

Assignment 4: Designing a Professional Development Experience

Remberto Jimenez

Stephanie Talalai

Jennifer Vanyi

New Jersey City University

Introduction

The South Brunswick School system recently implemented Google Apps for Education (GAFE) as a learning management system (LMS). However, adoption of GAFE across the district has been low and teachers, in particular, are not using the full potential of this tool and platform to enhance the learning experience. Evaluations show that teachers are not using it effectively. Some teachers are still giving instructional materials to their students in paper format instead of assigning them electronically in LMS.

A series of professional development (PD) sessions will be developed that focus on teacher usage and adoption of GAFE. Moreover, supervisors and school administrators will also sit in on these PD sessions to both understand the tool and to support district-wide adoption. The South Brunswick School District Superintendent, Dr. Sam Smith, has requested the design of a district-wide professional development series to remediate this situation and to include teachers, librarians, administrators, and other stakeholders.

Understanding the Learning Management System

What is an LMS? Park and Mills (2014) note how learning management systems, or LMS, are increasingly being used in education and are seen as centralized online platforms that deliver curricular content. Logofatu and Branescu (2014) indicate how an LMS is the infrastructure that delivers and manages instructional content, identifies and assesses individual and organizational learning or training goals, tracks the progress towards meeting those goals, and collects and presents data for supervising the learning process of organization as a whole. Lyashenko and Frolova (2014) note how an LMS can be used to develop a variety of educational products such as test banks, interactive vocabulary practice programs, and collaboration via

discussion boards and chats. Moreover, an LMS delivers content but also handles registering for courses, course administration, skills gap analysis, tracking, and reporting for both instructors and administrators (Logofatu & Branescu, 2014). There are also various providers of LMS. Some of the providers include Blackboard, Canvas, and Moodle. There are both free and for cost platforms that schools can utilize.

Understanding Google Apps for Education

EdtechTeacher (2016) discusses how Google Apps for Education (GAFE) is a core suite of productivity applications that Google offers to schools, and offers tools such as Gmail, Calendar, Docs, and Sites. The South Brunswick School District (2014), via the South Brunswick Curriculum Guide for Technology Education, outlines how GAFE has been incorporated throughout the district, including at the high school level. GAFE is already incorporated into the curriculum of the district. However, despite its incorporation from a technology perspective, there are issues of adoption and usage on the part of the instructors.

GAFE as LMS

As part of the enhancements made to the overall “G Suite,” GAFE offers a variety of collaborative features that are similar to those found in learning management system stalwarts such as Blackboard and Canvas. The South Brunswick School system has opted to use Google Apps for Education (GAFE) as an LMS. The idea of GAFE used as an LMS is not unique to the South Brunswick School System. This is supported by Pappas (2015) who notes that GAFE is more than a series of cloud-based applications; it offers educators a tool that can be used as a free Learning Management System (LMS). Hooker (2014) further notes that Google classroom and

the entire GAFE suite offers teachers the means to “create and organize assignments quickly, provide feedback efficiently, and communicate with their classes” (n.p.). Moreover, Hooker goes on to note how GAFE could mean the death knell for “platform monoliths like Blackboard and Canvas” (Hooker, 2014). Moreover, based on the study conducted by Logofatu and Branescu, noted how student feedback regarding GAFE as a Learning Management System was deemed positive, while administrators felt that GAFE could support administrative tasks and support teachers in managing large number of students (Logofatu and Branescu, 2014)

From a budgetary and technology implementation perspective, GAFE made the most sense for the South Brunswick School District. Google For Education (2016) notes how provides a powerful platform that supports collaboration, and can be used on any device. These features not only support the South Brunswick School District's BYOD policy in the higher grades, but it also complements the school's overall technology plan. Moreover, the use of GAFE as an LMS will allow the school district to use key LMS functionality without incurring additional costs.

Challenges and Proposed Solutions

Despite district-wide, back-end benefits, adoption among teachers and administrators has been low. The previous evaluations show that teachers are not using GAFE effectively due to teacher proficiency and comfort regarding the use of the GAFE platform. Moreover, not all teachers in the district incorporate digital tools into their lessons. This in turn has led to resistance in using GAFE since some instructors may see it as a “nice to have” versus a requirement in their respective classrooms. Additional feedback from district employees

includes lack of understanding of how to use the GAFE applications and how to pedagogically utilize such tools to support learning.

