
- engages students in real-world investigations about questions of interest to them using a range of texts that should include tables, charts, graphs, diagrams, videos, and articles:

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3. Intentional and standards-aligned instruction in disciplinary reading (continued)

- ❖ collects and analyzes data with students.
- ❖ models how to record data observations systematically and rigorously, and supports students as they learn how to do so, by:
 - employing multiple forms of representation to record data or model phenomena or relationships (e.g. drawings, numbers, graphs, charts, word-based descriptions, etc.).
 - teaching students how to translate from one representation of data to another in the process of data analysis.
- ❖ models how to discern data patterns and determine significance, and use evidence to support claims or inform engineering design solutions, and provides students supported opportunities to do so
- ❖ teaches students how to strategically use and analyze a range of science and/or engineering texts

and tools, including digital texts and tools.

- engages students in creating, analyzing, and evaluating a wide range of scientific models of phenomena, or engineering models of potential solutions to a design problem.
- scaffolds reading activities as appropriate using a range of strategies.
- scaffolds instruction to respond to linguistic diversity as students draw on texts and scientific representations.

Greenleaf, C., Brown, W., & Litman, C. (2004). Apprenticing urban youth to science literacy. *Bridging the gap: Improving literacy learning for preadolescent and adolescent learners in grades 4, 12*, 200-226.

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Tang, K.-S., & Putra, G. B. S. (2019). In Global developments in literacy research for science education (pp. 281–300). essay, SPRINGER INTERNATIONAL PU.

4. Intentional and standards-aligned instruction in disciplinary writing

The teacher:

- establishes various compelling reasons for writing in science (see Practice #1) and teaches students to:
 - ❖ write for different purposes, such as to process and analyze scientific texts, develop and carry out an investigation, to research and/or explain a phenomenon, to put forth an evidentiary claim or scientific model, or to communicate about engineering design processes and solutions.
 - ❖ write for different audiences, such as scientific, engineering, and public audiences.
 - ❖ consider how language choices and conventions can shift depending upon purpose and audience.
- provides regular time for students to write, aligned with instructional practice #1, both formally and informally, including the use of iterative writing processes (e.g. drafting, revising from feedback, editing, publishing)
- explicitly names, describes, and models the dispositions, strategies, and patterns of thinking typical of different forms of science writing.
- provides instruction in discipline-specific writing processes, strategies, and conventions, and discusses why those writing norms exist in the discipline (e.g. notation conventions) such as:
 - ❖ recording observations and other data in systematic ways (e.g. logs, notebooks, spreadsheets, tables, sketches, diagrams, etc.)
 - ❖ analyzing and interpreting data.
 - ❖ designing appropriate and flexible systems for recording, documenting and analyzing data and/or engineering design decisions.
 - ❖ developing models of relationships and patterns in data.
- teaches students how to write scientific arguments by:
 - ❖ using examples of well-written scientific arguments to help students learn the features of strong scientific arguments.
 - ❖ iteratively writing scientific arguments on a regular basis.
 - ❖ providing explicit instruction as needed in the use of text features, writing mechanics and other standards-aligned content.
- provides students scaffolded opportunities to explore and use different text features (e.g. headings; table of contents; glossary, etc.) and text structures (cause and effect; problem / solution; sequence of events; etc.) in their writing about science and engineering.
- engages students in using both paper/pencil and digital media tools to process investigations and develop models.
- moves students to independent levels of research, reading, and writing.
- scaffolds writing activities as appropriate using a range of strategies.
- supports students to write and communicate across linguistic differences.

Duschl, R.A. & Osborne, J. (2002). Supporting and Promoting Argumentation Discourse in Science Education. *Studies in Science Education* 38, 1.

Lee, O., Quinn, H., & Valdes, G. (2012). Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know. *Understanding Language: Stanford University School of Education*.

Pearson, P. D., Moje, E. B., & Greenleaf, C. (2010). Literacy and science: Each in the service of the other. *Science*, 328, 459-463.

