

Mark Twain Boyhood Home & Museum

Lesson or Unit Plan for *The Adventures of Tom Sawyer* (excerpts)

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City, State: Shelbyville, MO

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Hannibal, Missouri

“Exploring Caves”

LESSON or UNIT PLAN for *The Adventures of Tom Sawyer*

Essential Question: The cave setting plays an essential role in this book. Missouri and the United States Midwest has many caves. Why are caves so common in this geographic area, what geologic process forms caves, and what are the biotic and abiotic characteristics of caves?

Concept or Topic: Unit: Changes in the Earth, Cave Formation	Suggested Grade Level: 8 th grade (May be modified for grades 4-6.)
Subject: Science	Suggested Time Frame: 3 Block Schedule Class Periods (each 80 minutes in length)

Objective(s): Students in 8th grade will describe the general process of cave formation and five common geologic or ecologic characteristics of caves in a three-paragraph summary, scoring at least 24 out of 30 points on the scoring guide.

Missouri Learning Standards--Grade Level Expectations (Spring 2016):
6-8-ESS2-2: Construct an explanation based on evidence for how geosciences processes have changed Earth’s surface at varying time and spatial scales.

- Assessments:**
- Formative—Pre-assessment of how caves form, necessary geologic factors, common features and organisms.
 - Summative—Students will write descriptions of cave formation, describe common formations and communities within a cave.

Vocabulary: (Tier 3) carbonation, life-line, stalagmite, stalactite, habitat, population, community, habitat, biotic, abiotic, acidic

- Subject Area Integration:**
- Science with Writing and Art

- Background Information:**
- Students will have studied rocks and minerals. Students will have a basic understanding of mechanical and chemical weathering. Teacher will provide a brief summary of the story of Tom Sawyer, including the character relationship between Tom and Becky.

Materials:

- Materials specific to laboratory activities (see lab instructions.)
- Excerpts from *The Adventures of Tom Sawyer* (<http://literatureproject.com/tom-sawyer>)

Technology:

- Access to Internet capable computers
- Interactive whiteboard

Related Twain Quotes/Passages:

(Included on day 2. This passage will be used to introduce the part of the lesson on cave ecology following a “Human Graph” activity of student perception of bats. Students will arrange themselves into, “I like bats,” “I don’t have strong feelings for or against bats,” or “I hate bats” groups.)

BATS

A bat is beautifully soft and silky; I do not know any creature that is pleasanter to the touch or is more grateful for caressings, if offered in the right spirit. I know all about these coleoptera, because our great cave, three miles below Hannibal, was multitudinously stocked with them, and often I brought them home to amuse my mother with. It was easy to manage if it was a school day, because then I had ostensibly been to school and hadn't any bats. She was not a suspicious person, but full of trust and confidence; and when I said, "There's something in my coat pocket for you," she would put her hand in. But she always took it out again, herself; I didn't have to tell her. It was remarkable, the way she couldn't learn to like private bats. The more experience she had, the more she could not change her views.

I think she was never in the cave in her life; but everybody else went there. Many excursion parties came from considerable distances up and down the river to visit the cave. It was miles in extent and was a tangled wilderness of narrow and lofty clefts and passages. It was an easy place to get lost in; anybody could do it—including the bats. I got lost in it myself, along with a lady, and our last candle burned down to almost nothing before we glimpsed the search party's lights winding about in the distance.

"Injun Joe," the half-breed, got lost in there once, and would have starved to death if the bats had run short. But there was no chance of that; there were myriads of them. He told me all his story. In the book called *Tom Sawyer* I starved him entirely to death in the cave, but that was in the interest of art; it never happened. "General" Gaines, who was our first town drunkard before Jimmy Finn got the place, was lost in there for the space of a week, and finally pushed his handkerchief out of a hole in a hilltop near Saverton, several miles down the river from the cave's mouth, and somebody saw it and dug him out. There is nothing the matter with his statistics except the handkerchief. I knew him for years and he hadn't any. But it could have been his nose. That would attract attention.

- *Mark Twain's Autobiography*

Lesson Sequence: See following pages.

Homework: See daily sequence and student handouts.

Strategies for Exceptional Students:

- All hand-outs of reading materials will be provided to the resource room teacher so that reading support can be given.
- Some reading will be done on computer which allows students to “zoom” or change font size to read more easily.
- For the final assessment, total paragraphs could be reduced to 2 for students with IEPs that indicate a need for decreased assignment length. In this case paragraphs 1 and 2 would be combined into 1 paragraph and 4 specific facts would be required.

Lesson Sequence

Day 1—Introduction to Cave Geology

Hook/Intro—Pre-assessment of cave prior knowledge (written response to questions: What does it take to make a cave? How do you know what you know about caves?)

Teacher’s note: Question is deliberately ambiguous—does “make” mean geologic formation or does it mean critical components? Let students answer as they want, then clarify that we will be learning about both while using the literature of Mark Twain in the novel, *The Adventures of Tom Sawyer*.

Part 1: Geologic Formation of Caves

Remind students of characteristics of limestone and show limestone rock.