Moreover, teachers have requested training on how to best use the collaboration enabling tools in GAFE. Not all of the teachers and administrators are familiar with GAFE as a user or as an instructor. More importantly, district employees don't use GAFE tools to collaborate with each other. How can they be expected to have students collaborate via GAFE when they themselves don't utilize these features among their peers?

Therefore, the South Brunswick School District goal is to design a district-wide professional development series to remediate this situation and drive relevant usage and adoption of GAFE. This is inline with the work of Chen (2011) who notes how “although supporting in-service teachers for successful integration of educational technologies into their teaching practices has been a challenge, professional development in technology integration is found to help teachers gain technology skills and model good examples of using technology for teaching” (p. E5). This is further supported by McDonald (2014), who notes how on-going professional development should be a significant component of a professional's development. Moreover, professionals need to engage in continuous learning to ensure professional growth and improved student outcomes (McDonald, 2014).

Although teachers will be the main audience of the PD, they are not the only population that would benefit from understanding how to best use GAFE from a pedagogical and administrative perspective. The professional development series will also be expanded to include librarians, administrators, and other district stakeholders. The professional development sessions will include a variety of topics, including how to use each of the apps that are part of the GAFE suite. In addition, pedagogical approaches on how to apply GAFE suite tools into

classroom instruction will be included as part of the overall series. Moreover, the use of Google Classroom elements, including the grade book and assignment manager, need to be covered as part of a professional development series. Addressing these topics will support the district's adoption and reinforcement strategy

Professional Development Theoretical Design

The approach for improving district-wide GAFE implementation is based on three guiding principles for our professional development design:

- 1) On-going support
- 2) Communities of learners
- 3) Self-direction and choice

The belief of the South Brunswick district is that these principles will lead to more buy-in and practical application of the LMS than was previously found. Research supports each of these approaches and has shown that these principles can allow for more successful integration of concepts by teachers.

Mackey and Evans (2011) discuss how most formal PD experiences are limited to specific periods of time and are completed in that one session. This can often lead to an unsuccessful integration of technology due to the lack of on-going support. As seen in the above implementation schedule, the design of the GAFE PD will allow for continual, supported training over an extended period of time to allow faculty and staff to better assimilate and more fully merge concepts with daily teaching practices.

Chikasanda, Otrell-Cass, Williams, & Jones (2013) found that incorporating social frameworks of learning helps teachers learn from each other's experiences; creating an enhanced

knowledge of used technology. This is supported by the seminal work of Lave and Wenger (1991) on communities of practice. The inclusion of SIGs in the training design will allow for participants to better develop personally and professionally through the experience of learning within a community of practice, where people with a shared goal and interests learn from each other.

The last guiding principle in the design relates to self-direction and choice. Mushayikwa and Lubben (2009) noted that development should be seen as a bottom-up process initiated by the learner himself/herself. In traditional PD design, the administration decides what the participants need to learn and presents a workshop to the staff. This represents a top-down approach. Allowing faculty and staff to choose the workshops and SIGs with which they feel will best address their own individual needs creates an environment where the participants are more motivated to actively participate and apply skills in their day-to-day instruction.

Professional Development Strategy

The South Brunswick School District will employ a three-part strategy to support GAFE adoption and usage. The first part of the GAFE Professional Development strategy is to create the professional development curriculum. The curriculum will be prescribed via feedback from the teacher, librarian and administrative populations. A survey will be sent in advance to the key populations to understand the key topics and focus areas when it comes to GAFE. This will include both technical applications, administrative, and pedagogical applications of GAFE in the South Brunswick School District. Audience input will inform the development of various training sessions. PD offerings will be designed for different grade level groupings as well as technology proficiency levels. These sessions will be run by experienced staff members,

community members, and consultants. Session design may also be tailored to the various learning styles indicated by survey participants. Possible workshop topics could include Google Classroom, Docs, Forms, Sites, Sheets, Blended Learning using GAFE, Multimedia Tool Incorporation, Administrative tools, etc. These sessions will be made available to all district staff and participants, and they will be given the opportunity to choose the topics for which they feel they need the most training. Session choices will also allow for the formation of Special Interest Groups (SIGs) which is a key element of the third part of the strategy, outlined later in this document. The curriculum will remain flexible to address the needs of the district and increase comfort on GAFE usage.