Tang, K.-S., & Putra, G. B. S. (2019). In Global developments in literacy research for science education (pp. 281–300). essay, SPRINGER INTERNATIONAL PU.

5. Higher-order discussion of increasingly complex text across varying participation structures

The teacher:

- establishes compelling reasons that connect to students' identities for engaging in discussion of texts (see Practice #1), including texts produced by students, and involves students in
 - ❖ discussion of observations, investigations, models, or prototypes as they apply to a phenomenon or problem that is the focus of learning.
 - ❖ discussion of text genres, structures, and discursive practices of the discipline.
 - ❖ discussions that surface, in productive ways, students' ideas (regardless of scientific accuracy) about the science phenomenon and principles.
 - ❖ discussion in which they iteratively formulate explanatory models by integrating and synthesizing concepts across science domains and within engineering.
 - ❖ discussions of scientific claims in which they evaluate the evidence and reasoning used to support the claims.
- teaches students how to engage in productive discussions, making visible common purposes or outcomes of discussion and dialogue in science and engineering (e.g. forming hypotheses; triangulating data; testing hypotheses and forming conclusions based on analysis; defining an engineering problem; exploring how to optimize a design solution) while also attending to issues of equity, power, and justice.
- allocates time for whole-group, small-group, and pair discussion of text, and uses a range of discussion and grouping strategies.
- poses questions that foster textual understanding and higher-order engagement with text (e.g. questions that move students beyond literal understanding into inferential and extended thinking about ideas in text) and provides modeling and instruction to teach students how to generate their own higher level questions.
- has students read and discuss the findings and significance of multiple scientific accounts or explanations of a similar problem or phenomenon (e.g. comparing findings from two studies on the same question, or evaluating differing design solutions to the same problem).
- supports students explaining phenomena from a scientific perspective and often using age-appropriate and accurate scientific language.
- engages students in discussion around digital and media literacies as used in science and engineering practices, and engages students in dialogue through digital tools to share and communicate ideas.

Greenleaf, C., Brown, W., & Litman, C. (2004). Apprenticing urban youth to science literacy. *Bridging the gap: Improving literacy learning for preadolescent and adolescent learners in grades 4, 12*, 200-226.

Lee, O., Quinn, H., & Valdes, G. (2012). Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know. *Understanding Language: Stanford University School of Education*.

Rappa, N. A. & Tang, K.-S. (2018). Integrating disciplinary-specific genre structure in discourse strategies to support disciplinary literacy. *Linguistics and Education*, 43, 1–12. <https://doi.org/10.1016/j.linged.2017.12.003>

6. Opportunities for and instruction in speaking and listening

The teacher:

- establishes compelling reasons for presenting and listening to teachers' and peers' presentations, including the sharing of scientific explanations, arguments, and models; as well presentation of engineering design processes and solutions.
- makes visible the importance of audience and purpose for different types of scientific communication and provides opportunities for students to develop presentations for different audiences and purposes, both real and simulated.
- provides regular opportunities for students to listen and respond to oral presentations, including those that incorporate visual and quantitative evidence or data to make students' conclusions public (e.g., debate, reports, presentations to external audiences).
- models and teaches strategies for effective oral communication in science.
- teaches students strategies for listening and responding to presentations.

Duschl, R.A. & Osborne, J. (2002). Supporting and Promoting Argumentation Discourse in Science Education. *Studies in Science Education* 38 , 1.

Greenleaf, C., Brown, W., & Litman, C. (2004). Apprenticing urban youth to science literacy. *Bridging the gap: Improving literacy learning for preadolescent and adolescent learners in grades 4, 12*, 200-226.

Lee, O., Quinn, H., & Valdes, G. (2012). Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know. *Understanding Language: Stanford University School of Education*.

