SCALE
NU LeTUS responses to add to the UMICH Water Curriculum Project Profile

4.2 History

When was the curriculum first designed and used?

The UMICH/Detroit Public Schools water curriculum, "What is the Water Like in Our River?" was first customized for use in the Chicago Public Schools in the spring of 1999. This was done during a small study by four NU researchers and two CPS teachers, who are LeTUS partners with the original authors at the University of Michigan and the Detroit Public Schools.

The study was designed primarily to provide a dynamic example of teacher learning and teachers' warrants for change in the adaptation of a common LeTUS curriculum across our two sites: Detroit and Chicago (see Williams, AERA 2000). We were also more generally interested to find out what kinds of basic resource materials would need to be added to the existing curriculum to successfully use lessons that had been designed around the Rouge River in the new context of the Chicago River.

The two teachers participating in that first enactment, Lou Ellen Finn and Judy Lachance Whitcomb, both had 7th grade classes in fairly representative urban public schools in northern Chicago. Specifics of their customization experiences are described below in sections 4.3, 4.4 and 4.5. The supplemental items we gathered for our resulting "Resource Packet for CPS Teachers" is also described more fully below in section 4.3.

Since the spring of 1999, the "What is the Water Like in Our River?" curriculum has been used each spring (2000 and 2001) in some of our Chicago LeTUS schools. Approximately 25 teachers have used it in those two years. It is planned again for the spring of 2002, and will be supported by NU LeTUS staff then.

4.3 Evolution and iteration

How many times has the curriculum been redesigned? What were the significant changes (in the activity structure, in the learning goals, in the classroom setting, etc.) in each of these iterations? What prompted those changes?

There was a consensus in the original research group that some basic additions needed to be made to the existing UMICH/DPS curriculum guide for our teachers in Chicago. They were published in a supplement and distributed along with the curriculum at teacher kick off meetings. Most of the items are obviously in response to our having a new site (CPS standards, Chicago River background history, different watershed maps), and some are just the result of the luxury of an increased level of detail (a lesson-by-lesson materials list, tips for taking a river trip, grant information). However, one of the items was the result of the different philosophies of the LeTUS partners (the offering of more object icons for Model-it models).

Here is a brief list of the specific things we added as a result of the 1999 customization study. The supplement includes:

- Chicago Public Schools instructional standards for grades 6-8
- A brief history of the Chicago River (background info for teachers and students)

- Maps of the Chicago River, Illinois river basin, Lake Michigan, and Great Lakes watersheds
- Typical water quality values for the river (dissolved oxygen, nitrates, phosphates, pH)
- List of animals and plants found in the Chicago River
- Materials list for all of the lessons, and info on how to order supplies
- Tips for taking a river trip
- Additional icons for Model-it
- Local sources of information, excursions to museums, and assistance
- Grant ideas

In that first enactment, Ms. Finn planned to do the curriculum pretty much as the designers wrote it from UMICH/DPS. She intended to follow the lessons provided in the curriculum guide, making only minor changes only as necessary. Ms. Whitcomb planned to make fundamental changes to the driving question and to situate the lessons within a new context of her own design. They had decided to do this before they even began to use and adapt the curriculum. They wanted to see how their experiences would differ with slightly different instructional goals.

In Ms. Finn's class:
Ms. Finn chose not to take her class on the river trip in the beginning of the unit, but used a video called "Children of the River" instead. Her school was too far from a river site and logistics of the trip were too daunting. She adapted the first lessons in Learning Set 1 to fit the film. Groups were randomly formed by numbering off and were given specific items to look for in the film (topography, natural and human constructions, living organisms, etc). Students then watched the film and shared their observations. At this point, they also spent time brainstorming what they already knew about the river. They did the student questioning lessons as written.

In Learning Set 2, Session 1, Ms. Finn's class spent some time discussing models in general and what they are like. They built the physical models and observed what happened when sprayed with rain, but they did not do the Model-it activities at this point as written in the guide. These students were very familiar with the software, since they had done another curriculum in the previous fall. Ms. Finn would have done the Model-it lessons, had her students not been as familiar with the software already.

The class did not do any of the activities involving the maps in later in Learning Set 1, Session 2, because Ms. Finn wanted to be sure to have enough time for the stream tables and Model-It at the end of the unit. In Session 3: they spent a lot of time doing the stream tables, with students working together in groups. Each group had its own table to work with. They discussed observations of these stream tables after all were completed. There was also a large stream table which groups were able to use when they finished their work on their individual tables. This demo model proved valuable in that the results were somewhat better with the larger model.

When students had completed the stream tables and their discussions, they went to the computers to use the Model-it software. There was some difficulty with the software and the amount of information that students had from their observations. Students felt that they were not well enough prepared to complete the objects, factors, and relationships. They also felt limited by the objects that were provided and wanted to be able to add more of their own to represent how they saw the environmental issue. This was due, Ms. Finn believes, to their previous experience with the software.

In Ms. Whitcomb's class:
Ms. Whitcomb reports that she always tries to focus her students' attention on the connections between and interdependence among things in the physical world. When she planned to enact the UMICH/DPS water curriculum, she wanted to make sure that this effort continued. However, she was not quite sure how it would be accomplished since she had never done a water quality project. Her students gave her an idea on how to proceed: during the pre-activity informal survey discussions and following the initial watershed activity, comments and questions from the students led her to a watershed theme. This is slightly different focus from the water quality theme of the written curriculum.