The second part of the strategy is to create a repository to house key resources and information regarding the GAFE suite of tools. This will be done in the form of a GAFE PD Google Site (<https://sites.google.com/view/st-jv-ri-project4>) that will be used during and after the PD session by South Brunswick School District employees. The GAFE PD Site will also include links to videos and documents that can offer just in time and self-directed resources for teachers, librarians, and district administrators. Moreover, the Google Site will also be used to model the ways that district staff can utilize Google Sites for their classrooms, media centers, and department websites.

The third part of the strategy is to provide a series of Google Support Communities via the use of Special Interest Groups. Special Interest Groups (SIGs) will be formed to share best practices across each GAFE application and by category (i.e., pedagogical applications of GAFE or administrative best practices). These groups will utilize GAFE applications such as Google Hangouts, Google Docs, and Google Sites to enable collaboration. Moreover, the SIGs will offer instructors the opportunity to utilize these tools in a safe environment with their peers and

colleagues. They can then take their learning from the SIG groups and apply it in the classroom with their students.

Timeline and Implementation

The overall GAFE PD strategy will be implemented during the second half of the 2016-2017 school year and the first half of the 2017-2018 school year. The GAFE PD program will kick off with an announcement from Superintendent, Dr. Gary McCartney. Dr. McCartney will announce the school district's vision on how GAFE should be used across the district. He will then request all district staff to complete the pre-session survey to help the district customize the curriculum and develop the appropriate solutions. Dr. McCartney will also include the supporting tools and resources available via the launch of the GAFE PD site and formation of the SIGs across the district. A "pulse check" survey will be sent in June to assess district employee perceptions and attitudes towards the impact made by the PD to date. The following implementation schedule will be included as part of the communication.

Date	Activity
1/3/2017	Communication from Dr. McCartney is sent to district staff
1/10/2017	Launch of the GAFE PD Site
1/10/2017	Survey is sent to District Staff
1/23/2017	Survey closes
2/17/2017	PD Session 1 Launches
2/24/2017	Google Form on GAFE Topic Sessions/ SIGs is sent from Dr. McCartney.
3/12/2017	PD Sessions/SIG formations are announced. Follow up communications sent by SIG leaders.
3/15/2017	PD Session 2 Launches

4/20/2017	PD Session 3 Launches
5/25/2017	PD Session 4 Launches
6/20/2017	Pulse Check Survey is sent to assess the effectiveness of PD program to date.
9/2/2017	PD Session 5 Launches
9/3/2017	PD Session 6 Launches
10/13/2017	PD Session 7 Launches
11/22/2017	PD Session 8 Launches
12/20/2017	PD Session 9 Launches

The initial PD Session (#1) will be a whole district meeting on a Professional Day in February. All district staff will assemble at the South Brunswick High School Auditorium where a hired consultant will provide a high-energy overview of what Google Apps for Education can do for both instruction and for classroom and administrative management. The purpose of this session is to create excitement and motivation for the upcoming PD sessions and for the full integration of GAFE into daily teaching and procedures. This session will be a half-day presentation while the other half of the Professional Day will be devoted to another district topic.

The following PD Sessions (#2-9) will be organized via Google Form sign-up sheets that will be sent to all district staff. Participants will indicate their choices for PD workshops and their related SIG groupings. These forms will allow individuals to rank their preferences on a wide variety of GAFE topic offerings and to indicate their proficiency levels and grade levels with which they work. District administration will then organize PD sessions for each staff member based on their choices. These small-group sessions will meet in various classroom and computer lab spaces across the district, allowing for teachers from different schools to work together based on a common goal or interest. All course offerings will utilize Google Classroom

or Google Sites to allow group members to collaborate and to access course resources at any time.

The number of sessions needed for certain topics will be informed by the group instructor. With nine PD sessions allowed throughout the year, participants should be able to attend at least three different topic focuses in total. Sessions will be led by staff members who hold either Google Level 1 or 2 Certifications, community members with similar qualifications or by hired consultants. Staff members who volunteer to lead a PD group will be given release time for planning and a stipend. A master schedule for all offerings will be coordinated after surveys are analyzed.

Sample Agenda for One PD Session Offering **Google Classroom Agenda**

- 1) Introductions
- 2) Google Classroom Video & Join Class
- 3) Classroom Assignment- Complete Google Form & View Results
- 4) Classroom Overview
 - How to make assignments
 - How to share files and links
 - How to post comments
 - How students submit
 - How teacher views, comments on, and grades assignments
 - How students view teacher comments and grades
- 5) Create your class(es).
- 6) Mini-Sessions (Choose one to visit):
 - a) Finding and then sharing YouTube videos to Classroom
 - b) Making “discussion boards” in Google Sheets
 - c) Creating Google Slides for Classroom
 - d) Creating graded quizzes and/or exit tickets in Forms
- 7) Exploration Time- Spend this time on Classroom or other Google Apps. Ask questions, collaborate, play around or work on the extension activities
- 8) Wrap-up- Sharing, Group Discussion & Questions
- 9) Complete and submit PD evaluation form.

