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Map It! Creating Meaningful Learning Experiences in Social Studies with IHMC CmapTools

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Abstract

As a free software tool, IHMC CmapTools redefines the concept mapping learning strategy with an infusion of technology to provide students with meaningful and non-rote learning experiences. The following review discusses what IHMC CmapTools is, the literature-supported academic benefits of student-employed concept mapping, and how my secondary social studies colleague and I introduced this software to his students to create meaningful learning opportunities with social studies content. After working with IHMC CmapTools for over four years in both social studies and non-social studies classes, I would strongly encourage social studies educators in grades 5-12 to consider implementing this tool in their instruction as a means of enriching both their students' engagement with social studies material and their students' understanding of their own metacognitive processes.

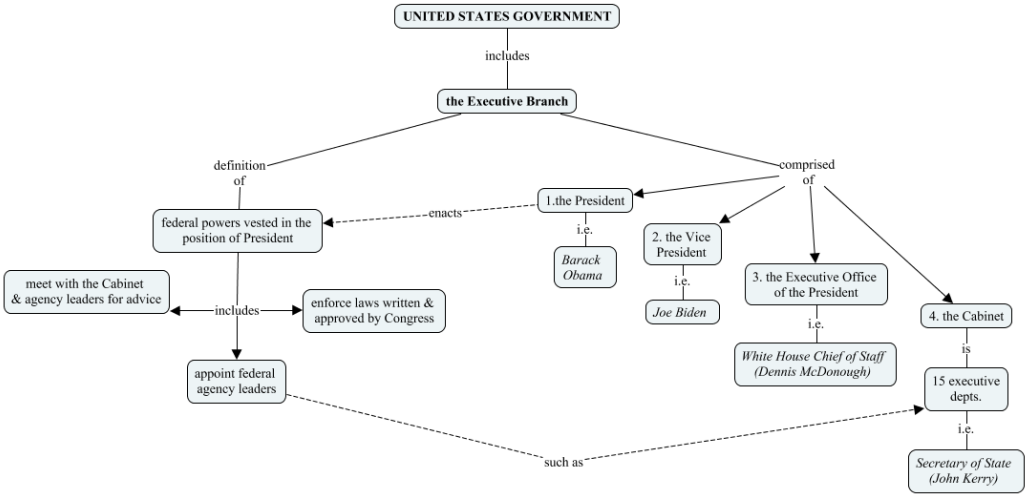
As a twenty-first century educator, I am continually searching for promising analytical and exponential learning tools for social studies students that will help them be successful in their academic achievements as well as provide them with meaningful, lasting, non-rote learning experiences. After working with IHMC CmapTools for over four years and in various classrooms, I believe this software is an excellent example of such a tool. The following review discusses what the Florida Institute for Human and Machine Cognition Concept Maps software, or IHMC CmapTools, is and how I and my social studies colleague incorporated it into secondary social studies classes to create meaningful learning opportunities for students.

Concept Mapping with IHMC CmapTools

IHMC CmapTools, a free and easy-to-download software created by the Institute for Human and Machine Cognition, fuses the learning strategy of traditional concept mapping with technology (Institute for Human and Machine Cognition, 2014). Concept mapping, or the construction of conceptual thoughts in a connective diagram format, serves as a method which, when implemented properly, optimizes the potential for meaningful learning experiences to happen (Novak & Caños, 2006/2008; Novak & Gowin, 1984). Meaningful learning occurs when students integrate new information (concepts) about a topic into their existing knowledge base and are then able to successfully explain and/or exemplify connections between the existing and new information (Novak & Caños, 2006/2008). To illustrate this connectivity, literature on concept mapping documents academic benefits of this learning strategy in secondary classrooms, specifically in students' academic achievement. This includes seven studies which indicated positive trends in students' academic achievement, with half of these studies noting a significant statistical difference (Barenholz & Pinchas, 1992; BouJaoude & Attieh, 2008; Brandt, Elen, Hellemans, Heerman, Couwenberg, Volckaert, & Morisse, 2001; Liu, 2004; Okebukola, 1992; Okoye & Okechukwu, 2010; Pankratius, 1990; Royer & Royer, 2004; Trifone, 2006; van Boxel, van der Linden, Roelofs, & Erkens, 2002). Four additional studies reported concept mapping as a beneficial learning and/or study strategy for secondary students as well as a beneficial resource for increasing students' metacognitive skills (Kostova & Radoynovska, 2010; Liu, 2004; Okoye & Okechukwu, 2010; Royer & Royer, 2004; van Boxel et al., 2002).