- Limestone is a sedimentary rock meaning it was formed by compacting and cementing of sediment.
- The sediment parent of limestone is calcium containing compounds from organic materials (from shells, bones, etc.) or from chemicals dissolved in water bodies.
- Limestone, being a calcium containing material is very susceptible to chemical weathering by weak acids.
- Most common large-scale bedrock on NE Missouri is limestone.

(Student Handout 1)

Activity 1—Where does the acid that attacks the limestone bedrock come from?

Materials: plastic cups, tap water, bromothymol blue, pipettes, drinking straws, goggles

Procedure:

1. Fill cup about 1/3 of the way with tap water.
2. Add ten drops of bromothymol blue to the cup and record the color of the solution.
3. Put on goggles.
4. Insert straw into cup and slowly blow into the water to bubble carbon dioxide into the solution.
5. Continue blowing gently until the solution changes color twice. Record color changes as they occur.
6. Clean Up—All solutions may be dumped in sink, cups and straws should be disposed of in trash.

7. Complete the table below and answer the questions which follow.

DATA

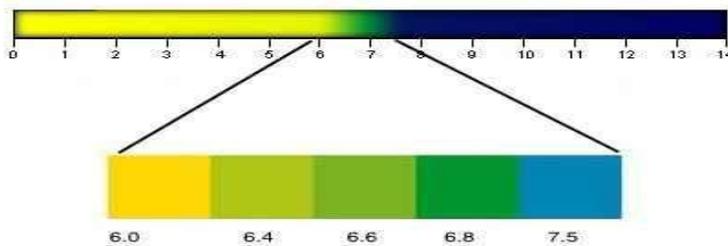
	Initially	1 st color change	2 nd color change
Color			
Approximate pH (from table)			

Background Information:

The pH scale ranks solutions according to their relative abundance of H⁺ ions. Acids are lower than 7 on the scale, 7 on the scale is neutral and values above 7 are bases. Acidic solutions will cause chemical change in calcium compounds. The lower the pH number, the stronger the acid is. Strong acids will cause faster and more dramatic changes.

Bromothymol blue is an “indicator” that will change color as a solution’s pH changes. Bromothymol blue is unique because it changes color over very small pH variation.

bromothymol blue



Questions

1. Use the scale above to finish the data table. Which color of solution is acidic? _____
2. What gas in your exhaled breath made the water become acidic? _____
3. Water falling as rain also dissolves and absorbs this gas. As rainwater soaks into the soil, it also absorbs this gas. Therefore, rainwater is (*slightly* *strongly*) acidic. (circle one)

Extension—If conditions cooperate, collect and test the pH of rainwater using a digital pH probe.

Activity 2: Scale of weathering impact on limestone:

How much is limestone changed and how long does it take? (No hand-out, work from website.)

https://www.nps.gov/cave/learn/education/upload/geology_middle_school.pdf

Use pages 65-69 (pdf) for activity 2. Natural Acids—What Makes Those Big Holes in the Ground?

Cautions: Activity may need modification to include the idea of life-line of the cave—the crack that initially allows the infiltration of the water into the limestone rock layer. (I am thinking a third piece of chalk that has been coating with clear nail polish and then scratched. This is not written in because I

need to try it first and do not have access to materials at this time to do the activity.) Be sure to emphasize that vinegar is a much stronger acid than carbonated rain water. Chalk is also a very soft and soluble form of limestone. In the Midwest we are most familiar with a cave type known as “solutional caves.” There are other types of caves including those formed by waves, wind, volcanic activity, etc.

Active learning strategies/follow-up to lab activities: (See Teacher Materials following lesson sequence.)

I have/Who has in groups of 5 to review facts.

I have limestone.

Who has the gas that makes rainwater acidic?

I have carbon dioxide.

Who has the chemical present in most rocks that dissolve in acid?

I have calcium.

Who has the name for the crack present in bed rocks that allows water to seep into layers?

I have “life-line.”

Who has the term for the specific type of weathering that forms caves?

I have carbonation.

Who has the type of rock that has been weathered to form most Midwest solutional caves?

Homework and introduction to the next class: How do you know about caves? Have you ever read anything about caves in a novel or reading book?

Discussion of *The Adventures of Tom Sawyer* and distribution of assigned reading pages for next class.

Summary points to bring the story to the cave scene:

- Tom lives in St. Petersburg (Hannibal) with his Aunt Polly, cousin Mary, and younger brother Sid.
- He has met Becky Thatcher in the previous school year, gotten “engaged” to her and earned her wrath when she finds out he has already been “engaged”

Excerpts from *The Adventures of Tom Sawyer*

Downloaded from <http://literatureproject.com/tom-sawyer>

July 20, 2016

CHAPTER XXIX

THE first thing Tom heard on Friday morning was a glad piece of news -- Judge Thatcher's family had come back to town the night before. Both Injun Joe and the treasure sunk into secondary importance for a moment, and Becky took the chief place in the boy's interest. He saw her and they had an exhausting good time playing "hi- spy" and "gully-keeper" with a crowd of their school- mates. The day was completed and crowned in a peculiarly satisfactory way: Becky teased her mother to appoint the next day for the long-promised and long- delayed picnic, and she consented. The child's delight was boundless; and Tom's not more moderate. The invitations were sent out before sunset, and straightway the young folks of the village were thrown into a fever of preparation and pleasurable anticipation. Tom's excitement enabled him to keep awake until a pretty late hour, and he had good hopes of hearing Huck's "maow," and of having his treasure to astonish Becky and the picnickers with, next day; but he was disappointed. No signal came that night.