<https://sites.google.com/view/st-jv-rj-project4> (Link to Google Site)

Resources

Resources for Teachers:

[Introduction to Google Classroom Slideshare](#)

This SlideShare presentation gives an introduction to Google classroom and gives step by step instructions on setting up a classroom, creating a class and making announcements.

[Setting up your Google Classroom](#)

This YouTube video, Google Classroom Part 1, covers creating a new class, changing the class banner and adding students.

[Assignments and Announcements](#)

This YouTube video, Google Classroom Part 2, covers creating and managing assignments and announcements.

[Google for Education Essential Resources Guide](#)

Google for Education offers open technology to support learning for everyone, everywhere. In this document, you'll find a compilation of resources that schools and districts across the world have used to successfully Go Google.

[Applications for Google Classroom from Expert Alice Keeler](#)

YouTube video created by Google expert Alice Keeler on how to create a blended classroom using Google classroom.

[Google Cheat Sheets eBook](#)

This link will take you to a free eBook by Google expert Kasey Bell from Shakeuplearning.com. This eBook includes 8 Google Cheat Sheets for Teachers and Students! Each cheat sheet is filled with tips, tricks, and how-to information to take your Google Apps skills to the next level. Learn more about what Google Apps has to offer you and your students and become a more productive user.

[60 Smarter Ways To Use Google Classroom](#)

This blog post by Terry Heick, the director of TeachThought.com, gives the reader a list of 60 ways they can use Google classroom.

[Google Tutorials by Richard Byrne](#)

This page, created by Richard Byrne of FreeTech4Teachers.com, contains tutorials for using Google tools. The tutorials that Richard Byrne has created are available for use in your own blog, website, or professional development sessions.

[Great Pinterest Site with GAFE Resources](#)

This link takes you a Pinterest board, created by Kasey Bell from ShakeUpLearning.com, containing 189 pins detailing ideas, tutorials, and resources for using Google Classroom.

Resources for Librarians:

[Google Classrooms for the Library](#)

This article from the Pennsylvania School Librarians Association outlines several great suggestions on how to incorporate Google classroom into your school library.

[Using Google Classroom for Book Clubs](#)

This blog post from Two Reflective Teachers outlines how to use Google classroom to set up a book club for your students.

[50 Great Google+ Tips for School Librarians](#)

This informational article from OnlineCollege.org gives librarians 50 tips on how to use Google+ for new opportunities to communicate, resources for organization of information, and more, there are so many ways school librarians can use Google+ to improve what libraries offer and enrich the learning experience for students.

[“Google It” Better With Google Search Education](#)

This article by Tiffany Whitehead from School Library Journal introduces readers to Google search education which has a wealth of resources to help students develop the skills to conduct more effective searches.

Resources for Administrators:

[How to use Google Classroom for Professional Development](#)

This Daily Genius article by Nikolaos Chatzopoulos gives administrators some insight on how to use Google tools to create professional development, professional learning communities and encourage teacher collaboration.

[Google Apps for Education Administrator Help](#)

This help forum provided by Google is a great resource for administrators to visit for learning the G-Suite basics, joining an online community of Google administrators and learn all the features of the Admin console.

[5 Tips for Administrators to Make the Most of Google Calendars – from Jennifer Carey](#)

Organization and scheduling is an important part of an administrator's day. In this EdTechTeacher.org article, Jenifer Carey gives administrators five helpful tips on how to make the most out of Google calendars.

[20 Google Chrome Apps and Extensions for School Leaders](#)

Google expert, Kasey Bell from ShakeUpLearning.com, believes that “as leaders, it is important to model the tools and strategies you want to see in the classroom.” In this blog post, Kasey lists 20 Chrome Apps and Extensions for school leaders.

