Volume Three

Early Childhood through Young Adulthood/
Career & Technical Education
Adolescence and Young Adulthood/Mathematics
Adolescence and Young Adulthood/Science
Early Adolescence/Science
Working Wisdom VOLUMES

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Early Childhood through Young Adulthood / Exceptional Needs Specialist
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Introduction

The National Board for Professional Teaching Standards (NBPTS) was founded in 1987 in order to achieve the following mission:

To advance the quality of teaching and learning by

♦ maintaining high and rigorous standards for what accomplished teachers should know and be able to do,

♦ providing a national voluntary system certifying teachers who meet these standards, and

♦ advocating related education reforms to integrate National Board Certification in American education and to capitalize on the expertise of National Board Certified Teachers.

National Board Certification has proven itself to be a valid and reliable method of identifying the nation’s accomplished teachers, with the added benefit of providing candidates with a professional development experience many rate as the best they have ever experienced. They also note, however, that it took a great deal of time—usually the first six weeks to three months of their candidacy, working with their standards, collecting evidence, and drafting portfolio entries—before everything clicked and they suddenly “got it.” Here are some examples of what they “got.”

♦ An understanding of what the National Board is assessing and measuring vs. what “I” want them to assess and measure.

♦ The National Board’s concept of “quality teaching” (as defined by NBPTS standards) vs. a collection of definitions for quality, some directly contradicting others, based for the most part on idiosyncratic experience.

♦ The ability to understand what really matters when demonstrating accomplished teaching vs. good stories that make me feel good about myself but don’t represent productive work.

♦ The difference between convincing evidence vs. relevant but unconvincing evidence.

♦ An engagement in critical self-analysis based on high and rigorous standards that lead to better teaching—regardless of how “good” I was before I began.

♦ An understanding that, for the National Board, the only thing that ultimately matters is improved student learning.

♦ An understanding that National Board certification is a designation they are working hard to earn, vs. an award or recognition they hope to win.

Our first goal in developing this guide was to help National Board candidates “get it” sooner rather than later: if a candidate would normally have “gotten it” in six weeks, we want the candidate to “get it” in three; if it would have taken three months, we hope to reduce the time to a month-and-a-half. It will still require a great deal of effort on a candidate’s part to “get it,” but it is our hope, by drawing on the wisdom and experience of National Board Certified Teachers, we will mark a path candidates can follow in an attempt to steer this professional growth experience in its intended direction a little sooner than might otherwise be possible.
Our second goal is to encourage school districts throughout Kansas to use this resource as a companion to the Note-Taking Guides developed by NBPTS and published on their web site in order to enhance their own staff development activities. All teachers, whether they are working toward National Board Certification or not, can improve the quality of their work if they have a better understanding of the factors related to accomplished teaching. For example, it is not enough to simply assert that knowledge of students matters. An accomplished teacher knows and understands

♦ why knowledge of students matters;
♦ the kind of knowledge about students that is most relevant to a specific teaching assignment;
♦ how to efficiently and effectively collect that knowledge; and,
♦ how to use that knowledge to build and/or strengthen instructional skills and abilities that will in turn contribute to improved student learning.

This same level of understanding is also crucial in goal setting and forming meaningful connections between goals, planning, structuring of instructional sequence, formative and summative assessments, analysis, reflection—and the list goes on and on.

It is important to remember that the suggestions included in this resource will not replace the insight and effort a National Board candidate must apply to the individual work as the candidate goes through the candidacy process nor guarantee success. The information in this resource is based on the writers’ various personal experiences with the NBPTS certification process. There is much more a candidate will have to address and provide in the way of information, supporting documents, instructional artifacts, etc. for each entry. The guidance authors provide here is, from their experience, what will help candidates overcome their greatest challenges in regard to developing and submitting strong entries—entries focused on the tasks of accomplished teaching and learning, and show evidence of meeting the NBPTS standards.

How to Use this Guide

Working Wisdom: A Guide to Accomplished Teaching is a larger resource divided into volumes of similar certificate areas. The purposes of sectionalizing are two-fold: (1) it will appear less daunting and increase the probability of its usage by candidates; and, (2) it will be easier to update when certificate changes are made by National Board for Professional Teaching Standards.

To make this resource user-friendly and appreciative of a candidate’s time, the suggestions listed within each certificate have been condensed. Instead of repeating the same suggestions for repeated sections of the Note-Taking Guide in Entry 2 or Entry 3 of the same certificate, the first bullet may read, “Refer to suggestions provided in Entry 1.” If there are additional suggestions (those not listed in the previous entry) then those will follow that first statement. Visually, this may appear as if Entry 2 and Entry 3 are less important. This could not be further from the truth. Each entry (1, 2, and 3) has an equal weight in the overall scoring of the total assessment process.

While we have made these suggestions certificate-area-specific, if you look through certificates other than your own area of certification you will find some significant similarities to go along with the inevitable differences associated with teaching at different developmental levels and/
or content areas. Some aspects of good teaching cross over developmental and disciplinary boundaries. Others do not.

**Support for National Board Candidates**

We have titled this resource *Working Wisdom: A Guide to Accomplished Teaching* for two specific reasons. First, and most importantly, the suggestions included in it have worked for the National Board Certified Teachers who made them.

Second, these suggestions reflect the wisdom of the NBCTs who made them. By wisdom, we mean something very specific: a clear and convincing understanding of both the ends (National Board Certification) and the means (how to achieve that Certification) of the candidacy process. In other words, following the advice presented here has the potential to increase candidates’ respective understandings of what they should be most concerned with, why they should be concerned with it, and how they should act on that understanding. This vision of the “big picture” is essential to help candidates use their time efficiently and effectively.

**Assumptions**

We make three assumptions about National Board Candidates who choose to use this document for assistance in their pursuit of National Board Certification:

- You have read and studied the standards for your certificate area.
- You have read and studied the instructions for each portfolio entry for your certificate area.
- You have read and studied the rubrics and Note-Taking Guide provided in the Scoring Guide for your certificate area.

Note: The Portfolio Instructions and the Scoring Guide can be found by going to the downloads section of the NBPTS Website (www.nbpts.org), finding your certificate area, and following the appropriate link to the desired destination.

**Getting Started**

Once you have completed the three tasks listed above, the “working wisdom” of a National Board Certified Teacher can be of help to you. There are many ways to use these suggestions, but here are what we believe will be the most helpful.

If you haven’t already printed out the “Composing My Written Commentary” section from your portfolio entry instructions, do so now. Then sit down with (1) that document, (2) a copy of the standards for your certificate area, and (3) the corresponding section (by both certificate area and portfolio entry number) of this booklet.

You will notice a series of italicized questions in your portfolio instructions. The Note-Taking Guide was designed to help you collect the clear, consistent, and convincing evidence you will include in your response to each of these questions, while the suggestions in this booklet will both help clarify what is meant by “clear, consistent, and convincing” and make very specific suggestions regarding how to collect that evidence.

Begin by identifying the suggestions from *Working Wisdom* that both relate to a specific prompt in your portfolio instructions and appear to offer you the most fruitful use of your time.
It is important to remember not all suggestions will be equally helpful to all candidates. Each contributor has offered suggestions for gathering evidence to support a candidate’s decision of how to possibly respond effectively to these prompts. The candidate should use whatever combination of those suggestions that will best help answer the prompts in a manner that is clear, consistent, and convincing for the reality of the candidate’s own classroom and journey through the National Board process.

The candidate must remember there is limited space in which to respond to each prompt; therefore, all information cannot be included because all information is not equally compelling for the reality of the candidate’s own classroom. The suggestions provided in this resource serve as a possible guide for responding to the written commentary prompts for each portfolio entry.

In any certificate area, a candidate must use professional judgment to select the best evidence possible to include in a portfolio entry rather than just the relevant evidence. Merely relevant evidence just fills space and compels an assessor to ask “So what?” Best evidence, however, is convincing and compels an assessor to smile and nod in agreement. It is the same experience you have as a teacher when a student “gets it,” and you are amazed that someone so young has such significant understanding.

Always aim for amazement.

**What? So What? and Now What?**

The prompts for the written commentary in each portfolio should lead the candidate to three types of thinking: description, analysis, and reflection. All three are essential to providing a clear, consistent, and convincing written response. To aid in this thinking, the candidate could review the written commentary to determine if the following three questions have been addressed:

- **What?** (description)  
- **So what?** (analysis)  
- **Now what?** (reflection)

**Other Staff Development Activities**

It is impossible to predict how a grade level, team, department, school, and/or school district might want to use this resource to enhance staff development activities. The best uses of it will undoubtedly be found in the nexus between a particular set of student needs and the creativity of someone trying to meet those needs—not in an introduction written in an office far from the real lives of students and teachers. Still, there are some suggestions that can be made to help teachers and school leaders find that nexus for themselves and use it to their advantage.

**Standards Matter**

By bringing standards from the National Board into grade level, team, department, school, and/or school district staff development activities, we can begin to raise teachers and school leaders’ expectations of quality. One of the most important things a teacher must “get” before able to demonstrate accomplished teaching is a clear sense of what National Board “quality” is. The same principle applies to groups of teachers as well. Reading and discussing the standards can help teachers clarify expectations for themselves and their students, increase rigor without just piling the work on higher and deeper, and strengthen relationships between schools and their external stakeholders—particularly with parents and community partners—in
ways that lead to significantly improved student learning. Dumping all of the standards for a specific certificate area on a group of teachers and school leaders, however, is much like telling employees that the beatings will continue until morale improves. Each set of standards is much too comprehensive to be approached in this manner.

**Start Small**

We recommend, to the greatest extent possible, staff development with the standards be done in small groups of teachers and school leaders with related professional needs and interests, and the standards used meet the specific needs of the participants involved. This will rarely, if ever, lead to a one-size-fits-all staff development program.

For example, the Adolescent Young Adult/English Language Arts certificate area consists of 16 standards. *Standard II: Knowledge of English Language Arts*, is made up of at least 26 elements, ranging from “Teachers understand the nature of motivation—including both intrinsic and extrinsic rewards—and that understanding allows them to engage students through deliberately and strategically crafted language experiences” to “Literature is understood as an expression of human creativity that evolves over time and can describe intellectual currents, social forces, and innovations.”