7. Intentional efforts to build age-appropriate scientific vocabulary and conceptual knowledge

The teacher:

- presents vocabulary as language in use (rather than presenting scientific terms from decontextualized lists).
- capitalizes on students reading, writing, speaking, and listening experiences around phenomena to identify and use age-appropriate scientific words and principles.
- identifies multiple meanings or nuanced meanings of a scientific word across different contexts and encourages students to use new scientific words accurately in meaningful contexts (e.g., discussion of texts, discussions of content area learning, concept or semantic maps, diagrams).
- provides iterative opportunities for students to explore, review, and use new vocabulary over time, both verbally and in writing, including discussing ways that new vocabulary words relate to one another and to students' existing conceptual knowledge.
- when needed, explicitly teaches words that build necessary knowledge for reading and writing texts of instruction.
- engages students in morphemic analysis (i.e., analysis of the meaning of word parts) of unfamiliar words.
- selects Tier 2 and Tier 3 vocabulary words to teach using disciplinary texts.
- encourages productive talk among students, particularly during disciplinary learning and students' discussions of print or digital texts.
- encourages students to identify, explore and then appropriately use new words independently and provides learning opportunities to support this process.

Duschl, R.A. & Osborne, J. (2002). Supporting and Promoting Argumentation Discourse in Science Education. *Studies in Science Education* 38, 1.

Greenleaf, C., Brown, W., & Litman, C. (2004). Apprenticing urban youth to science literacy. *Bridging the gap: Improving literacy learning for preadolescent and adolescent learners in grades 4, 12, 200-226.*

Lee, O., Quinn, H., & Valdes, G. (2012). Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know. *Understanding Language: Stanford University School of Education.*

8. Ongoing observation and assessment of students' academic language and literacy development that informs their education

The teacher:

- engages in observation and assessment guided by:
 - ❖ an understanding of language and literacy development (e.g. understanding the difference between literal comprehension and inferential comprehension of any text, including scientific texts, is helpful for teachers when developing and analyzing text-based assessment items).
 - ❖ an understanding of assessment as an opportunity to identify and build upon student strengths, as well as to address areas of improvement;
 - ❖ an understanding of, and respect for, the student as a member of multiple cultures and linguistic communities;
 - ❖ a recognition of students' socioemotional needs;
- prioritizes multiple forms of student work as data for making instructional decisions rather than to standardized test scores which can mask proficiencies and areas in need of development.
- administers multiple forms of formative assessment as one source of information to determine which students may need additional instructional supports .
- employs formative and diagnostic assessment tools as needed to inform specific instructional targets (e.g., assessing knowledge of specific vocabulary words taught, reading and writing strategies being used and not used) and engage in the instructional practices described in this document.
- provides timely and specific formative feedback to students to guide learning and literacy development.
- involves students in the development of learning goals, as well as in supported, productive self and peer assessment / feedback.
- develops assessments that analyze how students apply disciplinary tools, concepts, and literacy practices.
 - ❖ assesses students' ability to analyze data and use evidence to support a scientific claim.

Keeley, P. (2015). *Science Formative Assessment, Volume 1: 75 Practical Strategies for Linking Assessment, Instruction, and Learning.* Corwin Press.

Bailey, A. L., & Heritage, M. (Eds.). (2008). *Formative assessment for literacy, grades K-6: Building reading and academic language skills across the curriculum.* Corwin Press.

9. Community networking to tap into available funds of knowledge in support of developing students' science knowledge and identities

The teacher provides learning activities that:

- help students connect and build on their in-school and out-of-school literacy practices and identities.
- connect science learning to family and community issues, local and regional problems or concerns, and economic and political decisions.
- tap into community activities and audiences to address and explore scientific questions, or natural and social concerns.
- connect to youth and popular cultural activities and concerns.
- leverage students' literacies, learning, and knowledge to benefit their school, district, and/or community (e.g. peer education, research fairs, student to student mentoring, service learning).
- invite people from diverse (e.g. ethnic, cultural, gendered, etc.) perspectives who represent a range of occupations who use science and engineering practices in their work to the classroom (either face-to-face or via digital tools) to work with and engage in conversation with students.
- connect to and engage with informal and out-of-school time science experiences in local communities (museums, laboratories, universities, community colleges, governmental agencies such as health departments, etc.).
- enable students to communicate their own and others' scientific models and explanations and engineering problems to authentic audiences through argumentation.