Morning came, eventually, and by ten or eleven o'clock a giddy and rollicking company were gathered at Judge Thatcher's, and everything was ready for a start. It was not the custom for elderly people to mar the picnics with their presence. The children were considered safe enough under the wings of a few young ladies of eighteen and a few young gentlemen of twenty-three or thereabouts. The old steam ferry- boat was chartered for the occasion; presently the gay throng filed up the main street laden with provision- baskets. Sid was sick and had to miss the fun; Mary remained at home to entertain him. The last thing Mrs. Thatcher said to Becky, was:

"You'll not get back till late. Perhaps you'd better stay all night with some of the girls that live near the ferry-landing, child."

"Then I'll stay with Susy Harper, mamma."

"Very well. And mind and behave yourself and don't be any trouble."

Presently, as they tripped along, Tom said to Becky:

"Say -- I'll tell you what we'll do. 'Stead of going to Joe Harper's we'll climb right up the hill and stop at the Widow Douglas'. She'll have ice-cream! She has it most every day -- dead loads of it. And she'll be awful glad to have us."

"Oh, that will be fun!"

Then Becky reflected a moment and said:

"But what will mamma say?"

"How'll she ever know?"

The girl turned the idea over in her mind, and said reluctantly:

"I reckon it's wrong -- but --"

"But shucks! Your mother won't know, and so what's the harm? All she wants is that you'll be safe; and I bet you she'd 'a' said go there if she'd 'a' thought of it. I know she would!"

The Widow Douglas' splendid hospitality was a tempting bait. It and Tom's persuasions presently carried the day. So it was decided to say nothing anybody about the night's programme. Presently it occurred to Tom that maybe Huck might come this very night and give the signal. The thought took a deal of the spirit out of his anticipations. Still he could not bear to give up the fun at Widow Douglas'. And why should he give it up, he reasoned -- the signal did not come the night before, so why should it be any more likely to come to-night? The sure fun of the evening outweighed the uncertain treasure; and, boy-like, he determined to yield to the stronger inclination and not allow himself to think of the box of money another time that day.

Three miles below town the ferryboat stopped at the mouth of a woody hollow and tied up. The crowd swarmed ashore and soon the forest distances and craggy heights echoed far and near with shoutings and laughter. All the different ways of getting hot and tired were gone through with, and by-and-by the rovers straggled back to camp fortified with responsible appetites, and then the destruction of the good

things began. After the feast there was a refreshing season of rest and chat in the shade of spreading oaks. By- and-by somebody shouted:

"Who's ready for the cave?"

Everybody was. Bundles of candles were procured, and straightway there was a general scamper up the hill. The mouth of the cave was up the hillside -- an opening shaped like a letter A. Its massive oaken door stood unbarred. Within was a small chamber, chilly as an ice-house, and walled by Nature with solid limestone that was dewy with a cold sweat. It was romantic and mysterious to stand here in the deep gloom and look out upon the green valley shining in the sun. But the impressiveness of the situation quickly wore off, and the romping began again. The moment a candle was lighted there was a general rush upon the owner of it; a struggle and a gallant defense followed, but the candle was soon knocked down or blown out, and then there was a glad clamor of laughter and a new chase. But all things have an end. By-and- by the procession went filing down the steep descent of the main avenue, the flickering rank of lights dimly revealing the lofty walls of rock almost to their point of junction sixty feet overhead. This main avenue was not more than eight or ten feet wide. Every few steps other lofty and still narrower crevices branched from it on either hand -- for McDougal's cave was but a vast labyrinth of crooked aisles that ran into each other and out again and led nowhere. It was said that one might wander days and nights together through its intricate tangle of rifts and chasms, and never find the end of the cave; and that he might go down, and down, and still down, into the earth, and it was just the same -- labyrinth under labyrinth, and no end to any of them. No man "knew" the cave. That was an impossible thing. Most of the young men knew a portion of it, and it was not customary to venture much beyond this known portion. Tom Sawyer knew as much of the cave as any one.

The procession moved along the main avenue some three-quarters of a mile, and then groups and couples began to slip aside into branch avenues, fly along the dismal corridors, and take each other by surprise at points where the corridors joined again. Parties were able to elude each other for the space of half an hour without going beyond the "known" ground.

By-and-by, one group after another came straggling back to the mouth of the cave, panting, hilarious, smeared from head to foot with tallow drippings, daubed with clay, and entirely delighted with the success of the day. Then they were astonished to find that they had been taking no note of time and that night was about at hand. The clanging bell had been calling for half an hour. However, this sort of

close to the day's adventures was romantic and therefore satisfactory. When the ferryboat with her wild freight pushed into the stream, nobody cared sixpence for the wasted time but the captain of the craft.