Members of a high school language arts department that consists of relatively inexperienced teachers could spend a year’s worth of work developing their skills in either of these two elements from *Standard II* and still have much work to do. Effective school leaders will recognize such an inexperienced group might need mentors to help them fully understand how to motivate all students, rather than those most like themselves, or that focusing on “literature as an expression of human creativity” is by no means an excuse to ignore conventions. Making wisdom work is not easy and requires experienced guidance, not trial by fire.

For a department consisting primarily of successful teachers with significant experience, however, such intense focus on either or even both of these elements could well be a waste of valuable time and erode staff morale. This group might be better served by linking the two elements from *Standard II* above with an element from *Standard IV: Fairness, Equity, and Diversity*, “Teachers appreciate and build on the diversity and commonalities they find within their classroom” and an element from *Standard V: Learning Environment*, “Teachers help students value what they have learned by providing the opportunity for them to apply their learning beyond the classroom.” Or their experience might lead them in an entirely different direction.

Most high school language arts departments, however, represent a mix of experience that makes these two extremes seem rather simplistic—and the same can be said of most groups of teachers in most schools. What really matters is that the teachers involved identify their needs and focus on those standards that will help them best meet those needs. This is where effective school leaders are critical, whether in the role of superintendent, curriculum coordinator, director of staff development, principal, grade level or team leader, department chair, mentor, or good friend. Since most teachers are not pursing National Board Certification, it is unrealistic to expect them to study the standards for their respective areas of certification to the same extent as would a candidate. Helping the teacher identify the connections among the needs of individual teachers, the needs of students, and the standards sets the stage for significant staff development that matters on a practical level for teachers. It is also critical that school leaders recognize when their “help” ceases to be helpful, and the best thing they can do is get out of the way of good work being accomplished.
Once these connections have been identified, this resource can provide helpful suggestions for specific staff development experiences that could range from self-contained, single-day sessions to on-going experiences that last an entire school year or even longer.

All teachers need to know and understand certain things:

- they need to use significant knowledge and understanding of their students to enhance the quality of their instruction;
- they need to have mastered the content for which they are responsible; they need to establish rigorous and worthwhile goals for their students;
- they need to engage in effective instructional design and create a learning environment that fosters student engagement;
- they need to simultaneously use assessments to both document and enhance student learning;
- they need to make concern for diversity a natural way to engage students rather than an imposition foisted on them by some external force;
- they need to view the establishment of meaningful partnerships with their students’ families and other concerned, external stakeholders within their school communities as fundamental job requirements; and,
- they need to engage in recursive, systematic reflection and critical analysis of their work.

*Working Wisdom: A Guide to Accomplished Teaching* is designed to provide educators with specific suggestions that will help them know and understand “these things.” We hope you find it useful.

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Entry 1:
Assessment of Student Learning

Entry 2:
Demonstration Lesson

Entry 3:
Fostering Teamwork

Contributor:
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Entry 1: Assessment of Student Learning

a. Knowledge of Students (KOS)

♦ Select only the areas below that are specific to your setting and necessary to demonstrate student impact for the lesson explained in the selected portfolio.

♦ Know the culture and special needs of your students.
  • Culture: languages spoken/written in the home, religious issues practiced or observed, gender issues.
  • Special needs: medications, 504 – IEPs, para support, emotional level, physical development level, ESL/ELL, and student life experiences (e.g., foreign /foster /migrant/mobility/military).

♦ Know students’ prior learning or experiences with technology.
  • Students’ understanding and prior use of computers, Internet, media sources, and software in the school setting and at home
  • Students’ current access at home and in the community to technology mentioned above

♦ Know students’ individual career interests.
  • Know each student’s specific career interests and future aspirations. This can be established through one-on-one conversations with each student and interest surveys.
  • Expose students to a variety of careers through professional speakers, field trips to news media organizations and production businesses, videotapes, Internet sites, etc.
  • Expose students to a range of career possibilities related to a particular skill so they may consider whether such choices are well matched with their interests and talents.

♦ Know and share the career opportunities available to students in your community and area.
  • Form relationships not only with students, but also with professionals in the community who can provide current and up-to-date technological viewpoints, career opportunities, and internship and job shadowing possibilities for specific students based on their skills and interests.
  • Know the software, technology, and hands-on experience requirements of local businesses, vocational institutions, and colleges that will help your students experience a successful transition from the world of schooling to work.

b. Goals/Connections (G/C)

♦ Determine a pretest/diagnostic hands-on tool to determine career and technical skills.
♦ Develop specific, hands-on production goals for each lesson in the unit.
♦ Know specific connection to student needs.
♦ Establish examples of what and how lessons/activities were planned based upon student strengths, weaknesses, and pre-determined interests.
♦ Explain how you determined student strengths and weaknesses.
♦ Tell what the students did or produced.
♦ Explain how the lesson met the goals (overall and individual).
♦ Explain why lessons were sequenced in a specific way. Connect this to student needs and instructional goals and how those meet career and technical goals.

c. Assessment (ASMT)

♦ Assessment must occur on multiple levels.
  • Use informal assessment: monitor student work on a regular basis to encourage student initiative, responsibility, and ownership of a project.
  • Tailor individual projects, assignments, and instruction based on assessments.
  • Use performance-based assessment tools such as portfolios, videotapes, demonstrations, and exhibitions to illustrate students’ growing accomplishments, knowledge, skills, and interests aligned with industry standards.
  • Develop your own tools to ensure a good fit between assessment tool and the goals set for each individual student.

♦ Build assessments tools around industry standards.
  • Share with students industry and workplace standards appropriate to their area of expertise and interest. Hold students accountable for those standards.
  • Build assessment tools and methodologies around national skills standards, industry certification, and licensure standards.

♦ Mold students into self-assessors.
  • Encourage students to become self-assessors through portfolio evaluation, resume writing, and weekly journal entries, promoting self-confidence and aiding in their decision-making about further education and career choices.

d. Rationale for Assessment (RA/ASMT)

♦ Explain why the assessment was a need for that particular student/group of students.
♦ Explain how the assessment was varied to meet the individual needs of the students based on each learning style, ability, and interest.

♦ Explain how students used the assessments based on national industry standards to improve their personal hands-on projects and display personal growth.

♦ Explain how assessment helped students in future decision making about careers.

♦ Show the relevance of the assessment through evidence that demonstrates the assessment measured what it needed to measure.

♦ Identify which part or parts of the assessment measured which goal or goals.

e. Content Knowledge (CK)

♦ Develop students who are “workplace ready.”

  • Create opportunities for students to gain understanding of workplace cultures and expectations through reading career literature, meeting with experienced workers in specific industries, and work site opportunities including internships, apprenticeships, cooperative education, and entrepreneurship.

  • Create class and individual activities to illustrate aspects of particular career choices.

  • Design classroom activities that help students develop employability skills such as a strong work and personal ethic, the ability to take responsibility for one’s own projects, and organization.

♦ Demonstrate integration of academic, career and technical content, and goals.

  • Design projects that help students understand the complexity of tasks within a field or career and develop academic skills that are brought to a particular job or career.

  • Create projects that require students to draw on knowledge and skills in many academic disciplines (e.g., school-based enterprises).

♦ Illustrate a strong grasp of current content knowledge.

  • Provide inclusion of important qualities needed to function in the workplace, such as interpersonal skills, critical-thinking abilities, basic communication and mathematical skills, and familiarity with the latest technology, including computers and automation.

  • Establish understanding of the process of acquiring a craft or career, the bases of different industries, and the process of exploring a career and planning for the future.

  • Demonstrate understanding of career paths and occupational structures that are promising and those which are limiting and how that information
is relayed to students.

f. Analysis of Student Work (ANA)

♦ Describe how the student(s) achieved the goal(s) set forth in the lesson/unit/project.
♦ If goals were met, cite specific evidence that proves the goals were achieved.
♦ If goals were not met, cite evidence that leads reader to decide what needs to be worked on.
♦ Describe how the project encouraged student creativity and problem solving.
♦ Cite any modifications made during the sequence.
♦ Cite evidence using content and details from student responses for making the modifications (rationale for change).
♦ Tie to other aspects (KOS, environment, goals/connections).
♦ Explain input/comments and rationale.
♦ Explain how learning was enhanced by analysis.
♦ Provide rationale for everything you did or did not do.

g. Feedback (FB)

♦ Provide constructive feedback that fosters an effective learning environment: regard for students, a genuine desire to help them do well, and a collaborative spirit of teamwork.
♦ Demonstrate how the role of teacher and employer feedback initiates students’ self-reflection, setting a course of action for improvement, and documenting progress for parents and other interested stakeholders.
♦ Work collaboratively with employers to ensure quality experiences for students, with teacher educating the employer on how to assess students and offer constructive feedback.
♦ Provide feedback throughout an entire project—not just at the end—in order to foster continued student learning.
♦ Research current industry feedback techniques to practice and tailor classroom feedback to reflect them.

h. Reflection (R)

♦ Identify and provide evidence from the student work/growth that dictates the next step(s) in this instructional sequence (re-teaching specific information, providing clarification of concepts, and modifying pacing—accelerating or slowing down instruction).
♦ Identify possible alternative approaches that could impact student learning of this particular group of students (more hands-on involvement, change in
technology used, collaborative learning, individualizing projects, etc.).

♦ Reflect on your teaching practice, identifying the strengths and activities that did/did not impact students learning throughout the instructional sequence (point to specific parts that were successful/impacting AND explain why; point out specific parts that were not as successful/impacting as hoped or anticipated AND explain why).

♦ Explain how you could move this lesson from good to great.

♦ Identify what you learned (good and/or bad) from this lesson that can be transferred to future lessons.

♦ Illustrate how you equip yourself, and your students, for the evolving future of technology and its constant changes through interacting with other professionals, exploring new resources, attending professional conferences and workshops, studying the professional literature, returning to business and industry, and participating in advanced education programs.

♦ Analyze input received from formal and informal conferences with professionals, families, students, and other teachers.