Traditionally, concept mapping is employed via paper and pencil in which students would use keywords or concepts to create a hierarchal web of information related to the original concept (Lui, 2004; Royer & Royer, 2004). For twenty-first century learners, IHMC CmapTools software allows the learner to construct digital concept maps, or Cmaps, via a technological vein as learners digitally map out their knowledge integration process of concepts and use prepositional words to link the concepts (Novak & Caños, 2006/2008). Figure 1 exemplifies one type of this conceptual construction in a hierarchal format using IHMC CmapTools where the topic "Executive Branch" of the United States' government and its components are portrayed as concepts (nodes) and the phrases "includes," "definition of," "comprised of," "enacts," "such as," and "i.e." serve as cross-linking propositions in the map.

Figure 1. The Executive Branch.



Through the digital connectivity of conceptual nodes, the Cmap author implements creativity while simultaneously producing knowledge (Novak & Caños, 2006/2008). This tangible method of cognitive construction via IHMC CmapTools also exemplifies how students' thought processes and patterns can work together to create and organize memory rather than regarding memory as a singular storage-house entity (Novak & Caños). In addition, the technological ease of using IHMC CmapTools facilitates more opportunities for the Cmap author to delve into and examine their own metacognitive processes since the Cmap serves as a visual representation of how the author codes, categorizes, and organizes information.

Both the literature and my personal experiences with introducing IHMC CmapTools to students supports the idea that technology-based concept mapping tools are preferred by students over the traditional paper and pencil method (Lui, 2004; Royer & Royer, 2004). In social studies classrooms, this software allowed our students to create tangible evidence of their understanding of historical content based upon their personal thought patterns and afforded them the opportunity to easily expand upon their knowledge base by incorporating new historical information into their pre-existing Cmap. As a result, some students choose to expand and reference their original Cmap repeatedly via the software. Cmaps may also be saved and/or submitted via cyberspace channels, although the student populations I worked with opted not to do this because the classroom teacher did not require it.

IHMC CmapTools: Promoting Student Engagement in Social Studies Content

To illustrate the implementation of IHMC CmapTools as a means for promoting meaningful, non-rote learning experiences for social studies students, this section details the implementation process and procedures that my social studies colleague and I used in his classes upon introducing the Executive Branch of the United States government to students. We felt that the introduction of the CmapTools software with this concept was opportune because students could first create Executive Branch Cmaps and then expand upon the Cmaps with content from the Legislative and Judicial Branches discussed later in the unit. The following also serves as a malleable template for any educator, specifically those teaching grades 5-12, to consider when deciding on how to best introduce the software to students.