CHAPTER XXXI

NOW to return to Tom and Becky's share in the picnic. They tripped along the murky aisles with the rest of the company, visiting the familiar wonders of the cave -- wonders dubbed with rather over-descriptive names, such as "The Drawing-Room," "The Cathedral," "Aladdin's Palace," and so on. Presently the hide-and-seek frolicking began, and Tom and Becky engaged in it with zeal until the exertion began to grow a trifle wearisome; then they wandered down a sinuous avenue holding their candles aloft and reading the tangled web-work of names, dates, post-office addresses, and mottoes with which the rocky walls had been frescoed (in candle-smoke). Still drifting along and talking, they scarcely noticed that they were now in a part of the cave whose walls were not frescoed. They smoked their own names under an overhanging shelf and moved on. Presently they came to a place where a little stream of water, trickling over a ledge and carrying a limestone sediment with it, had, in the slow-dragging ages, formed a laced and ruffled Niagara in gleaming and imperishable stone. Tom squeezed his small body behind it in order to illuminate it for Becky's gratification. He found that it curtained a sort of steep natural stairway which was enclosed between narrow walls, and at once the ambition to be a discoverer seized him. Becky responded to his call, and they made a smoke-mark for future guidance, and started upon their quest. They wound this way and that, far down into the secret depths of the cave, made another mark, and branched off in search of novelties to tell the upper world about. In one place they found a spacious cavern, from whose ceiling depended a multitude of shining stalactites of the length and circumference of a man's leg; they walked all about it, wondering and admiring, and presently left it by one of the numerous passages that opened into it. This shortly brought them to a bewitching spring, whose basin was incrustated with a frostwork of glittering crystals; it was in the midst of a cavern whose walls were supported by many fantastic pillars which had been formed by the joining of great stalactites and stalagmites together, the result of the ceaseless water-drip of centuries. Under the roof vast knots of bats had packed themselves together, thousands in a bunch; the lights disturbed the creatures and they came flocking down by hundreds, squeaking and darting furiously at the candles. Tom knew their ways and the danger of this sort of conduct. He seized Becky's hand and hurried her into the first corridor that offered; and none too soon, for a bat struck Becky's light out with its wing while she was passing out of the cavern. The bats chased the children a good distance; but the fugitives plunged into every new passage that offered, and at last got rid of the perilous things. Tom found a

subterranean lake, shortly, which stretched its dim length away until its shape was lost in the shadows. He wanted to explore its borders, but concluded that it would be best to sit down and rest awhile, first. Now, for the first time, the deep stillness of the place laid a clammy hand upon the spirits of the children. Becky said:

"Why, I didn't notice, but it seems ever so long since I heard any of the others."

"Come to think, Becky, we are away down below them -- and I don't know how far away north, or south, or east, or whichever it is. We couldn't hear them here."

Becky grew apprehensive.

"I wonder how long we've been down here, Tom? We better start back."

"Yes, I reckon we better. P'raps we better."

"Can you find the way, Tom? It's all a mixed-up crookedness to me."

"I reckon I could find it -- but then the bats. If they put our candles out it will be an awful fix. Let's try some other way, so as not to go through there."

"Well. But I hope we won't get lost. It would be so awful!" and the girl shuddered at the thought of the dreadful possibilities.

They started through a corridor, and traversed it in silence a long way, glancing at each new opening, to see if there was anything familiar about the look of it; but they were all strange. Every time Tom made an examination, Becky would watch his face for an encouraging sign, and he would say cheerily:

"Oh, it's all right. This ain't the one, but we'll come to it right away!"

But he felt less and less hopeful with each failure, and presently began to turn off into diverging avenues at sheer random, in desperate hope of finding the one that was wanted. He still said it was "all right," but there was such a leaden dread at his heart that the words had lost their ring and sounded just as if he had said, "All is lost!" Becky clung to his side in an anguish of fear, and tried hard to keep back the tears, but they would come. At last she said:

"Oh, Tom, never mind the bats, let's go back that way! We seem to get worse and worse off all the time."

"Listen!" said he.

Profound silence; silence so deep that even their breathings were conspicuous in the hush. Tom shouted. The call went echoing down the empty aisles and died out in the distance in a faint sound that resembled a ripple of mocking laughter.

"Oh, don't do it again, Tom, it is too horrid," said Becky.

"It is horrid, but I better, Becky; they might hear us, you know," and he shouted again.

The "might" was even a chillier horror than the ghostly laughter, it so confessed a perishing hope. The children stood still and listened; but there was no result. Tom turned upon the back track at once, and hurried his steps. It was but a little while before a certain indecision in his manner revealed another fearful fact to Becky -- he could not find his way back!

"Oh, Tom, you didn't make any marks!"

"Becky, I was such a fool! Such a fool! I never thought we might want to come back! No -- I can't find the way. It's all mixed up."

"Tom, Tom, we're lost! We're lost! We never can get out of this awful place! Oh, why DID we ever leave the others!"

She sank to the ground and burst into such a frenzy of crying that Tom was appalled with the idea that she might die, or lose her reason. He sat down by her and put his arms around her; she buried her face in his bosom, she clung to him, she poured out her terrors, her unavailing regrets, and the far echoes turned them all to jeering laughter. Tom begged her to pluck up hope again, and she said she could not. He fell to blaming and abusing himself for getting her into this miserable situation; this had a better effect. She said she would try to hope again, she would get up and follow wherever he might lead if only he would not talk like that any more. For he was no more to blame than she, she said.

