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A Study of Usage and Implementation of Flexbooks Among High School Algebra and Biology Teachers and Principles in Arizona

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A STUDY OF USAGE AND IMPLEMENTATION OF FLEXBOOKS AMONG HIGH SCHOOL ALGEBRA AND BIOLOGY TEACHERS AND PRINCIPALS IN ARIZONA

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A STUDY OF USAGE AND IMPLEMENTATION OF FLEXBOOKS AMONG HIGH SCHOOL ALGEBRA AND BIOLOGY TEACHERS AND PRINCIPALS IN CENTRAL ARIZONA

Shawn Hoffman-Bram

The purpose of this study is to discover the challenges, advantages and disadvantages regarding the implementation and usage of customized digital curriculum called Flexbooks or Open Education Resources (OER) in select high school biology and algebra courses in Arizona. The results of this study will be used to assist educational leaders in the implementation of Flexbooks into their respective educational systems.

While economics is a driving factor behind the Flexbook movement, many school systems are struggling with the technology support and necessary infrastructure in order to begin adoption. Studies conducted in higher education systems indicate that technology infrastructure enhancements and teacher training are essential to successful implementation and sustainability of digital content.

The results of this study reported challenges to Flexbook implementation in areas of time, Internet access, adequate resources, technology infrastructure and printing of Flexbooks. The reported advantages to the use of Flexbooks in the classroom were customization, alignment to curriculum, cost and Internet access. The reported disadvantages to the use of Flexbooks in the classroom were time and Internet access.

This study is essential to those educational leaders looking to implement customized digital curriculum, like Flexbooks and OER, into the classroom to not only help with the economic challenges of textbook adoption but to also move their systems forward in world of technology innovation with strong federal support.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

Chapter I

INTRODUCTION

Rapid growth of technology innovations challenge most K-12 public school systems to keep up with technology advancements while managing limited school budgets (Utah State Office of Education, 2012). The rising costs of textbooks, increased use of mobile technology and the individualized needs of today's learners force many educational leaders to consider alternative methods of delivering educational content (Odden & Picus, 2007). Utah's State Superintendent of Public Instruction, Larry Shumway, believes that open textbooks are an efficient use of technology since these texts can get into the classroom quickly, can be updated as needed rather than on a publishing schedule and cost only five dollars per book to print. According to the Utah State Office of Education (2012), textbook costs average $80 for a typical high school science book. In a recent statement by U.S. Secretary of Education, Arne Duncan (2012), said, "Open Educational Resources can not only accelerate and enrich learning; they can also substantially reduce costs for schools, families and students." He further believes that Open Educational Resources (OER) allows educators easy access to content that not only can be customized toward a specific class or content area, but it is also free.

STATEMENT OF THE PROBLEM

Education is rapidly changing, and reform efforts are abundant. Therefore, Open Education Resource (OER) has gained attention as a potential lower cost solution to the issues of textbook selection, adoption and implementation. However, little study has been conducted of the advantages, disadvantages and implementation strategies of OER at the K-12 level. There is extensive evidence that the cost benefit to using customized digital curriculum, such as Open Education Resources (OER), is a savings, however; there is little information as to why K-12 institutions are not rapidly embracing this new found opportunity. This study will examine the challenges associated with the implementation and usage of OER at the K-12 level by interviewing teachers and principals in Arizona that use OER, now commonly called Flexbooks, into their core high school courses of algebra and biology.

PURPOSE OF THE STUDY

Students today participate in a digital learning culture that encompasses their lives 24/7 while most of that learning occurs outside the school day (Garland & Tedeja, 2013). However, access to the Internet and digital content has given the educational environment better access for implementing OER, a new educational resource delivery method. United Nations Educational, Scientific and Cultural Organization (UNESCO), provides a simple definition of OER in their 2011 Basic Guide to OERs as educational resources (maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been

designed for use in teaching and learning) that are openly available for use by any educator or student free of monetary expense to cover royalties or licensing fees. OER is not to be mistaken for online learning or e-learning as many may assume when content is delivered or accessed via the Internet. While there is substantial information about the evolution, usage and implementation of OER at the post-secondary level, there is little research found that examines the usage and implementation of OER among public K-12 institutions. The purpose of this study is to examine the usage and implementation of OER among high school teachers and principals in Arizona. For the purpose of this study, the term Flexbook, will be used interchangeably with OER because the term Flexbook is more commonly known and recognized among K-12 teachers when researching customized digital content. Teachers interviewed in Arizona were only familiar with the term Flexbook even though its content is derived from OER.

In the last decade, significant advancements in the OER movement have occurred among colleges and universities with the help of The William and Flora Hewlett Foundation (D'Antoni, 2009). In 2002, in an international meeting, UNESCO (United Nations Educational, Scientific and Cultural Organization) officially announced the naming of Open Educational Resources and then recognized several higher education OER initiatives beginning throughout the world. UNESCO took action to informed their Member States of the concept of OER, support current initiatives worldwide, and develop the UNESCO OER Community consisting of more than 700 members from 105 Member States, 67 of which are developing countries.

Colleges and universities in many parts of the world deliver free educational resources to tens of thousands of students daily in every subject area (Butcher, Kanwar, & Uvalic´-Trumbic, 2011). In the United States when textbooks are produced and printed, three states typically lead the K-12 textbook adoption process for the rest of the nation. Those are Texas, Florida and California (Education Commission of the States, (ECS)). The following information outlines action these three states have taken regarding implementation and usage of OER:

Texas

1. Reviewed proposals for Open Educational Resources (OERs) and Electronic Textbooks that may be options for districts in April 2010.
2. Amended Education Code (Section A1AA (A) (31) by adding Section 31.004 to read as follows: the district provides each student with textbooks, electronic textbooks, or instructional materials that cover all elements of the essential knowledge and skills adopted by the State Board of Education for that subject and grade level.

California

1. Started the California Free Digital Textbook Initiative in 2009.
2. Proposed by 2010, high school students will have access to new and modified science, math, and history-social science digital textbooks.
3. Founded the California Learning Resources Network (CLRN).

Florida

1. Re-defined instructional materials to include electronic media and computer courseware/software that assists in instruction.
2. Allowed Florida educators to submit web site resources for review to be included in Curriculum Planning and Learning Management System (CPALMS).
3. Created an Invitation to Negotiate (ITN) to set up a Virtual Curriculum Marketplace to provide school districts with the ability to acquire a full range of products and services that will deliver digital content that is aligned with Florida's Next Generation Sunshine State Standards and implement a common statewide platform for accessing digital content, data, and an open platform for users to access the content at no cost to the state.

While California, Florida and Texas have historically been the leaders in education movements related to K-12 education, other states have recognized the value and economic benefit of digital learning and have begun their own movements. In 2009, the Indiana State Board of Education broadened the state's definition of textbook to include digital resources and computers. Virginia was one of the first to create, in conjunction with CK-12 Foundation, supplemental Flexbooks for physics, and Maine started issuing grants under Title IID (Enhancing Education Through Technology Act of 2001) to support teachers in the search of OER across all content areas (Levin, 2011).

There are significant differences in the selection of educational content and the curriculum adoption processes between post-secondary and K-12 institutions. University faculty and professors can independently determine textbooks for their courses and then pass that cost on to their students. K-12 systems are sometimes regulated by state and local policy about textbook selection and adoption and then absorb the cost of textbooks in their local budgets. Regardless of whether the textbook cost is passed on to students or absorbed by the higher education institution, both present funding and budgetary limitations. Barbara Chow, Education Programs Director at The William and Flora Hewlett Foundation, went on record to express her delight in Utah's leadership in the usage of open textbooks; she sees that districts budgets are under increasing stress, and digital technology in the form of open textbooks offers the potential to save school systems millions of dollars. In a study conducted by Wiley, Hilton III, Ellington, and Hall (2012), the cost saving of using Flexbooks in middle and high school science classes could approach two million dollars over a 7-year adoption period in the district of 10,000 students. These benefits, as reported in this study, are difficult to ignore when some textbooks cost over $100 per book and become outdated as soon as they come off the press.

RESEARCH QUESTIONS

Dr. David Wiley is one of the founders of OER and a supporter of customized digital curriculum. Dr. Wiley discovered that educators needed a platform in which to create their curriculum and then be able to print copies. Dr. Wiley partnered with

CK-12, a company that provides free access to high-quality customizable educational content in multiple modalities and is suited to multiple student learning styles and levels. Since 2007, CK-12 has been a leader in providing K-12 OER aligned to state curriculum standards and tailored to meet student and teacher needs. CK-12 created the Flexbook system which is defined as an online platform for assembling, authoring, and distributing interactive, multi-modal educational content (www.ck12.org). Content is searchable by subject, grade-level, and state and national standards. The Flexbook can be downloaded and used as-is, or can be customized by teachers to match their student's learning styles and their schools curricula (Gates, 2012). Inside each book, entire chapters or bite-sized concepts can be rearranged, added, removed, and edited. Any user can input text, photos, videos, exercises, study guides, assessments, notes, or highlights to their Flexbook. Flexbooks can be shared, for free, with user-created groups in print, online, by email, or on social media platforms including Facebook and Twitter (http://www.ck12.org/about/what-we-offer/).

Superintendents from a consortium of four school districts in Arizona expressed interest in the cost benefit of OER and chose to create Flexbooks for their high school algebra and biology courses. In the fall of 2012, this consortium of four school districts started using Flexbooks (under the guidance of Dr. David Wiley).

This study focuses on the usage, and challenges of implementation of Flexbooks in one Arizona school district. The data obtained from this study result from the conduct of interviews among the teachers who taught biology and algebra at the high school level and from principals participating in the implementation and use

of Flexbooks in this particular district. The research questions examined in this study are as follows:

1. What do principals identify in this study as the top three challenges to the implementation of Flexbooks?
2. What do teachers identify in this study as the top three challenges to the implementation of Flexbooks?
3. What do principals identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
4. What do teachers identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
5. Are there significant areas of agreement between principals and teachers in the advantages, disadvantages and implementation challenges of using Flexbooks?

LIMITATIONS

The following are some possible limitations of this study identified by the researcher:

- Because the research is so new in the area of Flexbook usage among high school core subject areas, there were limited practitioners to interview.
- Some of the challenges reported for implementation may not correlate across districts or states based upon state and local policies.

- Technical difficulties may be encountered during the interview process if the network and equipment do not support the interviews.
- Technology background and exposure of each participant may vary greatly.
- Since teachers may be authors of the Flexbooks they use, there may be bias in the response.
- Subject area of biology and algebra was the only areas accessible to this study.

DEFINITION OF TERMS

This section provides an operational definition of terms as they are utilized in the study.

Creative Commons (CC)–is a non-profit organization headquartered in Mountain View, California, United States devoted to expanding the range of creative works available for others to build upon legally and to share (https://creativecommons.org/press-releases/entry/3421).

CK-12–CK-12 is a non-profit organization based in California founded with the mission to produce free and open source K-12 materials aligned to state curriculum standards and customized to meet student and teacher needs (http://www.ck12.org/about/what-we-offer/).

Common Core–Common Core, Inc. is a non-profit 501 (c) 3 organization based in Washington, D.C. Created by education leaders in 2007, Common Core's

mission is to design curriculum materials that are faithful to the Common Core State Standards implemented by the Common Core State Standards Initiative, and to promote programs, policies, and initiatives that provide students with challenging and rigorous instruction in the full range of liberal arts and sciences (http://www.corestandards.org).

Copyright–Copyright is a legal concept, enacted by most governments, giving the creator of an original work exclusive rights to it, usually for a limited time (Bissell, 2009).

Digital Content–Digital content is creating new user habits and a shift in focus from customer to user. Digital technologies enable individuals to create and use their own digital content and create social, cultural, and/or economic value for themselves, their communities, or their country (SCORE, 2010).

Flexbook–an online platform for assembling, authoring, and distributing interactive, multi-modal content (http://www.ck12.org/about/what-we-offer/).

Internet–The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (*TCP/IP*) to serve billions of users worldwide (http://en.wikipedia.org/wiki/Internet_protocol_suite).

License agreement–issued by authorities, to allow an activity that would otherwise be forbidden. It may require paying a fee and/or proving a capability. The requirement may also serve to keep the authorities informed on the type of activity, and to give them the opportunity to set conditions and limitations (http://www.fairterms.info/what_is_a_license_agreement.html).

Massachusetts Institute of Technology (MIT) OpenCourseWare (OCW)–MIT OCW is an initiative of the to put all of the educational materials from its undergraduate- and graduate-level courses online, partly free and openly available to anyone, anywhere (http://ocw.mit.edu/about/ocw-consortium/).

Metadata–Metadata (meta content) are traditionally found in the card catalogs of libraries. As information has become increasingly digital, metadata are also used to describe digital data using metadata standards specific to a particular discipline. By describing the contents and context of data files, the quality of the original data/files is greatly increased. For example, a webpage may include metadata specifying what language it is written in, what tools were used to create it, and where to go for more on the subject, allowing browsers to improve the experience of users (Waters, 2013).

Organization for Economic Co-operation and Development (OECD)–is an international economic organization of 34 countries founded in 1961 to stimulate economic progress and world trade. It is a forum of countries committed to democracy and a free-market economy, providing a platform to compare policy experiences, seek answers to common problems, and identify good practices and co-ordinate domestic and international policies of its members (OECD, 2007).

Open Educational Resources (OER)–are freely accessible, usually openly licensed documents and media that are useful for teaching, learning, educational, assessment and research purposes (http://www.easterncapecurriculum.org.za/publications/open-education-resources).

Open Course Ware (OCW)–are course lessons created at universities and published gratis via the Internet (http://ocw.mit.edu/about/ocw-consortium/).

Open Content–Open content or OpenContent is a neologism coined by David Wiley in 1998, which describes a creative work that others can copy or modify (Liyoshi & Kumar, 2008).

Open Textbook–An open textbook is a textbook licensed under an open copyright license, and made available online to be freely used by students, teachers and members of the public. Many open textbooks are distributed in other printed, e-book, or audio formats that may be downloaded or purchased at little or no cost (Baker, 2009).

Quality–the standard of something as measured against other things of a similar kind; the degree of excellence of something (Pawlowski, 2007).

State Educational Technology Directors Association (SETDA)–is the 501(c)(3) non-profit, national member association that serves, supports and represents the interests of U.S. state and territorial educational technology leadership (http://www.setda.org/web/guest/aboutus).

The United Nations Educational, Scientific and Cultural Organization (UNESCO)–is a specialized agency of the United Nations (UN). Its purpose is to contribute to peace and security by promoting international collaboration through education, science, and culture in order to further universal respect for justice, the rule of law, and human rights along with fundamental freedom proclaimed in the UN Charter (UNESCO, 2002).

Web 2.0–The term Web 2.0 was coined in 1999 to describe web sites that use technology beyond the static pages of earlier web sites. A Web 2.0 site may allow users to interact and collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites where people are limited to the passive viewing of content. Examples of Web 2.0 include social networking sites, blogs, wikis, video sharing sites, hosted services, web applications, mash-ups and folksonomies (Bossu & Tynan, 2011).

