

## INTRODUCTION:

This report is composed of five parts: the introduction, three parts covering the results of each survey, and finally, the conclusion.

The Mid-Michigan Watershed Connections Project took place from May 2022 through June 2023 and included the training for 22 educators from the Mid-Michigan area. Of these educators, 16 participated in an initial survey, 9 completed a survey covering the meetings from May 2022 through August 2022 and 8 completed a post-program survey. In addition, 10 participating teachers responded to a supplemental survey conducted by the BWET administration. The following sections summarize findings for the 4 surveys conducted:

## FINDINGS FOR THE INITIAL SURVEY:

This survey was conducted over the first weeks of the program’s duration and was responded to by 16 of the program participants. Of the 16 respondents, 13 identified as Science Teachers while 3 identified as Classroom Teachers (all subjects). Several of the respondents have multiple certifications with the following breakdown in table #1:

Q2 What endorsements are on your certification in teaching? (check all that apply)

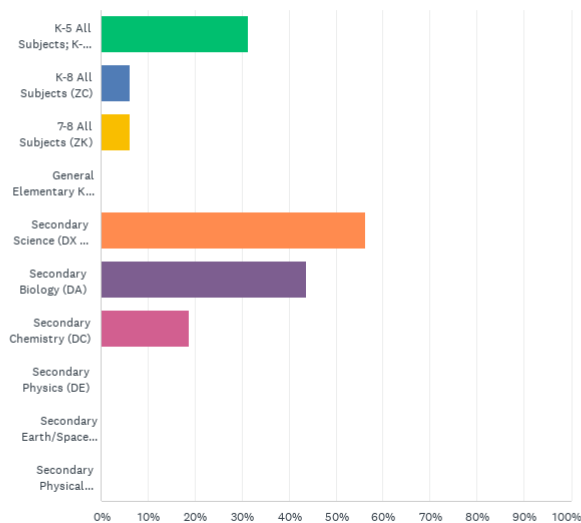


Table #1 Summary of Participant Certifications

Reported years of experience were: 18.25% with fewer than 5 years, 18.25% with between 5 and 10 years and the remainder (62.50%) reported more than 10 years of teaching experience.

Courses taught by participants varied among the spectrum of science courses, with the majority of sections taught being some form of biology as summarized in Table #2 below:

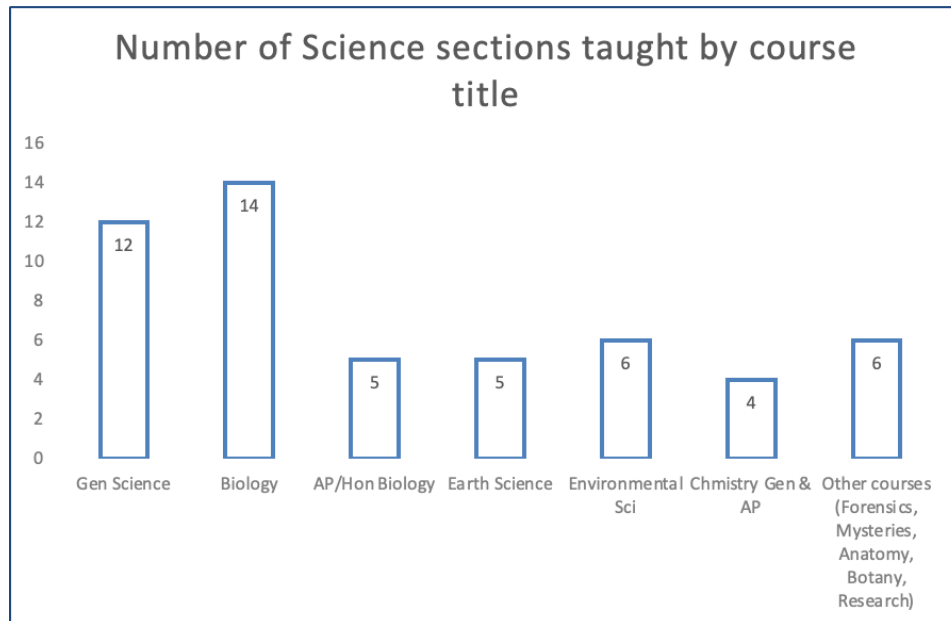


Table #2 Science Sections Taught by Participants

When asked why they chose to participate in this training program, some gave multiple reasons. The most common reason for participation was that the program “fit my interest in becoming a more effective educator, 87.5%; 31.3% reported that the scheduling of opportunities on their own time is better and 12.5% stated that they will get credit toward Professional Development through their employer; other reasons given were that they expected this program would offer opportunities to give their students outside experiences. Overall expectations for how the program would serve them included an increased ability to integrate improved understanding about watersheds and the B-WET program into classroom activities as well as to use the connections with experts in the field to connect students to the work they are doing in the field. As one participant put it: “My goal is to make connections with people in the field who can help offer my students opportunities to participate in work related to water (specifically in the areas of Experimentation, Photosynthesis/Respiration, Ecology, and Viruses/Bacteria) that contributes to real work and research in the world.”

This initial survey also asked participants to rate their own understanding of several objectives expected to be covered during the program; those results will be analyzed and reported in the final section of this document with those of the post survey.

#### SURVEY OF THE MEETINGS:

This survey was conducted after most of the meetings/workshops had been conducted and asked the participants about their experiences during each of the meetings/trainings that took place over the May of 2022 and through August of 2022. Nine of the participants completed this survey, and were asked to evaluate only the meetings that they participated in. Of the Summer 2022 meetings, 100% of respondents attended 4 of the 7 meetings; the additional 3 meetings had

respondent participation of 89%, 78% and 56% respectively. The questionnaire was structured to skip the evaluation portion of a meeting. The participants were asked to rate each meeting's objectives according to the following scale:

- 1 = Nothing really stood out, I won't be able to use this with my students
- 2 = Nothing new for me, but I will use this or similar activities with my students
- 3 = I learned some new information, but I won't be able to use this with my students
- 4 = I learned some new information, I will use this or similar activities with my students.
- 5 = I learned a lot, but I won't be able to use this with my students
- 6 = I learned a lot and I am excited to use this or similar activities with my students.

Scale responses for each objective were averaged to result in an average rating for each meeting on the 1-6 numerical scale. Results are summarized in Table #3 below:

Meeting Title	Average Rating
Woldumar Nature Center Meeting	5.32
July 6 Meeting at Okemos High School	5.68
Haslett Middle School Meeting	5.67
Eaton Rapids Meeting	5.26
Muskegon and Lake Michigan	5.65
July 29 Meeting in Lansing	5.65
Program at Lake Lansing	6.00

Table #3 Rating of Summer 2022 Meetings

As can be seen, the average overall rating for all meetings was above 5.2 out of 6. The meeting with the greatest reported value for participants was the Outreach Program at Lake Lansing, which focused on adapting the LIMNO Lake Education program to individual teacher settings including ideas for making equipment and keeping expenses low. The second most highly rated meeting was that at Okemos High School where, among other things, they learned about the programs provided by Michigan Department of Environment, Great Lakes and Energy (EGLE), participated in teacher led activities on water cycle, porosity and permeability of different soils and traveled to the Tollgate Project for urban stormwater management in Lansing.

**FINDINGS FOR POST SURVEY:**

This survey was conducted in June 2023, after all meetings had been conducted and teachers had already had the opportunity to implement new material with their classes and to provide a field

trip experience for their students. There were 8 respondents to the survey, 6 of whom reported being science teachers, one reported being a classroom teacher of all subjects and one reported being a long-term substitute teaching 7th grade science. Of the respondents, 1 reported having between 5 and 10 years of teaching experience and the remaining 7 reported more than 10 years of teaching experience. The science taught by the respondents ranged from 7th grade science to a range of high school science courses including, but not limited to: biology, physical science, earth science and chemistry.

In addition to rating their own understanding on the overall objectives of this program, which will be discussed in the final section of this report, participants were asked to think about how they thought they would be implementing this training in their classroom, and then consider how their ideas for implementing this training into their classroom(s) changed after having participated in the meetings for this program. Some of the responses are given here:

- “I used so much more [of] the materials than I thought I would. I thought I would learn about watersheds and environmental conservation and usage. I got so much more out of it than I thought I would. It drastically changed my environmental science classes and improved them. I have also used the information in my work with the zoo.”
- “I thought I might get one idea but my students got outside many times last year for water related work. Thank you!!”
- “I was teaching Environmental Science at a different school when I signed up for the training. In switching to a new school, and teaching different courses, my ability to implement the training changed significantly.”
- “I was able to relate the material more than I had anticipated; many of the concepts and lessons can be connected to other subjects such as math, economics, and [my school’s] "Global Goals" for their Magnet program.”
- “I used many of the lessons. Used the maps to help students understand watersheds. We are using our school pond to check for water quality using both Vernier equipment and by looking for micro invertebrates. We also have a marsh and a vernal pool on school property that we have been investigating..”