So they moved on again -- aimlessly -- simply at random -- all they could do was to move, keep moving. For a little while, hope made a show of reviving -- not with any reason to back it, but only because it is its nature to revive when the spring has not been taken out of it by age and familiarity with failure.

By-and-by Tom took Becky's candle and blew it out. This economy meant so much! Words were not needed. Becky understood, and her hope died again. She knew that Tom had a whole candle and three or four pieces in his pockets -- yet he must economize.

By-and-by, fatigue began to assert its claims; the children tried to pay attention, for it was dreadful to think of sitting down when time was grown to be so precious, moving, in some direction, in any direction, was at least progress and might bear fruit; but to sit down was to invite death and shorten its pursuit.

At last Becky's frail limbs refused to carry her farther. She sat down. Tom rested with her, and they talked of home, and the friends there, and the comfortable beds and, above all, the light! Becky cried, and Tom tried to think of some way of comforting her, but all his encouragements were grown threadbare with use, and sounded like sarcasms. Fatigue bore so heavily upon Becky that she drowsed off to sleep. Tom was grateful. He sat looking into her drawn face and saw it grow smooth and natural under the influence of pleasant dreams; and by-and-by a smile dawned and rested there. The peaceful face reflected somewhat of peace and healing into his own spirit, and his thoughts wandered away to bygone times and dreamy memories. While he was deep in his musings, Becky woke up with a breezy little laugh -- but it was stricken dead upon her lips, and a groan followed it.

"Oh, how COULD I sleep! I wish I never, never had waked! No! No, I don't, Tom! Don't look so! I won't say it again."

"I'm glad you've slept, Becky; you'll feel rested, now, and we'll find the way out."

"We can try, Tom; but I've seen such a beautiful country in my dream. I reckon we are going there."

"Maybe not, maybe not. Cheer up, Becky, and let's go on trying."

They rose up and wandered along, hand in hand and hopeless. They tried to estimate how long they had been in the cave, but all they knew was that it seemed days and weeks, and yet it was plain that this could not be, for their candles were not gone yet. A long time after this -- they could not tell how long --

Tom said they must go softly and listen for dripping water -- they must find a spring. They found one presently, and Tom said it was time to rest again. Both were cruelly tired, yet Becky said she thought she could go a little farther. She was surprised to hear Tom dissent. She could not understand it. They sat down, and Tom fastened his candle to the wall in front of them with some clay. Thought was soon busy; nothing was said for some time. Then Becky broke the silence:

"Tom, I am so hungry!"

Tom took something out of his pocket.

"Do you remember this?" said he.

Becky almost smiled.

"It's our wedding-cake, Tom."

"Yes -- I wish it was as big as a barrel, for it's all we've got."

"I saved it from the picnic for us to dream on, Tom, the way grown-up people do with wedding-cake -- but it'll be our --"

She dropped the sentence where it was. Tom divided the cake and Becky ate with good appetite, while Tom nibbled at his moiety. There was abundance of cold water to finish the feast with. By-and-by Becky suggested that they move on again. Tom was silent a moment. Then he said:

"Becky, can you bear it if I tell you something?"

Becky's face paled, but she thought she could.

"Well, then, Becky, we must stay here, where there's water to drink. That little piece is our last candle!"

Becky gave loose to tears and wailings. Tom did what he could to comfort her, but with little effect. At length Becky said:

"Tom!"

"Well, Becky?"

"They'll miss us and hunt for us!"

"Yes, they will! Certainly they will!"

"Maybe they're hunting for us now, Tom."

"Why, I reckon maybe they are. I hope they are."

"When would they miss us, Tom?"

"When they get back to the boat, I reckon."

"Tom, it might be dark then -- would they notice we hadn't come?"

"I don't know. But anyway, your mother would miss you as soon as they got home."

A frightened look in Becky's face brought Tom to his senses and he saw that he had made a blunder. Becky was not to have gone home that night! The children became silent and thoughtful. In a moment a new burst of grief from Becky showed Tom that the thing in his mind had struck hers also -- that the Sabbath morning might be half spent before Mrs. Thatcher discovered that Becky was not at Mrs. Harper's.

The children fastened their eyes upon their bit of candle and watched it melt slowly and pitilessly away; saw the half inch of wick stand alone at last; saw the feeble flame rise and fall, climb the thin column of smoke, linger at its top a moment, and then -- the horror of utter darkness reigned!

How long afterward it was that Becky came to a slow consciousness that she was crying in Tom's arms, neither could tell. All that they knew was, that after what seemed a mighty stretch of time, both awoke out of a dead stupor of sleep and resumed their miseries once more. Tom said it might be Sunday, now - - maybe Monday. He tried to get Becky to talk, but her sorrows were too oppressive, all her hopes were gone. Tom said that they must have been missed long ago, and no doubt the search was going on. He would shout and maybe someone would come. He tried it; but in the darkness the distant echoes sounded so hideously that he tried it no more.

The hours wasted away, and hunger came to torment the captives again. A portion of Tom's half of the cake was left; they divided and ate it. But they seemed hungrier than before. The poor morsel of food only whetted desire.

By-and-by Tom said:

"SH! Did you hear that?"