González, N., Neff, D., Amanti, C., & Moll, L. (2006). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. In *Funds of knowledge* (pp. 83-100). Routledge.

Lee, O., Quinn, H., & Valdes, G. (2012). Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know. *Understanding Language: Stanford University School of Education*.

Moje, E. B., Ciechanowski, K. M., Kramer, K., Ellis, L., Carrillo, R., & Collazo, T. (2004). Working toward third space in content area literacy: An examination of everyday funds of knowledge and discourse. *Reading research quarterly*, 39(1), 38-70.

10. Metadiscursive awareness within and across academic and cultural domains (attention to language use at the “meta” level, e.g. talking about talk)

The teacher:

- supports students connecting and building on their in-school and out-of-school literacy practices and ways with words by identifying language processes and discussing how language is used based on different purposes and audiences, and cultural perspectives.
 - ❖ e.g. discussing the role of audience and purpose with students by having them compare how they communicate with friends about an issue or problem to how they might communicate about the same topic with an authority figure like a principal, and then using this discussion to help them consider other comparisons of language use such as the differences between writing a text message and writing a scientific presentation. The goal is to make them aware of how language can and should shift in different contexts.
- engages students in metalinguistic discussion about ways with words within and across the disciplines and areas in need of development.
 - ❖ e.g. discussing how and why the meaning of a word like product changes in meaning across academic contexts
 - ❖ e.g. noting how the use of first person in writing changes across academic disciplines and genres
- provides learning activities that teach students to evaluate how language is used in powerful and effective ways in the discipline based on the purpose, audience, historical and social context, and genre of the text.
 - ❖ e.g. having students analyze important, influential texts in the disciplines of the sciences (e.g. Darwin's *On the Origin of Species*) and discuss why and how that particular text made an impact, with a focus on language use
 - ❖ e.g. teaching students about the standards of evidence in different forms of science writing and using these to create powerful arguments

Greenleaf, C., Brown, W., & Litman, C. (2004). Apprenticing urban youth to science literacy. *Bridging the gap: Improving literacy learning for preadolescent and adolescent learners in grades 4, 12*, 200-226.

Campbell, T., Oh, P. S., & Neilson, D. (2012). Discursive modes and their pedagogical functions in model-based inquiry (MBI) classrooms. *International Journal of Science Education*, 34(15), 2393-2419.

Glossary:

The terms below are part of the technical and disciplinary language of education. Many of these terms are familiar, but many also have multiple interpretations, so it is important to develop shared understandings of our operating definitions as you consider the practice recommendations in this document. We offer definitions of some important terms below. These particular terms are woven throughout this document and were identified as essential words of academic discourse by members of the statewide working group.

Critical Literacy

Critical literacy is the ability to read texts in an active, reflective manner in order to better understand power, inequality, culture, formative assessment, community, and injustice in human relationships.¹

Culture/Cultural Domains

Cultural domains are categories of human interaction, belief, and meaning that every culture shares. There are several domains of cultural, including Family & Kinship, Religion & Spirituality, Sex & Gender, Political & Social Relations, Economics & Resources, Time & Space, Language & Communication, Technology & Material, History & Myth, Sustenance & Health, Aesthetics & Recreation, and Learning & Knowledge. The intersections across domains show how cultures are holistic systems, meaning all the parts are connected, and change in one area will usually cause change in several other areas.

Culturally Responsive

Cultural responsiveness requires individuals to be culturally competent. This competency is having an awareness of one's own cultural identity and views about difference, and the ability to learn and build on the varying cultural and community norms of students and their families. It is the ability to understand the within-group differences that make each student unique, while celebrating the between-group variations that make our [world] a tapestry. Culturally responsive leaders need to continuously support minoritized students through examination of assumptions about race and culture. Further, they argue that as demographics continue to shift, so should practice that responds to student needs, understanding that it is “deleterious for students to have their cultural identities rejected in school and unacknowledged as integral to student learning” (Khalifa, Gooden, & Davis, 2016).