They were also asked about the program supported field trip they were able to take their students on. The field trips included:

- Lake Lansing for Lake Investigations in Michigan and Nature Observations (LIMNO) activities
- watershed monitoring in SouthEast Michigan
- water quality testing on Sycamore Creek with Woldumar and Ecogreen
- Taking the W G Jackson to do water quality testing on Lake Michigan and Muskegon Lake
- looking for micro plastics along the Lake Michigan beaches

- a VERNAL POOL field trip near Lake Lansing off of Wild Ginger Trail in Haslett, MI. “We learned about the features of vernal pools, their benefit to the ecosystem, and we sampled the water for organisms. It was great!”

**BWET SUPPLEMENTAL SURVEY QUESTIONS:**

Questions included in the supplemental survey included queries about time spent teaching the watershed concepts; open ended questions about student feedback, projects and knowledge of careers related to watershed and natural resources management as well as suggestions for future improvements to the Mid-Michigan Watershed Connections Program. The results are summarized below.

Ten of the participants responded to these questions. In response to time spent on teaching the concepts, there is a mix of responses: some participants responded in hours, some in weeks and some in months. The minimum number of weeks reported is 4 weeks, and the minimum number of hours, 26; while the maximum number of weeks reported is 14 weeks and the maximum number of hours is 15 hours per week for an unnamed number of weeks as shown in the table below:

Participant	Time
1	26 hours
2	12 weeks (6 during two different trimesters)
3	4 weeks
4	4 weeks first semester
5	Approx. 6 weeks
6	2 months
7	About 3 days per month (~15 hours per month)
8	Once a week
9	14 weeks
10	15 hrs per week

When asked about student feedback, teachers reported students being “amazed” at the interconnectedness of the Michigan watershed areas. In some cases students were repulsed at the knowledge that everything from the roads drains into the rivers, and that they were made more conscious of the effects of the litter thrown to the ground as well as the chemicals applied to their

yards. Some of the topics recorded by several teachers were student surprise about plastics and microplastics' long term presence in the environment, causing some students to commit to switching to reusable water bottles. Finally, students whose families are in agriculture, they “expressed surprise” that some of the farm management practices could contribute negatively to the health of the ecosystem and said they “had a better understanding of how their families’ adoption of regenerative techniques could make a positive impact.”

With respect to careers, some students were surprised at the possibility of a career where part of the job was to hike through wetlands. Other careers of interest included working in treatment facilities and natural resources. One teacher felt that they could have had a greater impact for students had they been able to invite someone in during the year.

Although, overall, responses to questions of future improvements conveyed significant satisfaction with the program, there were also some positive suggestions for improvement. These included a more convenient time schedule such as once a month meetings, a google classroom where digital resources could be posted, and more learner based information with less focus on lectures.

#### CONCLUSION:

The success of the Mid-Michigan Watershed Connections program is evidenced by the positive feedback from the teachers who, as stated in the Post-program survey, found value in using the skills, resources and ideas in their classrooms (see Post Survey section). In addition, the Initial and Post Surveys asked the participants to evaluate their own level of understanding and their level of confidence to teach the objectives covered during this program. For the level of understanding, the scale used for these ratings was the following:

- 1 = Not at all knowledgeable
- 2 = I have a little understanding, but definitely not enough to teach it
- 3 = Neutral - I am somewhat knowledgeable
- 4 = I have a considerable level of knowledge
- 5 = Expert

For their confidence in teaching the objectives, the following scale was used:

- 1 = Not at all confident
- 2 = I have a little understanding, but definitely not enough to teach it
- 3 = Somewhat confident, however, I have room for improvement
- 4 = Pretty confident, but I'd like to learn more
- 5 = Extremely Confident

The weighted averages of how the respondents rated themselves before and after are presented in

Tables #4 and #5 below:

<b>Rating of level of knowledge in each of the stated objectives</b>	<b>Initial Average Rating</b>	<b>Post Average Rating</b>	<b>Change in overall rating</b>
- explain what a watershed is, as well as the terms divide and tributary	3.38	4.50	1.12
- explain eutrophication of a lake and what factors contribute to it.	3.25	4.00	0.75
- describe how activities on land affect water quality	3.56	4.13	0.57
- describe connections between surface water and groundwater	3.44	4.00	0.56
- list parts of the water cycle and how the sequence of steps can vary	4.13	4.63	0.50
- explain what a water budget is and how that relates to flood risk	2.63	3.75	1.12
- find and use appropriate teaching activities in Project WET materials	3.19	4.50	1.31
- describe a way to engage students in research or service project	2.94	4.25	1.31
- describe at least 4 different professions which deal with water and watershed issues	3.19	4.50	1.31
- explain how macro-invertebrates can be used to evaluate water quality in lake or river	2.94	4.25	1.31
- describe ways of controlling erosion and runoff	3	3.88	0.88
- define a vernal pool	2.5	4.50	2.00
- define storm water and explain the problem associated with combining it with sewage	2.81	4.25	1.44
- explain problems associated with microplastics and where they come from	3.13	4.38	1.25
- describe what an Augmented Reality Sandbox can show	1.94	3.75	1.81

Table #4 Change in Participant Ratings of Knowledge of Covered Objectives

<b>Rate your current level of confidence to teach each of the stated objectives</b>	<b>Initial Average Rating</b>	<b>Post Average Rating</b>	<b>Change in overall rating</b>
- explain what a watershed is, as well as the terms divide and tributary	3.38	4.75	1.37
- explain eutrophication of a lake and what factors contribute to it.	3.13	4.13	1.00
- describe how activities on land affect water quality	3.69	4.25	0.56
- describe connections between surface water and groundwater	3.38	4.63	1.25
- list parts of the water cycle and how the sequence of steps can vary	4.06	4.75	0.69
- explain what a water budget is and how that relates to flood risk	2.50	4.00	1.50
- find and use appropriate teaching activities in Project WET materials	3.38	4.88	1.50
- describe a way to engage students in research or service project	2.94	4.63	1.69
- describe at least 4 different professions which deal with water and watershed issues	3.06	4.63	1.57
- explain how macro-invertebrates can be used to evaluate water quality in lake or river	2.81	4.38	1.57
- describe ways of controlling erosion and runoff	2.88	4.38	1.50
- define a vernal pool	2.38	4.75	2.37
- define storm water and explain the problem associated with combining it with sewage	2.88	4.50	1.62
- explain problems associated with microplastics and where they come from	3.19	4.75	1.56
- describe what an Augmented Reality Sandbox can show	1.69	4.00	2.31

Table #5 Change in Participant Ratings of Confidence to Teach Covered Objectives



Based on the average rating on each of the objectives, in all cases, respondents' rating of both their level of knowledge and their confidence in teaching the objective increased as a result of participation in the program. There were 3 objectives where the changes for participant's level of knowledge were found smallest (between 0.50 and 0.57 average difference from initial survey to post survey). These were also the objectives that the teachers rated themselves highest initially and therefore, had the smallest room to change. These objectives were: to list the parts of the water cycle and how the sequence of steps can vary, to describe connections between surface water and groundwater and to describe how activities on land affect water quality. When rating their confidence in teaching the objectives, the smallest changes (0.56 and 0.69 average difference from initial survey to post survey) occurred two of the same objectives, to describe how activities on land affect water quality and to list parts of the water cycle and how the sequence of steps can vary. The objectives with the greatest increases were the same for both teachers' level of knowledge and for their confidence in teaching the objectives. The increases in rating were 1.81 points and 2.31 points respectively for the objective "to describe what an Augmented Reality Sandbox can show," and 2.00 points and 2.37 points for the objective "to define a vernal pool." In conclusion, the data show that in all areas, the participants found value and usefulness from participation in the Mid-Michigan Watershed Connections program.

Also included in the Mid-Michigan Watershed Connections project, but not part of this evaluation, were two outreach programs addressing ways the participants could engage youth in the topics of watersheds and lake investigations. One of the outreach programs was a day-long program at Lake Lansing for staff of nature centers, conservation districts and youth camps. The second was a 2-hour program at a state conference for youth camp staff.