SUMMARY

This dissertation is organized into five chapters. Chapter I includes the introduction, purpose of the study, research questions, limitations, and definition of terms. Chapter II is a review of the literature and related information supporting the study design and implications to educational leaders. Chapter III is the research design and the methodology. Chapter IV provides the data analysis of information gathered through the qualitative interview process as described in Chapter III, and Chapter V includes the summary, conclusions recommendations for further research. This study will provide K-12 school leaders information and insight into the implementation challenges and usage of Flexbooks into their respective educational systems.

Chapter II

REVIEW OF LITERATURE

INTRODUCTION

In the rapidly advancing world of technology innovation, most K-12 public school systems are challenged to keep up with rapid technology advancements while faced with reduced school budgets (Utah State Office of Education, 2012). This study examines the usage and implementation of OER, or otherwise termed Flexbooks for the purpose of this study, among high school teachers in an Arizona school district.

This chapter reviews the literature from the evolution of OER to current issues of economics, sustainability and implementation of OER. Since the OER movement is only a little over a decade old (Wiley & Gurrell, 2009), the research among public, K-12 schools systems is very limited. Many of the journal articles found concentrated on the topics of implementation, sustainability and re-use at the post-secondary level. It was not until the last few years that articles, although not peer reviewed, were found related to K-12 education. Much of this information is included in case studies of school systems in which state education departments initiated efforts and/or opportunities to encourage schools to expedite their efforts in the area of technology

innovations. This literature review will examine three topics related to OER; those include OER evolution, OER challenges, and OER initiatives and implementation.

EVOLUTION OF OER

The advancements in technology seem to affect everyday situations. Podcasts, streaming video and movies, music downloads, e-books, and social networking allow people to access current information and content at a moment's notice. Ability to know answers to history, algebra, and geography questions can be accessed through smartphones and mobile devices (Butler, 2009). Many public education systems continue to use printed textbooks that are over 10 years old (Fletcher, Schaffhauser, & Levin, 2012).

In 1999, the Massachusetts Institute of Technology (MIT) Council on Educational Technology began exploring a variety of technology innovations (Abelson, 2008). Their interest was in how to utilize the Internet to enhance their student's academic experience. Their exploration produced the concept of OpenCourseWare (OCW), which became known as MIT's signature innovation in 2002 (OCW 2005). The vision of this innovation was to publish all of MIT's undergraduate and graduate level subjects openly and freely over the Internet for anyone to use. According to Koohang and Harman (2007), MIT's goal was, "to create a vast network of universities around the world offering open access to high-quality educational materials in a variety of different disciplines, in a variety of different languages, creating a global web of knowledge that will improve education around the

world" (p. 536). By November of 2007, MIT had completed the initial publication of virtually the entire curriculum, which encompassed over 1,800 courses in 33 academic disciplines (OCW, 2005).

By 2008, MIT's OCW initiative had developed into a consortium and soon incorporated itself as an independent non-profit organization. This consortium includes over 250 universities and associated organizations worldwide committed to advancing OCW sharing and its impact on global educational opportunity (OCW, 2005). Collectively, OCW Consortium members have published materials from more than 13,000 courses in 20 different languages available through the consortiums web site (http://www.ocwconsortium.org/en/members/members).

In 1998, during the infancy of the MIT revelation of OCWs, a professor, Dr. David Wiley, at Brigham Young University began investigating the idea of open licensing. He was interested in applying software code (metadata) to educational content. The term "OpenContent" was coined as a result of this investigation (Liyoshi & Kumar, 2008). At the United Nations Educational, Scientific and Cultural Organization (UNESCO) meeting held in 2002, the efforts of MIT and Dr. Wiley were discussed. This group, comprised mainly of representatives from developing countries coined the term, 'Open Educational Resources (OER)' (D'Antoni 2009). UNESCO defines OER's as: The open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes (UNESCO 2002).

The William and Flora Hewlett Foundation define OER as follows:

> teaching, learning and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials or techniques used to support access to knowledge. (www.hewlett.org)

The Hewlett Foundation has been instrumental in supporting OER initiatives around the world. Since 2002, they have been considered the primary champions of the OER movement (http://www.hewlett.org/programs/education-program/open-educational-resources). Another definition of OER comes from the study Giving Knowledge for Free, The Emergence of Open Educational Resources. This study describes OER as

> learning content, software tools to develop, use and distribute content, and implementation resources such as open licenses' that can be adjusted and which provide the benefits without restricting the possibilities for others to enjoy them (OECD, 2007, p. 10)

It is important to define the word "open" when used in a technological context and for the purpose of this study. Open Educational Resources, Open Content, Open Courseware and Open Licensing seem to defy the rules of copyright and access. Current creators and users of OERs suggest that in the world of technology, the word 'open" implies there is easy access to content (Wiley & Gurrell, 2009). In Downes' study (2007) he cites Walker's definition of 'open' as "convenient, effective, affordable, and sustainable and available to every learner and teacher worldwide." Downes also cites Sir John Daniel's (2009) definition of open it in terms of the four A's: accessible, appropriate, accredited and affordable. In the term 'OpenContent' the word open refers to the various permissions granted above and beyond copyright law.

In a report conducted by Hilton, Wiley, Stein, and Johnson (2010) open is described as a continuum of openness. When defining open in OERs, openness is rich and multidimensional. In this report Wiley is cited as defining the four 'R's of openness in 2009 in the "4R's Framework": 1) Reuse, people can use the content in its original form 2) Revise–people have the right to change and alter the content how they see fit 3) Remix–people can add and supplement content with other content 4) Redistribute–people can share the content they have changed or used freely and openly with others. The term OpenCourseWare (OCW) began with the idea that knowledge is the shared property of all and should be shared freely and openly (Johansen & Wiley, 2011).

However, in a study done by Downes (2007) he suggests that the word 'open', in terms of OER, isn't always 'without limitation whatsoever'. In fact, he continues to describe how authors and publishers of OERs are concerned about maintaining the authenticity of their content and the recognition they receive as a result of their work. Downs argues that authors should be able to retain some rights to their content as it is made available to the world free of charge.

Because the word 'open' seems to generate some concern among OER contributors, Creative Commons (CC) was born (Wiley & Gurrell, 2009). Founded in 2001 by a coalition of professors from a variety of institutions, one of those being MIT, CC exists to break down the barriers related to copyright and provide a platform where people can provide, use and alter, re-use materials with no restrictions whatsoever (Adida 2002). Authors can publish content under different versions of the CC license, CC translates the content into "metadata" which then grants the users

various permissions and allows them to find the content easier on the Internet. A large portion of content used today in OCW and OER is published under Creative Commons licensing (Johansen & Wiley, 2011). In 2001, California's state education system was struggling with costs and shortages of K-12 textbooks. They started The California Open Source Textbook Project (COSTP). COSTP's early goals were: 1) leveraging free and already existing K-12 content in the public domain; 2) better leveraging of curriculum from the best K-12 and college teachers; and 3) securing open licenses on new and dormant K-12 and college textbooks that is currently unavailable. Since its inception COSTP, highly recognized as a leader in the OER movement, has advised and guided many other K-12 and post-secondary organizations that are interested in Open Education (http://www.opensourcetext.org).

California, however, was not the first statewide initiative in the OER movement. Utah also changed its name from Utah State Textbook Commission to Utah State Instructional Materials Commission to reflect its interest in emerging digital and multimedia formats (Fletcher et al., 2012). From about 2005-2007 discussions emerged between Utah Centers for Applied Technology, Weber State University, Utah Valley State College, Brigham Young University, the University of Utah, and other Utah schools where the question was asked if they would share their courses as part of a Utah OCW Alliance. Based upon the favorable response and encouragement from Dr. David Wiley the Utah Legislature had become the first in the country to fund an OCW initiative in the amount of $200,000. This would be the start of Utah State University's Center for Open and Sustainable Learning Department

(http://opencontent.org/blog/archives/313). As states were researching, investigating, and considering aspects of digital content, various groups were being formed to address technology innovations on a broader scale.

In 2004, a cooperative called SCORE (Sharable Content Object Repositories for Education) was started by representatives from various state education boards. SCORE's interest was to break down the barriers of exchanging digital content from state to state and develop guidelines for state education leaders and policy makers around accessibility, portability, usability and reusability of electronic educational resources (SCORE 2010).

Launched in 2006, the California based, CK-12 Foundation was formed. This is a non-profit organization whose mission is 'to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-source, collaborative, and web-based compilation model, CK-12 pioneers and promotes the creation and distribution of high-quality, adaptive online textbooks that can be mixed, modified and printed' (i.e., the FlexBook™ textbooks) (http://www.ck12.org/about/terms-of-use/#more).

In 2007, significant advancements to OER were developing; Flat World Knowledge was founded to publish high-quality, peer-reviewed college textbooks and study aids that instructors can easily personalize to fit their learning environment. Students benefit from a choice of low-cost digital and print formats, at fraction of the cost of traditional textbooks (http://blog.flatworldknowledge.com/press/). Faculty in the Open and Sustainable Learning Department at Utah State, under the direction of

Dr. David Wiley, submitted an application to create the state's second virtual charter called, Open High School of Utah (OHSU). Founded by Dr. Wiley, Open High School of Utah opened its doors in the fall of 2009 to 400 students and is believed to be the first secondary school in the nation to use materials and textbooks that are free and open (http://www.openhighschool.org/wp-content/uploads/2010/07/THE-SALT-LAKE-TRIBUNE.pdf). Lastly, the Cape Town Open Education Declaration started to take form. This Declaration calls on educators, learners and organizations to share their materials freely and openly and to make use of OER by providing incentives and opportunities for implementation. The Declaration was signed in late 2008 and represented over 1600 individuals and 160 organizations (Wiley & Gurrell, 2009).

In 2008, Digital Promise was formally authorized as the National Center for Research in Advanced Information and Digital Technologies through Section 802 of the Higher Education Opportunity Act. This act was signed into law by President George W. Bush and formally launched by President Barack Obama in September 2011. Funding support came from the U.S. Department of Education, Carnegie Corporation of New York, William and Flora Hewlett Foundation, and Bill and Melinda Gates Foundation (http://www.digitalpromise.org/about-us/). With the federal government now paying attention to the OER movement, many more state education departments started passing legislative efforts to support similar initiatives. In 2008 and 2009, Indiana, California, and Texas made significant strides towards passing legislation. In fact, Governor Schwarzenegger was instrumental in implementing California's Digital Textbook Initiative, Indiana passed a bill allowing

more flexibility for schools in making their own choices about content, and Texas passed legislation allowing their textbook money to be used for digital content, computers and even professional development and technical support (Levin, 2011).

On January 25, 2012, the Utah State Office of Education announced that it will develop and support open textbooks in the key curriculum areas of secondary arts, science, and math. This decision came after observations of the successful pilot project of Dr. Wiley's work of the Open High School of Utah (Utah State Office of Education, 2012).

OER CHALLENGES

In review of the evolution of the OER movement, many challenges and barriers were identified. Richter and McPherson (2012) list six barriers to the full adoption of OER across the world. Those are: Historical effects of colonialism, language issues, contextual gaps, lack of cultural diversity, educational privilege and literacy, and the need for basic education. They elaborate on each category and conclude with some recommendations on the design of OER for reuse and adaptation. Challenges, however, also reported early in the OER movement were in areas of sustainability, licensing, quality, and technology infrastructure. These challenges were identified not only at the higher education level but also among K-12 systems as they began their initiatives with OER. It seems that because the movement of OER is based on the premise that everything is "free", future sustainability becomes one of the largest concerns. Koohang and Harman (2007) argue that the educational value of an

open digital content can contribute to its sustainability. They surmise that the more educators find the material relevant, easy to use, remix and then re-use, the more valuable it becomes to others for the same purpose. Downes (2007) outlines a variety of models that can ensure OER sustainability, he outlines these models in categories of funding, technical, content and staffing. Flat World Knowledge (FWK), founded in 2007, bases its business on the sustainability of open textbooks. Their goal is to make textbooks free and openly available online through the Creative Commons licensing process. FWK publications are peer reviewed and professionally edited and designed. Authors are paid a rate of 20% on all sales, which allow them to retain copyright of their books (Ovadia, 2011). FWK charges a fee to a user, which allows them to receive a paper copy of the book, a link to a book or an e-reader version of a book. Where Flat World differs from traditional publishers, is once the content is published, control of the content is then passed on to local experts, where under the Creative Commons licensing, they can 'make it their own' (Shelstad, 2011). Through the Flat World Knowledge Company, once an author makes any changes to content, their changes are saved and immediately a new version is available. Hilton III and Wiley (2011) did a case study on FWK one year after the company began allowing adoptions of their textbooks. At the time of their study, 10 textbooks were available for adoption in which 57,690 students in 1,153 different classes used FWK textbooks. According to Jenkins (2006) and Lessig (2008), education is at its best when learners construct knowledge actively and use a variety of elements from previous experts.

Another challenge OER faced is the issue of licensing or copyright. Early in its evolution, innovators of OER's such as Dr. Wiley and staff at MIT recognized the need for a company to maintain authors rights to materials while still publishing content in an open and free market. In 2001, Creative Commons was formed by a coalition of academics from a broad range of institutions, including Duke, Harvard, MIT, Stanford and Villanova. Its aim was to use the flexibility of copyright law to help support a rich public domain alongside traditional copyrights (Adida, 2002). Creative Commons wanted to support creativity by authors and artists by reducing barriers to the copyright process. According to DiBaise (2009), there could be an assumption that some authors of materials would welcome their content published under an open access framework if that meant that their information was more widely read and cited. Creative Common's product management team utilizes the same peer review and industry-tested editorial development process (to ensure all content is of the highest quality). In a 2010 study by Hilton and Wiley, various authors were interviewed about their opinions and motivations for free book distribution. Their study found that all the authors interviewed were glad they had openly licensed their work. They had increased exposure to their work and there was no negative affect to the sales of their work.

Even though sustainability and licensing are significant topics in the OER evolution, the topic of quality is also relevant to this study. Quality, as defined by Pawlowski (2007), is appropriately meeting the stakeholders' objectives and needs which are the result of a transparent, participatory negotiation process within an

organization. Pawlowski's study analyzes perceived quality of OER by post-secondary teachers and users of various repositories. Before Pawlowski could inquire about the quality of OER among users, he had to assess what quality resources mean for them. More than 83% of the users perceived higher quality to be measured by the multi-media aspects of the resource, the complex nature of the resource and their inability to produce it on their own. Also, 80% believed that resources which were scientifically correct would imply better quality while 79% measured it on proper alignment with their curriculum. Surprisingly, only 55% judged quality by where the source came from or on the reputation of the source (Pawlowski, 2007). Wiley and Gurrell in 2009, state that the free and open characteristics of OER have contributed to suspicions about the quality of resources. Their opinion is that until the research supports the utility of the resource for the learner, OER will continue to be perceived as poor quality by some.

Another aspect affecting OER quality is in a report by Smith and Casserly (2006). They state that the rapid growth of open content in the last decade reveals a challenge in finding high-quality material quickly over the Internet. Searching for quality content is overwhelming and frustrating and causes a negative online experience (Waters, 2013). This can be recognized by recent applications developed by Apple, Inc. and Google where search history of Internet content is used to recommend other content or similar areas of interest. Water's study from 2013 suggests the need for commonly agreed-upon vocabulary for describing content for educational search. His report mentions the work of David Gladney, who is the

project manager for the Association of Educational Publishers (AEP) and manages the Learning Resource Metadata Initiative (LRMI). Gladney was quoted in this report by saying, "finding a common metadata specification for marking up online content that is educational in nature is the aim of LRMI." Metadata is defined as data about data (Waters, 2013). LRMI was announced in 2011 and is funded through the Bill and Melinda Gates Foundation and the William and Flora Hewlett Foundation. Creative Commons oversees much of the technical work as well as provides a conduit to the OER community.

