



This is a work of future fiction. I do not call it science fiction, because I have every reason to expect that schools can change this much, and that it could happen during my career. If they do not,

it will not be because the technology is not available, but because we did not have the courage or vision to make such dramatic changes in the way that we prepare our students for their future.

Setting the Stage:

A FUTURE FICTION

Some of what you read in this short story will seem unbelievable. However, if you are aware of the advances in computers and networking over the past ten years, it will not be the technology that surprises you. It will more likely be what learners and educators do while they are engaged in teaching and learning. So let us remove the veil of our own industrial age upbringing for just a few minutes and see one possibility. Welcome to The Bacon School, 2014.



By David Warlick

The Story

Sally Crabtree sits at her desk as her A2 students amble out of her classroom, most talking in pairs and threes, some glancing at their tablets for messages from friends, parents, or project collaborators. Sally crosses her legs, lays her tablet in her lap and begins dragging icons around on the smooth bright surface using the stylus she slides out of the holder on the edge of the information appliance. As she busily works at her device, the information on the large plasma display at the front of the room begins to

change, some sections of text and images moving around, new ones appearing, and others disappearing. Blocks of information slide down into view illustrating weather conditions, Webcams in other parts of the world, and finally Arabic music, care of a Baghdad radio station.

Outside her classroom, students stroll down the hall toward their next class, B2 (B period, 2nd day of the week), or huddle in groups, talking, drawing at their tablet displays with fingers or styluses. Most of the conversations are simply social exchanges between newly pubescent middle-schoolers. However, a significant number of the interactions are discussions of the class projects in which teams of students are constantly engaged. Projects are the primary activity of Bacon School, and most other schools in 2014.

As she prepares for B2 to begin, Sally thinks back to her drive to school that morning with her young and excitable friend Isaac Johnson, one of the school's media center managers.

Earlier in the Morning:

Sally had just picked Isaac up at his small rental house, almost exactly half way between her family's home and The Bacon School. She had been listening to John Grisham's latest book

being read to her in a Mississippi accent by her tablet. She touched the **Stop** icon on her tablet, as her nearly silent hybrid car glided to the curb in front of the refurbished mill house. Isaac, who had been sitting on the porch scanning the news on his tablet while sipping his customary breakfast cola, dropped his tablet into his canvas messenger bag, jumped off of the porch, and slid into the passenger seat. As Sally pulled out onto the road again, their conversation went directly to Sally's beloved Reptiles, one of her student teams. Isaac was aware that they would be making their project presentation that morning during B2, since he works intimately with most of the school's teams on a daily basis. She had especially enjoyed the Reptiles, since that day at the beginning of the year when they chose their name. It was Alf's idea, but each of the other members had come up with a particular reason why the name fit.

The team is uniquely diverse in terms of academic characteristics. Two members, Desmone and Johann, are random thinkers and attention deficit. Samuel is a high achiever with an excellent memory and an analytical mind. Alf remains emotionally traumatized by the unfortunate, vicious separation and divorce of his parents a year ago. Neither of the parents have much interest in supporting their thirteen year-old son through his turmoil, each too engaged in their own bitterness and adjustment. Regardless of this odd diversity, the team had jelled into an exciting force for producing surprisingly insightful work.

Isaac described how the team had been working after classes, with Desmone and Samuel completing the text version of the project and Johann and Alf polishing up the audio/visual. He added that Alf had just as often been working by himself on another component of the project that remained a mystery.

"Finding the resources for their visuals was not a problem," Isaac said, "but, validating them was a useful challenge. Each of the team members took a section of earth history, and created Web shelves in their personal information libraries with resources that they identified. They shared their Web shelves and used the information as a basis for their evaluation. It was an interesting learning

experience for the team. I've asked if components of their shelves might be included in the Media Center.

"It was brilliant requiring Johann to handle the audio/visual editing and telling Samuel that he could only support him verbally." Isaac continued, admiringly. "Frankly, I was afraid that I would be pulled into supporting Johann more than I would like, but I found that he called on Samuel at least as much as he called on me. Also, he grasped the concepts and developed his skill, and he really seems focused on the communication, not technique."

Sally smiled at the reference to her scheme. "Thanks for supporting me on this, Isaac."