♦ Provide rationale for lessons/activities that go well by thinking about WHY it succeeded and how to adapt the lessons/activities.

♦ Provide rationale for lessons/activities that go poorly and reflect on how to avoid such results in the future.

♦ Seek advice from colleagues through discussions, in-class observations of your own teaching, and observations of others’ practice about how your instruction could be changed or modified for future success.

♦ Demonstrate that you have considered your own cultural background, biases, values and personal experiences when you teach, assign, assess, provide feedback, etc.

♦ Show how you plan to explore topics in which you have limited expertise and how you can experiment with alternative materials, approaches, and instructional strategies.
Entry 2: Demonstration Lesson

a. Knowledge Of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.

b. Goals (G)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Develop specific, hands-on production goals for the students as they perform the demonstrated skill, including the skills, concepts, attitudes, and processes you want students to develop.
   ♦ Note the relevant features of your students, the pre-requisite skills they possess that demonstrate they are ready to take on these new goals, and the goals they will transition to next after these initial goals are accomplished.
   ♦ Explain how the demonstration met the goals (overall and individual) and that the goals were important and linked to career and technical learning, justifying them as challenging and appropriate for students and specific teaching context.

c. Instructional Strategies (IS)
   ♦ Explain why the use of demonstration is an appropriate form of instruction for teaching this skill.
   ♦ Foster performance-based student learning of career and technical education subject matter by creating important, engaging activities for students to demonstrate, supporting critical thinking and problem-solving skills as they conceptualize and come to understand the skill.
   ♦ Design instruction to engage students in gaining command of important ideas, theories, facts, and skills as opposed to just memorizing facts and procedures.
   ♦ Utilize a broad assortment of teaching aids, focusing on current high-quality technologies in order to ensure students are adequately prepared for the changing job market.
   ♦ Create demonstration activities that have embedded within them the process, quality methods, tools, expectations, standards, and practices demanded in the workplace.
   ♦ Make all instructional resources relevant and current to students.
   ♦ Develop students’ ability to engage meaningfully in the process of skill exploration and acquisition.

d. Content Knowledge (CK)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Design demonstration projects that help students understand the complexity
of tasks within a field or career and develop academic skills that are brought to a particular job or career.

♦ Create demonstration projects that require students to draw on knowledge and skills in many academic disciplines (e.g., school-based enterprises).

e. Connections (CON)

♦ Develop students who are “workplace ready.”

♦ Create opportunities for students to gain understanding of workplace cultures and expectations through reading career literature, meeting with experienced workers in specific industries, and work site opportunities including internships, apprenticeships, cooperative education, and entrepreneurship.

♦ Create demonstrations to illustrate aspects of particular career choices.

♦ Design demonstrations that help students develop employability skills such as a strong work and personal ethic, the ability to take responsibility for one’s own projects, and organization.

♦ Know and use specific connections to help meet student needs.

♦ Explain why lessons were sequenced in a specific way. Connect this to student needs and instructional goals and how those meet career and technical goals.

f. Learning Environment (LE)

♦ Create a highly collaborative and cooperative classroom culture centered on problem-solving and investigation, addressing authentic workplace dilemmas.

♦ Promote and foster an environment of intellectual and physical safety where students feel respected and valued.

♦ Establish and maintain a productive learning environment by carefully blending attention to individual needs while focusing on the goals of the entire class.

♦ Create an environment that values fairness, recognizes and rewards quality work, and offers constructive criticism, which directs students toward growth and improvement of skills.

♦ Create an environment where equal treatment, fairness, and respect for diversity are modeled, taught, and practiced by all.

♦ Conduct classes in a manner that encourages respect for individual differences related to skills, culture, gender, ethnicity, language, diversity, physical exceptions, etc.

♦ Build positive and caring relationships with and among students and thereby model the kind of communities students will soon become a part of and perpetuate.
♦ Encourage students to recognize that successes and setbacks are both part of the processes of invention, discovery, and creation.

♦ Create an environment where students can demonstrate mastery of new skills and knowledge through classroom simulations, labs, on-the-job training, apprenticeships, clinical internships, or service-learning opportunities.

♦ Create a classroom environment that mirrors those found in high-performance workplaces.

♦ Involve students in the negotiation of classroom rules, routines, and behaviors, as is done in high-performance workplaces.

♦ Select projects that evolve and unfold, beginning with student interest and eventually taking on student direction.

♦ Instill in students character traits such as punctuality, honesty, fairness, tolerance, and the ability to make ethical decisions that will serve them well in the workplace and in life.

g. Assessment (ASMT)

♦ Refer to suggestions provided in Entry 1.

♦ Bring students into a given skill, process, or technique gradually and judge student achievement and readiness for next steps through assessing students in the context of work.

h. Analysis (ANA)

♦ Refer to suggestions provided in Entry 1.

♦ Explain how you modeled and explained relevant standards of practice during the demonstration.

♦ Explain how you supported students’ understanding and conceptualization of the important concepts and rationales associated with the skill and their understanding of the significance of the skill.

♦ Explain how you supported students by identifying misunderstandings or inappropriate implementation of the skill.

♦ Describe how the student(s) achieved the goal(s) set forth in the demonstration.

♦ Describe how the demonstration encouraged student creativity and problem-solving.

♦ Explain input/comments, or silence/lack of comments, during demonstration and rationale.

♦ Explain why you made certain comments during the demonstration.

♦ Describe how learning was enhanced by your actions during the demonstration.
♦ Explain why certain students may not have participated in the demonstration.
♦ Identify positive aspects of the demonstration.
♦ Cite the verbal and nonverbal engagement and communication during the demonstrations, including feedback between teacher–student, student–student, and student–teacher.

j. Reflection (R)

♦ Refer to suggestions provided in Entry 1.
♦ Provide rationale for demonstrations that go well by thinking about WHY it succeeded and how to adapt the demonstration.
♦ Provide rationale for demonstrations that go poorly and reflect on how to avoid such results in the future.
♦ Identify peak moments in this demonstration that raised your own personal definition of quality instruction.
Entry 3: Fostering Teamwork

a. Knowledge Of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)
   ♦ Refer to suggestions provided in Entry 1.

c. Instructional Strategies (IS)
   ♦ Refer to suggestions provided in Entry 2.
   ♦ Foster performance-based student learning of career and technical education subject matter by creating important, engaging activities for students, supporting critical-thinking, problem-solving, and teamwork skills as they conceptualize and come to understand the importance of teamwork.
   ♦ Create teamwork activities that have embedded within them the process, quality methods, tools, expectations, standards, and practices demanded in the workplace.
   ♦ Design instruction that helps students develop a strong work and personal ethic.
   ♦ Design work-based learning activities that provide opportunities for students to learn about high-performance workplace standards and current industry practice.
   ♦ Design lessons/activities that foster and support productive student teamwork and collaborative student interaction.

d. Content Knowledge (CK)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Create class and individual activities to illustrate aspects of particular career choices and how teamwork plays a vital part.
   ♦ Design classroom activities that help students develop employability skills such as a strong work and personal ethic, the ability to take responsibility for one’s own projects, teamwork, and organization.

e. Learning Environment (LE)
   ♦ Refer to suggestions provided in Entry 2.

f. Diversity (DIV)
   ♦ Ensure that students leave the program understanding the attitudes and behaviors that are likely to bring them success in the world of work by modeling and promoting the behavior necessary for a multicultural society.
♦ Provide opportunities for students to work to their own strengths as well as learn from those whose strengths are different.

♦ Emphasize the importance of equality, fairness, and respect in the community and the workplace.

♦ Expose students to individuals and cultures that might be new to them and provide opportunities in their ongoing program for such exposure.

♦ Match students with a mentor of different ethnicity or gender and invite community members with different backgrounds to visit the classroom.

♦ Help students understand the attitudes and behaviors likely to bring them success, as well as those that may cause disruption or dissent in the workplace.

♦ Provide legislation and policies that are related to fairness and equity, such as laws relating to sexual harassment and affirmative action and discuss attitudes and misunderstandings about these policies.

♦ Provide all students with access to high-quality career and technical programs.

♦ Give all students equal access to curriculum and expose them to additional options as well.

♦ Adapt technical equipment to students' special needs, seek equivalent learning opportunities at alternative sites, or help match students with more appropriate learning experiences.

**g. Feedback (FB)**

♦ Refer to suggestions provided in Entry 1.

**h. Analysis (ANA)**

♦ Refer to suggestions provided in Entry 1 and Entry 2.

♦ Explain how you modeled and explained relevant standards of practice during the teamwork lesson.

♦ Explain how you interacted with the teams of students to support their engagement with the activity and reinforced the importance of team-based activities.

♦ Explain how you guided students to work productively as a team through communicating effectively, identifying and solving problems jointly, sharing responsibility, valuing each other’s contributions, taking responsibility for their own learning and that of the other members of their team.

♦ Describe how the student(s) achieved the goal(s) set forth in the teamwork lesson.

♦ Explain why you made certain comments during the teamwork lesson.
♦ Describe how learning was enhanced by your actions during the teamwork lesson.

i. Reflection (R)

♦ Refer to suggestions provided in Entry 1 and Entry 2.
♦ Provide rationale for teamwork lessons that go well by thinking about WHY it succeeded and how to adapt the lesson.
♦ Provide rationale for teamwork lessons that go poorly and reflect on how to avoid such results in the future.
Entry 1:
Developing and Assessing Mathematical Thinking and Reasoning

Entry 2:
Instructional Analysis: Whole Class Mathematical Discourse

Entry 3:
Instructional Analysis: Small Group Mathematical Collaborations

Contributors:
Theresa Grospitch
Cheryl Kerns
Entry 1: Developing and Assessing Mathematical Thinking and Reasoning

This entry is the student work entry. The main objective is to demonstrate your ability to design and implement a unit of mathematics building on students’ current knowledge and understanding to develop and enhance students’ abilities to think and reason mathematically. Teachers should choose an appropriate learning goal or target for their students and develop an instructional sequence designed to assess students’ prior knowledge and build on it to deepen students’ mathematical thinking and enrich their mathematical skills.

a. Knowledge of Students (KOS)

♦ Gather the following information to help you with the first section of your commentary entitled Instructional Context.