In Pawlowski's (2007) study a number of approaches to determine the quality of OER's and their repositories were evaluated by users and teachers. When applying the approaches he identified three main aspects to consider prior to implementation; the effect of the quality approach, the perception of the stakeholder, and the cost of applying the approach. These aspects may keep the assessment simple and cost-effective. Pawlowski's study identifies peer review as the first evaluation method to determine OER quality. Peer review can be understood by looking at companies like Ebay and Amazon.com. Users assure the quality of a product by reviewing, rating and making recommendations that virtually anyone can access. Ehlers (2010) conducted a study where he identifies peer review as the most cost-effective method in determining quality of OER. According to Neven and Duval (2002), peer reviewing is time consuming and requires appropriate management and supervision to be effective. However, according to Nesbit, Belfer, and Vargo (2002), peer reviewed types of

ratings place more responsibility on the learner or user, which ultimately makes the quality measure more cost effective.

The second method Pawlowski's group identified was the Recommender system for evaluation. This can be recognized by recent applications developed by Apple, Inc. where the Genius feature recommends further suggestions based upon the users selections. The difficulty in this method is that there might not be enough content revealed for further recommendations.

The last method Pawlowski's group identified is the trust-based system. In this method, users of OERs must trust in the authors' reputation or the reputation of the organization from where the content was created. This method can encourage re-use of content over time. Regarding quality, OECD lists six reasons that institutions benefit from being involved in OER projects: 1) sharing of knowledge is an altruistic good thing to do; 2) free sharing and reuse of resources leverages taxpayer dollars; 3) resources can continually be improved without the cost of development; 4) it places institutions in a more competitive position; 5) OER projects attract new students; 6) open sharing speeds up the development of new learning resources which stimulate internal improvement and innovation.

Another challenge that exists in the OER movement for public school systems is the process or procedure for updating technology infrastructures that could support OER implementation efforts. In 2009, the Indiana State Board of Education sent a letter to school systems that broadened the language of textbook adoption to include digital resources and computers to deliver curriculum (Levin, 2011). In 2011, the

Texas legislature passed a bill that allowed school districts to use textbook money not only on digital content but also for computers, professional development and technical support (Levin, 2011). In terms of challenges with technology, Virginia seems to lead the nation in how to address the infrastructure need of schools. In the same Out of Print Report, the state of Virginia has a long history of fostering innovation in the use of educational technology. They started with shifting high stakes assessments to online. They launched Virtual Virginia in 2004 to deliver all advance placement and other courses to students. They were one of the earliest contributors to iTunesU, and in 2009 adopted its first digital textbook for high school physics. They claim that the numerous initiatives and support for the use of digital content has made educators more comfortable and familiar with the use of technology, which has advanced the integration of digital content into their curriculum.

INITIATIVES AND IMPLEMENTATION

A review of the literature found information about OER initiatives mostly at the higher education level and limited information as it related to K-12 systems. Many higher education OER initiatives aimed to reduce costs and make educational content more accessible to college students all over the world. While these are important and relevant topics for those considering partaking in the OER movement, initiatives at the K-12 level seem to be a little more complex related to implementation. In many studies in the last few years (Ehlers, 2010; Sclater, 2009; Wiley & Gurrell, 2009), in order for OER to become fully adopted and embraced, proper staff development and

support staff for instructional design must be provided. In the Out of Print Report: Reimagining the K-12 Textbook in a Digital Age, they outline seven key issues that need to be addressed prior to making a shift to digital instruction, those are: 1) Ensure sustainable funding for devices; 2) Plan for robust internet connectivity; 3) Update policies and procedures related to digital content and initiatives or incentives to encourage its use; 4) Prepare educators through sustained professional development; 5) Understand and ensure intellectual property and reuse rights of digital content; 6) Develop a process of vetting digital content at the local level to ensure quality control and usability; 7) Establish buy-in from leadership at both the state and local level to address policy changes for successful implementation (Fletcher et al., 2012).

Digital content allows for the use and re-use of current material from a variety of experts. In a study done by Eduventures (www.eduventures.com), teachers and administrators were asked a series of questions about the perceived benefits of using digital content. Nine out of the 10 respondents thought that digital content allowed for more current and higher quality instructional material. Teachers are able to individualize their instruction to each learners needs. This is important since national, state, and local entities continue to ask teachers to customize material to individual student needs in order to assure all students can learn at a specified standard.

A common implementation challenge according to the research is the staff or instructor concern over violating copyright laws. In McGerveran and Fisher's study (2006), of the educational use of copyrighted material in the digital age, classroom teachers remain unclear about the proper use and copyright laws of webpages, blogs,

wikis and images when used for instructional purposes. According to a report from OECD (2007) learning content in the OCW world is not just the course materials and syllabus in PDF's or electronic text, it also includes websites, simulations, text files, images, sound, digital videos and any other material that aids in a teacher's instruction. The OECD study of 2007, claims that copyright concerns and the cost to clear the rights of the content prior to publishing have been the greatest factors in the speed of the OER movement. OCED also listed some potential barriers when they identified benefits of OER for various stakeholders. One of those barriers was time and expense associated with gaining permission to use copyrighted materials. In 2009, D'Anotoni sought feedback from universities and organizations as users of OER to determine top priorities in advancing the OER movement. With over a 50% return rate, five priorities were established. The first identified priority was raising OER awareness and giving attention to the OER movement. The second priority was OER community building. The third was OER capacity building and the fourth was sustainability. The last and fifth identified priority was quality assurance. Quality assurance (everything being open access) is where instructors kept revisiting the concern over copyright. The SCORE Working Group on Digital Content Rights attempts to clarify copyright and licensing concerns among educators. They report that when state agencies fund the development of materials under open licensing agreements, the terms of the licensing should be consistent and uniform among all content areas. The most permissive license available should be promoted to allow the most flexible use of the material (SCORE, 2010). This working group developed

some guidelines regarding licensing that were intended to promote the use and sharing of content for everyone. These guidelines include: all resources developed and supported by public funds should be licensed for the highest level of flexible use available; sharing of resources freely and openly is expected; a single common license should be used for all resources, and all digital educational resources should be deposited into an organized, sponsored and endorsed repository.

One company aimed at supporting OER initiatives is Connexions. Connexions is a digital educational content repository and management system created for the delivery of educational content. Created in 1999 by a Rice University electrical and computer engineer, Connexions is one of the most popular sites in the world delivering content for free over the Internet to educators, students and parents 24/7 (http://cnx.org/aboutus/). To ensure quality control over their content Connexions developed what is called a lensing system. The lensing process allows trusted vetters to review and endorse content in their area of expertise. Anyone visiting Connexions website can see who has endorsed or 'lensed' content areas (http://campustechnology.comArticles/2007/06/Open-Source-Connects-Courseware-at-Rice-University.aspx?Page=3).

In July of 2007, the Community College Consortium for Open Educational Resources (CCOER) was launched. This was a collaborative effort with the Foothill-DeAnza Community College District, the Monterey Institute for Technology and Education (MITE), Rice University's Connexions, University of California College Prep (UCCP), Flat World Knowledge, California State University System's

Marketplace, the Institute for the Study of Knowledge Management in Education, the High Tech Center Training Unit, and the Student PIRGs. Its aim, with the financial help from The William and Flora Hewlett Foundation, was to create awareness of OER and help colleges to identify, create and/or repurpose existing OER to improve teaching and learning and make education more accessible for all learners (http://oerconsortium.org/about/). Under the leadership of Dr. Martha Kanter, this consortium grew to over 200 community colleges in four years. Since 2009, Dr. Kanter (as the U.S. Under Secretary of Education) has promoted the use of OER. One project of the CCOER was to explore the feasibility of creating low cost textbooks to community college students that were culturally relevant, accessible and high in quality (Baker, 2009). The Connexions group started by taking a traditional textbook, called Collaborative Statistics, found a supporter to purchase the rights to the book, and then converted it into an open, online textbook. By the fall of 2008, the Collaborative Statistics Open Textbook was adopted by fourteen instructors from four different colleges. Connexions staff conducted interviews and focus groups with the faculty and students who used the book. During the conversion of the traditional textbook to an open textbook, the CCOER developed an extensive review process and developed review criteria that could potentially serve as a model for other OER projects. The review process established standards for which open textbooks can be evaluated. This review process involved reviewers who read various chapters of the textbook, wrote reviews, submitted ratings (with an online rating system) and then

participated in online discussion with other reviewers (Baker, 2009). At the time of this study, the first open textbook was still under review.

In 2009, the Digital Textbook Initiative in California supported by Governor Arnold Schwarzenegger and the state board of education, aimed to align digital content to California's state standards. Founded in 2007 under the direction of Neeru Khosla, the CK-12 Foundation was looking to uncover ways that the old textbook could be invigorated through a digital medium (2012). CK-12 was committed to providing all its content as OER, free under the Creative Commons license, with its initial focus being grades 9-12. CK-12 is a non-profit organization dedicated to increasing access to high quality education materials for K-12 students all over the world (http://www.ck12.org/about/about-us/). CK-12 has been a pioneer in providing access to comprehensive, fully customizable digital textbooks called Flexbooks. Flexbook features include chapters that can be rearranged, added or removed; content that can be edited; interactive learning objects such as videos and multimedia; exercises that track student's progress; and assessments for differentiated instruction. In February of 2012, an article written in The Republic, named four school districts in central Arizona to be the first in the state to adopt Flexbooks. In this article, Wickenberg Superintendent, Dr. Howard Carlson stated cost as a main motivator for Flexbook adoption. However, he also stated that student test scores reported out of the Open High School, in Utah, greatly contributed to this recent adoption. Dr. David Wiley, founder of the Open High School of Utah, used Flexbooks through the entire school and reported a 65% reduction of textbook costs while student learning was not

affected (Wang, 2012). In September of 2012, CK-12 announced that they moving from a teacher-centered focus revolving around Flexbooks to a student-centered focus based on individual learning needs of students. California Learning Resources Network (CLRN) emerged as California's resource for digital textbooks. CLRN director, Brian Bridges, stated that one key advantage of working with digital content is that it is flexible for revision and updating to meet new information. Bridges stated in a June 9, 2009 interview that CLRN was already working with 10 publishers that had submitted their textbooks for review (Timmer, 2009). CLRN reviews the textbooks to ensure they align with California's state standards.

Implementation challenges that may impact the OER movement at the K-12 level are identified in the literature as legislative or policy language, funding limitations, and professional development practices. State or local policy language may need to be interpreted or even changed before a school system could even consider OER as an option. Language in curriculum adoption or textbook selection policy, school finance requirements, or some technology plans may impact OER implementation. In the area of professional development, school districts are expected to maintain highly qualified staff and provide training in best practices. Teacher contract language and labor agreements may contain language specific to professional development, funding and/or time. The review of such language and its interpretation are a major consideration in the implementation of OER. Only in the last couple years have there been statewide initiatives that have included OER language at the legislative level. Many states, through their state education departments, have passed

legislation affecting textbook and curriculum and adoption to include OER. Colleges and higher education systems are not as constrained by these mandates and their OER implementation challenges seem to be more around technology infrastructure and professional development. In fact, according to Morris-Babb and Henderson (2012), a survey of faculty at Florida colleges and universities indicate that individual faculty members themselves make the majority of the textbook decisions.

Fletcher et al. (2012) listed 22 states that have started some effort in the movement toward digital textbooks or OER initiatives. Educators in these states realize that if digital content is vetted at the local level and is easy to access, then it can help teachers individualize instruction in a shorter period of time. The report claims that, with the recent dialog and development of Common Core State Standards (CCSS), teachers will be forced to find new ways to teach. They are quoted;

> the educational environment isn't exploiting digital content for all of the benefits that can accrue for today's learners. The gap is widening for what we do in our lives – how we communicate, work, learn and play–and how we are educating our kids.' (Fletcher et al., 2012, p. 5)

The report, Out of Print: Reimaging the K-12 Textbook in a Digital Age by Fletcher et al. (2012), generated recommendations for K-12 policymakers, school leaders and publishers to consider when specifically examining the digital textbook concept. These recommendations include that by the year 2017/2018, school districts should: 1) complete the transition from printed textbooks to digital textbooks; 2) develop a clear vision on how the digital textbook should be used. This would include revising policies and procedures related to instructional materials, assessing technology infrastructure and support, and developing an implementation model for

teacher preparation and support; and 3) ensure support and sustainability among stakeholders for digital and open content.

The Utah State Office of Education announced on January 25, 2012, that it will encourage and support the usage and adoption of open textbooks in certain key curriculum areas. Utah was the first state education department in the nation to make a formal gesture in support of OER. The support of the Utah Office of Education is largely in part due to the success of the Open High School project started by Dr. Wiley in 2009. In December of 2010, a report from the Foundation for Excellence in Education, entitled *Digital Learning Now* brought legislative involvement to a new level. The authors of this report were Florida Governor Jeb Bush and West Virginia Governor Bob Wise. They commissioned the Digital Learning Council. This council's task was to develop a set of high quality digital learning elements. Each element identified action steps for state legislators to foster high quality, customized education for all students. This report also referenced work by the Evergreen Education Group, who conducts an annual review of policies and practices related to online and blended learning among K-12 institutions. While this report looks at all aspects of online learning utilizing a variety of instructional methods, their publication, titled *Keeping Pace for 2012* identifies some interesting updates from their 2011 findings. They report that nearly every state has at least on district using some form of online or blended learning content available to students. However, other than Utah, statewide initiatives embedding OER among all school districts is not common. Development of online learning requires a high level of time and money,

and student data and tracking systems must allow for accurate assessments for all stakeholders regarding student school performance (Watson, Murin, Vashaw, Gemin, & Rapp, 2012). According to Arne Duncan, Secretary of Education, "using digital textbooks, schools can save money on hard copies and get updated material to students more quickly. School districts also might be able to pick and choose their curriculum buffet-style. A district might choose one publisher's top-notch chapter on Shakespeare, but follow it with another publisher's section on Nathaniel Hawthorne's 'The Scarlet Letter'."

SUMMARY

In conclusion, the idea of OER for K-12 education generates interest among educators. Available literature outlines the many benefits of OER's among users at the college or university level. Even today, the technology has changed so much since the OER evolution that some of the formatting, access and training issues are less challenging than they were ten years ago. It does, however, seem that there is a predominantly consistent concern about copyright and who ultimately owns a resource. In addition, there is little consensus concerning quality content and having a technology infrastructure that can support all the content sources available which creates implementation challenges. At this point in the study, concerns remain about sustainability of OER initiatives, and whether certain funding models might be more conducive than others for sustaining projects. Recommendations for further research would be to examine existing OER initiatives to determine if they have achieved

sustainability and if so, the strategies used to accomplish this. It is also recommended that further research be conducted on student performance and/or student perceptions when using OERs. Further research on implementation strategies of OER in grade levels K-6, information on teacher perceptions in the development of OER, and student perceptions of OER at the high school level would be beneficial in moving OER initiatives forward.