As the B2 bell rings, Isaac sits at his desk in the media center and touches icons on his tablet causing a white document to appear on the display--a diagram of the Bacon School campus. He then taps with his finger the location on the map corresponding with Sally's classroom. Suddenly a full motion, real-time video of the classroom appears on his tablet, captured by a camera that is mounted in the back of the room near the ceiling.

An additional document slides out of the video window that lists the owners of about 50 computers that are also monitoring that classroom. There are often five to ten viewers of any one class, usually parents who wish to see what their children are doing and how they are behaving. Some pop in just to learn. However, when there is going to be a team project presentation, many more parents, other residents of the community, and teachers and students from other schools drop in to watch. All teams maintain Web sites that represent the progress of their work, including their work logs, considered resources, defenses, and their presentation dates.

As the students begin entering Sally's classroom, Isaac thinks back to an encounter he had with Desmone this morning just before A2.

Earlier in the Morning:

Ms. Shuni, the other Media Center Professional, had just walked into their office area from one of the classrooms, where she had been consulting with a teacher. "Conichiwa," she said as she passed Isaac's desk. Is it Japan week?

"Conichiwa, Margaret-san," John replied, with a prayer bow gesture.

The 32 year library media specialist walked over to her desk, fit her tablet into its cradle, and touched the print login surface of her keyboard with her thumb, causing a virtual connection between the two devices through the room's wireless network. As she began typing an e-mail message, a group of students ambled into the media center. Isaac rose from his desk and strolled out into the larger room to see if he was needed.

Desmone, a member of Sally's Reptiles, said something to the group she was with and then walked over to Isaac. She was visibly anxious. "Mr. Johnson, Alf got in trouble again last night." The young man motioned to a nearby unoccupied work area, and they both walked over and sat. "Have you heard from him? Have you seen him here at school yet? Will he be here for our presentation today?"

Isaac asked the girl for her tablet and then pressed the print login with his index finger so that the information appliance could reconfigure itself for his access. He then pulled up the school's information system, and learned that the boy's nametag had not been registered for the day. "He isn't in the building – yet," said Isaac.

The library media specialist then accessed the call-in register to see if Alf's mother had called indicating that he would not be in school that day. "His mother hasn't called in. Right now, it looks like he will be here." After a pause, Isaac said, "Just a minute!"

He pulled up the work folder for the Reptile's project and accessed Alf's video presentation, the part of the project in which he had been most engaged. Isaac touched the icon for the student's file, then touched the menu bar at the top of the display to select "Info" from the drop down list of options. A small white document appeared

with statistical information on the file including its size, type, location and other data. Isaac touched the word "history" and a second document sprang out. After reading the list of entries there, he looked up at Desmone and smiled. He handed the tablet back to her after touching an icon to erase his configuration, and said, "I think Alf will be here today!"

As she reached for her tablet, Desmone noticed that her friends had gathered their things and were headed out of the room. She quickly thanked the educator, and, with some uncertainty, turned to join her friends.

At the ring of the bell, Sally rises and walks over to the door, shaking the hand of each student as he or she enters the room. She smiles as she sees Alf walking rapidly down the hall to join the group as it enters her classroom. Alf is a tall young man with uncombed curly brown hair, the dark complexion of a boy who spends a lot of time outdoors, and the customary awkwardness of a teenager who is growing too fast. He shakes Sally's hand, but does not look up at her, moving away and toward his seat in the rear of the room.

As she turns to her classroom, she recalls the morning visit from Mr. Ball, their balding and portly principal.

Earlier in the Morning:

Sally looked up in mock irritation as the 31-year educator spun one of the rolling student desks over to her work area and sat heavily in the seat without consideration of his greater than average size. Sally and Mr. Ball had been friends for all of the eight years that he had been the chief administrator of Bacon, both professionally and personally. Their long friendship and professional relationship did not require niceties. He began with the heart of the problem. "Alf Greeley was taken in by the police last night for vandalism," he said.

Sally sighed and replied, "It was probably another fight with his mother. He is still hurting so much from their split, and she simply does not

know how her reaction is making things worse for her son."

"All we can do is to try and keep him engaged in his projects and help him in anyway that we can." Mr. Ball said. "I just thought you should know, so that you can handle things accordingly."

"His team, the Reptiles, is making their ecology movement presentation today." Sally finally smiled at her friend and boss. "If you were to casually come in to watch, it would be an encouraging gesture."

Mr. Ball stood and said, "Send me a message when they are getting started and I'll do what I can!"