♦ Information for this is a collection of data that may be obtained from the following sources:

- Building profile, school report card, state assessments, associate principal, building office personnel, district office, district or school website, other education professionals and IEPs.

- Surveys of non-confidential issues: pre/post surveys, learning styles, interest inventories, personalities, etc.

- Internet search on your city for community data

♦ Although each of the following sections below affect what you teach and how you teach your specific students, select only the areas that are specific to your setting and necessary to demonstrate student impact for the lesson explained in the entry. Remember: some of this information may be included in your contextual information.

- Gender, age, grade in school

- Community (e.g., urban/suburban/rural, levels of affluence, geographical location, cultural life experiences)

- Academic ranges (e.g., strengths/weaknesses, honors/AP, reading level/writing level/math level – state assessment proficiencies)

- Student interests (e.g., sports, fine arts, technology)

- Special needs – any that apply

- Family (e.g., economics, free/reduced lunch, parent education, family structure)

- Ethnicity/cultural issues

- Personality of the class (e.g., solitary thinkers, effective small group learners, large group participation, leaders/followers, work ethic, do they question material or just accept information from the teacher)
• Relevant features (e.g., available resources, schedules, underlying course purpose, course sequence, teacher availability)

• Instructional challenges: skills, knowledge and previous experiences (e.g., How do they approach assignments? Do they think and reason or just follow a pattern? Do they have the skills but need to develop the reasoning to truly problem solve?).

b. Goals/Connections (G/C)

♦ Gather the following information to help you with the second section of your commentary entitled Planning.

♦ Identify the important mathematical concept and the learning goals/targets for the entire instructional sequence.

• Be sure you can identify what the students know and don’t know about the mathematical idea before you begin.

• Be sure you can develop a learning sequence where students are required to demonstrate more than just the development of key mathematical skills. One in which they are required to communicate their understanding of the key mathematical concept requiring them to implement said skills.

• Consider what modifications/interventions you will implement if students don’t grasp the concept the first time through the instructional sequence.

• Use NCTM’s Principles and Standards for School Mathematics as a resource for identifying the important mathematical concept as well as identifying learning goals/targets designed to enhance students’ understanding. Other resources would be NCTM publications like Mathematics Teacher or Mathematics Teaching in the Middle School; state assessment outcomes and learning indicators; College Board’s SAT/ACT required concepts and/or skills; Advanced Placement course topics.

• Identify several learning goals/targets for the entire instructional sequence. These may extend beyond what you will feature in the entry. Be sure you can support how each of the goals supports and facilitates student understanding of the important mathematical concept.

• Break down the big idea into 3 or 4 specific goals. Describe each goal with regards to what the student will be doing/demonstrating/communicating.

• Label each goal (e.g., Goal 1 or G1) and refer to them throughout the analysis.

• The featured sequence may include a balance of developing students’ understanding algebraically, numerically, graphically, and/or verbally. The sequence should also have students doing mathematics, interacting with each other, using a variety of resources to move beyond the textbook,
and developing complex thinking and problem-solving strategies.

c. Instruction (INS)

♦ Gather the following information to continue with the second section of your commentary entitled Planning.

♦ Describe the overall instructional sequence. This includes

  • Prior knowledge and skills
  • Instructional activities leading up to and between the featured activities
  • Examine your instructional activities to make sure they match your goals, that they demonstrate an incremental and logical progression of skills and processes.
  • Be able to explain how each activity connects to each other as well as how each activity meets the needs and/or learning styles of all students.

♦ Selecting the two featured activities. Consider

  • The specific connection between the activities and the big idea or mathematical concept is central and critical.
  • These activities should demonstrate mathematical reasoning or reveal how students were thinking about the idea before and then after the activities.
  • Something that is procedural would not be the best choice. Choose activities that require students to demonstrate and apply mathematical skills and processes that they have developed in the instructional sequence as a foundation for their overall conceptual understanding of the mathematical idea. Choose activities where students are required to communicate their critical thinking process and/or conceptual understanding.
  • Be able to explain how each activity connects to each other as well as how each activity meets the needs and/or learning styles of all students.
  • Be able to explain how each activity provides insight into individual student knowledge and conceptual understanding of the substantive mathematical idea as well as allows students to demonstrate achievement of learning goals.

♦ Specify the links between your assessment and your featured activities.

  • These links are key to the experience as it reveals the student’s progress.
  • Design the pre- and post-assessments before you begin planning the instructional sequence so as to ensure that you are directly teaching to the goals you are going to assess.
  • Pre-assessment data can be used to justify your instructional decisions.
and sequencing.

• Assessment data should be gathered from conceptual and procedural knowledge/skills.

• Throughout the instructional sequence, vary types of assessment to meet the needs and learning styles of all your students.

• Explain how you used feedback to support student learning: annotations on papers, drawing diagrams, reworking problems for students, specifying steps, specific ideas for how they could improve their understanding of the concept, etc.

♦ Specify the challenges and/or stumbling blocks in learning the important mathematical concept and/or in completing the instructional sequence of activities that typically occur.

• It would be beneficial for you to tie your knowledge of teaching mathematics to specific knowledge about this particular group of students.

• If you modify any activities in response to student needs, whether individually or as a group, it is important to identify/explain that accommodation. Also explain how you knew to do what you did.

• Explain the common mistakes and errors students make in learning this mathematical idea and what you were able to anticipate/prevent as well as what you had to specifically re-teach to correct, etc.

d. Analysis (ANA)

♦ Gather the following information to help with the third section of your commentary entitled Analysis of Two Student Responses. The information should be presented in separate sections for each student.

♦ Provide contextual information to bring the student to life. Describe the unique characteristics of this student. The critical information varies based on the individual student but it might include some of the following characteristics: gender/age, level of maturity, mathematical ability demonstrated in previous grades/courses or units of instruction, interest level in mathematics, confidence demonstrated to date in other activities, level of ability to interact within the whole class, small groups or as an individual, economic status, specifics from standardized assessments including state assessments, other kinds of diagnostic information, ethnic or cultural issues, elements of the students home life that have a direct effect on learning, and any other special needs.

♦ It is important to discuss each student’s strengths and weaknesses, gaps in prior knowledge and misconceptions from which he/she operates. Also, it is vital to link how this profile impacts their ability to grasp the big mathematical concept.

♦ Explain how each student progressed between the featured activities. Comment specifically on what each activity revealed to you about their level of
understanding of the concept, their progress, their initial misconceptions and how were they altered, their mathematical confidence, and/or the enriching of their understanding.

♦ Cite specific evidence in the student work exemplifying their ability to critically think as they progressed through the learning sequence.

♦ Address each goal/target with specific evidence from the featured activity and what that evidence illustrates about the extent to which the students achieved those goals.

e. Assessment (ASMT)

♦ Throughout this process, keep in mind that the National Board assessor is looking for evidence that you use a variety of assessment strategies in order to improve your work with students. While this is not a specific question to be addressed, throughout your commentary you should provide evidence in your instructional sequencing that you employ various strategies and use the results to adjust/modify/enrich instruction.

f. Feedback Next Steps (FB)

♦ Gather the following information to help with the third section of your commentary entitled Analysis of Two Student Responses. The information should be presented in separate sections for each student.

♦ Explain conceptual understanding.
  
  • Explain how you used the information you gathered in comparing/contrasting featured activities to provide specific, timely feedback to each student.
  
  • Provide specific evidence of the nature and content of the feedback, including written and verbal comments.
  
  • Cite how the feedback improved student ability and helped the student to achieve the instructional goals.
  
  • If you provide verbal feedback, you will need to document this as well, possibly by writing it on the paper copies of the activities and then tying this into your commentary.

g. Content Knowledge (CK)

♦ Throughout this process, keep in mind that the National Board assessor is looking for evidence of your knowledge of mathematical content and pedagogy.

  • Throughout your commentary, be sure that your discussion, vocabulary, notation, etc., are mathematically accurate and course appropriate.
  
  • In your instructional sequencing and decision-making, as well as your student analysis, make sure you consider the use of sound pedagogy for your level/group of students.
h. Reflection (R)

♦ Gather the following information to help with the fourth section of your commentary entitled Reflection.

♦ Consider next steps for instruction.
  - Identify and explain what the next steps should be as indicated by the evidence of student performance.
  - If the students were successful in attaining the goal, what will be the next logical step in increasing their understanding of the important mathematical concept?
  - If the students were not successful in attaining the goal, what will be done to remedy the situation (e.g., re-teaching, remediation activities or modify the instructional pacing)?
  - It is important that you use evidence from the student work as a basis for what comes next. Based on the evidence, are the two students featured in the entry typical within the whole group or not?

♦ Identify and explain what evidence the students’ responses contained that suggest you should do something differently next time. Consider such ideas as altering the pacing, the instructional activities themselves, or changing the preceding activities. Provide rationale for alternatives to the sequence you used.

♦ Analyze your teaching practice for the strengths and weaknesses revealed through this instructional sequence. If something did not work, note it and explain exactly why it did not work. Be sure to use evidence from the student work as proof.

♦ Identify and explain what activities you would repeat using your analysis of the student work.

♦ Even if the activity worked well, explain what you could do to make this lesson even better the next time.

♦ Explain what you learned about yourself and/or your teaching as a result of this activity that could be used to help you improve your work with students.
Entry 2: Instructional Analysis: Whole Class Mathematical Discourse

This entry is a whole group video entry that demonstrates how you facilitate a classroom discussion using targeted questioning to develop student understanding about an important mathematical idea. You will demonstrate your ability to engage students in mathematical discourse as the whole class investigates, explores, or discovers important mathematical concepts, procedures, or reasoning processes that promote student learning.

a. Knowledge Of Students (KOS)

♦ Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)

♦ Refer to suggestions provided in Entry 1.

♦ Gather the following information to help you with the second section of your commentary entitled Planning:
  - National/state/district curriculum standards
  - Course outline
  - State assessment guidelines
  - College Board Standards (if applicable to the math class you are teaching)
  - Link between preceding topics in mathematics to the lesson being observed in the video; describe how you made that link.