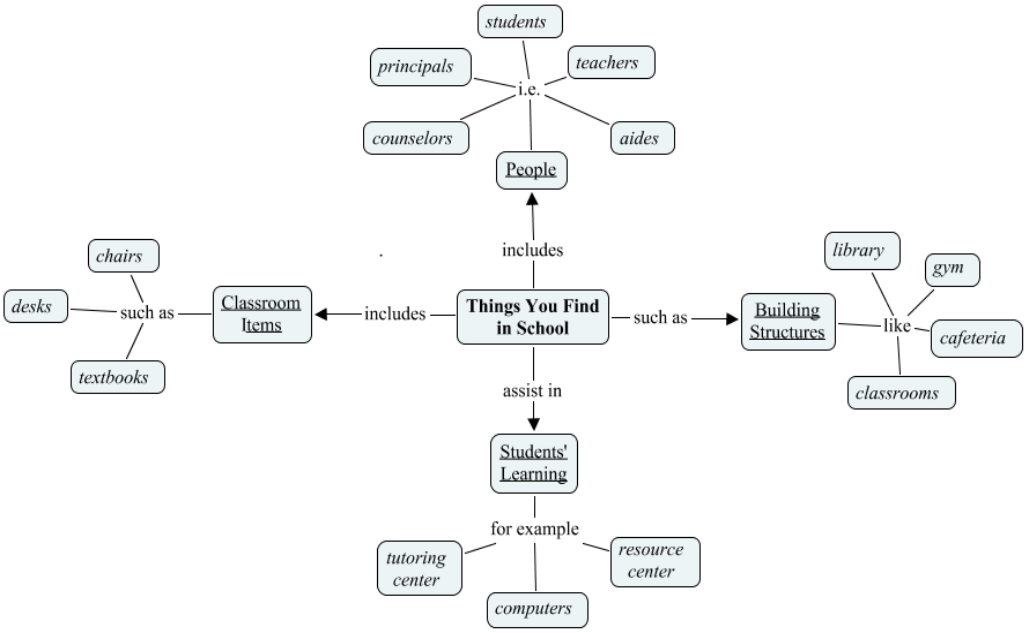
Preparing to Use IHMC CmapTools

At this point, some educators might be dismissive of using IHMC CmapTools because of the lack of technology in their classroom. Before disregarding this technological approach to learning, however, it is important to note that my social studies colleague also faced this concern. As a solution, we gained administrative and media center specialist permission for the software to be installed on all library computers, on computers in one of the school's computer labs, and on the two computers my social studies colleague housed in his classroom. This solution allowed us the flexibility to reserve enough computers for class time use which was imperative to the success of introducing IHMC CmapTools to the students. It also gave students ample access to the software during their free periods if they lacked computer or internet access at home.

Introducing IHMC CmapTools: Class Concept Map & Program Exploration

To prepare students for working with IHMC CmapTools, my social studies colleague and I first provided a general instruction guide that I created entitled "IHMC CmapTools Quick Start Smart Tips" on how to use the software (see Appendix A). We then engaged students in an introductory activity utilizing IHMC CmapTools which consisted of the classroom teacher asking for student input to create a Cmap on a topic students already had knowledge of, such as "Things we find on a farm" or "Things we find in school" (see Figure 2).

Figure 2. Things We Find in School.

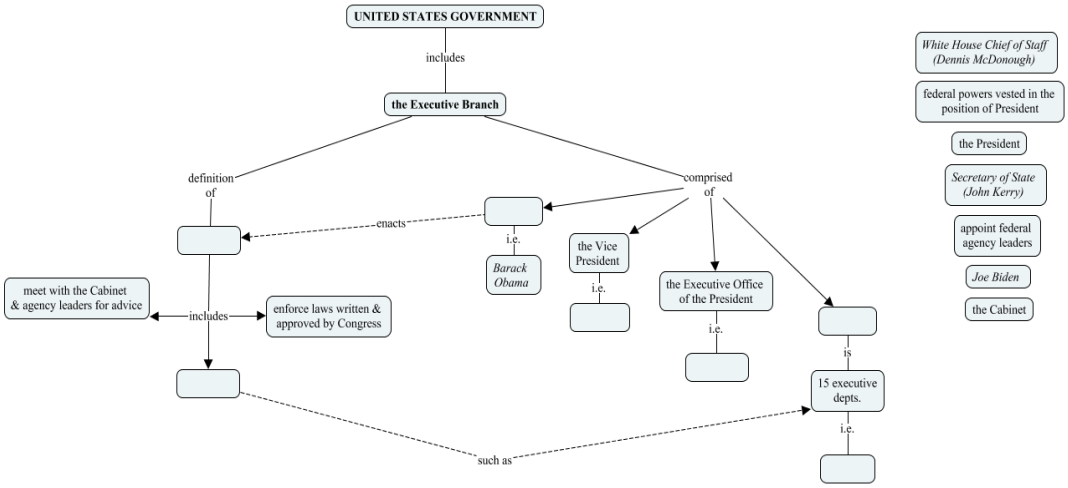


This foundational Cmap activity allowed us to illustrate the basics of the software and communicate how concept mapping represents thought patterns, it also gave us the opportunity to emphasize how no single "right way" to map exists. We then had the students reproduce the class map on their own computers as my social studies colleague and I circulated amongst the students to address concerns and questions for the benefit of all, as well as assist in troubleshooting situations when they arose. For educators wishing to introduce the software to their students in the near future, I would also recommend directing students to the recently updated IHMC CmapTools website where "how to" video tutorials are available (Institute for Human and Machine Cognition, 2014).