Pre-Workshop Participant Survey- Google Apps for Education

South Brunswick School District ~ Professional Development Series

*** Required**

Please enter your first and last name. *

Your answer: _____

Please provide your Gmail account. *

Your answer: _____

Select your school from the drop-down menu. *

What grade level(s) do you teach or work with? Please check all that apply. *

- | | | | |
|---------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| <input type="checkbox"/> Pre-K | <input type="checkbox"/> Fourth | <input type="checkbox"/> Eighth | <input type="checkbox"/> Twelfth |
| <input type="checkbox"/> First | <input type="checkbox"/> Fifth | <input type="checkbox"/> Ninth | |
| <input type="checkbox"/> Second | <input type="checkbox"/> Sixth | <input type="checkbox"/> Tenth | |
| <input type="checkbox"/> Third | <input type="checkbox"/> Seventh | <input type="checkbox"/> Eleventh | |

Are you a classroom or special area teacher? *

- Classroom Teacher
- Special Area

If you are a special area teacher, what subject do you teach?

Your answer: _____

Are you currently using Google Apps for Education?

- Yes
- No

Please indicate your current Technology proficiency:

- Beginner- still learning how to use technology effectively
- Basic – able to handle only simple technological tasks with or without assistance

- Intermediate – able to handle independently technological tasks or assignments
- Advanced – able to handle independently nearly all types of technological tasks or assignments
- Expert – able to handle independently all types of technological tasks or assignments and serves as a role model or coach for others
- Other: _____

How comfortable are you on a scale of 1 to 5 with incorporating GAFE into instruction in your classroom?

1 2 3 4 5

Not at all comfortable

Very comfortable

What style do you prefer in a professional development workshop?

- More instructor-directed / Step-by-step tutorials
- More participant-directed / Point me in the right direction and let me play/ Instructor is a "guide on the side."

Which Google topic are you most interested in learning more about? (Please check all that apply.)

- | | |
|---|--|
| <input type="checkbox"/> Google Classroom | <input type="checkbox"/> Google Extensions/Add-ons |
| <input type="checkbox"/> Google Drive | <input type="checkbox"/> Google Forms |
| <input type="checkbox"/> Google Sites | <input type="checkbox"/> Google Hangouts |
| <input type="checkbox"/> Google Slides | <input type="checkbox"/> Gmail |
| <input type="checkbox"/> Google Docs | <input type="checkbox"/> Blogger |
| <input type="checkbox"/> Google Sheets | <input type="checkbox"/> Google + |

Other: _____

Is there anything else you would like to share or inquire about regarding our upcoming Google Apps for Education workshop series? _____

Link to the Pre-Workshop Survey <https://goo.gl/forms/sfhzrfcuJzpGkNW43>

Evaluation Instrument

The purpose of instituting a plan to evaluate professional development is to determine its effectiveness after it has been delivered. According to Haslam (2010), there are five questions that need to be considered when designing an evaluation:

- Should the activity be evaluated?
- What are the key elements of the professional development that will be evaluated, and what assumptions hold these elements together?
- Who is likely to be interested in the evaluation, and what do they want to know about the professional development?
- What resources are available to support the evaluation?
- Who will work on the evaluation?

Post-Workshop Participant Evaluation- Google Apps for Education

South Brunswick School District ~ Professional Development Series

*** Required**

Please enter your first and last name *

Your answer: _____

Please enter the name of your school. *

Your answer: _____

Please enter the date and place of your Google Apps for Education Professional Development. *

Your answer: _____

1. Which of the following statements best describes the primary purpose of your Google Apps for Education professional development? *

- To communicate new ideas for me to consider using in my classroom.
- To provide an opportunity for me to learn from other teachers.
- To help me understand GAFE.
- To help me apply/implement GAFE in my classroom.
- Not clear.
- Other: _____

2. Which of the following statements best describes the usefulness of the Google Apps for Education professional development? (Select one.) *

- It was a good start.
- It was a good start, but I have a lot of questions.
- It was a good start, and I look forward to using the new ideas in my classroom.
- It provided everything I need to use the new ideas in my classroom.

- I don't think that these ideas will work very well in my classroom.
- It's too soon to tell.

3. Indicate the extent to which the Google Apps for Education professional development met your professional learning needs. *

- It addressed my professional learning needs completely.
- It addressed some of my professional learning needs.
- It did not address my professional learning needs.
- This professional development did not help much because I was already familiar with this topic.

4. To what extent was the Google Apps for Education professional development aligned with South Brunswick's goals for improving instruction? (Select one.) *

- The professional development was very closely aligned with goals for instructional improvement.
- The professional development was somewhat aligned with goals for instructional improvement.
- The professional development was not aligned with goals for instructional improvement.
- The professional development was inconsistent with goals for instructional improvement.
- I don't know.