♦ Identify CLEARLY the mathematical “big idea” for the entry.

  • When planning, be able to answer the following questions: “What do I do if they already know the material?” “What do I do if they don’t grasp the concept the first time through the instructional process?”
  
  • Define what each goal was designed to do.
  
  • Link each goal to the unit goal (big idea) and to the needs of the student.
  
  • Be able to describe how a whole class discourse format best supports your goals.

c. Content Knowledge (CK)

♦ Teacher’s content knowledge and knowledge of mathematics pedagogy will be evidenced through
  - Sequencing of the lesson within the curriculum
  - Goals of the unit and goals of the lesson and a description of how whole class discussion facilitated/enhanced student learning
  - Description of why this lesson was taught through whole group discourse
and how the needs of the students are met through this instruction

• Demonstration of how your content knowledge allowed you to correct and redirect misconceptions during the discussion

d. Instruction (INS)

♦ The following information will also be used to help you with the second section of your commentary entitled Planning:

• Identify the sequencing of the lesson within the curriculum unit. Describe the level of understanding of the students, preceding topics, and how the featured lesson fits into the unit objective.

• Articulate the advantage of the whole group to enhance student learning of this particular topic.

• Identify key interactions or concepts that would indicate to you that the students are using mathematical reasoning and communicating mathematically.

e. Learning Environment (LE)

♦ Is the learning environment equitable, accessible and fair?

• Show evidence that students are willing/able to communicate different viewpoints without repercussion.

• Demonstrate evidence that different learning styles (if applicable) are accepted and integrated within the class.

• Is the learning environment productive and conducive to mathematical reasoning and discourse (including questioning and probing)?

• Show evidence of students sharing viewpoints or discoveries.

• Show how students participate within the group and listen to each other.

• Demonstrate evidence that students can negotiate mathematical ideas, ask each other for clarification, and/or be willing to teach each other within the group.

• Whole group discourse cannot be “staged.” This methodology needs to be utilized on a regular basis in order to work effectively in the classroom.

• When videotaping, make sure you can be seen on the video at some point in time in your selection. Primarily, the whole class needs to be visible at all times.

• This is not a video of a teacher lecturing. It is student-led, student-centered discourse and exploration.

f. Engagement (ENG)

♦ Students should have a strategy for building ideas based on the group’s
Wisdom

WORKING

Adolescence and Young Adulthood/Mathematics

A Guide to Accomplished Teaching

Students should demonstrate inquiry from each other and they should demonstrate their willingness to help each other. Although the teacher can facilitate this process by asking strategic questions, the students need to demonstrate taking responsibility for their own learning (e.g., “I don’t understand” followed by “Here, let me show you.”).

Make sure you are aware of the verbal and nonverbal signals of levels of interest or engagement in the topic of discussion.

g. Assessment (ASMT)

Provide evidence the teacher practices ongoing, informal assessment while teaching and adjusts instruction as warranted. The assessor of the video will be looking to see how the teacher

- Interacts with the whole class
- Facilitates discussion so that it is truly student-driven
- Determines understanding without intervening in the group’s discourse
- Gets students back on track if they are not understanding
- Extends the lesson if the students are understanding

h. Analysis (ANA)

It can be helpful to create a transcript or storyboard of the video, marking time in the margins for reference. Knowing where you had discussions with student’s using questioning techniques to help their mathematical reasoning is critical. When specifying students in the video, utilize their name and color of attire. Once the color of attire is specified, you can then just utilize their name. Select specific examples and quotes from the video that demonstrate specific questioning/prompting techniques you used. Be sure to also identify non-
verbal cues. It is critical to show active verbal exchange and nonverbal signs of engagement. Facial expressions and body language are critical indicators and vary by individual.

♦ Briefly identify why the whole group format was essential to learning the goals of this unit. Cite specific things that would not have occurred if you had used another method.

♦ Explain how the learning goals were achieved. Cite specific student words and actions that were evident in the video to prove they accomplished the specific goals.

♦ Identify and explain specific video segments where your ability to perform informal assessments of learning impacted the whole class discussion. Show how your content knowledge allowed you to correct and redirect misconceptions during these discussions. Were you able to predict which students would struggle at a particular point and provide interventions at that point? Where were those and what did you know to do because you know those students so well?

♦ Use student words and the flow of the conversation to demonstrate students had ownership of the conversation...that you were aware of unanticipated opportunities this ownership provided and what that revealed about not only the students’ understanding of the mathematical idea but their ability to negotiate and connect ideas. Analyze the student-to-student as well as student-to-teacher discourse.

♦ Identify modifications you made in response to student needs during the video. How did you know to make those modifications and what was the impact of doing those on the whole group discourse?

♦ Cite and explain specific video segments that prove students achieved the learning and also were able to engage in mathematical discourse with each other and you (the teacher).

i. Feedback (FB)

♦ Throughout this process, keep in mind the National Board assessor is looking for evidence you provide feedback to students frequently, constructively, and in a supportive manner. Remember, feedback is not always verbal.

♦ Make note of the feedback given from other students, not just from you.

j. Reflection (R)

♦ Identify moments where student understanding and ownership of the discourse were at a peak. Explain why your expertise in either content knowledge or pedagogy influenced the direction the lesson took. Justify the choices you made while the lesson was going on that shows your expertise.

♦ Reflect on your interaction with students. Identify the strengths and weaknesses it shows about your teaching practice. Cite segments of student words/actions that were successful and explain why you consider these
successful (either in terms of your goals for content or discourse). Cite video segments with student words/action that could be improved in future lessons and explain why.

♦ What would you do differently and why? Be honest with yourself. Look at what you would change, and give reason(s) why the change would be beneficial to the students. Also, look at what went well and why it worked.
Entry 3: Instructional Analysis: Small Group Mathematical Collaborations

a. Knowledge of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)
   ♦ Refer to suggestions provided in Entry 1 and Entry 2.

c. Instructional (InS)
   ♦ Refer to suggestions provided in Entry 1 and Entry 2.
   - Articulate the advantage of the small group to enhance student learning of this particular topic.
   - Describe any techniques used to create the small groups (i.e., color theories, birth order, self-assessments on leadership roles). Be specific with examples showing how these methods were demonstrated in the small group.
   - You may also describe any techniques used previously that were not successful if you deviate from what the theories suggest you should do.
   - Groups do not always work the same. Use your knowledge of students to identify and match students with similar small group styles for this lesson.
   - Describe how the use of small groups was essential to this particular exploration and relate to students’ mathematical understanding of the concept.

d. Content Knowledge (CK)
   ♦ Refer to suggestions provided in Entry 2.

e. Learning Environment (LE)
   ♦ Refer to suggestions provided in Entry 2.
   ♦ Is the learning environment safe and inclusive?
   - Establish the evidence of why the groups are set the way they are.
   - Demonstrate evidence that different learning styles (if applicable) are accepted and integrated within the small group.
   - Small group discourse cannot be “staged.” This methodology needs to be utilized on a regular basis in order to work effectively in the classroom.

f. Engagement (ENG)
   ♦ Refer to suggestions provided in Entry 2.
g. Assessment (ASMT)

♦ Refer to suggestions provided in Entry 2, keeping in mind the focus is on small groups.

h. Technology/Manipulatives (T/M)

♦ Discuss the significance of teacher’s use of technology/manipulatives in promoting students’ mathematical understanding. The teacher must show the concept under investigation could not have been taught as effectively without the manipulatives or technology incorporated. The teacher must demonstrate how the learning is enhanced or even made possible, how it allows the learner to make conceptual connections, or how it allows students to teach each other through technology or manipulatives.

i. Analysis (ANA)

♦ Refer to suggestions provided in Entry 2.

♦ Briefly identify why the small group format was essential to learning the goals of this unit. Cite specific things that wouldn’t have occurred if you had used another method.

♦ Identify and explain specific video segments where your ability to perform informal assessments of learning impacted the small group discussion. Show how your content knowledge allowed you to correct and redirect misconceptions during these discussions. Were you able to predict which students would struggle at a particular point and provide interventions at that point? Where were those and what did you know to do because you know those students so well?

♦ Cite and explain the critical role the manipulative/technology played in accomplishing your learning goal. Use specific student words, actions or discoveries that wouldn’t have been possible without the manipulative or technology

j. Reflection (R)

♦ Refer to suggestions provided in Entry 2.
Entry 1:
Teaching a Major Idea Over Time

Entry 2:
Active Scientific Inquiry

Entry 3:
Whole Class Discussions about Science

Contributor:
Fred Nelson
Entry 1: Teaching a Major Idea Over Time

a. Knowledge of Students (KOS)

♦ Identify special needs. Gather information from IEPs, snapshot, paraeducators, special education staff/case managers, parents. Explain effect on decisions about activities, assessments, pacing of instruction.

♦ Know your students’ learning styles. Use a simple personality (Myers-Briggs) or learning style survey. Relate to need for activities that engage hands-on or visual learners. Google search “Learning Styles Surveys”

♦ Have students complete “introduction cards.” Survey for previous science/math classes, preconceptions about your class (What word comes to mind when you hear “Physics?”), reason for taking your class, favorite class, college/career plans.

♦ Gather information on parents/guardians and resources for class (careers, rationale).

♦ Assign students to lab groups using KOS.

♦ Understand larger issues (e.g., enrollment trends, graduation requirements, college entrance; relevance to course structure, pace, math level).

♦ Consider extracurricular activities, family/home issues, other courses.

b. Major Idea/Goals/Connections (MI/G/C)

♦ Identify major idea. Check National Science education Standards or Major Ideas in Science appendix to Portfolio Instructions. Use one of these. DO NOT use any concepts not explicitly in the Standards.

♦ Rationale should be based on KOS.

♦ Make holistic considerations. Connect to history, society, technology, mathematics, culture, entertainment.

♦ Goals must be measurable.

♦ Learning objectives must be measurable and observable, so you can prove growth using evidence from student work.

♦ Connect specific content objectives to other science content. (E.g., show evidence of students learning how understanding of forces from physics applies to movement of tectonic plates in Earth science or chemical bonding in chemistry.)

c. Instruction (INS)

♦ Explain learning cycle (exploration, concept development, application, 5E).

