

Recommendations

Our recommendations are based on our results and are supported by the literature review.

Target Audience

- The K-12 target audience for RTD education product(s) should be middle-school and high-school students and teachers, and if prioritizing between those two, the first priority should be middle-school students and teachers.
- We believe RTD lessons could work with all students, including those under-served/under-represented, such as minorities, ESL students, students in schools with limited access to technology, etc. However, this study cannot answer the question of how to best meet the needs of these students and their teachers. That needs more study.

Vision & Goals

- RTD brings the real world into the classroom and it is the main reason teachers use RTD in their lessons. This “real world” connection should be a key part of the vision and goals for education products based on RTD.

The Content: Data

- The design/development of a RTD education product should, at least initially, be based on the data types that teachers currently use, which will make their use of the product more likely. The top ones teachers currently use are: temperature (air & water), pH, salinity, dissolved oxygen and currents.
- Student-collected data was an important part of RTD lessons for both middle-school and high-school classes, but more so for middle school. If data are provided, teachers are mostly interested in local data sets. Whatever data or sources are the bases of a RTD education product, it was clear from teachers’ conversations that the data must be relevant to their students.

Product Format & Features

- The design of a RTD education product should incorporate these features at a minimum:
 - page layouts that are simple, not too cluttered, with few words
 - intuitive navigation in and out
 - data that are easy to get to—just a couple of clicks
 - lots of visually based explanations (illustrations, pictures, graphics) and data visualizations, but simple in design
 - good easy-to-access explanations of content, parameters and terms
 - map interface so users can find where real-time data are collected
 - lesson plans for teaching science concepts with real-time data
 - local data sets that could also be compared to places nationwide
 - data visualization tools (ability to graph, map and chart data)
 - ease, flexibility when comparing data parameters
 - access to tabular data as well as data visualizations
 - easy download to Excel or other spreadsheet
 - tips on how to get started using real-time data in classroom with students
 - different entry points for different levels of learners—from introductory to advanced.

- Most teachers were fine with an Internet-based product as long as they could download data to Excel. Very few teachers requested that RTD be provided on a CD or in print materials.
- There were mixed views regarding audience use of an online education product—should it be for teachers or for students? Teachers offered no clear guidance on this issue.
- View this product as part of a whole program that includes, ideally, all of the following:
 - data collection at NERRS or other sites local to schools
 - data use in the classroom (the RTD education product)
 - training of classroom teachers: pre-service training, in-services, ongoing support
 - training of NERRS Education Coordinators (ECs) on the use of RTD in NERRS education programs and on working with classroom teachers to help them integrate RTD into their teaching.

Barriers & Challenges

- The greatest barrier to this product for teachers is the disconnect between the potential for RTD in exciting/ connecting students to the real world and the reality of today's K-12 teaching environment with state standards and high-stakes testing. Any RTD product needs to be designed to support what teachers currently have to teach/ test and be integrated into what they do instead of as an add-on.
- if NOAA scientists and educators view RTD as the future for science, there needs to be work on the political front with science education reform to make changes in what teachers are required to teach/ test and how they teach so that what they do matches how science is conducted.

Next Questions

As part of the stakeholders' questions we asked what they would like to know about how K-12 teachers' use RTD in their classrooms and what questions they would like this evaluation project to answer. Below are the questions posed at the start of this project that we believe this evaluation report addresses in whole or to a large degree.

Front-end/Needs Assessment Questions Addressed

*I would like someone to gather a variety of successful examples
What are the best products and tools using RTD for teachers?
How frequently do they use this? Would they want to use it more and if so what would they need to make that happen?
Relevance to classroom curriculum - how does access to RTD support classroom activities?
The ease with which near real-time data are used, the frequency that the data is used, the top 5 data that are used for water quality discussions (e.g., dissolved oxygen, PAR, satellite color information, etc). What's missing for the teacher's information/support?
What parameters do they target? What parameters would they like to see that aren't widely available?
What they use, what they prefer, what works best and what kind of feedback they get from students.
What they find useful? What their students find interesting?
How the fit it in state and national standards and testing?
What they're currently using and where it comes from if they could pick any RTD, what would be most utilized in their classroom?
Why are some teachers able to use the data but not others? Who is more likely to use the data middle school teachers or high school teachers? Private school or public? The informal feedback I get from teachers is that high school classes are so test oriented that the teachers don't have the freedom to do this kind of teaching. I would like to know if that is true.*

Below are some of the questions that still need consideration as NOAA continues to develop RTD education products.

Additional Front-end/Needs Assessment Questions

*How does this relate to other curriculum and field trip opportunities?
If science teachers are the only ones using RTD in their classrooms. Exactly how much of their classroom teaching is dedicated to state test topics.
How NOAA can be more supportive to teacher needs--greater communication between teachers/scientists.
I'm not aware of use in my area so local uses etc.
Offer an in-service training associated with an annual NERRS Education Coordinator's meeting. Who, what, where, how is it [RTD] being done.*

Formative Evaluation Questions

*How are they getting the students engaged with the material?
It is crucial to know whether exercises will be teacher led with whole class or used by students with no direct supervision.
Teacher focus group would be very valuable, however the best data would come AFTER they tried to use the material in the classroom. It's one thing to brainstorm while well caffeinated, and another to implement in a classroom with 26 students.
What training and support would be required to motivate a teacher to use RTD?*

Summative Evaluation Questions

*Are the students really understanding the significance of the data?
Impacts on learning? Anecdotes on how RTD changed lessons or students' enjoyment of curricula.
Usefulness of RTD as a tool for applying real data to lessons?
Can students relate to RTD? Does it help them to understand the scientific process better? Does use of RTD help students to better understand the interdisciplinary nature of different classroom disciplines (i.e., physics, mathematics, biology etc.)?*