Both held their breath and listened. There was a sound like the faintest, far-off shout. Instantly Tom answered it, and leading Becky by the hand, started groping down the corridor in its direction. Presently he listened again; again the sound was heard, and apparently a little nearer.

"It's them!" said Tom; "they're coming! Come along, Becky -- we're all right now!"

The joy of the prisoners was almost overwhelming. Their speed was slow, however, because pitfalls were somewhat common, and had to be guarded against. They shortly came to one and had to stop. It might be three feet deep, it might be a hundred -- there was no passing it at any rate. Tom got down on his breast and reached as far down as he could. No bottom. They must stay there and wait until the searchers came. They listened; evidently the distant shoutings were growing more distant! a moment or two more and they had gone altogether. The heart-sinking misery of it! Tom whooped until he was hoarse, but it was of no use. He talked hopefully to Becky; but an age of anxious waiting passed and no sounds came again.

The children groped their way back to the spring. The weary time dragged on; they slept again, and awoke famished and woe-stricken. Tom believed it must be Tuesday by this time.

Now an idea struck him. There were some side passages near at hand. It would be better to explore some of these than bear the weight of the heavy time in idleness. He took a kite-line from his pocket, tied it to a projection, and he and Becky started, Tom in the lead, unwinding the line as he groped along. At the end of twenty steps the corridor ended in a "jumping-off place." Tom got down on his knees and felt below, and then as far around the corner as he could reach with his hands conveniently; he made an effort to stretch yet a little farther to the right, and at that moment, not twenty yards away, a human hand, holding a candle, appeared from behind a rock! Tom lifted up a glorious shout, and instantly that hand was followed by the body it belonged to -- Injun Joe's! Tom was paralyzed; he could not move. He was vastly gratified the next moment, to see the "Spaniard" take to his heels and get himself out of

sight. Tom wondered that Joe had not recognized his voice and come over and killed him for testifying in court. But the echoes must have disguised the voice. Without doubt, that was it, he reasoned. Tom's fright weakened every muscle in his body. He said to himself that if he had strength enough to get back to the spring he would stay there, and nothing should tempt him to run the risk of meeting Injun Joe again. He was careful to keep from Becky what it was he had seen. He told her he had only shouted "for luck."

But hunger and wretchedness rise superior to fears in the long run. Another tedious wait at the spring and another long sleep brought changes. The children awoke tortured with a raging hunger. Tom believed that it must be Wednesday or Thursday or even Friday or Saturday, now, and that the search had been given over. He proposed to explore another passage. He felt willing to risk Injun Joe and all other terrors. But Becky was very weak. She had sunk into a dreary apathy and would not be roused. She said she would wait, now, where she was, and die -- it would not be long. She told Tom to go with the kite-line and explore if he chose; but she implored him to come back every little while and speak to her; and she made him promise that when the awful time came, he would stay by her and hold her hand until all was over.

Tom kissed her, with a choking sensation in his throat, and made a show of being confident of finding the searchers or an escape from the cave; then he took the kite-line in his hand and went groping down one of the passages on his hands and knees, distressed with hunger and sick with bodings of coming doom.

CHAPTER XXXII

TUESDAY afternoon came, and waned to the twilight. The village of St. Petersburg still mourned. The lost children had not been found. Public prayers had been offered up for them, and many and many a private prayer that had the petitioner's whole heart in it; but still no good news came from the cave. The majority of the searchers had given up the quest and gone back to their daily avocations, saying that it was plain the children could never be found. Mrs. Thatcher was very ill, and a great part of the time delirious. People said it was heartbreaking to hear her call her child, and raise her head and listen a whole minute at a time, then lay it wearily down again with a moan. Aunt Polly had drooped into a settled melancholy, and her gray hair had grown almost white. The village went to its rest on Tuesday night, sad and forlorn.

Away in the middle of the night a wild peal burst from the village bells, and in a moment the streets were swarming with frantic half-clad people, who shouted, "Turn out! turn out! they're found! they're found!" Tin pans and horns were added to the din, the population massed itself and moved toward the river, met the children coming in an open carriage drawn by shouting citizens, thronged around it, joined its home-ward march, and swept magnificently up the main street roaring huzzah after huzzah!

The village was illuminated; nobody went to bed again; it was the greatest night the little town had ever seen. During the first half-hour a procession of villagers filed through Judge Thatcher's house, seized the saved ones and kissed them, squeezed Mrs. Thatcher's hand, tried to speak but couldn't -- and drifted out raining tears all over the place.

Aunt Polly's happiness was complete, and Mrs. Thatcher's nearly so. It would be complete, however, as soon as the messenger dispatched with the great news to the cave should get the word to her husband. Tom lay upon a sofa with an eager auditory about him and told the history of the wonderful adventure, putting in many striking additions to adorn it withal; and closed with a description of how he left Becky and went on an exploring expedition; how he followed two avenues as far as his kite-line would reach; how he followed a third to the fullest stretch of the kite-line, and was about to turn back when he glimpsed a far-off speck that looked like daylight; dropped the line and groped toward it, pushed his head and shoulders through a small hole, and saw the broad Mississippi rolling by! And if it had only happened to be night he would not have seen that speck of daylight and would not have explored that passage any more! He told how he went back for Becky and broke the good news and she told him not to fret her with such stuff, for she was tired, and knew she was going to die, and wanted to. He described how he labored with her and convinced her; and how she almost died for joy when she had groped to where she actually saw the blue speck of daylight; how he pushed his way out at the hole and then helped her out; how they sat there and cried for gladness; how some men came along in a skiff and Tom hailed them and told them their situation and their famished condition; how the men didn't believe the wild tale at first, "because," said they, "you are five miles down the river below the valley the cave is in" -- then took them aboard, rowed to a house, gave them supper, made them rest till two or three hours after dark and then brought them home.