Chapter III

METHODOLOGY

INTRODUCTION

The purpose of this study is to determine the challenges associated with the usage and implementation of Flexbooks in select high school core curricular areas of algebra and biology. The importance of this study is that it is helpful to educational leaders because many public school systems are forced to operate with less revenue and yet are challenged with increasing costs of printed textbooks. The use of Flexbooks is of interest to educational leaders not only because of potential cost savings, but also because of the access to educational resources. This study analyzed the data from a series of personal interviews with teachers and principals who currently use Flexbooks in their classroom and school. Through this qualitative design method, background variables of this study such as core subject areas taught, length of time in the position, and training were considered when determining Flexbook usage and implementation challenges.

Research Questions:

1. What do principals identify in this study as the top three challenges to the implementation of Flexbooks?

2. What do teachers identify in this study as the top three challenges to the implementation of Flexbooks?
3. What do principals identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
4. What do teachers identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
5. Are there significant areas of agreement between principals and teachers in the advantages, disadvantages and implementation challenges of using Flexbooks?

This chapter addresses the general research design, participants, instrumentation used for data collection and analysis, and limitations of this research. The results of this study will assist educational leaders in the implementation of Flexbooks into their respective educational systems

RESEARCH DESIGN

In the review of literature, a superintendent in Arizona became familiar with Dr. Wiley's work and the Open High School in Utah. This researcher contacted the Arizona school district Superintendent, who, in the fall of 2012, initiated the implementation of Flexbooks into the district's high school courses of algebra and biology. This Arizona district was one of the first in the nation to pioneer OER/Flexbooks into an existing public school system. From this contact it was determined that the teachers and administrators using Flexbooks in this district would

be appropriate for this study. Currently, there are six teachers and two principals overseeing the Flexbook initiative in this district. At the time of the study, only the teachers in the subject areas of algebra and biology used Flexbooks. The researcher (based on the limited number of staff utilizing the Flexbooks), determined that a case study using qualitative methods of face-to-face interviews would provide the most in-depth information. According to McNamara (1999), interviews are particularly useful in cases where the researcher needs to obtain the story behind a participant's experience. The interviewer can pursue more in-depth information around a topic. Kvale (1996) indicates that a qualitative research interview seeks to understand and describe the meanings of central themes of the subjects. He goes on to say that the main task in interviewing is to understand the meaning of what is said. In this case study, a standardized, open-ended interview was conducted. The definition of a standard, open-ended interview according to Kvale is: "the same open-ended questions are asked to all interviewees; this approach facilitates faster interviews that can be more easily analyzed and compared." According to Valenzuela and Shrivastava (2014), aspects of qualitative research interviews include:

- Interviews are completed by the interviewer based on what the responded says.
- Interviews are completed by the initial form of research
- The interviewer works directly with the respondent.
- The interviewer has the opportunity to probe or ask follow up questions.

- Interviews are easier for the respondent, especially if opinions or impressions are sought.
- Interviews are time consuming and they are resource intensive. The interviewer is considered part of the measurement instrument and has to be well trained in how to respond to any contingency.

Maheshwari (2011) cited the work of Frey and Oishi (1995) in defining an interview as "a purposeful conversation in which one person asks prepared questions (interviewer) and another answers them (respondent)" Jensen and Jankowski (1991) cite that interviews are done to gain information on a particular topic or a particular area to be researched. Interviews are a useful tool which can lead to further research using other methodologies such as observation and experiments.

Strauss and Corbin (1990) state that qualitative methods can be used to better understand any phenomenon about which little is yet known or to gain more in-depth information that may be difficult to convey quantitatively. They cite several writers who have identified what they consider to be the prominent characteristics of qualitative, or naturalistic, research (Bogdan & Biklen, 1982; Eisner, 1991; Lincoln & Guba, 1985; Patton, 1990). The list that follows represents a synthesis of these authors' descriptions of qualitative research:

1. Qualitative research uses the natural setting as the source of data. The researcher attempts to observe, describe and interpret settings as they are, maintaining what Patton calls an "empathic neutrality" (1990, p. 55).
2. The researcher acts as the "human instrument" of data collection.
3. Qualitative researchers predominantly use inductive data analysis.
4. Qualitative research reports are descriptive, incorporating expressive language and the "presence of voice in the text" (Eisner, 1991, p. 36).
5. Qualitative research has an interpretive character, aimed at discovering the

meaning events have for the individuals who experience them, and the interpretations of those meanings by the researcher.

6. Qualitative researchers pay attention to the idiosyncratic as well as the pervasive, seeking the uniqueness of each case.
7. Qualitative research has an emergent (as opposed to predetermined) design, and researchers focus on this emerging process as well as the outcomes or product of the research.

As described by Richards (2006), there are two general rules to help determine validity in a qualitative research study. One of those is the attention to the fit of the question, data, and method and the other is to ensure that accountability is present for each step of the analysis.

Data was collected through the interviews conducted in the fall of 2013. A questionnaire of 11 open-ended questions was used for each interview. Each open-ended question answer was coded and analyzed into specific categories or themes. Themes and/or categories of responses were examined for relationship to usage and implementation challenges of Flexbooks. Frequency distribution, coding and cross tabulation was used to summarize data. Demographic questions related to years of service and length in current position were asked to assess subject's experience with their content area and educational experience. Subjects were also asked to rate their level of technology competency. Subjects were given a handout of the SAMR model (see Appendix C) to use to complete a self-assessment of their competency level in the use of technology. In 2006 the SAMR Model was introduced by Ruben Puentedura (2013) in collaboration with the Maine Department of Education and their learning technology initiative. The model describes the life cycle of technology integration. This handout provided the subjects a visual from which to assess their level of

technology integration competency. The SAMR Model divides technology use in the classroom into two general categories labeled Enhancement and Transformation. Within each category, sub-categories are identified. Sub-categories are: 1) S–Substitution as taking technology into the classroom as a direct tool substitute with no functional change to the curriculum, delivery or learning of content; and 2) A–Augmentation has technology as a direct tool substitute but evidence of improved learning or content delivery is present. In the Transformation category, sub-categories are: 1) M–Modification which implies that technology has significantly redesigned a task; and 2) R–Redefinition which uses technology to create new tasks previously deemed inconceivable.

Interview questions for this study were developed to ask subjects about their background as well as their perceptions regarding the use of Flexbooks. Questions one through five asked background information on the subjects, questions six through eleven were developed to gather information regarding the study's guiding research questions.

Interview Questions:

1. What is your current title?
2. How long have you been in your current position?
3. Referencing the SAMR model where would you rate your level of competence with technology?
4. What was the most compelling reason for you to begin using Flexbooks?

5. What type of training or professional development did you receive prior to using Flexbooks?
6. What was your level of involvement in authoring or editing the content of the Flexbook?
7. In your opinion, what were the top three challenges in implementing Flexbooks into your school/subject area?
8. In your opinion, what would you say are the advantages of using Flexbooks in the classroom?
9. In your opinion, what would you say are the disadvantages of using Flexbooks in the classroom?
10. What suggestions do you have for other educators in your similar position when considering implementing Flexbooks?
11. Do you have anything else you would like to add regarding the implementation or usage of Flexbooks?

In the summer of 2013, an application was made to the Institutional Review Board (IRB) to secure research approval. Review and approval by the IRB is required for any research involving human subjects as a protection for those individuals. After IRB approval was received scheduling of interviews commenced.

PARTICIPANTS AND SELECTION PROCESS

As mentioned in the literature review, Dr. David Wiley has been instrumental in the Open Education Resource movement across the country. Dr. Wiley opened the

first Open High School in Utah. This high school was founded on the premise that Open Education Resources, while being a more cost effective option to printed textbooks, will prove to be a better approach to student success as a result of the customized curriculum. Dr. Wiley partnered with the CK-12 organization to produce a digital textbook that included the content his teachers were using in their various subject areas, thus the name Flexbook. A few Arizona public school districts expressed interest in this concept and contacted Dr. Wiley. Dr. Wiley allowed teachers and administrators from Arizona to visit his Open High School in Utah and listen to what teachers had to say about the creation and usage of the Flexbooks. The Open High School in Utah is now in its fourth year of operation, while the Arizona system just began implementation of Flexbooks in the fall, 2012, in the two core classes of biology and algebra. Arizona was chosen for this study because of its unique position of being one of the first states to have schools that transitioned from using a traditional printed textbook for its biology and algebra classes to the new Flexbooks. To date, there has not been a study to determine the challenges of the implementation of Flexbooks among principals and teachers in Arizona.

This study researcher collaborated with the Superintendent of the Arizona school district to schedule interviews with six teachers that use Flexbooks for their biology and algebra classes in the high school. Interviews were also scheduled with two principals involved in the Flexbook implementation process in the same district. Face to face interviews with six teachers and one principal were conducted via Webconnect on October 25, 2013 and November 1, 2013. The second principal was

unavailable during the October and November dates but responded to interview questions via email.

INSTRUMENT

Qualitative Interview Protocol

Face to face interviews were conducted individually via Webconnect from the subjects' school district. Interviews were recorded, transcribed, analyzed, and coded to identify themes that aligned to the research questions. Each interview (using the same questions for both teachers and principals) was conducted individually. Prior to each interview, subjects were asked to sign an informed consent (see Appendix A) and were given the interview questions to review briefly before questioning. Questions were asked in the same order for each subject. Interviews were not constrained by time limitations and interview lengths ranged from 15 to 40 minutes. Questions were initially asked that identified the position and tenure of the participants. A series of questions were asked related to the usage and implementation of Flexbooks. Interview questions were developed by studying similar surveys and instruments about OER conducted at the higher education level. Questions were field tested (with principals and teachers enrolled in an Educational Administration and Leadership doctoral program) in the summer of 2013. Changes to the interview protocol involved the addition of a handout to provide subjects with a visual reference for technology competency (see Appendix C). Interviews were pre-arranged through the support of the Superintendent of the Arizona school district. For the purpose of the study, names

of participants were kept confidential. Qualitative techniques were utilized to analyze interview data. The rational for conducting individual teacher and principal interviews was to develop a deeper understanding of the challenges related to implementation and usage of Flexbooks Strauss and Corbin, 1990, define qualitative research as research that reports findings through means other than quantification. The researcher read transcribed interviews two times to explore the data. Transcripts were then organized into themes that aligned with the research questions. Those themes were then organized into a spreadsheet for coding purposes. As described by Creswell and Plano Clark (2011), "coding is the process of grouping evidence and labeling ideas so that they reflect increasingly broader perspectives" (p. 131). Berkowitz (1997) suggests considering six questions when coding qualitative data:

1. What common themes emerge in responses about specific topics? How do these patterns (or lack thereof) help to illuminate the broader central question(s) or hypotheses?
2. Are there deviations from these patterns? If so, are there any factors that might explain these deviations?
3. How are participants' environments or past experiences related to their behavior and attitudes?
4. What interesting stories emerge from the responses? How do they help illuminate the central questions or hypotheses?
5. Do any of these patterns suggest that additional data may be needed? Do any of the central questions or hypotheses need to be revised?

6. Are the patterns that emerge similar to the findings of other studies on the same topic? If not, what might explain these discrepancies?

Berkowitz (1997) further explains that words, phrases or events that appear to be similar can be grouped into the same category. During the analysis of the coding the researcher determined whether there was sufficient data that supported each research question. In this case there were.

LIMITATIONS

Limitations are those elements over which a researcher has limited or no control. Limitations for this study were as follows:

- Because of the limited number of teachers in the sample group, their responses may not represent all teachers who are implementing Flexbooks.
- Since the study was conducted in only one district, the information found here may not be applicable to other sites.
- Technology and Internet access issues reported in this study may not be applicable to other districts.
- Because of the limited number of principals in the sample group, their responses may not represent all principals who are implementing Flexbooks.
- Since subject areas of biology and algebra were the only content areas in this study, other content areas may not experience the lack of resources that were reported here.

- Because interviews were conducted in an open room with remote access, censoring of responses from the subjects was a concern.
- It was difficult to draw significant commonalities between teachers and principals because of the low number of subjects.
- One of the principals had no involvement in the Flexbook creation or implementation.

SUMMARY

The purpose of this study is to determine the challenges related to implementation and usage of Flexbooks among high school core content areas of algebra and biology. The results of this study are to assist educational leaders in the implementation of Flexbooks into their respective educational systems. Chapter III outlined the research design of interview protocol and methods of data collection and analysis for qualitative research. Chapter IV will provide qualitative findings for each research question and Chapter V will conclude the study with a discussion and recommendations for further research.

Chapter IV

RESULTS

INTRODUCTION

Chapter IV provides a brief summary of this case study purpose, research design and methodology, study questions, results, synthesis and summary. The purpose of this study was to determine the challenges, advantages and disadvantages of the implementation and usage of Flexbooks (OER) in high school algebra and biology classrooms in a select Arizona school district. In a recent statement by U.S. Secretary of Education, Arne Duncan (2012), he stated, "Open Educational Resources can not only accelerate and enrich learning; they can also substantially reduce costs for schools, families and students." He further states that Open Educational Resources (OER) allow educators easy access to content that not only can be customized toward a specific class or content area, but it is also free. Section 802 of the Higher Education Opportunities Act initiated by President Bush and formally introduced by President Obama in 2011, supports research to advance digital technologies that improve learning at all education levels (www.digitalpromise.org). In 2010, Florida Governor, Jeb Bush and West Virginia Governor, Bob Wise commissioned the Digital Learning Council. The purpose of this council was to encourage all state legislators to

implement a form of digital curriculum by the year 2017 (DigitalLearningNow.com). This legislation and increased interest among state policy makers related to digital content curriculum and textbook selection cause education leaders to seek information about advantages and disadvantages of Flexbooks as well as implementation strategies. Working groups attending the 2011 State Education Technology Directors Association (SETDA) summit created recommendations for legislators and educators to follow in order to properly implement a form of digital textbook by the year 2017. Education leaders find that, as a result of legislative action and support, they must examine the implementation and usage of Flexbooks to meet changing federal and state legislation and policies. The results of this study can be used to assist educational leaders in the implementation of Flexbooks into their respective educational systems. In this case study, a qualitative research design was utilized in which interviews were conducted with participants currently using Flexbooks in an Arizona public school system. Interview questions were designed following a review of literature and developed by studying similar surveys and instruments regarding OER conducted at the higher education level. Interview questions asked participants to identify challenges in the implementation of Flexbooks in a public high school system in the subjects of algebra and biology, and to identify advantages and disadvantages to their use. The questions were designed to determine whether there was any significant agreement between principals and teachers in their responses. Interview responses were transcribed, analyzed and coded to identify themes that align with the study research questions. The research questions guiding this study are:

1. What do principals identify in this study as the top three challenges to the implementation of Flexbooks?
2. What do teachers identify in this study as the top three challenges to the implementation of Flexbooks?
3. What do principals identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
4. What do teachers identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
5. Are there significant areas of agreement between principals and teachers in the advantages, disadvantages and implementation challenges of using Flexbooks?