My social studies colleague and I then gave his students a brief IHMC CmapTools in-class assignment using a specific social studies concept (i.e., the Executive Branch) for students to map out individually so they could further acquaint themselves with the software. This portion of the implementation process was only mildly successful in comparison to the implementation process a former University of Milwaukee (UWM) colleague and I instituted in non-social studies classes where we provided a scaffolding map for students to complete rather than asking them to immediately construct their own maps. In a scaffolding map,

students receive a partially created map with (or without) a list of the missing concepts and are asked to complete the map (see Figure 3).

Figure 3. The Executive Branch.



The CmapTools study my UWM colleague and I implemented in two non-social studies classes involved one class receiving a scaffolding map during the introduction process and one class that did not. The majority of the students in the class with a scaffolding map completed all of their assignments while the majority of students in the class who were introduced to Cmaps without a scaffolding map did not. Additionally, students in the class with the scaffolding map verbally affirmed to my UWM colleague and I via informal classroom dialog how they found the scaffolding map to be a great visual aid in understanding what a completed Cmap might look like. These students also verbally relayed to us how they referenced their scaffolding map during their initial work days with the software and during construction of their individual Cmaps. Based on this student feedback, I would strongly recommend educators consider providing either a paper or digital scaffolding map to their social studies students for the first IHMC CmapTools in-class assignment to assist in a smooth transition with students' use and understanding of the software.

In my social studies colleague's classes, the IHMC CmapTools in-class assignment we gave to students was accompanied with a task summary sheet and a check-off list which we marked off after reviewing each student's Cmap (see Appendix B). This served as an immediate check for understanding and allowed us to remedy content concerns as needed. The summary sheet listed the conceptual content theme(s) targeted and information that we wanted students to expand on in their Cmaps. This allowed us as the educators to reinforce the notion that each

student's Cmap represented *their* thought process and that their map wasn't "wrong" as long as the content was being incorporated correctly (e.g., historical facts or event sequence were not misconstrued). The check-off list ensured students' practice with specific IHMC CmapTools features (e.g., use of the styles function to color code nodes, bold face vocabulary words) which assisted students in creating unique and personalized Cmaps to enhance both their learning experience with the social studies content and with the software.

We found that our students were very successful in the above introductory procedure when we gave students two consecutive class periods to complete it. These two initial, consecutive class periods affirmed students' grasp of the tool and enhanced their ability to organize and understand social studies content before delving into more advanced, individual work which followed in first weekly and then biweekly IHMC CmapTools lab days.

Crafting an Interactive Social Studies Cmap with Media Options

Once our students grasped how to utilize IHMC CmapTools, we introduced the multimedia options of the software as a means for students to further enhance their Cmaps and their understanding of social studies. The multimedia options available include the ability to insert web links, resources (e.g., pictures, images, charts), and individual concept annotations (e.g., vocabulary definitions, students' personal content notes) into Cmaps. Once again, to assist our students I created and distributed a "Quick Reference Multimedia" handout (Appendix C), however, as previously noted, the IHMC CmapTools website now includes "how to" video tutorials for consideration. The social studies student populations who interacted with the multimedia options expressed great enthusiasm for the inclusion of these in their Cmap creation experiences and many students related how they felt these options enhanced their conceptual understanding of content material. More specifically, the informal verbal student feedback collected was a direct result of students initiating conversations with me prior to the start of our second class in introducing and working with CmapTools. Valuable student insights expressed included caveats such as this from one female student: "I even showed this to my mom last night. She thought it was really cool too and she might even use it!" and this from a male student: "I didn't want to do this [Cmap] yesterday...but I woke up today and actually remembered stuff about the Executive Branch and the pictures I put in my map." Such student feedback reaffirms the technological savoy and "techie" interest of the Millennial Generation, attributes which we as social studies educators should incorporate into our classes and positively nurture in our students' academic experiences. However, the most significant verbal commentary and tribute to Cmaps as a valuable learning tool in this experience came from a

male student who asked my social studies colleague: "Can we do this [Cmaps] for all our stuff? Like from now on? I really get what we're talking about now."

To Cmap or Not? Go for it!