5. Which of the following statements best describes the support that you received from your principal to participate in the Google Apps for Education professional development? (Select one.) *

- The principal strongly encouraged me to participate.
- The principal encouraged me to participate.

- The principal tried to discourage me from participating.
- I did not discuss the professional development with the principal prior to participating.

6. Which of the following statements best describes the support that you received from your principal to apply what you learned in the Google Apps for Education professional development in your classroom? (Select one.) *

- The principal has encouraged me to apply what I learned in my classroom.
- The principal has encouraged me to apply what I learned in my classroom and has offered to help.
- The principal has not encouraged me to apply what I learned in my classroom.
- I have not discussed what I learned with the principal.

7. Which of the following statement best describes the likelihood that you will apply what you learned about Google Apps for Education in your classroom? (Select one.) *

- I have already applied GAFE in my classroom.
- I have already applied GAFE in my classroom, and it seemed to work well.
- I have already applied GAFE in my classroom, but it was not appropriate for my students.
- I look forward to applying GAFE in my classroom in the next few weeks.
- I look forward to applying GAFE in my classroom sometime later this year.
- I would like to apply GAFE, but I don't have the materials that I need.
- I don't think that these things will work with my students.

8. Which of the following statements best describes how the Google Apps for Education professional development compares with other professional development in which you have participated during the past year? (Select one.) *

- This professional development was more useful than other professional development that I have participated in.
- This professional development was about the same as other professional development that I have participated in.
- This professional development was less useful than other professional development that I have participated in.
- I don't have an opinion.
- I don't have an opinion because I haven't participated in any other professional development in the last year.

Please add your comments regarding the Google Apps for Education Professional Development.

Link to the evaluation: <https://goo.gl/forms/ugTolJcfyhJIQN183>

References

- Chen, C. (2011). Transforming online professional development: The design and implementation of the project-based learning management system (PBLMs) for in-service teachers. *British Journal Of Educational Technology*, 42(1), E5-E8. doi:10.1111/j.1467-8535.2010.01143.x
- Chikasanda, V., Otrell-Cass, K., Williams, J., & Jones, A. (2013). Enhancing teachers' technological pedagogical knowledge and practices: A professional development model for technology teachers in Malawi. *International Journal of Technology & Design Education*, 23(3), 597-622. doi:10.1007/s10798-012-9206-8
- Edtechteacher (2016). What is GAFE? Retrieved from: <http://edtechteacher.org/gafe/>
- Google for Education (2016). Productivity Tools_ How To. Retrieved from <https://www.google.com/edu/products/productivity-tools/#how-to>
- Haslam, M. B. (2010). *Teacher professional development evaluation guide*. National Staff Development Council. Retrieved from www.nsd.org
- Hooker, C. (2014). Is Google Classroom the LMS we have been waiting for? *Tech & Learning*, 34(11), 54. Retrieved from <http://search.proquest.com/docview/1542375766?accountid=12793>
- Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press
- Logofatu, B., & Branescu, A. (2014). Case study - A free LMS based on Google apps for credits, University of Bucharest. Paper presented at the International Conference The Future of Education in Florence, Italy, 3 13-18. Retrieved from <http://search.proquest.com/docview/1534145403?accountid=12793>

- Lyashenko, M. S., & Frolova, N. H. (2014). LMS projects: A platform for intergenerational e-learning collaboration. *Education and Information Technologies, 19*(3), 495-513.
doi: <http://dx.doi.org/10.1007/s10639-014-9333-9>
- Mackey, J., & Evans, T. (2011). Interconnecting networks of practice for professional learning. *International Review of Research in Open and Distance Learning, 12*(3), 1–18.
- Mushayikwa, E., & Lubben, F. (2009). Self-directed professional development: Hope for teachers working in deprived environments? *Teaching and Teacher Education, 25*, 375–382.
- Pappas, C. (2015). What can Google Classroom offer to the world of elearning. Retrieved from <https://elearningindustry.com/google-classroom-a-free-learning-management-system-for-elearning>
- Park, J. Y., & Mills, K. A. (2014). Enhancing interdisciplinary learning with a learning management system. *Journal of Online Learning and Teaching, 10*(2), 299-n/a. Retrieved from <http://search.proquest.com/docview/1614680143?accountid=12793>
- South Brunswick School District (2015). South Brunswick curriculum guide for technology education. Retrieved from http://www.sbschools.org/departments/curriculum/parent_guides/docs/Tech_Ed_Parent_Guide.pdf