In order to do a proper study of the implementation of Flexbooks into high school courses, a school district in the beginning phases of Flexbook implementation needed to be identified. This researcher conducted three conversations with an Arizona school district Superintendent to assess the level of Flexbook implementation. The Arizona district initiated the implementation of Flexbooks into the district's high school courses of algebra and biology in the fall of 2012. As a result of this information this researcher determined that the recent experience of Flexbook implementation in this particular district would be beneficial to future educators. The Arizona superintendent also shared that there are currently six high school teachers and two principals that have either participated in the Flexbook implementation process or have begun using Flexbooks in their classrooms. This researcher determined, based on the limited number of staff utilizing the Flexbooks, that a

qualitative case study using face-to-face interviews would provide the most in-depth information.

Currently, there are six teachers and two principals participating the Flexbook initiative in the select Arizona district. At the time of this study, the subject areas of algebra and biology were using Flexbooks. It was determined that all six teachers and both principals would be interviewed in order to gather enough information about each position's perspective on Flexbook implementation and use.

Interview responses are reported according to each research question of the study. Responses were analyzed by a coding process used to identify themes that emerged from the responses of each person interviewed. Information on years of experience in their current position, and training in OER content was also obtained in order to determine if there were any common themes related to participant responses in these areas related specifically to the challenges, and advantages and disadvantages of the implementation and usage of Flexbooks. In this chapter, interview responses were reported by providing background information of the subject group and by identified themes that respond to the research questions.

RESEARCH DESIGN

To gather data for this study, the researcher conducted interviews of six teachers, (subjects 1-6) and two principals (subjects 7 and 8) from an Arizona school district. Seven of the eight interviews were conducted via Webconnect on October 25 and November 1, 2013. Interview length ranged in time from 15 to 40 minutes. Interviews were audio and video recorded, and all responses were transcribed for

qualitative coding and analysis. The eighth subject answered all interview questions via email response.

Subjects' Background Information and Importance

Each of the interviewees was asked five questions related to their background. These questions were asked to determine if there were common responses among the participants that would assist other educators in the implementation and usage of Flexbooks.

These questions were:

1. What is your current title?
2. How long have you been in your current position?
3. Referencing the SAMR model where would you rate your level of competence with technology?
4. What was the most compelling reason for you to begin using Flexbooks?
5. What type of training or professional development did you receive prior to using Flexbooks?

The responses for each of these questions are shown below. After the results from those questions are shown, results for each of the five research questions of the study are provided.

Brief Description of Subjects for This Study

Subject 1: 21st year at the high school in the same position of biology, teaching biology

Subject 2: 15th year at the high school, has taught biology and earth science

Subject 3: 1st year at the high school, was reassigned from the middle school after 14 years.

Subject 4: 13th year at the high school teaching all different levels of math

Subject 5: 1st year at the high school in math, was reassigned after 12 years in special education.

Subject 6: 4th year at high school in biology and math.

Subject 7: 7th year as the high school principal

Subject 8: 10th year as the Blended Learning Program/Virtual Academy principal with 35 years total in the district.

Years in the District and Time in Current Position

It was important to establish years of experience in the district and time in current position as these may be factors in how the subjects responded to questions related to implementation and usage. For example, subject 7 indicated that the implementation might have been more successful if it had not been mixed in with other initiatives also being implemented at the same time in the district. He/she went on to say that many who have been in the district for a while have seen many initiatives come and go. The way this opinion is stated could infer that those with more years of service to the district or position might not see the unique benefits of Flexbooks themselves.

Another reason to ask respondents about years in the district and time in their current position was to discern if veteran staff and new staff might respond differently

to the study questions. This researcher wanted to determine if those who had been in their position for ten or more years would respond more negatively or positively than first year teachers to the Flexbook initiative in the district. This information would be beneficial to school districts that would need to identify staff and/or subject areas for Flexbook implementation purposes.

Table 1, shows how each interviewed subject answered questions about years of service in the district and time in their current position. This researcher determined that the usage of Flexbooks was not affected by years of service in the district or time in current position.

Table 1

Years in District and Current Position

Subjects	Years in District	Years in Current Position
Subject 1	21	21
Subject 2	15	15
Subject 3	14	1
Subject 4	13	13
Subject 5	12	1
Subject 6	4	4
Subject 7	7	7
Subject 8	35	10

Six of the eight subjects have served more than 12 years in the district at the time of the interviews. Subjects one and two have stayed in their current positions of high school algebra and biology for over 15 years. Subjects three and five are in the first year of their current position of biology and math at the high school. Subject three was reassigned from the middle school program within the district and subject

five was reassigned from the special education program in the same district. This information is provided to show experience in specified content area and service to the district and how that affects implementation and usage of Flexbooks.

Subjects were also asked to rate their level of competency with technology because the use of Flexbooks requires technology competency. By establishing a competency level among subjects, this researcher could determine whether the reported advantages and disadvantages to Flexbook usage were correlated to technology competency. In order to determine technology competency, subjects were given a handout of the SAMR model (see Appendix C) to use as a self-assessment of their competency level in the use of technology. The SAMR Model was introduced by Ruben Puentedura in 2006 in collaboration with the Maine Department of Education and their learning technology initiative. The model describes the life cycle of technology integration. This handout provided the subjects a visual from which to assess their level of technology integration competency. The SAMR Model divides technology use in the classroom into two general categories labeled Enhancement and Transformation. Within those two categories, Enhancement describes level S– Substitution as bringing technology into the classroom as a direct tool substitute with no functional change to the curriculum, delivery or learning of content, and level A– Augmentation as using technology as a direct tool substitute but evidence of improved learning or content delivery is present. In the Transformation category, level M– Modification implies that technology has significantly redesigned a task, and level R– Redefinition implies the use of technology to create new tasks previously deemed inconceivable.

Table 2 defines the SAMR Model and indicates reported technology competency among the subjects interviewed.

Table 2

Technology Competency Using the SAMR Model

	The SAMR Model			
Subject	S-Substitution	A-Augmentation	M-Modification	R-Redefinition
Subject 1	X			
Subject 2		X+		
Subject 3			X	
Subject 4	X			
Subject 5	X+			
Subject 6			X	
~~Subject 7~~				
Subject 8				X

+ indicates that they responded as being in between levels.

Based on this information, the researcher determined that experience in the district or current position had no impact on the assessed level of technology competency among the subjects. Subjects 3, 6 and 8 reported their levels to be in the Transformation category, implying that they were using Flexbooks to modify or redefine their instruction. These subjects taught different subjects in the high school and ranged in years of service from four years to 25 years in the district. Subject 7 chose not to answer this question because he/she stated that his/her position does not currently integrate technology into his/her daily duties. Therefore, no answer was given. Subjects 1, 4 and 5 reported using Flexbooks in place of traditional texts

without changing delivery or instructional methods. Subject 4 stated, "it's just another book, it's used as a supplement." Subject 2 reported competency as at the end of the Augmentation stage and moving into the Modification stage. This subject was beginning to use the Flexbook as a main tool for instruction with multimedia components being added.

Another question asked of the subjects was the most compelling reason the subject identified as to why he/she begin using Flexbooks. This information would provide a broader perspective about the reporting of advantages and disadvantage to the use of Flexbooks in the classroom. Results of this question are shown in Figure 1 below.

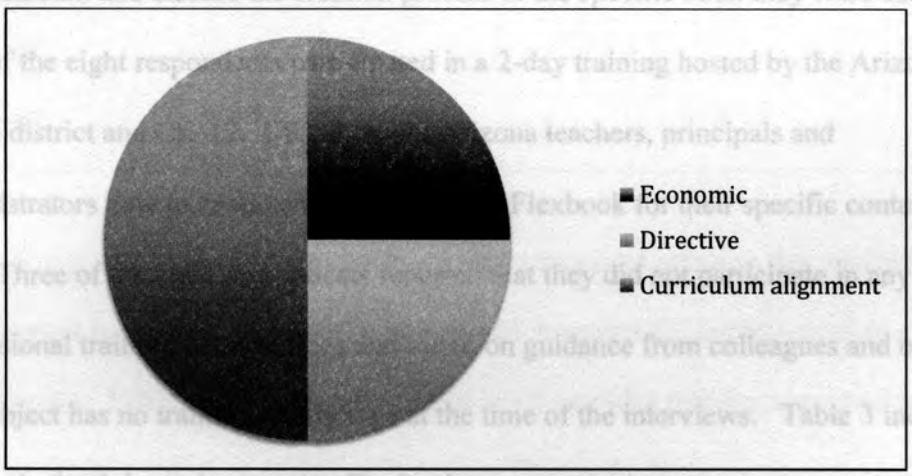

Figure 1

Compelling Reasons to Begin Using Flexbooks

When subjects were asked about the most compelling reason to begin using Flexbooks, four of the eight respondents reported the ability to customize and align to the state standards as most compelling. Two of the respondents stated that they just

followed the directives of their superintendent while the other two presumed there was some cost benefit associated with the usage but did not have the data to know for sure.

Another background question asked of the subjects was to identify the type of preparation, professional development or training they had prior to the implementation or usage of Flexbooks. For the purpose of this study, this researcher wanted to ascertain if participation, whether full, partial or none, in professional development or training opportunities would affect respondent's answers to implementation challenges of Flexbooks. When asked about prior training related to Flexbooks, three of the eight respondents were able to visit the Open High School in Utah for 2 days of professional development. During this visit they were able to observe teachers using Flexbooks in the classroom and discuss the creation process of the specific book they were using. Four of the eight respondents participated in a 2-day training hosted by the Arizona school district and CK-12. CK-12 taught Arizona teachers, principals and administrators how to create and edit their own Flexbook for their specific content area. Three of the eight respondents reported that they did not participate in any of the professional training opportunities and relied on guidance from colleagues and only one subject has no training of any type at the time of the interviews. Table 3 indicates the level of training prior to using Flexbooks.

Table 3

Prior Training to Implementation or Usage of Flexbooks

	Training Opportunities			
Subject	Utah Visit	On Site CK12 Training	Guidance from colleagues	None
Subject 1	X	X		
Subject 2	X	X		
Subject 3	X	X		
Subject 4			X	
Subject 5			X	
Subject 6		X		
Subject 7				X
Subject 8			X	

It was determined by the results of this background question that professional development is certainly beneficial and essential to successful implementation efforts of Flexbooks. Subjects that had participated in all provided training opportunities felt confident in their ability to author, edit and use Flexbooks however, they did indicate that formatting a Flexbook was not part of any training thus, creating great challenges during the authoring process. As reported in Table 1, two of the subjects were not in their current positions at the time the training opportunities were made available. These two subjects reported using guidance from colleagues or shadowing as an option for training. In this case, being new to their position and to the idea of

Flexbooks, their responses to Flexbook implementation were more concise than their responses to the disadvantages or advantages of Flexbook usage.

Another question asked as part of the subjects' background information was the extent to which the subjects authored or edited the Flexbooks they were using. This was important because the researcher believed that subject responses to this question could relate directly to the research questions about advantages and disadvantages to using Flexbooks. In order to determine bias in the subject's responses regarding disadvantages and advantages, the amount of involvement in the creation of the product was important to measure. When asked about authoring or editing the Flexbook, four of the respondents learned how to author and/or edit their own Flexbook in their content area. Two of the respondents only reviewed or did minor editing of the Flexbooks because of the nature of their position or being newly reassigned into their current positions. Two of the respondents only observed the process of creating a Flexbook or were not involved in any capacity. Table 4 provides subject responses to this background question.

Table 4

Authoring and Editing Flexbooks

	Authoring	Editing	Review	None
Subject 1		x		
Subject 2	x			
Subject 3	x			
Subject 4	x	x		
Subject 5				x
Subject 6			x	
Subject 7				x
Subject 8			x	

Three of the four respondents who indicated extensive involvement in both authoring and editing Flexbooks had participated in professional development and training opportunities provided by the district. The fourth subject indicated that subject two provided guidance in this area. All subjects, regardless of the level of authoring or editing a Flexbook reported benefits of the ability to customize curriculum.

Background information presented in this study creates a deeper understanding of the subjects being interviewed. This was important to report because of the interview format and because the interview questions were primarily open ended. In order to draw conclusions from the subject's responses to the research questions it was important to establish a baseline of both experience and preparation of the subjects

prior to their implementation of Flexbooks. This information allowed the researcher to determine if there were correlations in these areas that might be helpful to future educators when looking at the implementation or usage of Flexbooks in their respective systems.

During the interview process each open-ended question answer was coded and analyzed into specific categories or themes. Themes and/or categories of responses were examined for relationship to usage and implementation challenges of Flexbooks. Frequency distribution, coding and cross tabulation was used to summarize data. The coding document found below shows how each subject responded to the open ended questions and how the themes were identified that support each research question (see Figure 2).

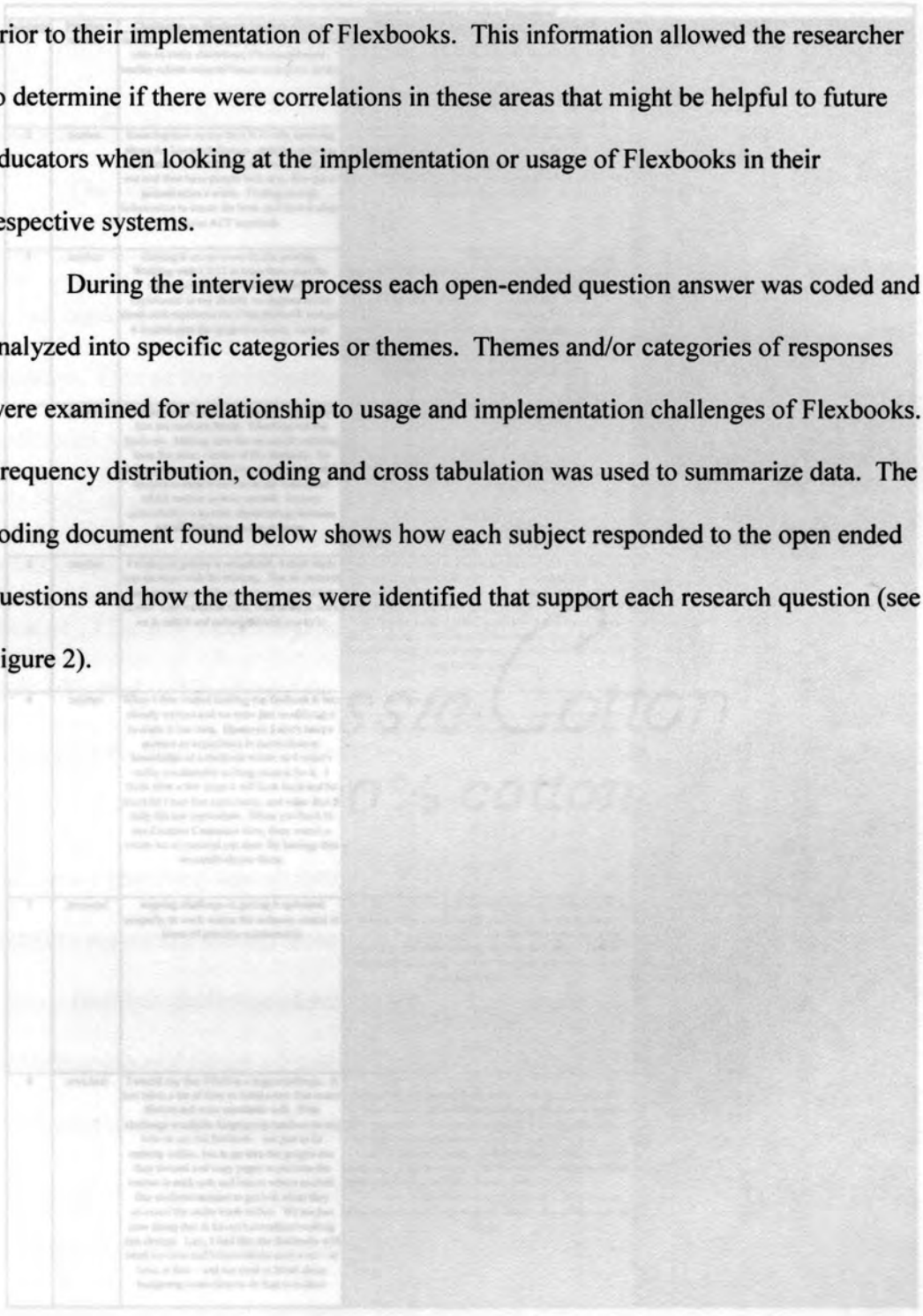

Figure 2

Interview Questions Coding Document (Subjects 1-8)