Based on my theory-to-practice experience with IHMC CmapTools both in social studies classes and non-social studies classes, I have found this software to be an extremely beneficial, non-rote learning tool that provides students with meaningful learning experiences and appeals to their technological proclivities. The software requires students to ponder and grapple with their own metacognition which therefore presents them with the opportunity to increase their academic achievement and recollection of social studies concepts to enhance learning, as was the case of the student I worked with who found he was able to recall Executive Branch concepts more readily. At its minimum capacity, CmapTools offers social studies students the ability to break free of the traditional note-taking style of copying vocabulary terms from a textbook or PowerPoint presentation and instead physically organize content material in a way that corresponds to their own learning style. In this enhanced learning process, the student retains ownership of their own learning and the amount of social studies content the student could mentally digest and recollect could be much more significant than content presented to the student via the traditional banking system (Freire, 2010). As a final recommendation, I would strongly encourage social studies educators, especially those servicing students in grades 5 and up, to take advantage of the free IHMC CmapTools software and author-generated handouts located in Appendices A-C to see what kind of meaningful learning experiences your students can become engaged in with this technology.

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Appendix A

IHMC CmapTools Quick Start Tips Student Handout

Start IHMC Cmaps:

Tip #1 – *Before starting your Cmap, format your settings in order to save to your flash drive*:

- Insert your flash drive (thumb drive) into the computer
- On the main Cmap screen, click on "Edit" then on "Preferences"
- In your "Edit Preferences" box, you must change the "Root folder for My Cmaps" from the C Drive (C:\) to your flash drive (typically referred to as E Drive or E:\) by:
    - Clicking on the "Browse" button
    - Click on "My Computer" icon in the next box
    - Double click on your flash drive icon when it appears *(or highlight it & click "OK")*
- The (E:\) drive should now show up in the "Edit Preferences" box
- Click "OK" & begin your Cmap!

Tip #2 – *Creating your Cmap is like mapping how you think*:

- Concept bubbles & linking phrases help you map so that a topic makes more sense to you & shows how topics interconnect to each other
- Click once on a concept bubble to show the connecting arrows (use to create map & link concepts)
- Double clicking on a concept bubble will allow you to add or change the text

Tip #3: *Saving your Cmap (save after you've completed Tip #1):*

- Go to "File" & click on "Save Cmap As" (if "Error" box appears, just click "OK")
- Type in the name (title) of your Cmap in the "Save Cmap As" box & click "Save"

Using the Tool Box to Style Your Cmap

Tip #4: Press down the Control (ctrl) button & hit the "T" button to quickly bring up your Tool Box

Tip #5: Click once on a concept bubble & use the "Object" Tab on the Tool Box to change the color schemes, shapes, etc. *(Double click on text in concept bubble & click on "Font" tab to change text).*

Tip #6: Click on a linking arrow & use the "Line" Tab on the Tool Box to change the shape, arrowheads, etc.

Tip #7: To change the color for more than one bubble, click on a concept bubble then hold down the Control (ctrl) button & click on other bubbles *(see Tip #5 for color selection).*

Exiting Cmaps

Tip #8: *Save your Cmap one last time! Double check to make sure it saved to your flash drive by:*

- Go to the Desktop (computer's main screen) & double click on "My Computer" icon
- Double click on your flash drive (E Drive)
- If your Cmap is saved, right click on the flash drive icon & select "Eject" *(if it is not saved, close out this box & follow Tip #3)*
- Wait for the E Drive icon to disappear (or give you a "You may now remove your drive" message) & take your flash drive out of the computer

Tip #9: *Remember to save to your flash drive if you work on your Cmaps at home too!*

Tip #10: *Forgot your flash drive? Email your Cmap to yourself by:*

- Save your Cmap to the C drive (C:/) or under "My Documents" in My Computer
- Open up your personal email online
- Click on "new" or "compose" to send a new email & put your email address in the "To" line
- Put "Cmap" or something of that nature in the "Subject" line so you don't accidentally delete it
- Click on the "Attach Files" button (or the paperclip icon)
- Click on "Browse" & find your Cmap in the C Drive (or My Documents)
- Double click on your Cmap to attach it, then click "Attach Files" button *(if necessary – some emails may not have this)*
- Check to make sure your file is now an email attachment
- Hit "Send"

Appendix B

In-Class Assignment Summary Sheet & Check-off List

Task 1: Use IHMC CmapTools to construct a concept map of the attributes which compose culture as previously discussed in our history class. Include specific examples for each attribute.
Note: Remember, there is no "correct way" to map because you are mapping out how you think and process information. Be mindful, however, that you are mapping the correct information!