*As the principal shoved the abducted seat back in the direction of the other desks, Sally pulled up her e-mail utility, addressed a message to Mr. Ball, and wrote the note, "Reptiles are starting their presentation! -SC-". She set it for delayed delivery, to be sent directly to his pocket tablet upon her click of a **Send** icon that suddenly appeared in a corner of her tablet.*

Sally returns to her desk, picks up her tablet and glances at the attendance document that automatically appears, indicating that one of her B2 students is not present, but that he is on the campus. Attendance remains a political necessity, but teachers no longer have to call the roll since the campus proximity system knows the location of all students and faculty on campus by their nametag chips.

A series of checks also appear by the student names on her class roll, indicating that they have submitted their class assignments. Some checks indicate initial submission of the work, others indicate that submitted work has been reviewed by the teacher, reworked by the student, and re-submitted. One student name has no check by it, but one suddenly appears as she is scanning the list. She looks up at the youngster, who blushes and returns his attention to his tablet.

She touches with her finger the **Send** icon at the corner of her information appliance, and the short message, written earlier in the morning, is sent directly to Mr. Ball's pocket tablet.

Sean, the missing student, walks quickly into the room, shakes Sally's hand distractedly and finds his desk. Then Sally announces, "As you know, today the Reptiles ("slither slither" the members murmur at the mention of their team name) will make their presentation. I have to say that I am very excited about this presentation. Johann, Desmone, Alf, and Samuel have all worked very hard on their report, and I think you will learn a great deal from this presentation."

Sally continues, "But before we get started, I want to mention that you have an assignment posted on your calendars. I want you to read a short story written by a teenager from Croatia. A2 read it yesterday, and we had some very interesting discussions about the story today. Mr. Johnson also contacted the author and she sent a video file, in which she explains why she wrote the story. You are welcome to access A2's discussion and Nadia Kaufman's video file from the school's video archive."

"Now, without any further adieu, I introduce to you the Reptiles."

With the team's customary "Slither, Slither" chant, the room darkens and the front display board goes black, as Johann manipulates icons on his tablet with a glowing stylus. As the room turns dark, the classroom door opens and closes softly as Mr. Ball walks quietly in and sits in a seat toward the back of the room. From the center of the room, Desmone speaks, "The Institute of Ecosystem Studies' definition of ecology is 'Ecology is the scientific study of the processes influencing the distribution and abundance of organisms, the interactions among organisms, and the interactions between organisms and the transformation and flux of energy and matter.'" White text of the definition gradually brightens into view on the large display with key terms shifting to red. Then the definition gradually fades away into black.

Desmone continues, "There are no guarantees. The world is in flux. Conditions change, and the ecological balance teeters here and there,

sponsoring the loss of some species, and the introduction of new ones. Some weaken, and others become stronger...”

While she speaks, images of now extinct species surface into view, and then fade again. In the background, and watermarked to about half brightness, two videos impose on each other. One displays a group of cheetahs chasing down a wildebeest that has been taken by surprise. The other shows a pride of lions failing to catch three gazelles that rapidly dart left and right out of reach. Desmone continues to speak, describing specific species of both animals and plants that have disappeared or changed dramatically, and the environmental conditions that seem to have caused the change.

Finally the images fade to a map of the world done in negative relief, appearing as it did millions of years ago. A timeline appears to the right of the map beginning at about 200 million years ago. A citation also appears in off-white indicating a Web site that was the source of the data. Immediately, a pointer, starting at the bottom of the timeline, starts to move up slowly. Simultaneously, landmasses begin to move in a motion with which the students are already familiar. Many of them have also used this animation from the Smithsonian Institute’s web site.

The team is not downgraded for using the familiar animation. However, the class becomes noticeably more interested as splotches begin to fade in and out in specific locations on the map. Numbers are imposed over the splotches as they gradually expand and become more opaque and then shrink to transparency. Soft but intense music plays in the background, credited to a talented student who had attended Bacon school two years earlier through a short citation appearing in the lower corner of the display. Samuel speaks over the animation and music, describing periods in the planet’s relatively recent history of mass extinctions and seemingly spontaneous rises in species diversity.

“Each rise and fall has corresponded with some dramatic change in global conditions: ice ages, planetary collisions, volcanic or seismic calamities...” Samuel speaks on eloquently.