Before day-dawn, Judge Thatcher and the handful of searchers with him were tracked out, in the cave, by the twine clews they had strung behind them, and informed of the great news.

Day 2: Part 1: Analysis of Cave Structures

Hook/Intro:

Bell work: Write three important events in this part of the story in chronological order. Share through a “Whip It” activity.

Introduce the second reading purpose:

We are now familiar with the story, but we want to look at it as a source of information about cave formation and structures.

Work through the following cave formation visualization:

http://www.classzone.com/books/earth_science/terc/content/visualizations/es1405/es1405page01.cfm

Also read through the information on caves provided by Mark Twain Cave:

<http://www.marktwaincave.com.php53-18.ord1-1.websitetestlink.com/wp-content/uploads/2015/02/CAVE-CLASS.pdf>

Re-read the story with a highlighter in hand. When Mark Twain describes cave formations or ecology (living and non-living components of an area,) highlight that portion of the text.

As you read and identify these descriptions, consider whether Twain has accurately described common cave features, both geologic, biologic, and environmental. Use the following marks with your highlighted areas of text:

- ! – description seems consistent with current cave knowledge
- X—description seems incorrect with current cave knowledge
- ? –description is confusing or you are unclear what they are describing

Circle any unknown vocabulary terms.

In your table group, go through your highlighted descriptions and use “Round Robin” to put correct scientific terminology in the margin by each. Discuss among your group and reach consensus as needed.

Lesson: Part 2: Bats!

Intro/Hook: Human graph for student perception of bats.

Read aloud the quote from *The Autobiography of Mark Twain*. (See “Other Quotes” section of cover page.) Have students read the Bat Guide Sheets from the Missouri Department of Conservation.

<http://nature.mdc.mo.gov/discover-nature/field-guide/little-brown-myotis-little-brown-bat>

<http://nature.mdc.mo.gov/discover-nature/field-guide/indiana-myotis-indiana-bat>

Homework: Distribute the Student Hand-Out 2 : “Fact vs. Opinion” and True or False

Next class period is field trip day. Be sure to have your permission slips and admission money turned in.

Day 3—Field Trip Day

Mark Twain Cave and Sodalis Nature Preserve

<http://www.hannibalparks.org/parks/sodalis-nature-preserve/>

Homework: Student Hand-Out 3

Complete your “entry ticket” before the next class. Entry ticket will serve as the conclusion and final assessment for the unit.

Using your Twain excerpts, cave and bat fact sheets, and personal experiences write a three paragraph summary of your knowledge of caves. Each paragraph should contain a topic and conclusion sentence plus detail sentences. At least one quotation from Mark Twain must be used in your paper. In order to show your thorough understanding be sure you include at least five common geologic or ecologic characteristics of caves in your summary. Follow the outline of paragraph order given below:

Paragraph One: General formation of caves.

Paragraph Two: Cave characteristics.

Paragraph Three: Bats and cave ecosystems.

Scoring Guide: Each requirement is worth up to 5 points

- Student followed the format given for paragraphs and their order. _____
 - Student used appropriate grammar, spelling, and conventions. _____
 - Student correctly explained the general formation of caves. _____
 - Student included cave formations and characteristics. _____
 - Student included correct information about bats or cave ecosystems. _____
 - Student used a Twain quote and credited its source. _____
- Total out of 30** _____

Student Handout 1

Activity 1—Where does the acid that attacks the limestone bedrock come from?

Materials: plastic cups, tap water, bromothymol blue, pipettes, drinking straws, goggles

Procedure:

1. Fill cup about 1/3 of the way with tap water.
2. Add ten drops of bromothymol blue to the cup and record the color of the solution.
3. Put on goggles.
4. Insert straw into cup and slowly blow into the water to bubble carbon dioxide into the solution.
5. Continue blowing gently until the solution changes color twice. Record color changes as they occur.
6. Clean Up—All solutions may be dumped in sink, cups and straws should be disposed of in trash.

DATA

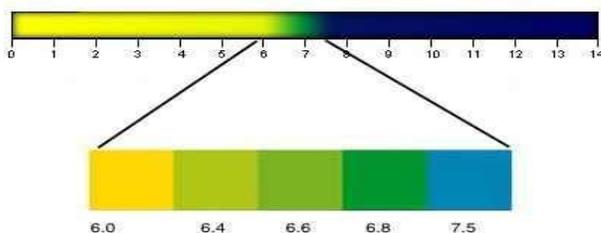
	Initially	1 st color change	2 nd color change
Color			
Approximate pH (from table)			

Background Information:

The pH scale ranks solutions according to their relative abundance of H⁺ ions. Acids are lower than 7 on the scale, 7 on the scale is neutral and values above 7 are bases. Acidic solutions will cause chemical change in calcium compounds. The lower the pH number, the stronger the acid is. Strong acids will cause faster and more dramatic changes.