♦ Implement discrepant events and/or exploration. Use to engage students; can be a demonstration (more effective if a student-led demonstration).
Consider safety in demonstrations. Refer to Flinn Scientific catalog or website; NSTA website is another good resource.

Explain misconceptions. Identify from pre-test; look at science education research for lists of misconceptions; check the FLAG website http://www.flaguide.org/index.php for ideas.

USE INQUIRY. Student questions determine sequence; focus on data collection/evidence.

d. Assessment (ASMT)

Be diagnostic (Force Concept Inventory, DIRECT.) Use the FLAG website http://www.flaguide.org/index.php for resources.

Use formative assessments.
- Minute paper—students have one minute at the end of the class to answer an understanding-measuring question
- Interactive response system (PRS, CPS, Qwizdom)
- Detailed observation
- Just-in-time teaching—use feedback from students (emails, minute papers, end-of-class quizzes, prompted journal entries) to determine reteaching, more lab activities, (more concept development)
- Concept maps

Use summative assessments.
- Traditional tests
- Authentic (portfolios, projects, writing, concept maps, webquest)
- Relate alternative assessment projects to individual student interests from KOS
- Post-test—calculate gain scores
- Rubrics, grading checklists—establish quantitative grading for authentic tasks

Correlate assessment questions/activities/exercises to learning objectives.

Identify opportunities that promote fairness/equity.

e. Analysis (ANA)

Collect lots of student work! Not just quizzes, but constructed response work—essays, lab writeups, experimental procedures, data analyses (graphs, tables, diagrams).

The commentary and the evidence should be completely linked. (There are no
surprises in the evidence that weren’t in the commentary.)

♦ Explain, don’t describe, what is shown.

♦ Did students achieve goals? What evidence shows this achievement? What evidence shows areas to be improved?

♦ What modifications were made during the sequence and what evidence from student responses/work was used to determine those modifications?

♦ This entry should show your strength in content and pedagogy.

♦ Using evidence from student work, explain how growth over time has occurred, not just an improved score but transfer of learning.

♦ Using evidence from student work, explain how technology impacts learning. Why was technology necessary to reach this level of learning that couldn’t have been reached without it? One of the work samples must have a technology connection.

♦ Identify using evidence from student work what specific misconceptions were present before the unit (and identified in the planning commentary) and are now conceptually correct.

**f. Feedback (F)**

♦ Feedback must connect specific learning objectives and specific level of performance from student evidence (formative assessments).

♦ Feedback should address specific misconceptions present in the student’s work.

♦ A score on a quiz is not feedback.

♦ Verbal feedback is okay, but written is better evidence.

♦ Restructuring the instructional sequence based on student performance on formative assessment can be effective, but needs to be communicated to students.

♦ Feedback is a loop from objective to instruction to assessment to performance to teacher to student.

**g. Content Knowledge (CK)**

♦ Provide evidence for CK through use of resources (ASMT, INST).

♦ Connect INST to current science education research.

♦ Does not mean teacher must always know the answer; teacher can demonstrate science inquiry with an authentic investigation.

♦ Address ALL student misconceptions; do not allow to perpetuate (e.g., students equating velocity with acceleration, mass with weight).
♦ Focus content instruction on the BIG IDEA.
♦ Demonstrate CK through historical references (e.g., discovery of DNA molecule, development of atomic structure).

h. Instructional Resources (IR)
♦ Technology can be a pedagogical tool and is weighted heavily in this entry.
  • Interactive Response System
  • Multimedia projector
  • World Wide Web—class web pages, webquests, resource pages
  • Simulations, animations, applets
  • SmartBoard, Schoolpad
  • Emphasis on teacher-student and student-student communication
  • Videos (Nova, Mechanical Universe, Bill Nye; better use is short clips from popular films—Star Wars, Apollo 13)
  • Textbook ancillary materials—CD-ROMS, websites
♦ Technology can be a data collection/analysis tool.
  • LoggerPro (Interface & sensors)
  • Graphical Analysis
  • Excel
  • Mathematics connections
  • Graphing calculators
  • Digital imaging—video analysis of motion
♦ Technology is not an add-on, used for technology’s sake. It must be integrated into the activity.
♦ Consider community resources.
♦ Consider career connections.
♦ Decisions on use of resources should always consider
  • Rationale, KOS
  • Relevance to major idea in science
  • Correlation to learning objectives
  • Developmentally appropriate
  • Safety
  • Furthering equity, fairness, access (access may be an issue with use of
computers, internet)

i. Reflection (R)

♦ Identify using evidence from student work that shows learning of the major idea and measurable.

♦ Identify using evidence from student work specific learning objectives that were learned or not learned. Identify reasons why.

♦ Identify and provide evidence from the student work/growth that dictates the next step(s) in this instructional sequence.
  - Reteach specific information
  - Extension activity based on student interests/needs
  - Fill in gaps/provide clarification of concepts
  - Modify pacing – accelerate or slow down instruction

♦ Identify possible modifications to instruction.
  - Peer evaluation
  - Graphic organizers
  - Cooperative learning
  - Kinesthetic activities
  - Visual activities
  - Technology (e.g., was more time spent training students to use the technology than them using the technology to learn?)
  - Context of questions/activities (e.g., not every student is equally comfortable studying projectile motion using the context of kicking a football.)
  - Pacing of instruction/activities.

♦ JUSTIFY THE REASONS FOR THE USE/MODIFICATION/ABANDONING OF THE IDENTIFIED STRATEGIES.

♦ Identify what activities/practices had NO IMPACT on student learning; explain using evidence from student work.

♦ Identify other resources that could be used more effectively; identify resources that were not effective. (Use evidence from student work.)

♦ If the unit was effective, what could make it more effective for every student?

♦ Identify aspects of the instructional sequence that enhances your understanding of accomplished teaching.
Entry 2: Active Science Inquiry

a. Knowledge of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Explain why students are grouped the way they are, and cite evidence from the video that demonstrated impact on learning

b. Goals/Connections (G/C)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Learning objectives must be observable, so you can prove growth using evidence from the video.
   ♦ Connect specific content objectives to other science content. (E.g., show evidence of student learning of heat transfer in physics applies to weather patterns in Earth science or global warming in ecology.)

c. Instruction (INS)
   ♦ Refer to Suggestions provided in Entry 1.
   ♦ Use a constructivist approach (prior knowledge, discrepant event, conceptual change). Identify where and when these discrete events occur in the video.
   ♦ Explain the learning cycle (exploration, concept development, application, 5E). Identify what stage(s) of the learning cycle occur where and when in the video.

d. Science Inquiry (INQ)
   ♦ When and where in the video is evidence of student use of prior knowledge?
   ♦ When and where in the video is evidence of student development of investigation questions?
      • Student design of investigation
      • Student identification of dependent and independent variables and controls
      • Student decisions about data collection (type and amount)
      • Student collection of data, use of equipment
      • Student use of measurement and mathematics
      • Student analysis of data collected
      • Student communication of results
      • Student representation of major concept in multiple modes (verbal, graphical, mathematical, visual)
      • Student collaboration
      • Teacher use of open-ended questions to guide/focus/direct student inquiry
• Student familiarity with all of the above (cannot be the first time—students know how to do all of these; minimal questions, answered by each other, not the teacher)

e. Instructional Resources (IR)

♦ Refer to suggestions provided in Entry 1.

♦ Explain how classroom layout maximizes opportunities for inquiry. Students’ design of experiment allows as much room as needed.

♦ Explain how use of time maximizes inquiry. Do not need to contain all three segments in the same class period.

♦ Use teacher-designed materials or processes to support the inquiry activity.

f. Learning Environment (LE)

♦ Room layout allows for students free to make appropriate modifications for the inquiry process.

♦ Students have equitable access to resources during the activity.

♦ Use hallways, courtyards, parking lots, parks. Science needs a lot of room for experiment and data collection.

♦ Other artifacts in the classroom support inquiry.

♦ Check for safety. Be attentive to issues of chemical/physical hazards; there should be NONE!

♦ Cooperative learning group assignments should be made using KOS as an important vehicle for ensuring equity, fairness, access.

g. Analysis (ANA)

♦ Refer to suggestions provided in Entry 1.

♦ Identify using evidence from video what specific misconceptions were present before the activity (and identified in the planning commentary) and are now conceptually correct, and the point in the video where conceptual change occurs. (When does the light bulb come on?)

♦ Specifically identify examples from the video of student inquiry. (See INQ.)

h. Content Knowledge (CK)

♦ Refer to suggestions provided in Entry 1.

i. Reflection (R)

♦ Refer to suggestions provided in Entry 1.

♦ Explain, using evidence from video, learning of the major idea that is measurable.
♦ Explain, using evidence from video, specific learning objectives that were learned or not learned. Identify reasons why.

♦ Explain, using evidence from video, student work/growth that dictates the next step(s) in this instructional sequence.
Entry 3: Whole Class Discussions about Science

a. Knowledge of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)
   ♦ Refer to suggestions provided in Entry 1 and Entry 2.
   ♦ Goals must be learning goals. The act of discussing is not a goal.
   ♦ Learning facts (knowledge level) is not a goal for this type of activity.
   ♦ Goal should be at the analysis/evaluation level.
   ♦ The goals and objectives must be appropriate to discussion and not better achieved with another mode. (E.g., measuring air resistance with falling coffee filters is a good experiment; examining the different historical models of atomic structure is a good discussion.)
   ♦ Topics with some “controversy” seem to work well to stimulate student interaction (science-technology-society issues).
   ♦ Debate or trial discussions provide structure for students and enable participation.
   ♦ The goal should not be to recap what has already been learned. It is not simply a “reporting-out” on conclusions already made; the discussion itself is the method of reaching a new conclusion.
   ♦ Develop a rubric for measuring student performance in preparation and discussion.

c. Analysis (ANA)
   ♦ Refer to suggestions provided in Entry 1 and Entry 2.
   ♦ Refer specifically to the rubric for evaluating student performance in the discussion.
   ♦ Specifically identify examples from the video of learning due to the discussion.

d. Learning Environment (LE)
   ♦ Room layout of circles seem to work the best.
   ♦ Students have equitable access to resources (internet, computers, books, teacher, time, equipment) to prepare for the discussion.
   ♦ Identify how the structure of the activity enable access, fairness, and equity.
   ♦ Identify teacher-to-student, student-to-teacher, and student-to-student interactions that demonstrate equity. Students are comfortable discussing with the teacher and each other as equals.
♦ The absence of intimidation and anxiety about the discussion is evidence of a safe environment.