Culturally Sustaining Pedagogy

Seeks to perpetuate and foster—to sustain—linguistic, literate and cultural pluralism as part of school for positive social transformation and revitalization. (Django Paris and H. Samy Alim)

Direct instruction

Direct instruction is a broad term used to describe the explicit teaching of a particular skill set or body of knowledge through lecture delivery or demonstrations to students.

Direct instruction is a valuable approach to teaching discrete skills and particular sets of facts that students need. It can and should be paired with other instructional approaches like inquiry-based learning.

In direct instruction, the teacher is providing information to the students. In the 6-12 classroom, this might be seen as lecture or dialogue. The students' role is to listen, ask meaningful questions, take notes, and consolidate information.

Disciplinary Literacy

Disciplinary literacy refers to the specialized literacy practices of a particular disciplinary domain or area (e.g. mathematics, history, biology). These practices include the ways that scholars identify, evaluate, use, and produce the wide range of texts and information or data sources typical of their particular discipline, including the specialized reading, writing, and communication practices used to analyze, produce, and share information. Disciplinary literacy also includes specialized vocabularies and communication norms that shift across purposes and audiences authentic to the discipline. Some scholars include ways of thinking about text and communication as a part of disciplinary literacy.

Disciplinary literacy instruction helps students learn the content and practices of important academic disciplines and also helps them develop critical literacy and thinking skills. This includes, but is not limited to, the use and production of a wide range of texts. Disciplinary literacy instruction also helps to prepare students for critical media consumption, college level learning, and a range of career trajectories.

Discourse

Discourse, in the context of this document, refers to the ways of using language and communication practices in a particular community or domain. Discourse norms

Discourse continued on next page

and practices shift across disciplines and/or communities.

Explicitly teaching students the discourse of a discipline helps them gain access to content presented in disciplinary texts, prepares them to produce disciplinary work, and builds their metacognitive awareness of language across domains.

Discursive

Discursive means “of or relating to discourse.” So the discursive practices of a discipline, for example, are the distinct ways that people in that discipline generally use communication and language in their work.

In mathematical writing, for example, adjectives are used only when needed and with precision. When reading a mathematics text, therefore, mathematicians tend to view adjectives as precise descriptors and don’t look for deeper meanings. In historical writing, however, adjectives have the potential to convey an attitude or perspective about events, so historians think about who the author of a text was as they also analyze their word choice and consider the possible bias of the source. The discursive practices of the disciplines are different, so texts are read differently as well.

Domain

In this document, domain refers to an academic subject or field of study.

It is important to introduce students to the idea that the domains or disciplines they study, while similar in some ways, also have important differences in how knowledge is constructed and communicated.

Explicit instruction

Explicit instruction involves planned and purposeful instruction in which a teacher clearly lays out identifiable learning goals for students, provides modeling or demonstration of a skill or strategy, opportunities for practicing the developing skill with feedback, and additional independent practice with clear criteria for success.

Explicit instruction is particularly important for the development of academic vocabulary, disciplinary reading

skills, and disciplinary writing skills. Learning goals should drive the selection of instructional strategies, and learning processes need to be clearly modeled and scaffolded for students.

Formative Assessment

Formative assessment is a planned, ongoing process used by all students and teachers during learning and teaching to elicit and use evidence of student learning to improve student understanding of intended disciplinary learning outcomes and support students to become self-directed learners. Effective use of the formative assessment process requires students and teachers to integrate and embed the following practices in a collaborative and respectful classroom environment: Clarifying learning goals and success criteria within a broader progression of learning; Eliciting and analyzing evidence of student thinking; Engaging in self-assessment and peer feedback; Providing actionable feedback; and Using evidence and feedback to move learning forward by adjusting learning strategies, goals, or next instructional steps. (Michigan Assessment Consortium)

Funds of Knowledge

Funds of knowledge is a concept that emerged from the work of researchers Luis Moll, Cathy Amanti, Deborah Neff, and Norma Gonzalez (2001). They describe funds of knowledge “as the historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and well-being” (p. 133). In other words, funds of knowledge represent the resources that students can call upon in their learning through life experience and in connection to social networks in their community.²

Attending to funds of knowledge in a learning community can help both teachers and students tap into valuable resources and extend their learning opportunities beyond the classroom walls.