Once that watershed them had been chosen, Ms. Whitcomb's next task was to develop five areas of concentration from which teams could choose their focus. These five areas were: human development, living organisms, natural constructions, point and non-point source pollution, and topography. Each group looked at the effects of the quality of the water and watershed from the perspective of its chosen area of concentration.

In order for students to formulate hypotheses of potential disruption of the watershed's ecosystem, a problem needed to be posed. Students were told that a sports complex was going to be built in the north riparian zone of the Chicago River near LaBagh Woods (an area very close to their school). Throughout the project, students had to determine the impact of the focus area on the complex construction as it related to the water quality of the river. The culmination of the project was to propose a watershed plan that would minimize the impact of the construction on the watershed with an emphasis on their team's focus area.

Here are short descriptions of the major activities Ms. Whitcomb added to her unit:

> Research: using multiple sources, her students researched what a watershed is, what a balance watershed ecosystem (with emphasis on a particular focus area) would be, what impact human construction may have on the watershed, etc. This research led to the problem statement.
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> Problem Statement: Student teams developed a problem statement that identified the cause and effect factors of the sports complex development on the riverbank from the team's focused perspective. Although dynamic (subject to ongoing revisions) throughout the project, this led to the construction of a scientific model of the problem.
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> Model: A scientific model of each team's problem was constructed using the Model-it software. Students identified objects, factors and relationships between them in order to clarify the causes and effects of the problem. This process was dynamic through the rest of the project.
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> Research Site Visit: During this river trip, students tested the river water for basic indicators of water quality. These indicators were levels of dissolved oxygen, nitrates, phosphates, and pH. Additional indicators were temperature upstream and downstream and turbidity. Testing materials were the test tabs provided in the LaMotte kits. In addition, PASCO probes were utilized for a second test of pH and temperature. To facilitate student learning and testing procedures a field guide was prepared for each team member as well as an additional one that was turned into the instructor. Teams were expected to record observations pertinent to their area of focus.

Preparing a Watershed Plan: In the class periods following the site visit, students refined their problem statements, models, and began to research viable solutions to the potential problem. These solutions had to be realistically possible. The refinement of the problem statements and models was possible due to the site visit research and additional book and internet based research.

Presenting a Plan: Students then presented their problem, model, and proposed solution to the whole class. Each of their peers had to prepare questions to give to the team that demonstrated. They submitted brief, one-page Watershed proposal sheets developed by the teacher. The final report was not simply about the quality of the water in the river, but about a proposed design of a sports complex.

4.4 Examples of curricular change

Some changes are larger than others, but not everyone agrees about which changes are major and which changes are minor. Please give an example of what you would consider a major change that occurred during redesign and an example of what you would consider a minor change.

Ms. Whitcomb's enactment represents a major change in the curriculum as written. First, she redefined what the driving question was, and the manner in which the students received the driving question. They developed their own questions, around a problem of proposed construction. She felt very strongly that the question had to come from the students.

She also engaged them in a series of activities (described above in section 4.3) that were not in the original curriculum at all.

Ms. Finn's use of the video was an example of a minor change because the purposes of the video and the river trip were the same: to introduce the students to their local river and to get them started in making observations and asking questions about it.

Her skipping the first Model-it lesson was also minor, as her students already had experience with the program.

Ms. Finn's addition of a demo stream table in addition to the students' individual tables was a minor change from what was written.

Both teachers adjusted the focus of the curriculum from water quality to watersheds. I believe it was a minor change in the case of Ms. Whitcomb- because the students still focused on water quality but in the context of a watershed investigation- but a major change in the case of Ms. Finn- because the students did not ever fully address parameters of water quality in the later lessons.

4.5 Justifying change

What kinds of evidence do you use to motivate and justify changes to the curriculum? Do certain kinds of evidence (e.g. teacher feedback, available classroom time, qualitative or quantitative data from classroom research studies, researcher or developer impressions from being in the classroom, etc.) carry greater weight in the redesign process? Is different evidence required to justify different kinds (e.g. major vs. minor) of change? Why?

It became clear to Ms. Finn that there was insufficient time for a complete enactment of the curriculum as written in the five weeks before the end of the school year. She decided that it would be necessary to choose which lessons could be used to give the students a viable

experience. She acknowledges that she did not do a complete enactment of the curriculum. She had only 5 weeks to do what was meant to be an 8-week curriculum. Therefore, time was the greatest factor in Ms. Finn's decisions to skip portions of the curriculum as written. She had to cut, so she chose to make it a "watershed" rather than "water quality" learning experience. Due to time, she reports, " we were not able to complete any f the water testing activities [at the end of the curriculum]. This would, I believe have helped with my students' frustration at not having enough information for their Model-it and would have given them a much better picture of water quality and the river. The parts of the unit that we did were more about watersheds and river dynamics. They were not as relevant to water quality and it made the [existing] driving question harder to get at."

Ms. Finn's main focus was to make the unit an overall worthwhile learning experience for her students. She felt she did that, and that the lessons still had integrity in the order in which she did them. The things she left out, in other words, were not necessary to help them build their understandings of watersheds and the importance of watersheds in a systemic view of human-environment interaction. She left out the entire second half - the water tests themselves. She made changes based on her understanding of the students' previous knowledge and experience, like with the Model-it software.

For Ms. Whitcomb, it was not so much the time constraints as the relevance of the driving question that drove her changes. She wanted to be sure that the student had a good reason for engaging in the activities and she spent a good deal of time on the set up of the unit. She used parts of the curriculum that applied to the problem, but did not follow any proscribed sequence or lesson plan. She has a great deal of experience in curriculum design and was very comfortable doing this.