♦ Discussion rules/management procedures should promote fairness, equity, and access without curbing participation.

e. Engagement (ENG)

♦ Evidence from the video demonstrated student interest in the topic and the activity.

♦ Identify examples of nonverbal engagement (e.g., body language, eye contact, listening pose, ready to interject pose).

♦ Avoid “rules of dis-engagement” that suppress participation. (There is no need for students to raise their hands to say something in a discussion.)

♦ Interruptions can be evidence of engagement.

♦ Identify examples of student engagement in the complete activity (e.g., preparation for the discussion with organized notes).

f. Feedback (F)

♦ Teacher feedback to students (verbal or nonverbal) during video must not hamper participation. (Do not say “good” or indicate approval of particular statements or students.)

♦ Teacher attentiveness to all students is the best feedback during the video.

♦ Teacher participation in the video should exclusively be to maintain and encourage the discussion; prompt with open-ended questions.

♦ Feedback at the conclusion of the activity must connect specific learning objectives and specific level of performance from student performance in the video.

♦ Feedback should address specific misconceptions present in the discussion.

♦ Feedback is a loop from objective to instruction to assessment to performance to teacher to student.

g. Content Knowledge (CK)

♦ Provide evidence for CK through the topic for the discussion. (E.g., compare and contrast the phenomenon of wave/particle duality” is a high CK topic, “discuss the names of the elements” is not.)

♦ A teacher-provided set of resources is evidence of CK (e.g., bibliography, list of reviewed websites, CD-ROMs, journal articles).

♦ The structure of the activity is evidence of CK. Focus on higher-level learning objectives (analysis/evaluation instead of knowledge).
♦ Address ALL student misconceptions in the instructional sequence, but allow students the opportunity to "discuss their way" to the correct concept.

**h. Reflection (R)**

♦ Refer to suggestions provided in Entry 1 and Entry 2.

♦ Identify possible modifications to the activity (e.g., more teacher involvement or more student involvement).
  - Structure of the discussion question (too abstract?)
  - Connection to prior knowledge/rationale
  - Resources available to students
  - Student preparation for discussion
  - Structure of the discussion (open or assigned roles—trial/debate/hearing)
Entry 1:
Designing Science Instruction

Entry 2:
Probing Student Understanding

Entry 3:
Inquiry through Investigation

Contributor:

Stacy Cordes
Entry 1: Designing Science Instruction

a. Knowledge of Students (KOS)

♦ Information for this is a collection of data that may be obtained from the following sources:

- QPA or NCA building profile, building secretary, district office, district public information, other educational professionals, IEPs, parents
- Surveys of non-confidential issues: pre/post surveys, learning styles, interest, personalities, color theories, etc.
- Internet search on your city for community data

♦ Although each of the following sections below affect what you teach and how you teach your specific students, select only the areas that are specific to your setting and necessary to demonstrate student impact for the lesson explained in the portfolio entry. Remember: some of this information may also be included in your contextual information.

- Gender and age
- Physical/psychological age (e.g., 14 but thinks as an 8-year-old)
- Community (e.g., urban/rural/suburban, employment opportunities, geographical location, cultural life experiences)
- Academic ranges (e.g., strengths/weaknesses, honors/AP, reading level/writing level/math level)
- Science level (e.g., comfort level with inquiry method, interest level, inquisitive group of students, state assessments, other standardized test results)
- Student interests (e.g., sports, fine arts, Discovery Channel, technology)
- Special needs—any that apply
- Family (e.g., economics, free/reduced lunch, parent education, family structure)
- Ethnicity/cultural issues

b. Goals/Connections (G/C)

♦ Identify your scientific concept (big idea), the process skills (observations, data collecting), and learning goals (aligned w/ standards). Explain how they are connected to one another.

♦ Provide rationale for why they are relevant for this group of students, based on their needs, and how your instruction will assist the students in meeting the goals you have set. Be sure to include how the concepts and skills are central to science.
♦ Determine a pretest/diagnostic tool. Use data/information from the tool to provide rationale for your goals.

♦ Use the data/information to develop goals for EACH lesson in the unit. Identify specific connections to student needs.

c. Instructional Sequence (ISEQ)

♦ Explain the instructional sequence. Provide evidence of why it was logical and of its effectiveness. Indicate how student progress/performance dictated a change in your original plan.

♦ Provide examples of how student strengths and weaknesses and/or interests directed your instruction.
  - Explain how strengths and weaknesses were determined.
  - Explain what the students were asked to do and what they actually did.
  - Cite in your commentary and on student work where you used differentiated instruction to assist student learning.

♦ Give a specific explanation of how the goals were met. Address each goal, concept, and skill.
  - Explain how each lesson helped meet the goals you set (overall and individual).

♦ Explain how each lesson was built on the previous lesson. Show how they were connected or interrelated in helping the students reach the goals you set.
  - Justify your instructional sequence. Explain how it was based on student needs and your instructional goals.

♦ Explain how each activity promoted students’ scientific reasoning.

♦ Explain how the instructional sequence/activities moved the students from a broad/vague understanding to a deeper understanding of the concept. (E.g., students go from saying “Convection currents cause plates to move,” to explaining how convection currents work and move the plates to their current locations.)

♦ Explain how this lesson establishes connections to other contexts of science. (E.g., convection currents can also be found in the ocean and atmosphere.)

d. Assessment (ASMT)

Remember: the word “evidence” refers to materials sent with the portfolio to verify the commentary. The word “tools” refers to equipment, technology, materials, approaches, and strategies used to demonstrate performance.

♦ Be sure the assessments are relevant and they measure what needs to be measured.
♦ Identify which parts of the assessments measured a specific goal.

♦ Indicate diagnostic, formative, and summative assessments used. Explain how the data collected helped modify your instructional method.

♦ Explain how you individualized assessments to meet student needs. Provide rationale for making modifications or not making modifications.

♦ Show assessment variety (e.g., performance-based, paper pencil, constructed response, compare/contrast, physical product, portfolio entry, formal/informal, observations).

♦ Identify how the assessment demonstrated student growth and tied to the goals. Identify specific references to growth as cited in the evidence.

♦ Explain how the assessments showed a need for further instruction or advanced instruction.

♦ Explain how the assessments were relevant to students and provided immediate feedback.

e. Technology (T)

♦ Provide rationale for why specific technology resources are appropriate and relevant. Take in to consideration your learning goals, knowledge of students, and availability.

♦ Examples may include some of the following: computer spreadsheet, Internet, SmartBoards, clickers, K’Nex, virtual tours, videos, United Streaming, digital thermometers, etc.

♦ Explain how technology assisted your instruction. Tell what you used and how it helped you improve your instruction.

♦ Explain how the students used technology in their activities. Explain how technology was used by the students and how it increased their learning or advanced their understanding.

f. Instructional Resources (IR)

♦ Identify resources you used to assist instruction or student learning. Provide a rationale for the use of the resources and cite proof of how they increased student learning.

♦ Examples of resources may include: texts, trade books, videos, Internet, websites, teachers, paras, parents, members of the community, CDRom, curriculum resources, guest speakers, tours, newspapers, magazine articles, games (computer or other), TV programs, museums, Web Quests, SciLinks, photographs/illustrations.

♦ Activities that may become resources include: Thinking Maps, graphic organizers, role playing, debates, demonstrations, cookbook experiments, model building, hands-on activities.
♦ Instructional resources should be rational, current, relevant, affordable, available, safe, reliable, and hold students’ interests.

♦ Consider your knowledge of students, learning objectives, and the big idea.

♦ Classify where this fits in the learning cycle: exploration/concept development/application.

g. Analysis (ANA)

♦ Truly provide an ANALYSIS of student work. Do not merely describe what the assessor is seeing, but explain what he/she is seeing; give it meaning. (Don’t say they scored 8 out of 10 questions correctly. Tell why they missed those two and what learning took place that enabled them to get those 8 correct. What does 8 of 10 mean to you?—not 80% mastery, but what concepts and skills are demonstrated in those correct responses? After the assessor reads your commentary they should be able to look at the evidence and know it means what you said it meant.)

♦ Did the student meet the goals for the activity/assignment/project? If so, cite proof from the student’s work. If not, cite places in the student’s work that provide proof the student is still struggling. Explain how the response leads your future instructional decisions.

♦ Identify modifications made during the sequence. Cite evidence from the student work that guided any changes for the class or the individual student. Provide rationale for modifications.

h. Feedback (FB)

♦ Explain your rationale for any feedback you provide the students. This includes verbal and/or written feedback on the activities submitted.

♦ If there are areas where no feedback was provided, a rationale for that should be provided as well. (Perhaps you want the student to make the connection on their own after you have used another strategy.)

♦ Explain how your feedback, or lack there of, enhanced student learning. Tell how your feedback helped “make it click” or opened the door for new ideas to take root.

♦ Identify positive outcomes, unanticipated outcomes, and where appropriate, outcomes that reveal the need for further work.

i. Content Knowledge (CK)

♦ Explain how your knowledge of the science content helped you teach this unit and students reach the goals you have set.

♦ Explain how your knowledge of learning pedagogy helped you plan this instructional sequence so it best enables students to attain the goals you have set. (E.g., based on your understanding of how students learn and this science content, is it best for students to have a basic or a more in-depth understanding of density before introducing convection currents? Or can convection currents be understood without prior density experiences?)
♦ Provide a rationale for how your learning and teaching experiences have helped you develop learning sequences promote student learning. Explain the “method to your madness.”

j. Reflection (R)

♦ Identify and provide evidence from the student work/growth that indicates the next step(s) in this instructional sequence. Should you reteach? do an extension activity based on student interests/needs? fill in gaps or provide clarification of concepts? or modify the learning pace (slow down or accelerate instruction)?