Genre

Genre is a category of artistic composition, as in music or literature, characterized by similarities in form, style, or subject matter. It is also used to describe different forms or types of writing and communication. A

genre has identifiable characteristics and structures that differentiate it from others.

While most commonly used in literature and English Language Arts, genre is used across these documents to refer to different types of texts that are produced in the disciplines. Different genres of text have different conventions, structures, and other features, and it is important to make these visible to students as they both read and produce a range of texts.

Inquiry and inquiry-based learning

Inquiry-based learning is a form of learning that starts with the development and exploration of questions, problems or scenarios—rather than simply delivering information or facts. Inquiry learning involves students in investigations, research, phenomena-based or problem-based learning experiences in which they construct knowledge. It is often facilitated with a teacher helping to guide the inquiry process.

While more time consuming, research suggests that inquiry-based learning in all major content areas results in deeper student learning of conceptual knowledge. All of the major sets of learning standards and/or frameworks (CCSS, NGSS, C3) now explicitly attend to and promote inquiry in the classroom.

Inquiry-based learning falls along a continuum. Inquiry with high teacher direction and low student direction may be referred to as “Limited Inquiry”. When students have more direction on the continuum, we may use the term “Structured Inquiry”. Further along the continuum with higher student direction is referred to as “Guided Inquiry”, and inquiry with the highest level of student control and the lowest level of teacher control is referred to as “Open Inquiry”.

Intentional Instruction

Intentional instruction occurs when the teacher is clear and transparent about what they are going to teach. In this framework, teachers purposefully identify and then implement specific strategies, tools, or learning routines that can help students achieve established learning goals.

Intentional instruction pays attention to

what students will learn, but also how, when, and why they will learn it. This includes creating, sharing, connecting to, and assessing learning targets.

Intentional instruction is an important concept in that it reminds educators of the importance of intentional planning and thoughtful selection of strategies, tools, and routines that align with learning goals.

Linguistic Diversity

Approximately seven thousand spoken languages and innumerable spoken dialects and sign languages are in use around the world, some with millions of speakers and others with only a few. The study of linguistic diversity includes how languages are acquired; language pedagogy; individual and societal impacts of bi/multilingualism; policy and political issues; and language maintenance, revitalization, and loss. Addressing these issues requires multidisciplinary perspectives, and the references here reflect that multidisciplinary. (Teresa McCarty and Ran Chen)

Literacy

In this document, literacy is framed as a set of socially constructed (developed by people through interaction) practices that use some form of a symbol system to communicate meaning, along with a technology to produce and share it. Therefore, literacy is more than just the skill sets of reading and producing different forms of texts; it also includes the application of these skills “for specific purposes in specific contexts of use” (Scribner & Cole, 1981).

Literacy then provides the means to access, process, and communicate information. It is central to all academic disciplines and should thus be included as an important component in disciplinary instruction.

Literacy has always been a collection of cultural and communicative practices shared among members of particular groups. As society and technology change, so does literacy. Because technology has increased the intensity and complexity of literate environments, the 21st century demands that a literate person possess a wide range of abilities and competencies, many literacies.³

Media literacy

“Media Literacy is a 21st century approach to education. It provides a framework to access, analyze, evaluate, and create messages in a variety of forms, from print to video to the Internet. Media literacy builds an understanding of the role of media in society as well as essential skills of inquiry and self-expression necessary for citizens of a democracy.”⁴

Media literacy is extremely important in today’s technologically driven society. Students encounter a vast amount of information across multiple media, and they must call upon a wide body of knowledge and a range of analytical skills to critically interact with this information.

Metadiscourse

Metadiscourse is a term that refers to a discussion about a discussion (and so on), as opposed to a simple discussion about a given topic. It involves communication and consideration of communication itself. **Metadiscursive** then means “of and pertaining to metadiscourse.”