Interview Questions Coding Document				
Subjects	**Position**	**Challenges to Flexbook implementation**	**Advantages of using Flexbooks in the classrom**	**Disadvantages of using Flexbooks in the classroom**
1	teacher	level of technology in the classroom, no one to ones in every classroom, it's a supplement, teacher selects material based on student needs,	ability to be tailored to ACT , ability to match material with assessments, in the creation of it grew a lot of buy in from those who worked on it	[redacted]
2	teacher	Knowing how to use the CK12 site, knowing about the layout challenges, margins, printing requirements, and finding the time. To lay it out and then have people look at it, then get it printed takes a while. Finding enough information to create the book and have it align to our ACT standards.	Scope and Sequence is going to flow and go in the order we need. Every student will be able to have a printed copy and be able to write in it and take it home if they don't have access. No backpacks, if they loose a book they can pull it up on their phone or ipad.	[redacted]
3	teacher	Getting it set up correctly for printing. Working with CK12 to have them post the content on their site. Getting the IT department in my district to respond to the needs and requirements of the flexbook and get it loaded onto the ipads in a timely manner.	Teacher created authorship empowers the teachers. Creates a perspective that teachers are the experts in their content areas. Aligned to our curriculum and district initiatives. Information is more applicable, it's a living document that we can change and adjust to the demographics of the classroom. Kids at all levels can see how the book fits with where they are and as a result feel more confident and hopeful of success. We can teach students how to be better prepared for college by having the ability to write in the book and take notes.	[redacted]
4	teacher	The time each day it takes to get it set up and into the students hands. Checking out the ipads etc. Making sure tha we are all working from the same version of the flexbook. So many edits can be done on a regular basis, that its hard to keep everyone in the look about which version is most current. Internet accessibility is another disadvantage because not all kids have access at home.	We can align it to our curriculum.	[redacted]
5	teacher	I think just getting it completed. I think there was an issue with the printing. Not all students have computers at home so not everyone has access. Last would be time, time to do it, work on it, edit it and getting the kids use to it.	I have it printed out so I use it for notes in class, the kids are now use to it so they can go online anytime and look at it, its always there and always available to them. Ours is really well developed, the examples are very nice, the explanations are very nice, the layout is nice, parents were impressed. Some parents found it easier to help their student with homework. If a student is absent, they can keep current with the unit and section and stay ahead.	[redacted]
6	teacher	When I first started looking the flexbook it was already written and we were just modifying it to make it our own. However, I don't have a masters or experience in curriculum or knowledge of a textbook writer, so I wasn't really comfortable writing content for it. I think after a few years I will look back and be thankful I had that experience, and value that it truly fits our curriculum. When you have to use Creative Commons sites, there wasn't a whole lot of material out there for biology that we could choose from.	That it is directly aligned with our curriculum and what we are teaching in class. We don't have a bunch of information that we don't need, just the material we need to cover.	[redacted]
7	principal	ongoing challenge is getting it uploaded properly, to work within the software model in terms of printing requirements	Easily accessible for kids, we have ipad carts, they can access them at home from their own devices. The books clearly connect with the ACT standards. Having an Ipad for every student is cost prohibitive for us. We were able to fund the ipads we have through a grant. The grant is done, so we will not be purchasing anymore.	[redacted]
8	principal	I would say that TIME is a huge challenge. It just takes a lot of time to build a text that meets district and state standards well. Next challenge would be helping my teachers to see how to use the flexbook – not just in its entirety online, but to go into the google doc they created and copy pages to put into the course in each unit and lesson where needed. Our students seemed to get lost when they accessed the entire book online. We are just now doing that & haven't completed making this change. Last, I feel like the flexbooks will need revision and improvement each year – at least at first – and we need to think about budgeting some time to do that somehow	Students can't say "they forgot their book at home". ☺ Many of our blended students don't work on their curriculum at home but only in our blended learning program in our lab, since they don't have internet at home. So, using flexbooks in the classroom helps because we don't run out of textbooks, which before did happen – and if a student prefers to use a hard copy of the flexbook so he/she doesn't need to open that screen all the time we have them available. The last advantage is the cost. I can afford $5 to $7 per book – to have some printed copies in the lab, whereas before I was using really old books.	[redacted]

Figure 2

Interview Questions Coding Document (Subjects 1-8)

RESEARCH QUESTION RESULTS

Research Question One

The first research question, what do principals in this study identify as the top three challenges to the implementation of Flexbooks, focused on the implementation of Flexbooks from a principal's perspective. Two principals were interviewed for this question. One of the principals, or subject 7 for the purpose of this study, held a traditional role as a high school principal in the Arizona district while the other principal, or subject 8, had supervision responsibilities in an alternative learning environment. Principal subject 8 became extensively involved in the use of Flexbooks because of the non-traditional nature in which the students in the alternative program were educated. This alternative program used online resources and blended learning techniques to educate the students. Reasearch question one specifically targets principal's reactions to the challenges associated with the implementation of Flexbooks into their schools/programs. Qualitative responses were transcribed and coded to determine the top three challenges identified by the two principals.

The first challenge identified by both principals was lack of time to train, build/develop and create a Flexbook. The second challenge to the implementation of Flexbooks identified by both principals was technology related. Subject 7 was quoted, "An ongoing challenge is getting it uploaded properly to our network or IPads, to work within the software model in terms of printing requirements." This principal also reported that he/she had heard from staff that they were having trouble with the layout and requirements that enable them to print the book and when printing the

book, there are no page numbers and students often were lost in the reading. Because of these comments, subject 7 discerned that there was minimal staff interest because his/her staff still preferred being able to flip through the pages of a traditional text. Neither principal was able to identify a third challenge but subject 8 did state that the Flexbook will need annual revisions and improvements and, therefore, trying to find the money to support teachers for this will be a challenge.

In summary, time and technology concerns were reported by both principals. Time was reported as a concern in the preparation or creation of a Flexbook, in training of staff to create and use a Flexbook, and in future allocation of time for revisions and edits to a Flexbook. Technology was also reported since the implementation of a Flexbook required decisions about internet access, methods to upload Flexbooks on mobile devices and which devices would provide appropriate tracking and support to student learning.

Research Question Two

The second research question examined in this study, what do teachers identify as the top three challenges to the implementation of Flexbooks, focused on implementation of Flexbooks from a teachers' perspective. This researcher determined there was value in gathering the perspectives from teachers with regard to Flexbook implementation to determine if there were commonalities among teachers and, to determine if there were differences in their responses from those of principals. Six teachers were interviewed in this qualitative case study. Qualitative responses

were transcribed and coded to determine the top three challenges identified by the six teachers. For reporting purposes, teachers will be identified as subjects 1-6.

The first challenge identified by four of the subjects was the lack of clarity in how to layout and print copies of Flexbooks for classroom use. In both subject areas of biology and algebra, four teachers reported that they decided to print a set of books for the classroom to help address access issues for students who did not have internet at home. In order to print the Flexbook, specific margin and layout specifications had to be met. Subject 2 reported that not knowing in advance about the layout requirements was a challenge. Subject 3 stated that preparing a Flexbook for printing became quite time consuming and frustrating. This subject also said that he/she was not aware of all the layout requirements prior to printing the Flexbook. Subject 2 indicated that there was a wait period for the Flexbook to be approved for printing from the printing company.

A second challenge reported by three of the subjects was a lack of material or resources available in their specific content area. Those three subjects reported using sites like CK-12 and Creative Commons when creating and authoring their own Flexbooks. They reported using these sites because the content had been vetted through appropriate copyright processes. Subjects 2, 3, and 6, in the biology department, reported that the biology resources on the CK12 site lacked depth in some of the units they needed to include in their book. Subject 2 was quoted as saying, "Finding enough information to create the book and have it align to our ACT standards is a challenge." Subject 6 commented, "When you have to use sites like

Creative Commons, there wasn't a whole lot of material out there for biology that we could choose from."

The third and last challenge identified by three of the subjects in the implementation of Flexbooks was student accessibility to the Internet. Subject 4 spoke about the demographics of the Arizona school district and its large geographical attendance area. He/she stated that there are very remote cities and neighborhoods within the district that do not have Internet capabilities. He/she went on to say that many students only have access to the Internet at school so accessing a Flexbook afterschool is problematic. Subject 1 stated that IPads have been purchased but not every classroom has them and taking them home is not an option since Internet access is required. Subject 5 stated that Flexbooks can be accessed by any mobile device but the Flexbook in a digital format is still hard for many students to navigate easily.

In summary, teachers reported the top three challenges to Flexbook implementation were; 1) formatting and preparing Flexbooks for printing; 2) locating enough content for their subject areas to complete units in their Flexbooks; and 3) student access to the internet since demographics of the district did not allow for equal access for their students. Because of this last challenge, four of the teachers also preferred to have printed Flexbooks available to students in their classroom.

Research Question Three

The third research question examined in this study, what do principals in this study identify as advantages and disadvantages of the usage of Flexbooks in the classroom? For the purpose of this study, principals will be identified as subject 7 and

subject 8. Qualitative responses were transcribed and coded to determine common advantages and disadvantages identified by the two principals.

For this research question, advantages and disadvantages will be summarized separately. Both principals reported that student access was an advantage to the Flexbook use. Subject 8 was quoted as saying, "Students can't say that they forgot their book at home. Students are able to access the book from any computer or mobile device including their phone if they need." Subject 8 reported that the students in the blended learning program do not work on their curriculum at home so having Flexbooks available in the lab and on the computers is a benefit to them. Subject 7 stated that they have purchased IPad carts through a grant and, therefore, access has been very convenient for students. A second advantage reported by both principals was the cost. Subject 7 stated that he/she knew there was a cost benefit to the district during the implementation process but wasn't aware of what economic impact had been made. Subject 8 reported that printing Flexbooks costs between $5 and $7 per book which allows enough copies to be printed for every student in the program. He/she said, "We used to have a problem running out of textbooks for each student and now that is not a problem anymore."

Regarding disadvantages, there were not common themes identified between the two principals interviewed. Subject 8 reported that he/she did not feel there were any disadvantages to the usage of a Flexbook use unless one counts the typos that were missed during the editing process. He/she went on to say that typos can also occur in the traditional textbooks as well so perhaps this disadvantage is not unique to the Flexbook. Subject 7 stated, "I don't know if the teachers really like them as much

as the traditional textbook. I think they like flipping back and forth through the pages." He/she also said that he/she did not feel there was complete buy-in from the teachers and "if this idea had come from them, there would be buy-in."

In summary, the advantages from a principal perspective on the usage of Flexbooks in the classroom were: student access since all students had their textbook in the classroom, and that the low cost allowed for printing enough books for the students. In terms of disadvantages, neither principal reported the same disadvantage in the interview process. One principal reported that teacher buy-in could be a disadvantage while the other principal could not specifically identify any disadvantage unique to Flexbooks.

Research Question Four

Research question four examined advantages and disadvantages to Flexbook usage in the classroom from a teacher perspective. Six teachers were interviewed and qualitative responses were transcribed and coded to identify these advantages and disadvantages. For the purpose of reporting the responses to this question, teachers will be identified as subjects 1-6.

Five out of the six teachers interviewed stated that the alignment to the curriculum or the ability to customize the content was the greatest advantage to using Flexbooks. Subject 1 reported that the ability of the Flexbook to be tailored to the Arizona Comprehensive Tests (ACT) and the ability to match material with assessments created buy-in from the teachers who authored the book. Subject 2 said that the scope and sequence allowed for a better flow and order of the content.

Subject 3 reported that the information found in Flexbooks is more applicable to the students and, since it is a living document, it can be adjusted to individual learning styles. He/she went on to say, "Flexbooks can be easily adapted to meet the needs of a student who might be struggling academically, or perhaps visually impaired, or who needs an extra challenge. Kids at all levels can see how the book fits with where they are and as a result feel more confident and hopeful of success." Subjects 4 and 6 reported that the alignment to the curriculum creates so much efficiency that it eliminates all the other content that they usually just skipped over. A second advantage reported by five of the six teachers was the accessibility to Flexbooks for the students. Subject 2 stated, "they really don't need backpacks. If they lose a flexbook, they can just look it up on their phone or iPad." Subject 5 reported that when students are absent, they can go online to access their Flexbook and still stay on track. He/she went on to say that if the Flexbooks are printed, students have their own copy in which to write in and take notes. Subject 3 equated the Flexbook to college textbooks, by stating that "students own and use them how they wish, this is better preparation for college." In summary, the two common advantages identified by teachers for Flexbook usage were; 1) alignment to the curriculum because it allows for customization to learning styles as well as meeting state standards; and 2) easy access for students who may not have internet capabilities at home or who need to keep up due to absence.

Regarding disadvantages, subject responses did not result in clear common themes. Subjects 1, 5, and 6 reported that even though Flexbooks are supposed to address access issues, there still can be students without internet at home. These

subjects solved that issue by printing enough Flexbooks for a classroom set and did not allow students to take them home. Subject 6 stated, "we didn't print the biology book because we never got it completely finished to where we wanted and it was too large to print." Subjects 2, 3 and 4 spoke about time and capabilities of creating a Flexbook. Subject 2 did not feel there were enough "eyes" looking at the book for it to be fully comprehensive. He/she stated, "I would prefer that since some are more expert in topics than others, more people should be involved in the authoring." He/she went on to say that the Creative Commons site did not always have the depth needed in some content areas. Subject 3 said, "You discover your limits in writing a book." Subject 4 said that finding the time for preparation and the time to continually work on the Flexbook updates with no professional development was a disadvantage. In summary, reported disadvantages about the usage of Flexbooks in the classroom were inconsistent among subjects. While three of the subjects identified access to Flexbooks to be a challenge among students, the other three subjects spoke about the time it takes to write and edit a Flexbook. Other comments reported by the subjects were, "There is no teacher book, so preparing for substitutes is difficult." "Getting buy-in from other teachers is difficult if they didn't start at the beginning of the book." And, "There is a lack of technology infrastructure to adequately support the use of Flexbooks in the classroom."