As he continues, Sally is taken back to a conversation she had with the boy during their work on the ecology project. Samuel is thought by many to be a technical genius. He has a genuine gift for understanding and using technology. He also has a flair for using these tools to communicate persuasively. She had convinced Samuel, however, not to handle the programming and data manipulation for this project, but that he leave that up to Johann. Samuel could give Johann verbal directions. She had also asked Samuel to do more of the copy and script writing on this project, an activity that she knew would be a challenge for him.

Several Days Earlier:

Sally entered the school media center, a faint electronic click registering her entrance from the chip in her nametag. She stepped aside, so as not to block the doorway, and surveyed the room. The media center has far fewer books than it did when she went to middle school in the middle 1980s. There is a section in one corner that consists of shelves with books of various sizes and colors. They are almost exclusively fiction books that students check out for pleasure and for assignments in their humanities classes. These books remain because it is a deeply held belief that students appreciate the experience of reading a story without the benefit of electronic appliances. Regardless, most reading is done with tablet computers and smaller pocket text and audio readers.

The biggest portion of the room is devoted to work areas that Isaac calls “Knowledge Gardens.” Most of these workspaces consist of a table, with a 19-inch display, attached to a folding cradle that can swivel 360°. The display can be assigned to any tablet in its vicinity when the owner touches the print login pad. Scattered around the table are small, but efficient, keyboards, each of which can also be assigned to any tablet with the touch of its print login pad.

There are also two small stages with 4x8-foot display boards where teams can practice their presentations. She sees a number of work areas that are much more casual, with homey lamps, bean bag chairs, low sofas, and assorted pillows. The media center is set up for knowledge construction, not just information accessing.

Students come here to work, and mostly to work in small groups. It is rarely a quiet place.

Sally found the Reptiles and walked over. All four were together discussing their defense of one of the information resources they are using. She caught Samuel's eye and asked if he would join her for a minute. She had read through the talented young man's text document for the project, which was comprehensive and well organized. It appeared, though, that he had paid very little attention to grammar and sentence structure.

They sat down at an unoccupied table and she laid her tablet down, saying, "I wanted to talk for just a minute about your report."

"I'm not finished with it yet, Ms. Crabtree." Samuel immediately replied, somewhat defensively.

The veteran middle school teacher ignored his plea. She had expected a reaction from the young man who was more comfortable writing computer code than prose. "I wanted to discuss something anyway. It is a good time in your process."

The youngster resigned himself as Sally reached over and touched her index finger to the print login on the table's 19" display. Immediately her tablet display was mirrored to the larger device. She pulled up a comments file that had been sent regarding a project from the previous year by another team. Sally continued by complimenting the boy on his thoroughness and the overall organization of the document, specifically pointing out the logical flow. Then she said, "I want you to read these comments from an architect, concerning the introduction of a project last year to design a school campus of the future."

As Samuel read, Sally followed, reading it again. The architect had first applauded the students on their insights and technical abilities, but then criticized them brutally on the quality of their writing. She (the architect) explained, "Poor written communication conveys a lack of respect for an audience, the product being described, and a lack of respect for the writer himself. Poor communication puts a blemish on the entire

message or product that is difficult or impossible to remove again."

Isaac had walked up and was reading over their shoulders, having planned this meeting with Sally. Isaac said, "Writing text for people to read is a lot like writing computer code. Computer code is text that is written for a computer. You write it to convince the machine to do what you want it to do. If the syntax of the code is wrong, then the computer does not perform as you intended."

He continued, "You write for people in order to affect them in some way, to inform them about a topic or event, or to cause them to behave in some way. If your syntax is wrong, then you can fail in what you want to accomplish."

Samuel cocked his head slightly, a personal gesture indicating he was considering what the adults had said. He admitted that he had never thought about grammar in that way and would be interested in a recommendation for some instructional software to improve his intuitive grammar skills.

Sally is drawn back to the presentation as Alf rises and walks to the front of the room. As he turns to face the audience, he nods to Desmone, who begins the multimedia presentation. Sally could tell from the expression on her face that Desmone is nervous about controlling the presentation since she had not yet seen it.

The large screen goes black again, but in rising volume, music begins to play, a very slow and eerie piece with cellos, wooden blocks, and low flutes. A citation surfaces into view at the bottom of the screen in white, crediting the music to Alf Greeley. Sally's eyebrow rises as she acknowledges a new talent for this young man.