So metadiscursive analysis is the process of using language to analyze and consider how language is used in different contexts. Building metadiscursive awareness is important so that students become more thoughtful and strategic in their use of language. Students move through multiple academic domains over the course of a day, each with differing ways of communicating, and it is helpful to make this visible to them.

Modality

A modality is a specific form or mode in which something exists, is experienced, or is expressed.

Students encounter information and data, and they communicate about information and data, across multiple modalities. They interact with print text, audio, video, and multimodal websites. It is therefore important to provide practice and instruction with information across modalities.

Modeling

In this document, when referring to general teaching practices, such as “teacher models how to discern data patterns,” modeling is

the teaching practice of demonstrating a process for students in order to show them how it is done.

Effective modeling involves breaking down complex practices into steps when helpful; questioning learners about what they are seeing; thinking out loud; and engaging students in dialogue about the practice or process once demonstrated.

More specific to science and mathematics, modeling also refers to the development of simplified representations of complex concepts or systems that help to explain a phenomenon or to make predictions about the phenomenon. Models can be mental representations or other external representations that exist in diverse formats, from drawings to 3D models to physical enactments of systems.

Morphemic Analysis

Morphemic analysis is a strategy used to determine or infer the meanings of words by examining their meaningful parts (prefixes, suffixes, roots, etc).

Morphemic analysis is a key skill for building word knowledge that is important across all of the academic disciplines.

Multimodal

Multimodal refers to something occurring or being communicated through multiple media of communication or varying forms of expression. For example, a campaign video may have images, music, text, and data all presented in one multimodal text. Students regularly interact with multimodal texts (videos with embedded audio text, for example), and need instruction and practice in order to be critical consumers of these texts.

Problem-based learning

Problem-based learning is a student oriented pedagogical framework in which learning about a given topic is grounded in collaborative work to solve a complex problem or answer an open-ended question.

Problem based learning is often used interchangeably with inquiry-based learning. In this document, we preferred to use problem based learning as we see it as a more open and flexible term. In this framework, engaging problems drive

learning and help to motivate students and provide purpose for literate practice. Problem based learning involves problem exploration and definition; elicitation and consideration of prior knowledge; generation of new questions that must be answered; evaluation of possible problem solutions or answers and ways to develop them; and engagement in the process of resolving the problem or answering the question; communication of findings, conclusions, or claims; and the possibility of generating new questions.

These practices, in general, are common to all disciplinary learning. Moreover, problems provide purpose for learning and direction for the use and production of text.

Registers

A register is a variety of a language used for a particular purpose or in a particular social setting (e.g. formal vs. informal registers in different situations).

Students learn about register as they learn about how our language use changes across social settings and communities.

Scaffolding, scaffolds

A way of teaching in which the teacher provides support in the form of modeling, prompts, direct explanations, and targeted questions – offering a teacher-guided approach to build independent knowledge or skill. As students begin to acquire mastery of targeted objectives, direct supports are reduced and the learning becomes more student-guided and independent.

Scaffolding is key to effective instruction and helps students develop new knowledge and skills when they are challenged. As scaffolds are removed students can become more independent learners. It is important, however, for teachers to use scaffolds strategically so as appropriately challenge students and engage them in productive struggle.

Social Emotional or Socioemotional Learning

Social and emotional learning (SEL) is an integral part of education and human development. SEL is the process through which all young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions. (CASEL)

Student Identities

Age, gender, religious or spiritual affiliation, sexual orientation, race, ethnicity and socioeconomic status are all identities. Some identities are things people can see easily (like race or assumed gender), while other identities are internalized and are not always easy to see (like a disability, socioeconomic status or education level). The broader society, over history, has defined, ascribed meaning, and given status and power to various identities. Since they can shape the experiences of students within classrooms, it is important for teachers to understand social identities to actively develop inclusive learning environments for all students

Text

In literary theory, a text is any object that can be "read," whether this object is a work of literature, a street sign, an arrangement of buildings on a city block, or styles of clothing. In this document, text refers to any kind of encoded information that students are asked to analyze, use, or produce.