Research Question Five

The last research question examined in this study was, are there significant areas of agreement between principals and teachers in the advantages, disadvantages

and implementation challenges of using Flexbooks? This researcher sought to determine if there were areas of agreement between these two subject groups since each represented a different job classification and perspective. Agreement about the advantages, disadvantages, and implementation challenges of using Flexbooks between these two subject groups' responses would be beneficial to future educators when considering implementation of Flexbooks into their schools/classrooms. Interviews were recorded and transcribed to identify themes and consistencies for question five.

In examining responses among principal and teacher groups regarding the advantages of using Flexbooks, both groups identified accessibility as a common advantage. Both groups reported the ability of students being able to access the Flexbooks in a variety of mediums like tablets, phones and printed books as an advantage. To address the issue of students not having access to the Internet when at home, the ability to print the Flexbooks at a reasonable price seemed to alleviate this concern. There were no other significant themes identified between the groups in the advantages of using Flexbooks.

When the two groups' responses were compared about disadvantages of using Flexbooks in the classroom, principals reported that lack of equal access was a disadvantage while only half of the teachers mentioned access in their responses. There were no other significant themes identified between the groups in the disadvantages of using Flexbooks.

Regarding implementation challenges, both groups identified lack of time as a significant challenge. Six of the interviewed subjects cited time as a challenge when

creating a Flexbook, editing a Flexbook and planning for future revisions of the Flexbook. Principals reported time as a challenge from a professional development perspective because of the needed resources to support teachers using Flexbooks. Principals and teachers stated that there was a lot more time involved in finding content and laying out the Flexbook to meet the proper printing requirements than had originally been anticipated. One principal and four teachers spoke about the time in relationship to technology because of the time needed to check out tablets to students at the beginning of class or in uploading Flexbooks to the tablets or mobile devices. In summary, both groups unanimously identified time for development of the Flexbooks and teacher training as the greatest challenge to Flexbook implementation.

Additional Comments

This researcher had the opportunity to ask the interviewed subjects about any other comments or recommendations they would have for the field. These were open-ended questions at the end of the interview process. For the purpose of this study this researcher labeled each quote to match research questions about implementation or usage of Flexbooks. Listed below are quotes from teachers:

- Make sure your scope and sequence are defined prior to creating a Flexbook. (Implementation)
- Make sure you know the state standards for your content area. (Implementation)
- Try to observe or shadow people who have used a Flexbook. (Implementation)

- Plan to still use all existing textbooks the first year. (Use in classroom)
- Print out a classroom set of Flexbooks. (Use in classroom)
- Have a master Flexbook to use for editing purposes. (Use in classroom)
- Consider your technology infrastructure and firewall limitations – can you download content from UTube for example? (Implementation)
- Laptops might be better than Ipads for security reasons and beware that Apple products do not support Flash, which, is sometimes part of the content that is available. (Implementation and usage)
- Have clear direction from your superintendent about the intended use of the Flexbooks in the district, school and classroom. (Implementation)
- Learn how to use sites like CK-12 and how to find open resources. (Implementation)
- Demo material in the classroom for a while before adding it to the Flexbook. (Use in classroom)
- It is a work in progress and won't be perfect the first time. Consider using just a small section the first year to get the students use to it. (Use in classroom)
- Consider having a graphic designer for your editing and formatting purposes. (Implementation)

Listed below are the summarized responses from principals:

- Consider your technology infrastructure; do you have enough IT people to support the implementation and the equipment to handle the downloading and servicing of mobile devices? (Implementation)

- Each student should have their own device and their own printed copy of the Flexbook. (Use in classroom)
- Consider implementation at the elementary level first. (Implementation)
- Don't choose certain subjects or teachers initially, to create more staff buy in, include all staff at once regardless of the level. (Implementation)
- Consider sharing content with neighboring districts, it makes everyone's content richer. (Use in classroom)

SUMMARY

This case study was designed to identify implementation challenges and advantages and disadvantages to Flexbook usage as reported by algebra and biology high school teachers and their principals in a school district in Arizona. This chapter presented analysis of data and results of the study. Qualitative data were collected through interviews with six teachers and two principals from an Arizona school district. Qualitative data were analyzed by transcribing interviews and coding responses to identify themes. Of the study's guiding research questions, questions one and two asked subjects to identify the top three challenges in the implementation of Flexbooks into a school or classroom. For question one, the two principal subjects identified two common challenges: lack of time to build and create Flexbooks, and difficulty in the layout and printing of Flexbooks.

In question two, teacher subjects identified three common challenges: the layout and printing of Flexbooks, lack of available material or resources in their content area, and equal student access to technology, specifically the internet.

Research questions three and four related to the usage of Flexbooks in the classroom. Teachers and principals were asked to identify advantages and disadvantages of Flexbook usage from their perspective. In question three, both principals identified access to the Flexbook by students from home or at school, and the reduced cost of Flexbooks compared to traditional textbooks as advantages. The principals each identified a disadvantage from his/her perspective. One said that more people needed to read the final copy of the Flexbook to catch typos, and the other principal said there was less teacher buy-in than hoped.

The majority of teachers in question four identified the customization and the alignment to their curriculum as an advantage of Flexbooks and, student access to the Flexbooks via the Internet. The disadvantages reported by teachers were not as clearly identified by a majority of teachers. The printing layout and the fact that some students did not have access to the internet at home were cited as disadvantages by at least two of six teachers

Research question five explored similarities between principal responses and teacher responses related to implementation and use of Flexbooks. In terms of agreement between principals and teachers when looking at the advantages of using Flexbooks, both groups identified accessibility as being a common advantage. Both groups also reported the ability of students being able to access the Flexbooks in a variety of mediums like tablets, phones and printed books as an advantage. Principals reported that access was a disadvantage while only half of the teachers mentioned access in their responses. There were very few commonly identified themes that support this research question.

Additional comments from both teacher and principal subjects during the interview process about Flexbook implementation advised other educators to be patient, receive district and building-level support, know curriculum and the state standards for content area, and make sure there is a technology infrastructure to support the development and printing of the Flexbooks.

Chapter V

DISCUSSION, RECOMMENDATIONS, AND CONCLUSION

Chapter V will provide an overview of the study, a brief summary of the methodology and discussion of each of the research questions. Professional practice implications of the study and recommendations for further study are discussed.

INTRODUCTION

Rapid advancements in technology challenge most K-12 public school systems to keep up with technology innovations and integration while managing reduced school budgets. Utah's State Office of Education (2012) announced that it will develop and support open textbooks in key curriculum areas of secondary language arts, science and math for all districts in the state. Larry Schumway, Utah's State Superintendent of Public Instruction reports that, open textbooks are a great use of technology and elevates Utah to the number one ranking most cost efficient school system in the country. Recent pilot studies conducted by Dr. David Wiley, one of the founding fathers of Open Education Resources (OER), found that Utah high school students learn the same amount of science in classes using $5 open textbooks as they do in classes using the $80 traditional textbooks (Utah State Office of Education, 2012). The rising costs of textbooks along with increased use of mobile technology

and the individualized needs of today's learners are forcing many school systems to consider alternative methods of delivering educational content (Odden & Picus, 2007). In a recent statement by U.S. Secretary of Education, Arne Duncan (2012), states, "Open Educational Resources can not only accelerate and enrich learning; they can also substantially reduce costs for schools, families and students." He goes on to say that OER allow educators easy access to content that not only can be customized toward a specific class or content area, but it is also free.

Section 802 of the Higher Education Opportunities Act initiated by President Bush and formally introduced by President Obama in 2011, supports research to advance digital technologies that improves learning at all education levels (www.digitalpromise.org). In 2010, Florida Governor, Jeb Bush and West Virginia Governor, Bob Wise commissioned the Digital Learning Council. The purpose of this council was to encourage all state legislators to implement a form of digital curriculum by the year 2017 (Bridges, 2011). This legislation and increased interest among state policy makers related to digital content curriculum and textbook selection cause education leaders to seek information about advantages and disadvantages of Flexbooks as well as implementation strategies. Working groups attending the 2011 State Education Technology Directors Association (SETDA) summit created recommendations for legislators and educators to follow in order to properly implement a form of digital textbook by the year 2017. Federal and state policies related to curriculum adoption or textbook selection are currently being reviewed by education leaders and altered to accommodate this federal request. Students today

participate in a digital learning culture that encompasses their lives 24/7, while most of that type of learning occurs outside the school day (Garland & Tedeja, 2013). Access to the Internet and digital content has made the educational environment better prepared for implementing OER, a new type of educational resource delivery method. However, little study has been conducted on the advantages, disadvantages and implementation strategies of OER at the K-12 level.

The purpose of this study was to examine the challenges, advantages and disadvantages of OER, commonly referred to as Flexbooks, among select high school teachers and principals in an Arizona school district that currently use Flexbooks in subjects of biology and algebra. The results of this study will be used to assist educational leaders in the implementation of Flexbooks into their respective educational systems.

The research questions guiding this qualitative case study are:

1. What do principals identify in this study as the top three challenges to the implementation of Flexbooks?
2. What do teachers identify in this study as the top three challenges to the implementation of Flexbooks?
3. What do principals identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?
4. What do teachers identify in this study as advantages and disadvantages of the usage of Flexbooks in the classrooms?

5. Are there significant areas of agreement between principals and teachers in the advantages, disadvantages and implementation challenges of using Flexbooks?

In this case study, interviews were conducted with participants currently using Flexbooks in an Arizona public school system. Interviews were chosen as a method of data gathering as few subjects were available and in depth information was desired. Interview responses were transcribed, analyzed and coded to identify themes that align with the research questions. During the interview process background information was obtained on each subject. This background information included: 1) time in district and current position; 2) professional development and training prior to Flexbook implementation; 3) assessed level of technology competency using the SAMR Model; and 4) extent of authoring and editing Flexbooks. This information was helpful in order to establish some understanding about each subject's tenure in the district, years of teaching in the specific content area, and technology and training exposure that might influence their responses to interview questions.

DISCUSSION AND CONCLUSIONS

The research questions that guide this qualitative case study are:

Research Question One

The first research question for this study examined the challenges to Flexbook implementation from a principal perspective.

What do principals identify in this study as the top three challenges to the implementation of Flexbooks?

Two principals were interviewed for this question. One of the principals held a traditional role as a high school principal in the Arizona district while the other principal had supervision responsibilities in an alternative learning environment where a variety of learning methods were used. Two challenges were identified by both principals in areas of time and technology related to Flexbook implementation. Time was reported as a concern in the preparation or creation of a Flexbook. One principal, with very minimal involvement in the Flexbook implementation process, indicated that staff seemed surprised and frustrated about the printing and layout process of a Flexbook. Staff reported not having expertise in the area of layout and design and encouraged district leadership to consider hiring graphic artists for this process. Time was mentioned as in training of staff to create and use a Flexbook, and in future allocation of time for revisions and edits to a Flexbook. Both principals could foresee challenges in the allocation of time in their professional development calendars to support the teachers who needed time for edits and revisions to current Flexbooks but to additional staff in the creation and production of Flexbooks in other content areas. Technology was also reported as a challenge since the implementation of a Flexbook required decisions about internet access, methods to upload Flexbooks on mobile devises and which devices would provide appropriate tracking and support to student learning. One principal explained that the technology department did not plan for the uploading process of Flexbooks on mobile devises and therefore classrooms had to

wait for this to occur before accessing the Flexbook. Throughout the literature review, higher education systems also mentioned challenges with technology infrastructure related to downloading and access to content (Levin, 2011). Mobile devices that the high school chose were not fully capable of showing all the content of a Flexbook when Flash content was included and sometimes the district's security features blocked content that was intended to be part of the unit. Lastly, technology concerns related to Internet access was reported by both principals. The demographics and geographical challenges of the district do not allow for all students to have Internet access at home. This challenge does, in some ways, negate the idea of Flexbook usage if one of the primary benefits is immediate access. The school district is creatively finding ways to help these students have access to content they need but having a set of printed Flexbooks for each classroom is still a reality they must provide.

Research Question Two

The second research question for this study examined the challenges to Flexbook implementation from a teacher perspective.

What do teachers identify in this study as the top three challenges to the implementation of Flexbooks?

Six teachers were interviewed in this qualitative case study. Teachers reported the top three challenges to Flexbook implementation were: formatting and preparing Flexbooks for printing, locating enough content for their subject areas to complete units in their Flexbooks, and student access to the internet. Teachers reported challenges to implementation similar to the principals in the amount of time it took to

format and prepare a Flexbook for printing. The teachers did not suggest time to be an issue as much as they were frustrated with the layout process. In order to print their Flexbooks, proper formatting of margins, graphics and design requirements had to be followed. Many of the teachers had reported being unprepared for this process and almost surprised by its need for specificity when books were returned multiple times for additional edits. Half of the teachers had participated in the trainings that the district of Arizona provided but none of the trainings covered layout and formatting processes.

Finding enough content was another implementation challenge by those who authored and edited their own Flexbooks. During the authoring and editing process, teachers were using sites like Creative Commons and CK-12 to develop their Flexbooks to align with their state standards. In the content area of biology, two teachers reported that depth to particular units were lacking and therefore had to supplement with a printed chapter of another textbook. It was commonly reported in the literature review that the quality of OER/Flexbooks will be enhanced through the increased use and reuse of the material. Since the movement of Flexbooks is fairly new among K-12 institutions, the depth of material or even entire content areas may not be developed at this current time. However, with the speed of technology and rapidly developing Internet sites looking to provide educational content in a digital format, this challenge could soon be eliminated as a top concern among educators.

Demographics and geographical challenges of the Arizona district do not allow for equal access to the Internet for their students in their homes. This was reported as

a challenge among the teachers because the intended use of a Flexbook should be digital in nature. Students could/should be able to access homework and assignment information beyond the school walls. Since this is not feasible at the current time in this district, many of the teachers provide printed Flexbooks to each student. Many of the teachers mentioned that even though their district purchased mobile devices and many of the students have mobile phones, the lack of internet access in certain neighborhoods in the district wouldn't allow for those types of devices to work properly.

Research Question Three

The third research question for this study examined the advantages and disadvantages to Flexbook use in a classroom.

What do principals in this study identify as advantages and disadvantages of the usage of Flexbooks in the classroom?

Two principals were interviewed for this question and both reported student access as the main advantage to Flexbook use in the classroom. Because Internet access is a challenge for many students at home and most Flexbooks in this district are printed at a very low cost, both principals saw the advantage to each student having access to their own book as an advantage. One principal mentioned that even if a student forgot their Flexbook at school, and could access the Internet, they could still keep place with the classroom assignments. This was also mentioned in circumstances of absences due to illness. Another principal like the idea of students having their own

books to be able to write in and use how they need as better preparation for a post-secondary experience.

In terms of disadvantages, neither principal during the interview reported the same disadvantage of the use of Flexbooks. However, one principal reported that teacher buy-in could be a disadvantage. This was mentioned because he/she felt that because only two content areas using Flexbooks, other teachers were not invested in the process and perhaps felt isolated. It was not mentioned by any of the subjects in the interview process why algebra and biology were chosen in Arizona for the Flexbook initiative, but the literature would suggest that there is currently more content available in areas of math and science. It was recommended by this particular principal that a building-wide implementation effort to the use of Flexbooks would enhance teacher buy-in.

Research Question Four

The fourth research question for this study examined the advantages and disadvantages to Flexbook use in a classroom.

What do teachers in this study identify as advantages and disadvantages of the usage of Flexbooks in the classroom?