♦ Identify possible alternative approaches that could impact student learning of this particular group of students. Provide rationale or justification for alternative strategies. Some could include compare/contrast, peer editing, graphic organizers, cooperative learning, differentiated instruction, hands-on, incorporating technology.

♦ Reflect on your teaching practices. Identify strengths and weaknesses that did/did not impact student learning throughout the instructional sequence. Point out specific parts that were successful/impacting and **explain** why. Point out specific parts that were not as successful/impacting as hoped or anticipated and **explain** why. Factors may include the activity itself, the questions, the sequence of activities/instruction, the resources, etc.

♦ Identify adaptations/modifications made along the way or possible ones that could be made. State why they were/would be appropriate.

♦ Cite specific student feedback used that influence instruction.

♦ Explain how you can move this lesson from a good lesson to a GREAT lesson.

♦ Identify what you learned (good and/or bad) from this lesson that can be transferred to future lessons.

♦ Identify defining moments in this instructional sequence that raised your own personal definition of quality instruction.

*Focus on students with different abilities. Don’t use two special education students or two with the same struggles. Consider using students with different challenges for you as a teacher. Perhaps consider a gifted student that you struggle to provide with a learning challenge.

*Be sure to clearly articulate the goals and connections for the students for all the entries.

*Put a strong focus on the analysis and reflection for all the entries.
Entry 2: Probing Student Understanding

a. Knowledge of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Explain your goals for this video segment. What information are you hoping to learn about your students’ knowledge/understanding? Remember, you want to gain an understanding of what your kids know or think they know about the new concept.
   ♦ Explain why this probing technique/activity works best for this group of students and their needs.
   ♦ Explain how this activity fits into your instructional sequence. It should be part of the natural flow of this instructional sequence.

c. Student Understanding (ST/UD)
   ♦ Cite specific examples and quotes from the video demonstrating specific questioning and probing techniques to gain an understanding of student knowledge and ideas. (This might be a discrepant activity, asking for more detail, having the student relate the idea to past/real-life experiences, restating their idea, etc. You might ask for group consensus then have those who do or do not agree explain why.)
   ♦ Cite examples from the video segment that demonstrate how you were able to gain a better understanding about student ideas/beliefs in a non-verbal way. (This could be using illustrations, diagrams, student drawings. Show how you can reach all the students, not just the ones who will speak out. Let the assessor know that you want to know about all your students, not just the active learners.)
   ♦ Cite dialogues and situations from the video; explain what you are learning from the students. Be specific. Don’t just quote the student, but tell the assessor what the content and details from the statement actually tell you about the student’s idea/understanding. Identify correct information as well as misconceptions.
   ♦ Explain how what you are learning about student understanding helps guide the discussion. (Sometimes the students may take control of the discussion and provide you with little opportunity for input. Perhaps they are debating an idea. If it is relevant to your learning goals or a good/healthy discussion is taking place let them continue in the lead. Only when they get way off track or disrespectful you should step in and guide the discussion back. Provide a rationale for why you let the students be in control of the discussion. Remember this is mainly about student discourse, not a teacher lead discussion. You are a guide, not a dictator.)
d. Learning Environment (LE)

♦ Explain how you strive to make this learning environment conducive to all student learning/participation.

♦ Consider “fair”, “equitable”, and “accessible” as one category, not three separate entities. To be fair students will get what they need. Access means students will have equal opportunities in learning experiences. Equity means you have leveled the playing field, everyone has a fair shot. (Things that make your environment fair, equitable, and accessible may be allowing students to draw their ideas; share in their group, but not require them to speak to the whole class; modified instructions; etc.)

♦ Give examples of how your environment is safe for all the students and how you provide opportunities for all students to participate in some way, either active or passive.

♦ Identify positives for student participation.

e. Engagement (ENG)

♦ Look at teacher-to-student discourse, student-to-teacher discourse, and student-to-student discourse. Cite how the students are engaged in the discourse. Select a segment of the lesson that is predominately student-to-student.

♦ Identify verbal and non-verbal signs of interest. (A student laying his/her head on the desk does not look interested, but a student whose eyes widen and nods his/her head is showing some kind interest/agreement. They may not speak but they are listening.)

♦ If students are not actively engaged in the discourse then don’t use this video.

♦ It is possible for students to be meaningfully engaged in discourse that is not always relevant to your goals. Cite how and why the discourse shown on the video is relevant to your featured concept/goals, or related/connected to your concepts/goals.

f. Analysis (ANA)

♦ Truly analyze the video. Don’t just quote what is said by you and/or the students. Give meaning and understanding to those quotes. When the assessor reads the commentary then watches the video he/she will know that you truly understood what your students were thinking and they will see the discourse on the video as an insightful tool you used to guide your instruction.

♦ Just providing a quote is a “so what?” A quote with an analysis of the meaning behind it answers the “so what?” question.
♦ Don’t describe the video; explain it.

♦ Pay attention to the content and details in the conversation. Don’t assume because the student wasn’t loud or passionate it was not relevant or noticed.

♦ Identify modifications made during the video. Cite evidence from the video that guided any changes. Provide rationale for modifications.

♦ If your goals for the video were met, explain how, and if not explain why. Provide specific evidence for either.

g. Content Knowledge (CK)

♦ Refer to suggestions provided in Entry 1.

♦ Explain how your knowledge of the science content helped you introduce this concept so you would have a clear understanding of student ideas/beliefs.

♦ Explain how your knowledge of learning pedagogy helped you plan this probing activity so it best enables you to have a clear understanding of what the students know. Based on your understanding/experience, what should your students know compared to what they did know at the beginning?

♦ Provide a rationale for how your learning and teaching experiences have helped you develop this activity in such a way that allows you to gauge your students level of understanding. Explain the “method to your madness.”

h. Reflection (REF)

♦ Refer to suggestions provided in Entry 1.
Entry 3: Inquiry through Investigation

a. Knowledge of Students (KOS)
   ♦ Refer to suggestions provided in Entry 1.

b. Goals/Connections (G/C)
   ♦ Refer to suggestions provided in Entry 1.
   ♦ Explain your goals for what is seen during this video segment. Identify what the students should be seen doing or saying. Remember, you should be demonstrating how you support the students in scientific inquiry discourse as they interpret data they have collected from an investigation. They should be the ones trying to make sense of the data, not you. You are simply a guide that gently leads them, and answers questions they may have regarding their struggles to understand the data.
   ♦ The goals should be student goals (your goals for what the students need to do, not goals for how you guide them).
   ♦ Explain why this investigation/activity works best for this group of students and their needs.
   ♦ Explain how this activity fits into your instructional sequence. It should be part of the natural flow of this instructional sequence.

c. Instruction (INS)
   ♦ Explain what the students were asked to do for the investigation and for the data analysis. This should go beyond merely collecting data, graphing it, and saying the temperature increases at a steady rate.
   ♦ Cite instances in the video where your specific questioning and probing techniques helped the students analyze/interpret/make sense of the data. (If they say the temperature increased at a steady rate, then you need to explain how you guided the students to actually explain why they think it went up. They don’t need to be correct, but they need to be using scientific reasoning. You can address the misconceptions when appropriate.)
   ♦ Your instructions and guidance should foster scientific reasoning. Cite when and where your students gave explanations, not descriptions.

d. Use of Data (UD)
   ♦ Cite examples from the video of how you guide your students to use scientific reasoning to analyze and interpret the data. Since this does not come naturally for most students, you need to demonstrate how you teach them to analyze and interpret. (An example would be analyzing data yourself. Having the students listen to you make sense of data gives them an example to follow.)
   ♦ This investigation should not be a stand alone. It needs to fit into your instructional sequence, giving it value and relevance. Explain how the data
analysis and interpretation in this investigation was used to deepen the
students’ understanding of the concept. Explain how this investigation assisted
the students in reaching the goals for the unit. Explain what your students
have a greater understanding of now than they had before the investigation.

e. Learning Environment (LE)

♦ Refer to suggestions provided in Entry 1.

♦ Some students may not be mentally mature enough yet to analyze/interpret
data at a higher level. Explain how you accommodate them so they feel
their ideas hold value rather than “out of their league.” Some students may
already think at higher levels therefore making analysis easier. Explain how
you challenge them to go one step further with their ideas. Be sure to give
rationale for both sides.

f. Engagement (ENG)

♦ Refer to suggestions provided in Entry 2.

♦ Cite how the students are engage in the discourse of interpreting and
analyzing the data. Select a segment of the lesson that is predominately
student-to-student.

♦ By changing a variable students will be able to gather different data relating
to the same concept. (E.g., the rate sand, water, and soil absorb and release
heat. There are three variables, two groups per variable, and as a result you
have discourse on why they absorb and release at different rates. This can
open debates and deeper analysis by the students.)

♦ Consider the quality of the student-to-student, teacher-to-student, and
student-to-teacher discourse. Are they simply arguing or agreeing with each
other without providing reasons? Are you giving answers they could/should
come up with themselves with a little thought or probing? A much stronger
video will be one where you can cite examples seen in the segment where
they are challenging each other, supporting each other, all in a safe and
respectful way. Cite examples where you are challenging them and supporting
them.

g. Analysis (ANA)

♦ Refer to suggestions provided in Entry 2.

♦ Don’t describe the video; explain it. Explain what this video segment tells you
about your students’ ability to analyze and interpret data. Cite proof found in
the featured segment.

h. Content Knowledge (CK)

♦ Explain how your knowledge of the science content helped you choose this
investigation and helped to guide the students in analyzing and interpreting
data.
♦ Explain how your knowledge of learning pedagogy helped you plan this investigation so it would better enable your students to analyze and interpret data to gain a deeper understanding of the concept. Explain why this investigation was appropriate for this group of students and their needs.

♦ Provide a rationale for how your learning and teaching experiences have helped you develop this investigation in such a way that allows you to guide and teach your students to interpret and analyze data. Explain the “method to your madness.”

i. **Reflection (R)**

♦ Refer to suggestions provided in Entry 1.