As stated, students should have opportunities to work with a wide range of texts. Every academic discipline uses a wide range of texts and multiple ways to produce and communicate knowledge.

Text feature

Text features are the structural components of a text that provide guidance for readers, listeners, and/or viewers at the practical and conceptual level.

Structural text features in print, for

instance, include titles and subtitles, italics and bold words, tables of contents and indexes, and pictures and captions. In audio texts, features may include music, sound effects, a change in speaker; or verbal cues indicating a transition.

Conceptual text features include elements such as an argument with claim, evidence, and reasoning; a sequential narrative; a cause and effect explanation; a problem and solution structure; a comparison and contrast; or other specific way of organizing ideas.

Attending to text features can help students learn to read, listen, and view as well as to and write, speak, and produce texts more effectively for a variety of audiences, purposes, and contexts.

Text features include titles subtitles, headings, italics and bold words, table of contents, index, pictures and captions, diagrams, and other such parts of the larger text that convey meaning and provide structure.

Students can learn to use text features to read more strategically, and can also learn to use text features in their own text production to develop coherent and considerate texts.

Text structure

Text structure refers to how information within a text is organized, both in terms of format and conceptual structure. With respect to conceptual structure, text structure is the way that ideas are organized in a text, such as through an argument with claim, evidence, and reasoning; a sequential narrative; a cause and effect explanation; a problem and solution structure; a comparison and contrast; or other specific way of organizing ideas.

Attending to text structure helps students learn to read and produce text more effectively and helps them discern conceptual frameworks and ways of thinking about text and the ideas being communicated.

Theme

A **theme** in a piece of writing, a talk, or a discussion is an important idea or subject that runs through it. Theme is defined as a main idea or an underlying meaning of a literary work, which may be stated directly or indirectly. It is important not to confuse a theme of a literary work with its subject. Subject is a topic that acts as a foundation for a literary work, while a theme is an opinion expressed on the subject. For example, a writer may choose a subject of war for his story, and the theme may be his personal opinion that war is a curse for humanity. Usually, it is up to the readers to explore the theme of a literary work by analyzing characters, plot, and other literary devices.⁵

Tiered Vocabulary

Tier 1: These are the common, everyday words that most children enter school knowing already. Since we usually don't need to explicitly teach these, this is a tier without tears!

Tier 2: This tier consists of words that are used across the content areas and are important for students to know and understand. Included here are process words like analyze and evaluate that students will need to access and understand content; to participate effectively in

discussion, writing, and problem solving; and to apply their understanding outside the classroom. These are words to own for the rest of life.

Tier 3: This tier consists of content-specific vocabulary—the words that are often defined in textbooks or glossaries. These words are part of the disciplinary literacy (of mathematics, of science, of technology, etc.) and often convey precise and nuanced concepts and information. Year to year, these terms build and extend the breadth and depth of students' knowledge in and understanding of a subject, and students are unlikely to learn these terms by absorbing them in day-to-day life.⁶

Visual literacy

Visual literacy is the ability to analyze, interpret, and make meaning from information presented in the form of an image, or other visual representation.

Across multiple disciplines, images, graphics, and other visual representations are used to convey meaning. Students need instruction and support to learn the disciplinary, analytical skills of visual literacy.

Voice

Voice is the distinct personality, style, or point of view of a piece of writing or any other creative work.

Students need to become aware of differences across disciplines with respect to voice and the ways that voice is developed and expressed.



Literacy learning for all



¹ <http://www.learnnc.org/lp/pages4437>

² <http://www.learnnc.org/lp/pages939>

³ <http://www2.ncte.org/statement/21stcentdefinition/>

⁴ <http://www.medialit.org/about-cml>

⁵ <https://www.collinsdictionary.com/us/dictionary/english/theme>; <https://literarydevices.net/theme/>

⁶ Beck, McKeown, and Kucan (2013)