Six teachers were interviewed and qualitative responses were transcribed and coded to identify these advantages and disadvantages. Five of the six teachers stated that alignment to their curriculum and the ability to customize their book content were the top two advantages. Many of the teachers reported these advantages for various reasons. Some felt the customization was especially beneficial for students with

different learning needs. Whether a student required more of a remedial approach to the content or a rigorous approach, both could be accomplished with simple modifications to a Flexbook. One teacher reported the ease of making the Flexbook font larger for a student with visual impairments. Others reported that the ability to directly align with the scope and sequence of the district and the state standards was much more efficient. This alignment was appreciated because pages were not being skipped or chapters omitted as they had been in a traditional text. Teachers did report access as their final advantage to the use of Flexbooks since students can access the books at school, at home or in print.

The reported disadvantages about the usage of Flexbooks in the classroom were inconsistent among the teachers. Three of the teachers identified access to Flexbooks a disadvantage for some students. Other teachers spoke about the time it takes to write and edit a Flexbook as a disadvantage. This was reported more commonly because of the challenges associated with the layout and formatting of a Flexbook for printing. However, there were two teachers that did mention their lack of confidence in writing content as a disadvantage to Flexbook use. They state that even though they feel they know their content and can teach effectively, they are not professional writers and feel intimidated by the process of authoring a Flexbook for others to use. This comment may be addressed as the Flexbook use among K-12 institutions becomes more common. Arizona is among the first K-12 public institutions in the nation to begin using Flexbooks. One could surmise, that beginning authors and editors of Flexbooks in this district feel extreme pressure to produce a

comprehensive document. The literature however, suggests just the opposite in how material should be reused, revised, remixed and redistributed (Wiley, 2009). It may be that the initial creation of a Flexbook seems daunting but as others engage in the remixing and redistributing stages, the book itself becomes more effective and adaptable. One teacher did mention that preparing for substitutes was a disadvantage, because Flexbooks do not have 'teacher books'. It was surprising to note that even though there was some reported disadvantages to the use of the Flexbook in the classroom, none were instrumental in the decision to not use Flexbooks in the future. All interviewed teachers much preferred Flexbooks over any other printed material they had used.

Research Question Five

The fifth research question for this study examined the agreement between teachers and principals in regards to Flexbooks.

Are there significant areas of agreement between principals and teachers in the advantages, disadvantages and implementation challenges of using Flexbooks?

This researcher sought to determine if there were areas of agreement between these two subject groups since each represented a different job classification and perspective. Regarding implementation challenges, both groups identified time as a significant challenge. Six of the interviewed subjects cited time as a challenge when creating a Flexbook, editing a Flexbook and plans for future revisions of the Flexbook. Principals reported time as a challenge from a professional development perspective

because of the needed resources to support teachers using Flexbooks or in training new teachers in new content areas.

In examining responses between principal and teacher groups regarding the advantages of using Flexbooks, both groups identified access as being a common advantage. Both groups reported the ability of students being able to access the Flexbooks in a variety of mediums like tablets, phones and printed books as an advantage. When the two groups' responses were compared about disadvantages of using Flexbooks in the classroom, both principals and three of the six teachers reported access as a disadvantage. It was surprising to have access being listed by both groups as an advantage and disadvantage to Flexbook use. It is however, prudent to the success of the Flexbook/OER movement in the country to determine appropriate technology supports and access for students in K-12 public institutions. It was evident in the reporting that teachers and principals saw the economic and educational benefit to using Flexbooks but the access issue became such a barrier that those interviewed for this study felt limited and restricted from its full potential.

LIMITATIONS

Limitations are those elements over which a researcher has limited or no control. Limitations for this study were as follows:

- Because of the limited number of teachers in the sample group, their responses may not represent all teachers who are implementing Flexbooks.

- Since the study was conducted in only one district, the information found here may not be applicable to other sites.
- Technology and Internet access issues reported in this study may not be applicable to other districts.
- Because of the limited number of principals in the sample group, their responses may not represent all principals who are implementing Flexbooks.
- Since subject areas of biology and algebra were the only content areas in this study, other content areas may not experience the lack of resources that were reported here.
- Because interviews were conducted in an open room with remote access, censoring of responses from the subjects was a concern.
- It was difficult to draw significant commonalities between teachers and principals because of the low number of subjects.
- One of the principals had no involvement in the Flexbook creation or implementation.

RECOMMENDATIONS FOR THE FIELD

Based upon the literature review and this research study, this researcher recommends that K-12 educational leaders consider the following four issues before implementing Flexbooks into their school systems.

- Ensure that students have access to a basic level of technology. Since access to technology was reported as a crucial aspect to the success of Flexbooks, it is in the best interest of school leaders to determine in advance, the purpose and use of the Flexbook and then compare that with the capabilities of the technology infrastructure. If it is determined that the infrastructure is inadequate for the intended purpose of the Flexbook, then enhancements would need to be made.
- Consider a district wide implementation plan. School leaders and officials need to determine how Flexbooks will be used in their systems. Based upon this study, an approach to include all staff across the district and appropriate training opportunities in the creation and use of Flexbooks would create the most investment and buy-in from staff and students. If a district-wide approach is not feasible, appropriate communication and rational would be suggested to maintain moral.
- Develop a timeline for creation, production and revisions of Flexbooks. This study found that teachers and principals expressed a desire to have a plan for Flexbook creation, production and future opportunities for revisions and edits. A thoughtfully created professional development would support this desire.
- Encourage remixing and redistributing of Flexbooks across districts. The quality and benefits of the Flexbook, or any digital content for that matter, become greater as more content experts add and remove material. By

creating and adding content to the Flexbook on a consistent basis the more current and applicable the material will be for today's learner.

These recommendations support the recommendations found in the Out of Print: Reimaging the K-12 Textbook in a Digital Age report by Fletcher et al. (2012). These recommendations include: 1) by the year 2017/2018, school districts should complete the transition from printed textbooks to digital textbooks; 2) develop a clear vision on how the digital textbook should be used, this would include revising policies and procedures related to instructional materials, assess technology infrastructure and support, and develop an implementation model for teacher preparation and support; and 3) ensure support and sustainability among stakeholders for digital and open content.

RECOMMENDATIONS FOR FUTURE RESEARCH

Based on information found in this study, this study researcher suggests future research in areas of:

- The academic impacts of Flexbooks on student learning and achievement. This type of research would help schools determine what difference Flexbooks would make to various types of learners, in what content areas and at what levels when considering Flexbook implementation. While there is newly developing research in this area, there could be specific areas of study on the remedial, gifted or non-traditional type of student.

- The economic impact of the development of Flexbooks, (or digital content) to school system budgets. While the production cost of an existing Flexbook is quite minimal, the cost to produce the Flexbook from inception to completion could be extensive. Many of the teachers in this study were compensated for this time. Further research would provide educators a comparison of the cost savings of using digital Flexbooks and teacher time for training and creation.
- Teacher technology competency and the methods of use of digital content in the classroom. Since the use of Flexbooks or digital content requires a certain level of technology competency, further study into various levels of technology proficient teachers, would provide education leaders information about how these teachers are using this technology to enhance student learning.
- A study of student perceptions of Flexbooks. In the review of literature, higher education students reported that reading digital content was not as easy as reading printed text and some suggest that comprehension of material being read from an electronic device is not as effective as printed words on paper (McCarthy, 2011). In contrary studies however, students with learning difficulties actually perform better with interactive technology devices than paper textbooks (Luik & Mikk, 2008). A future study asking students about the advantages and disadvantages of Flexbook use could provide good information for educators.

SUMMARY

Education is rapidly changing and reform efforts are abundant (Butcher et al., 2011). Therefore, OER has gained attention as a potential lower cost solution to the issues of textbook selection, adoption and implementation. (Odden et al., 2007). Economic benefits of using Flexbooks, as reported by Wiley et al. (2012) could address budget issues school districts face when purchasing textbooks. Flexbooks, when created in a digital format, decrease the expense associated with purchasing traditional textbooks. There is extensive evidence that the cost benefit to using open textbooks is a quite a savings however, there is little information as to why K-12 institutions are not rapidly embracing this new found opportunity. This researcher investigated if there were other reasons subjects reported to pursue the use of Flexbooks other than economic benefit. However, little study has been conducted on the advantages, disadvantages and implementation strategies of OER. This study examined the challenges around the implementation and usage of OER at the K-12 level by interviewing teachers and principals that have begun using open textbooks, now commonly called Flexbooks, into their core high school courses of algebra and biology. The identified themes of this study are reported in the following three categories; implementation challenges, advantages to Flexbook use in the classroom and disadvantages to Flexbook use in the classroom. The reported challenges to Flexbook implementation are: time, Internet access, adequate resources, technology infrastructure and printing of Flexbooks. The reported advantages to the use of Flexbooks in the classroom are: customization, alignment to curriculum, cost and

Internet access. The reported disadvantages to the use of Flexbooks in the classroom are: time and Internet access. The results of this study provide a broader and deeper understanding to educational leaders who are considering implementing customized digital curriculum, like Flexbooks into their respective education systems. Educational leaders would be advised to observe systems that are currently using Flexbooks before implementation would take place. Policy makers, school boards and elected officials would be advised to review statutory language related to curriculum adoption and resource allocation to include support for technology enhancements and professional development in school systems looking to consider customized digital curriculum. The limitations of the study are numerous being that this topic is so new. Further research is highly encouraged in areas of economic impact to school systems implementing Flexbooks or another form of customized curriculum, academic impacts to students using customized curriculum and effective strategies to motivate educational leaders towards innovative instructional delivery practices.

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APPENDICIES

APPENDIX A

Qualitative Interview Informed Consent

A STUDY OF USAGE AND IMPLEMENTATION OF FLEXBOOKS AMONG HIGH SCHOOL ALGEBRA AND BIOLOGY TEACHERS AND PRINCIPALS IN ARIZONA

Informed Consent

You are invited to participate in a research study of the implementation and usage of Flexbooks in Algebra and Biology classes. You were selected as a possible participant because you have had involvement in the development of Flexbooks or are currently using them in your classrooms. This research project is being conducted by Shawn Hoffman-Bram, a doctoral student in the Educational Administration and Leadership Department at St Cloud State University.

Background Information and Purpose
The purpose of this study is to discover the challenges regarding the implementation and usage of Flexbooks (OERs) in high school biology and algebra courses. The results of this study will be used to assist educational leaders in the implementation of Flexbooks into their respective educational systems.

Procedures
If you decide to participate, you will be asked a series of 11 questions in a face to face interview about the implementation challenges regarding Flexbooks and the advantages and disadvantages to their use.

Risks
There will be no risks, discomforts or inconvenience as a participant in this study.

Benefits
There are no monetary benefits or compensation as a result of participation in this study.

Confidentiality
Information obtained in connection with this study is confidential. Although the names of individual subjects will be kept confidential, there is a possibility that you may be identifiable by your comments in the published research. Information obtained in connection with this study is confidential and will be reported as aggregated (group) results. To prevent identification of research subjects, data will be presented in aggregate form with no more than 1 – 2 descriptors presented together.

Research Results
At your request, I am happy to provide a summary of the research results when the study is completed.

Contact Information
If you have questions right now, please ask.

1. Researcher - Shawn Hoffman-Bram
   1805 Trentwood Dr,
   Sartell, MN 56377
   (320)224-1936 or smhoffmanbram@stcloudstate.edu.

2. Advisor – Dr. John Eller
   Educational Leadership And Higher Education
   Education Building B127
   Saint Cloud State University
   720 Fourth Avenue South
   Saint Cloud, Minnesota 56301-4498
   (320) 308-4272 or jfeller@stcloudstate.edu

You will be given a copy of this form for your records.

Voluntary Participation/Withdrawal
Participation is voluntary. Your decision whether or not to participate will not affect your current or future relations with St Cloud State University, the researcher, or Wickenburg Unified School District. If you decide to participate, you are free to withdraw at any time without penalty.

Acceptance to Participate
Your signature indicates that you are at least 18 years of age, you have read the information provided above, and you have consent to participate. You may withdraw from the study at any time without penalty after signing this form.

_____ _____

Signature Date

APPENDIX B

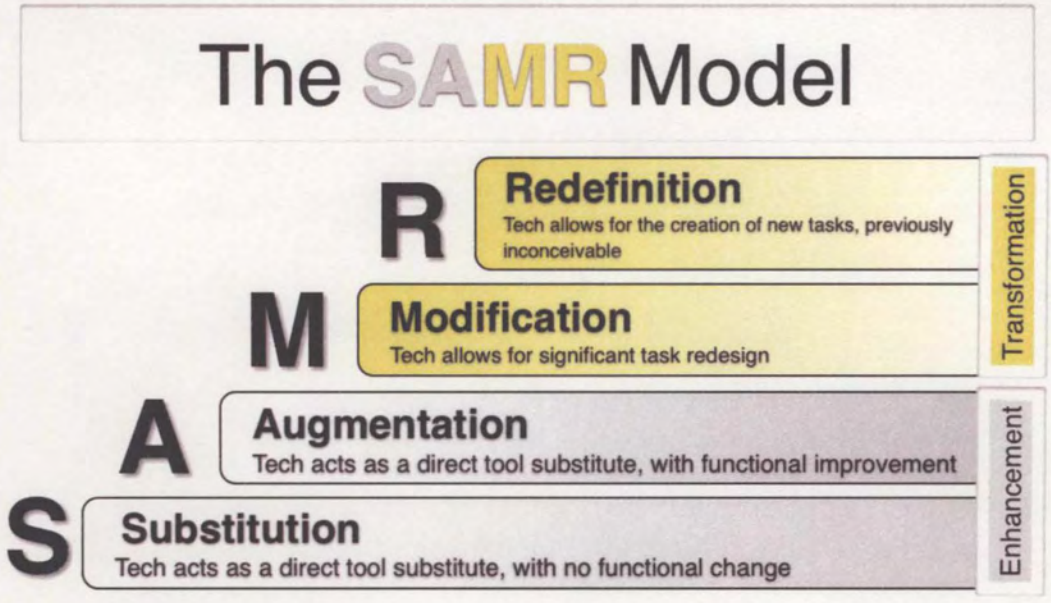
Qualitative Interview Questions

Interview Questions:

1. Are you a teacher or administrator?
2. How long have you been in your current position?
3. Referencing the SAMR model where would you rate your level of competence with technology?
4. What was the most compelling reason for you to begin using Flexbooks?
5. What type of training or professional development did you receive prior to using Flexbooks?
6. What was your level of involvement in authoring or editing the content of the Flexbook?
7. In your opinion, what were the top three challenges in implementing Flexbooks into your school/subject area?
8. In your opinion, what would you say are the advantages of using Flexbooks in the classroom?
9. In your opinion, what would you say are the disadvantages of using Flexbooks in the classroom?
10. What suggestions do you have for other educators in your similar position when considering implementing Flexbooks?
11. Do you have anything else you would like to add regarding the implementation or usage of Flexbooks?

APPENDIX C

Qualitative Interview SAMR Model Handout


The SAMR Model
R
Redefinition
Tech allows for the creation of new tasks, previously inconceivable
M
Modification
Tech allows for significant task redesign
A
Augmentation
Tech acts as a direct tool substitute, with functional improvement
S
Substitution
Tech acts as a direct tool substitute, with no functional change
Transformation
Enhancement