As the citation fades away again, a map of the world returns with a timeline to the right that covers a three thousand year range. The timeline pointer moves up the centuries and more splotches of red began to expand out becoming opaque, and then receding back into

transparency. As the visuals proceed and the music fades back, Alf begins to speak, casually walking across the front of the room, identifying various periods of social turmoil and listing the number of people killed in violence as the labels and numbers impose themselves over the splotches.

As the timeline marker enters the later part of the second millennium, Alf describes the Protestant Reformation, the Spanish Inquisition, the fall of Imperialism, the American Civil Rights Movement, and the American War on Drugs. Alf finally says, "And the war on..." but stops abruptly.

Surfacing on top of the world map, a video clip materializes and shows the beating of Rodney King in 1992. Other videoed examples of violence by the police or military surface, play, and fade out of view, and as this occurs, Alf finishes his sentence, "...daring! Daring to be different, daring to resist, daring to celebrate or to mourn. Daring to be yourself in a world where fitting in makes things run smoother, but makes people run cold."

Then he stops, and walks back to his seat. The room is silent, and even Desmone remains motionless, until she smiles to herself and then turns and smiles at Alf. It was a powerful presentation, and there was also the provocation of Alf's video clips. There would be much discussion of this presentation from the community, and many opportunities for the team to defend their work.

Later, after lunch, Sally sits in her classroom office reviewing the Reptiles' presentation. Her classes are over and she has the afternoon to engage in planning and other professional activities including: review of student work, research for her own presentations, meetings with students and teams on their progress, and online meetings with other professionals and collaborators. All class performances are recorded and available through the school's video archives. She has isolated the Reptiles' morning presentation into a separate file, which she is now annotating with comments.

Beneath the video is another document displaying the rubric that had been agreed upon

by the team. In most objectives, each member of the team received excellent marks. For Alf, the objective that called for compelling communication was an "A" easily. She checked him at "Exceeded Expectations". It was a striking presentation and the quality of the video editing was exquisite. He had never demonstrated such skill before, and if she did not know that scores meant little to Alf, she might have suspected unethical use of copyrighted information. The presentation would provoke reactions from the community. Sally noticed that the outside comments bin was already filling up. She would spend a sizable part of the afternoon screening them for the students.

After reviewing the evaluations of the rest of the class and assessing the additional materials including student reflections on their project, Sally writes her initial comments for the team's review and then sets to writing her customary letters of thanks to the members. As she finishes her letters, Alf Greeley walks into the room.

"Alf, how are you?" The teacher asks with genuine interest.

"I'm fine, I guess." The moody boy replies. Then he adds, "Ms. Crabtree, about the violence in my video..."

The teacher knew that this was coming. There is a hard rule in all presentations, especially images and video, that there be no violence demonstrated.

"You could have stopped the presentation right then, but didn't." Alf continued.

"The reason for the policy is to avoid the glorification of violence. You weren't glorifying violence. You were using it to very effectively make a point. Your examples were not that different from the examples of the lions and the cheetah, which were also violent."

Alf nods his understanding and then looks directly at Sally and sincerely says, "Thanks!"

Meanwhile, Isaac's workday has entered its more intense period as the large media center fills up with students and student teams working on their projects. All of the knowledge gardens are

occupied by groups consulting with each other or working individually on specific components of their presentations. Many wear headphones as they consult with other team members or collaborators via teleconferencing or work with musical keyboards composing and editing background music or sound effects.

Isaac notices Desmone standing by the bookshelf, apparently waiting to talk with him. He commends the students he is sitting with on their work and excuses himself, walking over to the waiting teenager.

“I was just curious, Mr. Johnson.” She begins as he approaches, “How did you know that Alf would be here today?”

The young educator smiles at Desmone. “Do you remember when I checked Alf’s work files?” She nods. “His last work was done on a computer

whose owner was labeled as Sgt. Jonathan Frick. I know Sergeant Frick. He works the night shift for the police department. Evidently, Alf finished up his part of your project from the police station.”

Desmone cocks her head, not understanding.

Isaac continues, “Do you think Alf would have been working on his project at the police station if he had not fully intended to be in class for the presentation today?”

Desmone smiles, “Oh!” She immediately locks eyes with a friend across the media center, and looks back to the media coordinator. “Thanks, Mr. Johnson!”

“You’re quite welcome!” Isaac bows slightly.

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