Bromothymol blue is an “indicator” that will change color as a solution’s pH changes. Bromothymol blue is unique because it changes color over very small pH variation.

bromothymol blue



Questions

7. Use the scale above to finish the data table. Which color of solution is acidic? _____

8. What gas in your exhaled breath made the water become acidic? _____
9. Water falling as rain also dissolves and absorbs this gas. As rainwater soaks into the soil, it also absorbs this gas. Therefore, rainwater is (*slightly* *strongly*) acidic. (circle one)

Teacher Materials

I have/Who has in groups of 5 to review facts for cave formation.

I have limestone.

Who has the gas that makes rainwater acidic?

I have carbon dioxide.

Who has the chemical present in most rocks that dissolve in acid?

I have calcium.

Who has the name for the crack present in bed rocks that allows water to seep into layers?

I have "life-line."

Who has the term for the specific type of weathering that forms caves?

I have carbonation.

Who has the type of rock that has been weathered to form most Midwest solutional caves?

Student Handout 2—Fact vs. Opinion and True or False

Part 1: Read the following statements about Cave Geology or Ecology and determine if they are a fact or opinion. Write the word Fact or Opinion on the line to the left of each statement.

- _____ 1. Caves form slowly over vast amounts of time.
- _____ 2. Limestone, the rock type most associated with caves, is not pretty and that's why caves use colored lights in them.
- _____ 3. Bats serve a useful role in the community of a cave and in the areas that surround the cave.
- _____ 4. Bats can carry disease.
- _____ 5. At some point in a cave's formation, water had to be present.
- _____ 6. All Midwestern limestone caves have a "lifeline."
- _____ 7. Caves are one of the world's most unique geologic formations.

Part 2: Read the following statements and determine if they are true or false. Write the word True or False on the line to the left.

- _____ 8. Bats spend their whole life in a cave.
- _____ 9. Weak acids dissolving limestone are the only way that caves can form.
- _____ 10. Stalagmites and stalactites form while the passageways of the cave are forming when some minerals don't dissolve.
- _____ 11. Bats in Missouri are being threatened by a disease known as white nose syndrome.
- _____ 12. Bats preferred foods are insects that are generally caught mid-flight or "on the wing."
- _____ 13. The type of chemical weathering responsible for cave formation in limestone is called carbonation.
- _____ 14. Rainwater is naturally highly acidic due to carbon dioxide absorbed from the air and soil.
- _____ 15. Temperatures in Missouri caves are fairly constant making them feel cool in the summer and warm in the winter.

Answer Key: Student Handout 2—Fact vs. Opinion and True or False

Part 1: Read the following statements about Cave Geology or Ecology and determine if they are a fact or opinion. Write the word Fact or Opinion on the line to the left of each statement.

 Fact 1. Caves form slowly over vast amounts of time.

 Opinion 2. Limestone, the rock type most associated with caves, is not pretty and that's why caves use colored lights in them.

 Fact 3. Bats serve a useful role in the community of a cave and in the areas that surround the cave.

 Fact 4. Bats can carry disease.

 Fact 5. At some point in a cave's formation, water had to be present.

 Fact 6. All Midwestern limestone caves have a "lifeline."

 Opinion 7. Caves are one of the world's most unique geologic formations.

Part 2: Read the following statements and determine if they are true or false. Write the word True or False on the line to the left.

 False 8. Bats spend their whole life in a cave.

 False 9. Weak acids dissolving limestone are the only way that caves can form.

 False 10. Stalagmites and stalactites form while the passageways of the cave are forming when some minerals don't dissolve.

 True 11. Bats in Missouri are being threatened by a disease known as white nose syndrome.

 True 12. Bats preferred foods are insects that are generally caught mid-flight or "on the wing."

 True 13. The type of chemical weathering responsible for cave formation in limestone is called carbonation.

 False 14. Rainwater is naturally highly acidic due to carbon dioxide absorbed from the air and soil.

 True 15. Temperatures in Missouri caves are fairly constant making them feel cool in the summer and warm in the winter.

Student Handout 3

Entry ticket for final assessment

Admit One

Using your Twain excerpts, cave and bat fact sheets, and personal experiences write a three paragraph summary of your knowledge of caves. Each paragraph should contain a topic and conclusion sentence plus detail sentences. At least one quotation from Mark Twain must be used in your paper. In order to show your thorough understanding be sure you include at least five common geologic or ecologic characteristics of caves in your summary. Follow the outline of paragraph order given:

Paragraph One: General formation of caves.
Paragraph Two: Cave characteristics.
Paragraph Three: Bats and cave ecosystems.

Admit One

Scoring Guide: Each requirement is worth up to 5 points

- Student followed the format given for paragraphs and their order. _____
 - Student used appropriate grammar, spelling, and conventions. _____
 - Student correctly explained the general formation of caves. _____
 - Student included cave formations and characteristics. _____
 - Student included correct information about bats or cave ecosystems. _____
 - Student used a Twain quote and credited its source. _____
- Total out of 30** _____