Content Accuracy	***Student Initials***	***Teacher Initials***
All of the information used in concept map nodes is accurate		
Concept nodes linked appropriately and accurately with other concept nodes in the map		

Task 2: After creating your Cmap, complete each item on the list below to practice using IHMC CmapTools features and to add your personal creative touches to your map. Both you and the teacher should initial on the appropriate lines for each feature to ensure maximum points for this assignment:

Feature to Practice	*Student Initials*	*Teacher Initials*
Boldface the term "Executive Branch" & increase it to 14 point font (or larger)		
Italicize the examples for each attribute & change at least one attribute name to a different font		
Color-coded at least one concept and corresponding examples		

Change the shape of at least one concept node		
Alter the line thickness of at least one concept node		
Adjust the arrowheads of at least one concept connector (line)		
Transform at least one concept connector from a straight, solid line into a curved, dotted line		
Make the color of at least one concept connector something other than black		

Appendix C

IHMC CmapTools Quick Reference Multimedia Options Student Handout

Inserting Web Links

1. Find a web resource & right click on the web address to "copy" it (make sure the whole address – "http" – is included).
2. Right click on the concept bubble you wish to insert the web link to; select "Add Web Address"
3. Name the web resource in the dialog box that appears, place cursor in "Web Address" text box, & hit "Ctrl+V" to paste in web address
4. Click "OK"
5. An icon should appear on that concept bubble; click on it & then on the text that appears below the icon to view your website

Dragging in Resource (i.e.: picture)

1. Save your picture as a JPEG file on the computer Desktop or copy & paste the picture into your "Views –CmapTools" window.
2. Click on the picture & drag it over to the concept bubble on your Cmap where you want it inserted
3. Release the mouse, name your picture in the dialog box that appears & click "OK"
4. An icon should appear on that concept bubble; click on it & then on the text that appears below the icon to view your picture

"Mouse Over" Insertions

1. Right click on the concept bubble you wish to insert info; select "Add Info"
2. Type in your info within the "Mouse Over Info" text box & click "OK"
3. Place mouse arrow over concept bubble & wait 2 seconds – info will appear in a yellow box (then disappear when mouse leaves concept)
   Note: "Mouse Over Info" does not print out

Moving Sections

1. Right click, hold & drag mouse until all concepts you wish to move are highlighted (i.e.: blue borders); release mouse.
2. Place cursor on any highlight concept & click & drag to move entire highlighted section
3. Release & click in white space to un-highlight concepts

Nested Nodes (Compacting Info)

1. Right click, hold & drag mouse until all concepts you wish to nest are highlighted (i.e.: blue borders); release mouse.
2. Place cursor on any highlight concept & right click; select "Nested Node," then "Create"
3. Nested area will be grayed; use double arrows (<<) to expand or contract your node
4. When contracted, you may wish to use the "parent concept bubble" as a reminder of what info in nested underneath it (i.e.: parent bubble might be named "Congress" is nested information is about Congress).
5. To un-nest, right click in grayed area of node; select "Nested Node," then "Detach Children"

Spell Check

1. "Tools" on top menu bar; select "Spelling"
2. Spelling on entire Cmap will be checked

Printing Cmap

Option A:

1. "Control + Print Screen" (takes a "picture" of your Cmap)
2. Open up Word Doc & right click "paste"
3. Adjust paper settings (i.e.: horizontal page layout, margins, etc.)
4. Adjust print settings (i.e.: print in grayscale at school, review via "Print Preview")

Option B (if using a computer without full keyboard):

1. Open up "Snipping Tool" (go to "All Programs" then "Accessories")
2. Click "New" & use Snipping Tool to take a 'snapshot' of your Cmap

3. On Snipped snapshot, right click & select "copy"
4. Open up Word Doc & right click "paste"
5. Adjust paper settings (i.e.: horizontal page layout, margins, etc.)
6. Adjust print settings (i.e.: print in grayscale at school, review via "Print Preview")

About the Author

Erica M. Southworth is an Assistant Professor of Education at St. Norbert College. She instructs courses in social studies methods and secondary education. She earned her PhD from the University of Wisconsin-Milwaukee. Her research interests include women's agency in textbooks and curriculum materials and technology integration to promote student-centered learning in social studies. Please contact Dr. Southworth at Erica.southworth@snc.edu.