Case Study Example

Following is the sketch of an example that illustrates our approach for the presentation of cybersecurity concepts through case studies. The case is presented in episodes. Cues are given that indicate to a teacher where to stop the narrative in order to hold a discussion or allow the students to perform activities that will help them to discover important concepts. The discussions are framed so that they reinforce the secure thinking perspective.

The 3 symbol indicates a juncture in the story for a discussion and the 5 symbol indicates an activity. This approach will allow teachers to easily identify when a hands-on activity should be prepared. The project materials will map the enclosed number to supporting materials. These materials might include a detailed description of the directions a discussion might take and relevant background knowledge, or steps for preparation of the computing environment to support an activity.

The case is presented in the following section. The associated discussion and activities are given in Section 2.

1 Story

The picture released a flood of memories for Hansel. He can still scarcely believe he was saved. He and Gretel had been led into the woods by his stepmother and then abandoned. Stumbling on the witch’s house and all her treats had been a godsend. That is, until she locked him in that stupid birdcage. She fed him day and night. He was going to be her supper!

The stick had been Gretel’s idea. Even though she was exhausted from doing every menial task the witch required, she had figured out how to save him. When the witch felt his finger to find out if he was fat enough, that stick did the trick. Then Gretel pushed the witch into the oven! He was forever in Gretel’s debt.

The early days after they had escaped had been so difficult. He was suspicious of every act of kindness, he was petrified to go into the woods and he was so out of shape! But he had clawed his way back. He and Gretel both. Now he was able to accept kindness, he loved spending time camping in those same woods, and he was fit.

But this picture! He was in his skivvies! And out of shape to boot! He started trying to figure out how someone had gotten it. Where were those pictures? He had undertaken an exercise routine and started tracking his calories to lose the weight he had gained at the witch’s house. He tracked his progress by taking pictures periodically with the camera on his computer. He had wanted a brutally honest assessment, so he took the pictures with as much of his body showing as he could stomach. 1 He was pretty computer savvy, so at the time, he was sure no one could access them.

All the pictures had been taken on his old computer and he had not moved them to the new system when he upgraded. The old system wasn’t networked. He had sold it for what he could get when he decided to upgrade. 2 He did not have a password on his account, but he lived alone and no one had access to the system but him. 3 He should have encrypted the pictures, but he had
erased the hard disk so that no one could see them. It’s pretty unlikely someone could access his computer without his knowledge because: (1) no one was ever alone in his apartment and the system was way down the hall in his bedroom and (2) he had locked the case to the computer.

So how could this have happened? He was not on Facebook, but Gretel was. So was Inga. He and Gretel had always been good friends, as well as siblings, until Hansel started dating Gretel’s best friend Inga. Inga and Gretel had drifted apart and Gretel blamed Hansel. He had broken up with Inga. It had been messy. Now there are these pictures of Hansel in his skivvies on both Inga’s and Gretel’s Facebook page for all to see.

Wait a minute. After the upgrade he had given Gretel the external hard drive he used for backups. Could this have been it? Yes! He had forgotten to erase the external backup drive before he gave it to Gretel. Now he must try to figure out how to get the pictures back from Gretel and get them off her and Inga’s Facebook pages. He will talk to Gretel first. But if she refuses, he does know a thing or two about computers . . .

Next: Hansel hacks Gretel’s and Inga’s Facebook pages.

## 2 Discussion and Activities

| Question: Should Hansel have stored pictures of himself in this way? |
|------------------|----------------------------------------------------------|
| Sec. Thinking:   | What is personal or sensitive data?                      |
| Discussion:      | Since Hansel does not want the pictures to be seen by anyone but himself, they are sensitive data. What are other kinds of personal or sensitive data? |
| Summary:         | Hansel should have considered how he might save data that would provide the information he wanted while not causing embarrassment if they were leaked. He could, for example, have taken pictures that did not include his face. |

| Question: Could someone have gotten the pictures from Hansel’s old laptop? |
|------------------|----------------------------------------------------------|
| Sec. thinking:   | Where are the pictures?                                  |
| Discussion:      | The information flow diagram shows the flow of data from the camera to other storage devices. Usually an application that takes pictures stores the pictures on the hard disk. They may also be on external storage, like a USB drive or DVD. The application could also have transformed the data, for example through encryption. |
| Activity A:      | Any storage device to which Hansel has access to could be used to store the data. Students will be given a USB drive and asked to find photographs on the drive. The pictures will be stored in a standard directory containing both encrypted and unencrypted files. Students will then try to guess the passphrase to decrypt the pictures. The passphrase will be recoverable from data available from Hansel’s blog. A brute force decryption program program will demonstrate the relationship between key length and time required to recover the key. |
| Activity B:      | Students will be given a laptop and asked to find photographs that belong to Hansel where he is an ordinary user. His password will be effectively unrecoverable. |
### Activity C
Students will be taught about user-based access control and system administrator accounts. They will use a system administrator account to look at Hansel's unencrypted pictures.

### Activity D
A hard disk will be removed from a desktop and placed in a second system to recover the data from a system administrator account.

### Summary
If the pictures were not encrypted, anyone with access to the storage media on which the pictures were stored could access the data.

#### Question: Should Hansel have put a password on his laptop?

**Sec. thinking:** Where are the pictures? Who can access them?

**Discussion:** The pictures are in the same locations. Unencrypted data is still available to anyone with physical access. Yet now an attacker can get to the data more easily. He does not need to determine Hansel’s or the system administrator’s password and he does not need to remove the hard disk.

#### Question: What happens if someone gets Hansel’s hard drive?

**Sec. thinking:** Who can access the data?

**Discussion:** From earlier activities, students know that the data can be read from the disk. Students will be taught about secure delete.

**Summary:** No one can access the data after a secure delete.

#### Question: Could Gretel have gotten the pictures from Hansel’s external hard drive?

**Sec. thinking:** Who can access the data on the hard drive?

**Discussion:** From the previous discussion, students know that anyone with physical access can get to the data. The information flow diagram will be used to frame applications as actors that can transform the data as it moves between devices. Students will be taught about backup services.

**Activity:** Students will access data on an external drive that has been generated by a backup service that writes the data in a unique format. They will also access the data on a disk that was backed up using a simple copy command.

**Summary:** Anyone with access to the hard disk and that can interpret data written by the backup app can access the data.

#### Question: Should Gretel have posted Hansel’s picture on Facebook?

**Sec. thinking:** Was Gretel in the Cyber Bubble when she posted Hansel’s pictures?

**Discussion:** By posting anyone’s picture without their permission, you are putting forward an image of someone else that they may not like. Each person should be in control of their own “public image”.

**Summary:** Gretel should not have posted Hansel’s picture.
SUMMARY:

1. Hansel’s photographs were clearly personal data that he did not want made public.
2. Where was the data stored?
3. Who could access it?
4. What should Hansel have done differently to protect his data?
5. Should you publicly post pictures of other people?